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# **OBSTETRICS and GYNAECOLOGY *in 2 Books***

Book 1  
**OBSTETRICS**



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МЕДУНІВЕРСИТЕТ**





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# *Medical Student's Library*

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***Valery ZAPOROZHAN,  
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**V. M. Zaporozhan**

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**OBSTETRICS**  
**and GYNAECOLOGY**  
*in 2 Books*

Book 1  
**OBSTETRICS**

*Recommended*

*by the Ministry of Health of Ukraine as a textbook  
for English-speaking students of higher medical  
educational establishments  
of the IV level of accreditation*



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The textbook "Obstetrics and Gynaecology" consists of two books "Obstetrics" and "Gynaecology". The problems of modern physiological and pathological obstetrics and partially perinatology are highlighted in the first book.

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## PREFACE

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Obstetrics and gynaecology is the only medical speciality which has experienced the deepest changes during last 20 years. It is connected with the progress and mutual integration of the classical and newest branches of medical and allied sciences. Humanization of medicine, adoption of the new modern diagnostic technologies for the estimation of intrauterine fetus development has predetermined the development of perinatal era in obstetrics, formation of the prophylactic trend for the decrease in both maternal and fetal morbidity. Rapid development of diagnostic and surgical endoscopy has favoured adoption of minimally invasive surgery methods into gynaecology which should necessarily be known.

Obstetrics and gynaecology is one of the most complicated medical specialties, requiring from a doctor clinical thinking, precise knowledge and practical skills, intuition, and resolution when accepting the only right decision which is to save mother's and child's life.

Our goal was to create the manual integrating the subject as a whole and allows a student to determine the most important moments in pregnancy rational management, diagnosis of obstetrical pathology and

treatment of patients, and to find one's bearing in the heavy stream of medical information more available now. It goes without saying that a thorough study of a subject is impossible without daily practical work with patients under the leadership of doctors and teachers, deep mastering of lecture and learning material, constant work with monographs, and periodical special editions.

The manual is written according to the acting syllabi of the Ministry of Public Health of Ukraine for the students of the medical institutions of higher learning. It covers a wide range of the questions of physiologic and pathological obstetrics, perinatology. For the first time the problems of clinical physiology of the reproductive system, psychosomatic diagnosis and therapy are included in the manual. The English edition of the textbook is supplemented by tests, prepared by professor V. P. Mishchenko, in order to help students grasp the contents.

We hope that this manual will be useful not only for the students and young doctors but for experienced specialists and obstetricians-gynaecologists.

All the notions and wishes of the readers the Author will accept with gratitude.

## *Introduction*

# **SUBJECT OF OBSTETRICS AND GYNAECOLOGY. MAIN STAGES OF OBSTETRICS, GYNAECOLOGY AND PERINATOLOGY DEVELOPMENT**

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The word "Obstetrics" is derived from French word "accoucher" meaning "to help at labour".

Obstetrics is the most ancient field of medicine dealing with the process of conception, pregnancy, labour and the postnatal period as well as methods of assistance to a woman during pregnancy, labour and postnatal period.

The word "gynaecology" is derived from Greek words "gyne-" meaning "a female" and "logos" meaning "a science". Gynaecology deals with anatomic and physiologic peculiarities of the female organism, diseases of the female genital tract, methods of their prophylaxis, diagnosis and treatment. Modern obstetrics and gynaecology represent a unified clinical subject. In the last few decades obstetrics development has favoured the separation in the limits of this classical science a new trend of perinatology (derived from Greek prefix "peri-" meaning "near" and Latin word "natus" meaning "a birth") a science dealing with the fetus and newborn infant development and care.

The development of obstetrics and gynaecology is a component part of the historic route of acquiring and improving medical knowledge. The first information about gynaecology is found in the manuscripts of Ancient India, Egypt and Greece (IV cen. B. C.). Doctors of Ancient Egypt, for example, could distinguish symptoms of uterine bleedings, inflammatory diseases of the genitals, knew methods of women treatment, diagnosed mammary gland diseases, used oral contraceptives and determined terms of pregnancy. Midwives handled the delivery under domestic conditions. There is information about anesthesia and analgesia, and the performing of caesarean sections. In Mesopotamia they used silver for the diseases of genitals and doctors rendered aid at labour. In Ancient Iran doctors advocated the female bodies healthy physical condition, paid great attention to her diet, family life problems, warned about alcohol harmful influence and developed the foundations of medical ethics and self-improvement.

The Ancient Indian culture investigated a yoga system which has retained its meaning to the present day.

In Chinese medicine they widely used acupuncture. In Ancient Thibetian medical literature they de-

scribed methods of treatment for several female genital tract diseases.

Doctors of Central America conducted labour at genucubital position of a woman in childbirth, stimulated labour and lactation, gave manual aid at labour's handling and made embryotomy.

The medicine of the Ancient Greeks laid the foundations for a unity of empiric and phylosophic trends which in the XVII–XVIII centuries transformed into main principle of modern medicine, that of the unity of theory and practice. Medical knowledge of the Ancient Greeks dates from the II century B. C. and are reflected most in the myths (cesarean section on the cadavers). They taught obstetrics first in Arthemida's temples and in the VI–V centuries B. C. the first family medical schools appeared.

The alumnus of the Kossian medical was world-widely known Hippocrates (460–377 B. C.) proclaimed the main principle of a medical persons' activity, "Do not do harm!". The generalized points based on the medical knowledge of the Ancient East are reflected in his creative works. Gynaecologic school was developed by the representatives of the Knidian school who for example could perform vaginal examinations, estimate the state of the cervix and conduct intrauterine manipulations. Demetrius (representative of the Alexandrian school, III century B. C.) was the first who had described the fetus cephalic (head) presentation and determined it to be a physiologic one.

The alumni of the Greek medical schools were such famous doctors as Asklepiades, Galen, Soranus. The founder of obstetrics and pediatrics they rightfully believe to be Soranus from Ephes who taught midwives, wrote a practical manual on obstetrics and developed principles of obstetrical deontology. He described in details the structure of the female genitals, placenta and fetal membrane, put into practice methods of the fetus podalic version and insisted on inadmissibility of rough and forcible manipulations with the fetus. Traditions of the Ancient Greek medical science were continued by ancient Rome medicine and it achieved high development in the field of obstetrics. The state controlled the process of obstet-



rical aid, in particular, for a newborn infant life saving they practiced an obligatory caesarean section in the case of a woman's death during pregnancy.

At the II–III centuries B. C. during the decline of ancient Rome the universities where the future doctors had been trained, began their functioning. In Vizantia, Armenia, Arabian and European countries the first medical in-patient units had been established.

Islam, as it is known, prohibited to touch the body of a dead human being, that is why the notions about anatomy, physiology and a human being's general pathology were based only upon Halen's scientific views. But the Arabian medicine had enriched the world culture with new scientific observations, methods of therapy, diagnostic techniques. So, they had worked out recommendations on pregnant women hygiene, care and feeding of newborn infants.

Widely known surgeon of the Arabian East *Abulkasim* (936–1013) described the picture of extrauterine pregnancy and the Arabian doctor Ibn Zuhr (1092–1162) published the prescriptions of contraceptives. In the development of medicine in The Middle Asia during feudalism a leading role was played by Ibn Sina (980–1037) and his famous "Canon of medical science."

European wars in the Middle Ages promoted the development of surgery. The most prominent surgeon of that time was Ambruse Paré (1509–1590). He originated from a family of barbers who served in the court of the king of France. After a prolong period of oblivion he had revived the practice of caesarean section performance, and the fetus podalic version. The first doctor who had performed caesarean section on a live woman is considered to be German I. Trautmann (1610).

A valuable contribution to the development of anatomy made Andreas Vesalius (1514–1564) who had described in details the structure of a human being's organs in connection with their functions, predicting the discovery of greater and lesser (pulmonary) circulation.

The great *Leonardo da Vinci* (1452–1519) much more earlier than Andreas Vesalius described the structure of the skeleton, created muscles classification, described and drew a humans inner organs, including the genitals and Fallopian tubes (earlier than G. Fallopio did). Round uterine ligaments, fetus in a womb, placenta, though his drawings had been lost. A. Vesalius' contemporary was *G. Fallopio* (1523–1562), who headed the school of anatomy, surgery and obstetrics. He studied the Fallopian tubes structure and functions, development of the human embryo and its vascular system.

G. Fallopio's pupil had investigated placental functions, described embryonic duct (Aranzi duct), G. Fallopio's other pupil, L. Batallo had described the duct connecting artery pulmonalis with aortic arch (arcus aortae) and supporting the fetal intrauterine circulation. The representative of G. Aranzi's school,

H. Fabricius, had studied in detail and then described the fetus location in the uterus during pregnancy. W. Harvey and M. Malpighi made a valuable contribution to the development of teaching of circulation.

W. Harvey's follower, R. Graaf had described in details the structure and function of the female genitals.

Thus the development of obstetrics as a science began around the XVIII century following the rapid development of surgery. Professionally qualified doctors-obstetricians, instead of midwives, began to give aid to women in childbirth. On the boundary of the XVII–XVIII centuries a Dutch doctor H. Deventer (1651–1724) studied the bony pelvis, described the flat pelvis and the pelvis justo minor. His contemporary French doctor F. Moriso, the author of a famous academic work "About the disease of pregnant women and women in childbirth", offered his own method of the fetus head turning under its pelvic presentation. This method is used to the present day. Jean Lui Bodelock, a French doctor and scholar famous for his works about the female pelvis for the first time had introduced such notions as a large and lesser pelvis and used external pelvimetry (Bodelock's conjugate) which kept its meaning in our time, too.

In the XIX century the modern design of obstetrical forceps was formed. One suppose that primitive obstetrical forceps were used in ancient times. It is also considered as well that an Englishman P. Chamberlen investigated the first forceps at the beginning of the XVII century, but he kept his investigation secret for commercial reasons in connection with it they could find his forceps only in 1813. Description of the forceps of Dutch doctor J. Palpheine in the manual on surgery by L. Geister promoted their rapid reduction to practice and constant improvement. Thus, the new forceps models of A. Levret (France), F. Naegele (Germany), J. L. Simpson (England) appeared. Later on modifications were offered by N. N. Fenomenov (Russia) and I. P. Lazarevich (the Kiev school). At this particular period the first learned societies of obstetricians and gynaecologists (the first one appeared in England in 1852) and other medical specialists were created.

As a whole the XIX century was characterized by a considerable development of clinical medicine, assimilation of the newest achievements of fundamental knowledge in physiology, pathological anatomy, microbiology and immunology. L. Pasteur's prominent academic works, discovery of analgesia remedies (narcosis), asepsis and antisepsis (I. Zemelveise, O. Holmes, Jh. Lister, N. I. Pirogov, N. V. Sklifosovsky, K. K. Reuyer) triggered off the development of surgery, gynaecology and operative obstetrics.

German doctors had contributed greatly to the teaching of labour biomechanism and the female pelvis from the obstetrical point of view. In 1839 F. Naegele described an obliquely contracted pelvis (Naegele's pelvis) one of the variants of anterior pa-

rietal presentation (anterior asynclitism), *H. Robert* described a dollichopellic pelvis and *H. Kiplan* — a spondylitic one.

At the end of the XIX century a French obstetrician *A. Pinar* systematized methods of an external examination of a pregnant woman. Now the main and obligatory method of the fetus state estimation is auscultation of its heart sounds. A frenchman *K. Krede* offered the technique of afterbirth derivation through the abdominal wall in the case of its delay in the uterine cavity.

In the XIX century due to the wide introduction of antiseptics, asepsis, anesthesia as well as the use of haemotransfusion and antibiotics maternal morbidity and mortality rates from bleedings and infectious complications were significantly reduced. Also, due to the expansion of indications to caesarean section performance with taking into account the fetal interests and limitations as to application of “higher forceps”, version, fetus-destroying operations, the newborn infants morbidity and mortality rates had been decreased. New methods of medical aid rendering in pelvic presentation during labour had been offered by *M. Tsovianov* (Russia), *E. Bracht* (Germany). In the 50s a Swedish scientist *T. Malmstrom* and Yugoslavian gynaecologist *B. Finderle* used a vacuum extractor instead of obstetrical forceps.

Scientific and technical progress in the second half of the XIX century promoted not only the revision of many classical positions in obstetrics but had a stimulating influence on the development of perinatology, new reproductive technologies and endoscopic surgery in gynaecology.

The historical development of obstetrics was extremely hard and thorny in our country. For many centuries obstetrics was much more behind other fields of medicine in this country. Till the XVIII century there were just few doctors dealing with obstetrical aid in Ukraine and Russia. Midwives, barbers, healers and bone-setters gave medical aid during labour and delivery.

At the end of the XVI — beginning of the XVII century foreign doctors dwelling in Russia had to teach the local natives medical profession. Thus at the end of the XVI century *Ivan IV* approved *Aptekarsky Ukase* (Chemist's edict). The end of the XVII century — beginning of the XVIII was marked by *Peter the Great's* progressive reforms which favoured medicine and health care development. At that time in Russia the centres of obstetrics and gynaecology were Moscow and St. Petersburg. It was St. Petersburg where in 1724 the Academy of Sciences was founded and in 1755 the Moscow University was opened, where in 1764 the medical faculty was organized.

Maternity hospitals appeared in Russia only in the second half of the XVIII century. In 1754 *Katherine II* issued an edict directed to organize pursuit of midwives and their teaching. But only ten years later (1764) in Moscow due to persistent requests of some

progressive people the first maternity hospital was opened. In Russia the doctor awarded the title of professor in obstetrics and gynaecology was a widely known scholar, person of encyclopedic learning, medical practitioner and prominent educational specialist *Nestor M. Ambodick-Maximovich*. He was one of the first teachers of obstetrics in this country, he wrote the textbook “The art of midwifery or the Science about womanish pursuit”, investigated and made obstetrical fantom, which was used during teaching and near a pregnant woman bed, worked out theoretical principles and obstetrical forceps application technique; promoted into practice techniques of digital examination and digital opening of cervix; vaginal vaults tamponada. Besides, *M. M. Ambodick-Maximovich* advocated rational conservatism in labour management to avoid unnecessary and rash surgical interventions.

In 1798 in St. Petersburg and Moscow the first higher military medical educational establishments, medical-and-surgical academies were created. There worked a real Pleiad of famous scholars and teachers. *Wilhelm M. Richter* headed the Obstetrics and Gynaecology Department in the medical university for 30 years. His manual contains strict indications for surgical interventions in obstetrical practice. *W. M. Richter* developed and strengthened secondary obstetrical education and brought up medical personnel. He was the first who had determined the importance of the ratio between the fetus head and a woman in labour pelvis in the mechanism of labour, clarified the causes of its disturbance and origins of postpartum haemorrhages. The head of a learned society in physics and medicine, *W. M. Richter* actively studied the problems of prophylaxis, wrote a great number of reference books on the history of medicine in Russia, edited a medical journal, and supported gifted student youth.

The first department of obstetrics in St. Petersburg military medical academy was headed by the famous Russian obstetrician, gynaecologist and pediatrician *Stepan F. Khotovitsky* in 1832. He came out with an idea of separation of obstetrics and gynaecology from pediatrics in Russia. He was the first who had offered human blood transfusion according to a large loss of blood by women in labour; advocated rational conservatism in labour management, and was an opponent of forceps application on a mobile fetus head. *S. F. Khotovytsky* was an initiator of publishing the St. Petersburg military medical journal and headed its editorial board for many years.

As from 1848 this department was headed by *N. I. Pirogov's* pupil *Alexander A. Kiter*, who in 1846 was the first in Russia (25 years after the first operation of such a type in the world) to perform a successful vaginal uterus extirpation. *N. M. Ambodick-Maximovich* is considered to be the father of home obstetrics. *A. Kiter*, with good reason should, be called the father of home gynaecology. His “Manual to learn-

ing of the female disease”, the first textbook in gynaecology in Russia was very popular due to an intelligible account of operation techniques. A. A. Kiter’s hospital was a model one. The prominent obstetricians A. Ya. Krassovsky and V. M. Florinsky were his school alumni.

As from 1858 the department of obstetrics of the Medical Academy in St. Petersburg was headed by the brilliant surgeon Anton Ya. Krassovsky (1823–1898), N. I. Pirogov’s pupil. In 1885 he published “Manual on operative obstetrics”. It became a classical work. Being an adherent of “visual” labour, A. Ya. Krassovsky had distinguished in this process 5 moments, movements done by fetus presenting part. These moments are described in modern textbooks, too. In 1862 he was the first in Russia to perform ovariectomy with a successful outcome and in 1868 he published monograph “About ovariectomy”. Among his works there is a three-volume edition “A course of practical obstetrics” (1865–1879). A. Ya. Krassovsky was one of the organizers of a joint Moscow—St. Petersburg doctors’ society. Its first congress was summoned by his initiative in 1888. In 1886 he organized the publication of the journal “Obstetrics and female diseases” which now, after a long break, is being published again in St. Petersburg (the Military Medical Academy).

Vladimir M. Florinsky graduated from the Medical and Surgical Academy with honours in 1858. His thesis was devoted to perineal ruptures during labour. His textbook “The course of obstetrics and female diseases” was a reference for the specialists of that time.

In St. Petersburg in 1858 Martin I. Gorwits’ (1837–1883) monograph “Experience of miscarriages study” was published. In this work he described an early sign of pregnancy (softening of the low uterine segment) which a little later was substantiated and offered to use by Hegar (Gorwits—Hegar’s symptom). As from 1875, M. I. Gorwits delivered the course of obstetrics and female diseases in the Medical Surgical Academy. His monograph “Manual on pathology and therapy of the female genital sphere” with the author’s drawings to each part was one of the first investigations on gynaecology at that time. From M. I. Gorwits school originated the famous Russian obstetrician N. N. Fenomenov. In XIX century home learning schools were actively formed. Considerable learning centres of that time were medical faculties of Derpt, Vilno and later on those of Kazan, Kiev, Kharkov and Novorussian (Odessa) universities.

The department of obstetrics, female and pediatric disease in Kiev at the university of St. Vladimir was founded in 1841. The professor of this department, Alexander P. Matveyev (1816–1882) was a prominent organizer of practical obstetrics, a talented teacher and one of the leaders of obstetrical research work in the Kiev province. In his “Manual in obstetrics” almost fully for that time the routes of decision

of the most complicated clinical cases and their differential diagnosis were expounded. A. P. Matveyev wrote “Manual in midwifery pursuit” which had been reedited four times and a number of monographs devoted to the postnatal period and operative treatment of the uterus inversion. He was the first to suggest the blennorrhoea of newborn infants prophylaxis with 2% solution of silver nitrate into a conjunctival sac.

A. Ya. Krassovsky pupil, professor G. E. Rein headed the above mentioned department from 1883 to 1900, and in 1887 he founded the first learned society of obstetricians and gynaecologists in Kiev. He was one of the organizers of the Pirogov doctors congress (1903) devoted to the problems of aid rendering at labour.

Later on, in 1900–1903 the department was headed by professor Alexander A. Muratov. His research was devoted to the problems of female genital blood supply, extrauterine pregnancy, and the development of indications of surgical treatment of neglected complicated abortions. Professor G. G. Bryuno, who had graduated from the Kiev university and headed the department from 1919 performed Ukraine’s first expanded uterus extirpation using Wertheim’s method.

One of the most weighty contribution to the development of home obstetrics and gynaecology belongs to Ivan P. Lazarevich (1829–1902). After his graduation from the Kiev university in 1853 I. P. Lazarevich worked professor A. P. Matveyev’s assistant. In 1862 he was elected professor for the department of obstetrics, female and pediatric diseases of the Kharkov University where he had been working for about 25 years.

I. P. Lazarevich advocated the complete independence of obstetrics. Well-deserved fame was brought to him by his academic works “Activity of the female”, “Examination of the belly of a pregnant woman”, “Investigations in the field of differentiated diagnosis of pregnancy and tumors”, an illustrated textbook “The course of obstetrics” and also “History of obstetrics”, works about labour act physiology, operative obstetrics, and labour influence on the female organism.

An honourable member of many foreign learned societies, I. P. Lazarevich was a brilliant speaker and lecturer and more than once he addressed the international congresses with the papers. Besides he was a talented investigator, in 1849 he developed straight (without pelvic curve) forceps (Lazarevich’s forceps) and proved their merits over crossed ones. Later on the idea of the straight forceps was used by German scholar Kielland (Kielland’s forceps).

Due to his talent and energy, under the department headed by I. P. Lazarevich the institution for midwives training was organized. Midwives in the South of Ukraine were trained there.

I. P. Lazarevich first employed a number of new operations and developed indications and contraindications for their performance. In 1867 the Atlas of obstetrical and gynaecologic tools investigated by



I. P. Lazarevich was published. After I. P. Lazarevich the department was headed by the alumnus of the Kiev university and A. Ya. Krassovsky's school, Nikolay F. Tolochinov (1840–1906). His work was devoted to the problems of asepsis and antisepsis in obstetrics. He was the first to offer the uterus tamponing in the case of its hypotonia, later on described by J. Dürrssen. N. F. Tolochinov is the author of a "Textbook on the female diseases", a "Textbook in obstetrics", as well as a "Textbook on midwifian pursuit".

A great achievement of science was the appearance of "Normal and pathological anatomy of a woman" by *Kronid F. Slaviansky* (1847–1898), A. Ya. Krassovsky's pupil. He has published more than 50 valuable academic works, including a two-volume textbook. He also performed the first amputation of the vaginal part of the neck of the uterus. The scholar's school and his own service was a detailed exploration of pathohistologic and topographic and anatomic features of a process for which he put paramount importance. He conducted academic discussions with his staff discussing urgent theoretical and practical problems of gynaecology. On his initiative in 1881 they took a decision of a periodical convocation of doctor's congresses. At the age of 24 K. F. Slaviansky became privat-docent, at 26 he became a member of 28 Russian and foreign societies, and at the age of 29 he became a professor.

The representatives of his school were the famous obstetricians A. I. Lebedev, N. N. Fenomenov, D. O. Ott, and others.

An eminent representative of the Moscow obstetrical school was *Vladimir F. Snegiryov* (1847–1916). When writing the doctoral thesis "To the problem of determination and treatment of extrauterine bleeding" the scholar showed himself to be a serious clinician and researcher. His basis work "Uterine bleedings" (1884) had been re-published more than once and translated into French. In 1898 V. F. Snegiryov on his own savings organized the institution for advanced training of doctors of the outlying districts. He was the first to offer to do an artificial vagina of rectum, developed the operation of colpexy for pelvic bottom prolapse correction and anchoring, improved ovariectomy technique, uterus complete disposal, and offered a new method of a. uterina ligation. His considerable contribution to science is a book "Anatomy of pelvic organs". V. F. Snegiryov expounded in detail the clinical features of benign and malignant formations. He was the founder of the first in this country Society for cancer struggle and a number of radiotherapeutic societies.

Another representative of the Moscow school was professor *Nikolay I. Pobedinsky* (1861–1923), the author of a widely known textbook in obstetrics. He developed a surgical trend in obstetrics, studied the problems of caesarean section, contracted pelvis, combination of pregnancy and cancer, gestoses and

osteomalacia. Under his leadership more than 100 academic works had been written.

Alexey I. Lebedev (1850–1923), professor of gynaecology of the Military medical academy in St. Petersburg, was the first in Russia to expand indications to caesarean section, point out the remote consequences of this operation, and advocated physical methods in the conservative treatment of the female genital tract diseases (vaginal shower). He wrote the monograph "To the teaching about excessive aggragation of amniotic fluid" and a number of academic works on operative gynaecology. An honourable professor of the First Moscow State University, chairman of the obstetrical and gynaecologic society, founder and the editor of the journal "Gynaecology and obstetrics" *Alexander P. Goobarev* (1855–1921) was a brilliant specialist in the field of descriptive anatomy of the female genitals.

He is the author of the monographs "Surgical anatomy of the abdominal cavity" and "Operative gynaecology and principles of abdominal surgery".

In 1797 the first Russian Institute of Midwives was opened in St. Petersburg. In 1895 it became the Imperial Clinical Institution of Midwives. At the present time it is the Research Institute for obstetrics and Gynaecology named after D. O. Ott under the Russian Academy of Medicine. Professor I. F. Balandin was its first director. As from 1893 *Dmitry O. Ott* (1855–1929) was at the head of this Institute. As the author of the famous book "Operative gynaecology" he offered medial perineotomy, a new method of perineum ruptures recovery, original diagnostic method of Fallopian tube permeability determination, first performed colposcopy, clarified indications for caesarean section and investigated a number of instruments and devices. D. O. Ott was an organizer of a travelling obstetrical polyclinics rendering medical aid for the patients of scanty means, a chairman of obstetrical and gynaecologic society of St. Petersburg and one of the organizers of the all-union society of obstetricians and gynaecologists. Together with the Imperial Institute he simultaneously headed the Female Medical Institute and managed to win state subsidies for the future doctors trained there and concession for them equal with male-doctors. D. O. Ott's merit is the creation of a learned school of his own and a perfect system of midwives initial and advanced training.

One of D. O. Ott's closest collaborators was an alumnus of the Military Medical Academy *Vasily V. Stroganov* (1857–1938), who started to work at the capacity of obstetrician-gynaecologist in Chernigov province. After getting a doctoral degree in medicine he became a professor of the Imperial Institute in St. Petersburg. V. V. Stroganov's scheme of eclampsia treatment brought him word-wide fame. He dealt with the problems of placenta previa and hysterorrhexis. His book "Problem exercises for obstetrics" and the monograph "About the most important complications of pregnancy and labour" were very popular.

A talented teacher, scholar and practitioner *George A. Solovyov* (1856–1932) was engaged in eclampsia's problem, uncontrollable vomiting of pregnant women. He has offered "the capral index" for the redetermination of the female pelvis capacity which is used in practical obstetrics up till now.

The graduates of the St. Petersburg female medical institute (now the St. Petersburg State Medical university named after I. P. Pavlov) were the prominent scholars, practitioners and organizers of medical education such as N. N. Fenomenov, P. T. Sadovsky, L. A. Krivsky, K. K. Skrobansky, L. L. Okinchits, I. I. Yakovlev, I. F. Zhordania.

*Nikolay N. Fenomenov's* (1855–1918) doctoral thesis "To the teaching about kyphotic pelvis and symphysis rupture in labour" brought him a wide fame. In 1885 he headed the department of obstetrics and gynaecology in the Kazan university, then came back to St. Petersburg. As a director of the Nadezhdensky (now named after V. F. Snegiryov) obstetrical establishment, he worked at the department of obstetrics and female diseases of the Female Medical Institute. His "Operative obstetrics" published in 1892 has remained a classical manual up to the present. N. N. Fenomenov has exhaustively substantiated the indications, conditions and described the performance technique of practically all obstetrical operations, offered the method of the presenting fetus head perforation, decapitation, cleidotomy, improved obstetrical instruments and persistently adopted asepsis and antisepsis methods into everyday practice.

*Petr T. Sadovsky* (1863–1912) was famous due to his works "Teaching about epithelium role in the pathogenesis of Fallopian tubes retention cysts under their healing" and "The ways of microbes spreading from the cavity of the uterus". He described the technique of uterus disposal through the vagina and developed recommendations for the prophylaxis of uterus wounding at laparotomy and their reconstruction.

Professor of obstetrics and female diseases Leonid A. Krivsky worked out the problem of the repeated caesarean section, operative gynaecology, biomechanism of labour in case of abnormal fetus head presentation. L. A. Krivsky enlisted the best researchers of Russia to work on the "Manual in the female diseases" which was edited by him.

Professor D. O. Ott's school had gone through a prominent clinician *Rene V. Kiparsky* (1867–1938), co-author of the famous "Operative Gynaecology" and creator of a number of operations of the uterus wrong position correction and a brilliant master of vaginal operations. He was one of the first who had transplanted an ovary into the cavity of the uterus under the female infertility. He also improved the operative technique of the Fallopian tubes obstruction disposal. R. V. Kiparsky was an unsurpassed specialist of fistulous surgery. He was the first in this country to begin to use the urine bladder sphincteroplasty and adopt an artificial constrictor. He achieved

opening a special unit dealing with obstetrical and gynaecologic urology at his institute.

Academician *Konstantin K. Skrobansky* (1874–1947), an alumnus of the Military medical Academy in St. Petersburg created an original school of obstetricians and gynaecologists. He is the author of nearly 200 academic works and a textbook "Obstetrics and gynaecology". He headed up the performance of more than 50 theses. In the work "Experimental development of eclampsia pathogenesis" K. K. Skrobansky determined the role of placental tissue and producing by it substances in the development of late gestosis. He developed indications to surgical intervention in obstetrics and gynaecology, including cancer patients.

*Ludwig L. Okinchits* (1874–1941) received wide fame due to his academic works, e. g. a two-volume text-book in operative gynaecology and the manuals "Gynaecologic clinic", "To the problem of interaction of some endocrine glands". His monograph "Age-related changes of the hymen" played a significant role in the decision of disputable questions of medico-legal science.

One of N. N. Fenomenov's best pupils was *German G. Genter* (1881–1937), famous for his works "Premature placental expulsion", "Methods of examination in gynaecology" as well as the works devoted to the mechanism of labour and genital prolapse. The early signs of pregnancy and parameters, Genter's signs, are included in the modern text- and reference books in obstetrics, too. He wrote a "Manual in obstetrics", intended for practical doctors and students.

One of the most talented pupils of D. O. Ott, who got the nickname "Little Ott" was *Michail V. Yolkin* (1884–1940). Only the enumeration of his works in the main problems of obstetrics and gynaecology proves of the author's extreme erudition. Among them are "About regional anaesthesia in gynaecologic operations", "Operative treatment of uterine retroflexions in the author's method", "New methods of uterine extirpation at the condition of a complete prolapse in old women", "Modern views on eclampsia and methods of its treatment", "To the point of insufficiency of pelvis fundus", "Methods of postnatal infection prophylaxis", "Honorrrhea in women and its treatment", "Physical culture and menstrual function", "Malignant neoplasms of ovaries", "Caesarean section in the therapy of contracted pelvis", etc.

*I. I. Yakovlev* (1896–1968) was the representative of D. O. Ott's school. He developed a new methodical approach to the exploration of physiology and pathology of pregnancy and labour. He investigated the brain functions of pregnant women, offered physiologic methods of anaesthesia and analgesia, developed further knowledge of labour biomechanism and worked out classification of labour activity anomalies.

A powerful school of obstetricians and gynaecologists was created in Kazan. Its founder, *Victorin S. Groozdyev* (1866–1938) graduated from the St. Pe-

tersburg Military Medical Academy, he was A. I. Lebedev's pupil and one of the first oncogynaecologists in Russia. While a student, B. S. Groozdyev was awarded twice for his works. His works "About physiology of the female genital sphaera", "About uterine cancer" brought him well-deserved fame. A characteristic feature of V. S. Groozdyev research and practical activity as well as the pupils of his school was a tight relation between clinical and morphological sciences. He headed the department for 30 years. For almost 20 years he had been the editor of "Kazan Medical Journal". Popularity of this journal, which united the best academic forces of that time, has kept up to now. For a long time V. S. Groozdyev headed the Kazan medical society and was the founder of the local Institute for advanced training of doctors. He is the author of one of the best in the country text books in obstetrics and the female diseases. One could hardly find another so enthusiastic person in passing one's experience and popularisation of scientific knowledge among obstetricians and gynaecologists.

Nikolay I. Gorizontov, alumnus of the Kazan university and V. S. Groozdyev's pupil did everything in his power for the researches in the female genitals tuberculosis. The greater part of his research and educational work took place in Siberia, first in Tomsk and then in Novosibirsk where he created his learned schools.

Outstanding pupils of V. S. Groozdyev were *Michail S. Malinovsky* (1880–1976) and *Leonid S. Persianinov* (1908–1978). They became recognized leaders of the Moscow school of obstetrics and gynaecology and the founders of modern system of obstetrics. M. S. Malinovsky was a brilliant clinician and dealt with the problems of operative obstetrics, anesthesia in obstetrics and gynaecology, treatment of pregnant women with late toxicosis and postnatal pyo-septic diseases. He wrote a text-book which is very popular among students and practitioners up till now.

Academician L. S. Persianinov's merit is in the development of obstetrical traumatism problems, physiology and pathology of the uterus contractile activity, diagnosis and treatment of the fetal hypoxia and postnatal asphyxia. L. S. Persianinov was awarded the State Prize of the USSR for a series of works in perinatology. He was vice-president of the International association of obstetricians and gynaecologists.

In modern times such famous scholars as Ye. M. Vikhliayeva, B. I. Koolakov, G. M. Savelieva, N. N. Serov, T. A. Starostina, N. N. Pobedinsky, V. I. Krasnopolsky, V. Ye. Radzinsky have created academic schools of their own and continue to develop the traditions of the Moscow school of obstetrics and gynaecology. A great role in the formation of perinatology (starting from the 60-s of the XX century) as an independent branch of science that belongs to the famous works of P. K. Anokhin and his pupils (the 30-s) about functional systems of an organism, I. A.

Arshavsky's works about dominant of pregnancy. P. G. Svetlov, V. I. Bodiazhina learnt the problems of critical periods of embryo- and fetogenesis. The Petersburgian scholars N. L. Garmasheva and N. N. Konstantinova investigated fundamental problems of perinatal medicine.

The Kiev school of obstetrics and gynaecology was adequately represented by *Nikolay V. Shoovarsky* (1860–1922). His works in artificial fertilization, uterine myoma and pregnancy, about complications in the third stage of labour and placental structure and functions were generally recognized.

A particular role in the development of medicine in Ukraine, especially in Odessa belongs to *Nikolay I. Pirogov*, who being a trustee of the Odessa educational region (1856–1858) petitioned before the Government for the opening of a faculty of medicine in the South. Rector of the Novorossiysk University Fiodor S. Shvedov delivered the first lecture of that faculty on September, 1, 1900.

In 1920 the faculty of medicine was reorganized into the Medical Academy. Its rector became *Daniil K. Zabolotny* (later on he was elected the chairman of the Academy of Sciences of Ukraine).

As from 1921 the Odessa Medical Institute began functioning independently. Its rector from 1923 to 1927 was academician *Lev V. Gromashevsky*.

One of the organizers of obstetrical and gynaecologic aid in Odessa was *Grigoriy I. Gimmelfarb* (1857–1928). A valuable contribution to gynaecology were his works "To the problem of uterine deviation", and "To the clinic and treatment of uterine myoma". Having improved the radical surgery of uterine disposal by Wertheim he reduced its mortality rate to 2%. Having extensive knowledge of pathology, anatomy and laboratory technique, G. I. Gimmelfarb created the Museum of Pathology and Anatomy and founded the first laboratory.

In 1905 *Vsevolod N. Orlov* (1866–1927), the graduate of the St. Petersburg Military Medical Academy, academician's A. I. Lebedev's pupil, was elected to the post of professor of the department of obstetrics and the female diseases. Under his leadership the clinic of obstetrics and gynaecology in Odessa immediately occupied a distinguish place by the volume of operative interventions among the leading medical establishments of the country.

V. N. Orlov's investigations were devoted to problems of balneotherapy, the role of physical methods in the treatment of inflammatory diseases, X-ray therapy, radiotherapy, and adoption of catgut in to surgical gynaecology. V. N. Orlov is the author of a famous work "A textbook of the female diseases". In 1927 he organized the first student learned society, Odessa learned society of obstetricians and gynaecologists, policlinic for rendering a free of charge medical aid to the women in labour, where the assistant lecturers, the last grade students gave consultations and were on duty.

V. N. Orlov's department personnel, privat-docents



G. I. Tomson and F. V. Bookoyemsky had been elected the professors of the Odessa Higher Women's Courses and later on the professors of the Odessa Medical Institute. His pupils headed the departments of obstetrics and female diseases in other cities, e. g. V. D. Brandt headed the department in Kharkov, B. K. Gogoberidze worked in Tbilisi, and G. F. Tsomakion in Dnepropetrovsk.

The departments of obstetrics and gynaecology in the Odessa Medical Institute were headed by the professors V. N. Massen (1902–1904), V. N. Orlov (1905–1927), F. V. Bookoyemsky (1920–1922), G. I. Tomson (1928–1929), G. F. Tsomakion (1930–1939), G. K. Zhyvatov (1936–1948), B. K. Gogoberidze (1940–1941), A. M. Agaronov (1945–1954), O. Ye. Noodolska (1952–1953), N. P. Verhatsky (1953–1958), A. I. Malinin (1954–1965), Ya. V. Kookolev (1959–1971), U. I. Bizhan (1972–1983), I. N. Rembez (1965–1968), V. A. Solianick-Shileyko (1968–1990), A. A. Zelinsky (1983), V. F. Nagorna (1990–1994), V. N. Zaporozhan (since 1986).

A celebrated surgeon, a talented diagnost *Grigoriy F. Pisemsky* (1862–1937), professor of the Kiev Medical Institute and the Kiev Institute of Advanced Training for Doctors was a prominent representative of the Ukrainian school of obstetricians and gynaecologists.

He wrote more than 60 academic works. The most well known are his investigations of the uterine innervation, monographs about dermoids and works in operative gynaecology. G. F. Pisemsky was an editor of the journal "Ukrainian medical news", "Problems of oncology", initiator of the opening of the first prenatal consultation clinic in Kiev and creator of maternity hospitals rendering medical aid for women in labour in rural areas. His clinic was the first in practice of obstetrics and gynaecology to transfuse donated blood in Ukraine.

After G. F. Pisemsky the department of obstetrics and gynaecology of the Kiev medical institute was headed by professor *A. I. Krupsky*. Under his leadership the clinical base was improved and a biochemical laboratory was opened. From 1936 there were two departments of obstetrics and female diseases. One was on the medical faculty and the other was on the faculty of pediatrics.

One of the founders of obstetrics in Ukraine was professor of the Kiev medical Institute *Feodosiy A. Sokolov* (1870–1942). His doctoral thesis "About saline infusions as a method of treatment after acute losses of blood" became a foundation of theoretical points about the influence blood transfusion on the organism. F. A. Sokolov's works "About treatment of septic abortion", "Conservative treatment of myomae" were widely known. Having great experience in research and practical work he was active in the work of the Ukrainian Research Institute for Mother and Child Care. From 1938 to 1958 the department of obstetrics

and gynaecology N1 of the medical faculty of the Kiev Medical Institute was headed by professor and corresponding member of the Ukrainian Academy of Sciences *Alexander Yu. Loorie* who simultaneously was the chief obstetrician and gynaecologist of the Ministry of Public Health of Ukraine. He was an initiator of all cases of maternal morbidity analysis (maternal and fatal commissions) and labour anesthesia (1935). For this he was awarded the State Prize.

At that time they began to develop the unified positions on the main problems of obstetrics and gynaecology (a contracted pelvis, cesarean section, obstetrical bleeding, etc.). The experience of Ukrainian Research had been extended to all republics of the former Soviet Union. In the departments of operative gynaecology, the number of units of gynaecologic oncology were opened as well as the ones of septic gynaecology, and pathology of pregnancy. In the teaching of obstetrics and gynaecology a great attention was paid to practical skills. A. Yu. Loorie offered the modification of uterine extirpation by Westheim in combination with X-ray and radiotherapy.

From 1938 the department of obstetrics and gynaecology N2 was headed by the alumnus of the Kiev Medical Institute professor Piotr M. Booyko (1895–1943). The scholar's clinical and experimental work "Surgical treatment of vesicovaginal fistulae in women" characterized him to be a brave innovator and scholar-humanitarian. P. M. Booyko's life was tragically interrupted during the fascists occupation of Kiev.

Till 1953 the department of obstetrics and gynaecology N 2 was headed by the Honourable Science Worker, professor A. M. Olshanetsky, the author of one of the first investigations in the history of obstetrics and gynaecology of this country, a textbook "The founders of the Russian obstetrics".

On professor A. Yu. Loorye's initiative after the war first in the country they organized a women's prophylactic oncologic examination which reduced cancer mortality. Due to active academic, medical and organizing activity of the department of obstetrics and gynaecology of the Kiev Medical Institute the mortality rate from obstetrical bleeding has decreased.

For the first time the consulting rooms of climacteric pathology and pediatric gynaecology were opened. Further more the system of the advanced training of doctors was improved. In the development of pediatric gynaecology a leading role belongs to A. Yu. Loorye's pupils, Yu. A. Kroopko-Bolshova, I. B. Vovk and in oncologic gynaecology to V. K. Vinnitska, A. I. Yevdokimov, V. Ya. Zookher, N. V. Svechnikova and others.

From 1959 the department was headed by the alumnus of the Kharkov school of professor I. I. Gritshenko *Nikolay S. Baksheyev* (1911–1974), professor, chief obstetrician and gynaecologist of Ministry of Public Health of Ukraine. He created a learned

school which dealt with the problems of uterine contractions physiology and pathology, embolism with amniotic fluid, gestoses, fetal hypoxia and newborn children asphyxia and chemotherapy in oncogynaecology. His monograph "Uterine bleeding in obstetrics" was awarded V. F. Snegiryov's Prize.

One of N. S. Baksheyev's followers was an assistant professor T. Ya. Kalinichenko, a prominent organizer of health care in Ukraine. Raisa I. Malykhina was a famous specialist in tuberculosis of the female genitals. The heads of the departments of the Kiev Medical Institute (present day National Medical University named after A. A. Bogomolets) are famous Ukrainian scholars professor V. S. Artamonov, V. Ya. Golota, G. K. Stepankovska, chief specialist obstetrician-gynaecologist of the Ministry of the Public Health professor Boris M. Ventskovsky.

To 1990 the department of obstetrics and gynaecology N 1 was Headed by G. K. Stepankova. In 1991 she was elected a corresponding member of the National Academy of Sciences and the Academy of Medicine of Ukraine. She is the author of the work in the investigation of the mechanism of labour activity regulation, development of rational methods of labour management. Professor B. M. Ventskovsky and the scholars of his school made a valuable contribution to the development of obstetrics and perinatology (development of uterine physiology and pathology at pregnancy and labour, rational nutrition of pregnant women, preeclampsia, immature pregnancy, prolonged gestation, posnatal infection, oncogynaecology).

The department of obstetrics and gynaecology of the Kiev Institute of Advanced Training for Doctors was founded in 1918 on the base of the Kiev trade union of doctors. The organizer and the first head of the department was *Grigoriy F. Pisemsky* and the department gynaecology was headed by professor V. L. Lozinsky. G. F. Pisemsky's pupils were professors S. P. Vinogradova, E. Ya. Yankelevich. K. M. Zhmakin, V. P. Savitsky, V. M. Khmelevsky.

From 1971 to 1993 professor *Leonid V. Timoshenko*, a famous Ukrainian scholar and clinician, Corresponding Member of the Ukrainian National Academy of Sciences, Academy of Medical Sciences of Russia, European association of obstetricians and gynaecologists, V. F. Snegiryov's Prize winner (1985), was the head of the department. For his great contribution to the development of sciences he was awarded the medal of Semmelweis. By right he may be called the founder of modern obstetrics, perinatology and gynaecology in Ukraine. An unsurpassed educator of scholars and doctors, a sensitive doctor and a favourite among students, L. V. Timoshenko headed the department of the Lvov Medical Institute. It was first where he created a learned school. His followers are 16 heads of the departments of the leading institutions of Ukraine, among them are professors *Eugenia V. Kokhanevich*, *Stanislaw S. Leush*,

*Yuri P. Vdovichenko* and many other famous scholars. L. V. Timoshenko is the author of more than 600 academic works, in particular 20 monographs and textbooks. Under his management 85 candidate and 20 doctoral theses had been performed.

In the Ukrainian Research Institute for Mother and Child Care named after N. K. Kroopska (Kiev) created in 1936, the journal "pediatrics, obstetrics and gynaecology" was founded. This journal joined the best academic body of Ukraine. In the course of time, Ukrainian Research Institute for Mother and Child Care where worked such famous scholars and practitioners as professor G. F. Pisemsky, V. M. Khmelevsky, S. P. Vinogradova, academician A. P. Nikolayev was reorganized into the Institute of Pediatrics, Obstetrics and Gynaecology. As from 1994 the institute is directed by academy of medical sciences of Ukraine. The leading role in its development and formation belongs to professor A. G. Pap, academician of the Ukrainian Academy of Sciences and Academy of Medical Sciences of Ukraine, Elena M. Lukianova, Corresponding Member of Academy of medical sciences of Ukraine, professor Yemelian T. Mikhalenko. The last mentioned is the author of a number of monographs in obstetrics and perinatology, textbooks "Physiologic obstetrics", "Pathological obstetrics" and "Conditional tasks in obstetrics and gynaecology", "Gynaecology".

The main directions of the Institute's creative activity was the development of labour anaesthesia, regulation of labour activity, obstetrical bleedings, fetus and newborn infant haemolytic disease, late toxicoses of pregnancy, premature labour, fetus and newborn infants hypoxia (A. P. Nikolayev, L. V. Timoshenko, G. K. Stepankovska, A. G. Kolomyitseva). V. M. Khmelevsky was one of the first to offer to inject glucosa, calcium chloride, vitamins of group B and ascorbic acid for the treatment of fetal hypoxia (Khmelevsky's mixture).

Acad. *Anatoliy P. Nikolayev's* (1896–1961) monograph "Theory and practice of labour anaesthesia" (1953) is published in many foreign languages. His method of the fetal hypoxia treatment with the use of 40% solution of glucosa (20 ml), with cardiazol and oxygen inhalation (Nikolayev's triad) has gained ground in Ukraine, the former USSR and abroad. Academician A. P. Nikolayev, the graduate of the medical faculty of the Kiev Medical Institute throughout some time was the head of the department of obstetrics and gynaecology of the Poltava Medical Institute and director of the Research Institute for Obstetrics and Gynaecology of the Academy of Medical Sciences of the USSR (Leningrad).

The learned school of obstetricians and gynaecologists was formed in Kharkov too. There the department was headed by professor P. Kh. Khazhinsky, R. L. Livshina and from 1946 to 1972 it was headed by the Honoured Science Worker of the USSR, patriarch of the modern school of the Ukrainian obstet-

rics and gynaecology professor *Ivan I. Grishchenko* (1897–1983). A splendid surgeon and clinician, I. I. Grishchenko paid great attention to reconstructive surgery in the genitals developmental anomalies, as well as in genitourinary and intestinal fistulae. First in Ukraine he organized the Centre for the Investigation of Antropozonotic Diseases in Obstetrics. He headed the work on the exploration the izoantigen incompatibility of the mother's and fetus blood. He was the first in the USSR to perform amniocentesis, correction of the fetus position anomalies with an external prophylactic turn of the fetus on the head and exercise therapy, dealt with genetics problems of obstetrics and gynaecology.

I. I. Grishchenko is the author of 130 academic works, including a manual in obstetrics and 4 monographs. He was a secretary of the first editorial board of the journal "Pediatrics, obstetrics and gynaecology". Under I. I. Grishchenko's leadership they prepared 7 doctoral and 52 candidate theses. Later on his pupils headed the departments of obstetrics and gynaecology in Kiev (I. S. Baksheyev, R. I. Malykhina), Kharkov, Odessa (V. A. Solianick-Shileyko), Zaporozhie, Ternopol. As from 1966 the department of obstetrics and gynaecology of the medical faculty of the Kharkov Medical University was headed by the Honoured Worker of Sciences, academician of the National Academy of Sciences of Ukraine, the USSR and Ukraine State Prizes winner, professor V. I. Grishchenko, who simultaneously is the head of the Institute of Cryobiology and Cryomedicine of the National Academy of Sciences (Ukraine). He made valuable contributions to the investigation of the problems of cryosurgery, perinatology, toxicosis of pregnancy, determined the role of pineal body (epithysis) in physiology and pathology of the female reproductive system. His monograph "Antenatal death of the fetus" was awarded by V. F. Snegiryov's Prize. Under the leadership of V. I. Grishchenko they completed the first successful attempt of an extracorporal fertilization. He is WHO expert on natality rate, adviser for the programme "Human's reproduction". V. I. Grishchenko trained 13 doctors and 83 candidates of medicine. He is a member of the editorial board of the journal "Pediatrics, obstetrics and gynaecology", "Obstetrics and gynaecology" (Russia), editor-in-chief of the journal "Urgent points of cryobiology", chairman of the section for medicine and biology in the North-East Scientific Centre of the National Academy of Sciences (Ukraine).

In the department of obstetrics and gynaecology of the pediatric faculty of the Kharkov Medical Institute professor V. F. Matveyeva worked successfully. Now professor N. G. Bogdashkin, an Honoured Science Worker of Ukraine is the head of the above named department. The traditions of the Kharkov school are followed by such famous perinatologists as professor Ye. Ya. Grechanina, O. V. Grishchenko, N. A. Sherbina, L. G. Nazarenko, candidate of med-

icine N. P. Veropotvelyan (Krivoy Rog) and others.

The Institute for Mother and Child Care was first opened in Kharkov in 1923 and in 1928 similar institutions were opened in Kiev, Odessa, Dnepropetrovsk. A little bit later in Lvov and Mookachevo too.

In 1936 the department of obstetrics and gynaecology of the Vinnitsa Medical Institute was founded. Its head was professor S. I. Topooze. The heads of the department were professors A. A. Kogan, N. P. Verkhatsky, S. B. Golubin, R. I. Shterenberg, G. N. Smirnov. The merit of the learned schools creation belongs to professors V. A. Vartapetov and N. K. Ventskovsky. Such famous scholars as professor Ya. P. Solsky, P. G. Zhoochenko, P. P. Grigorenko, B. F. Mozerchook, A. N. Gaistrook were the representatives of this school. They dealt with the problems of gestosis, septic complications in obstetrics and gynaecology, investigation the influence of the environment on the organism of mother and newborn infant. The founders of the learned schools of their own were professor V. K. Chaika (Donetsk), K. V. Voronin (Dnepropetrovsk), L. B. Markin (Lvov), Ye. Ya. Grechanina (Kharkov), A. I. Rybalka (the Crimea), V. A. Solyanick—Shyleyko (Odessa).

The development of perinatology in Ukraine promoted the creation of the learned schools and departments of perinatal medicine in Dnepropetrovsk (prof. Z. M. Doobossarska), in Odessa (prof. A. A. Zelinsky), Kharkov (prof. O. V. Grishchenko, prof. Ye. Ya. Grechanina).

*V. A. Solianyck-Shileyko* is an alumna of prof. I. I. Grishchenko's Kharkov school of obstetrics and gynaecology. Her investigations are devoted to the problems of izoimmunization of the organism of pregnant women under incompatibility of the mother's and fetus blood, rehabilitative therapy of the inflammatory diseases of the genitals with the use of physical and balneologic factors and cryosurgery in gynaecology. He is the author of more than 200 academic works, 3 monographs. Under her leadership they made 3 doctoral and 23 candidates theses. The representatives of the oddesian generation of obstetricians and gynaecologists are professor V. M. Zaporozhan, O. V. Khait, A. A. Zelinsky, V. F. Nagorna, Ye. B. Zadorazhna, N. M. Nizova, A. G. Andriyevsky develop the problems of cryosurgery, treatment of hyperplasia and precancer process of the female reproductive system, endoscopic surgery in gynaecology, humans reproduction, perinatology, influence of the ecological factors on female health.

The present day direction of prenatal diagnosis of the fetus state (biopsy of chorion, placenta, genetic amniocentesis, cordocentesis) with the use of new instrumental, biochemical, biophysical, immunologic, microbiologic and molecular-biologic methods are under development.

Fetal therapy and surgery, additional reproductive technologies (extracorporal fertilization, hamets trans-

plantation and transfer of embryo) and endoscopic surgery in gynaecology are being developed, too. Centres for extracorporal fertilization have opened in Moscow, St. Petersburg (1986), Sochi, Krasnodar, Kiev, Kharkov, Donetsk and Odessa.

There is the system of treatment-and-prophylactic establishments in Ukraine. It includes women's and children's consultation clinics, maternity hospitals, hospitals, dispensaries. According to the law of Ukraine pregnant women, mothers of many children and single mothers are granted profits and financial aid.

Present day social and economic conditions are evidence of the necessity of serious changes in the

system of health care including those in obstetrics and gynaecology. Creative use of international experience in the field of insurance and family medicine is also necessary.

#### RECOMMENDED READING\*

3; 6; 11; 13; 15 (52–54); 16 (48–49); 23; 26; 27; 52.

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\* here and further the first figure shows index number of the source in the list of recommended reading given at the end of the book, figures in the brackets show the pages in the source.



### *Chapter 1*

## **PRINCIPLES OF OBSTETRICAL AND GYNAECOLOGIC AID ORGANIZATION IN UKRAINE**

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The main tasks of the mother and child care service is in rendering highly qualified specialized aid to women, pregnant women, women in labour, puerperae, premature and sick newborn infants and supervision and care for healthy children. More over, it is the organization of obstetric and gynaecologic aid that determines its efficacy and the knowledge of its basic indices and the skill to analyze the activity of obstetrical establishment are necessary for a doctor's work.

### **MAIN TRENDS OF OBSTETRICAL AND GYNAECOLOGIC AID DEVELOPMENT**

Mother and child care is the direction of the first priority in the state activity and devoted to the keeping of the gene pool of the nation. The greatest importance acquires the joining of obstetrical, gynaecologic and general medical service for adolescents health improvement, marriage and family planning, perinatal care of the fetus, improvement of centres and consulting rooms for prenatal diagnosis activity, improvement of general and specialized medical aid for pregnant women. The problems of prophylaxis, timely diagnosis and treatment of the oncologic patients are urgent up to now. Creation of the obstetrical and gynaecologic unites in the structure of many-profile hospitals, organization of the joint obstetric-therapeutic-pediatric complexes expands the possibility of a timely rendered medical aid by the qualified doctors of the boundary specialties (surgeons, urologists, therapists, neonatologists) as well as for the organization of modern powerful departments of intensive care and resuscitation, day-round laboratory service and functional diagnosis. For the improvement of specialized aid for mothers and children they create perinatal centres equipped with up-to-date

medical and diagnostic facilities for the estimation and correction of the fetus state, care and treatment of new-born infants.

### **THE MANAGEMENT BODIES**

In Ukraine obstetrical and gynaecologic aid is organized by the Main Department of Medical Aid for Mothers and Children under the Ministry of Public Health on Ukraine. The main legislative acts on the problems of maternity and childhood care adopts a corresponding commission of the Supreme Council of Ukraine. The Main Department of Medical Aid for Children and Mothers includes the units of medical and prophylactic aid for children and obstetrical and gynaecologic aid which executes organizational and methodical management of obstetrical and gynaecologic aid by realization of the Supreme Council laws, instructions, methodical directions and recommendations, information and orders. The important problems of obstetrical and gynaecologic aid are discussed at the meetings of the Ministry Board. The chief obstetrician and gynaecologist is in the staff of the Chief Office. The regional chief obstetrician and gynaecologist works in accordance with the plan, confirmed by the head of the Chief Office or heads of the district/municipal departments of public health. The main tasks of the chief obstetricians and gynaecologists are prophylaxis of gynaecologic diseases and complications in pregnant women revealing of initial stages of the disease, adoption in practice the latest methods of diagnosis and treatment, advanced forms and methods of work for the aim to reduce maternal and perinatal morbidity and mortality, occupational oncogynaecologic diseases, improvement of their treatment.

The chief obstetrician and gynaecologist attracts to the fulfillment of the duties mentioned above associations and societies of obstetricians and gynaecologists, personnel of both obstetrical and gynaecologic



establishments and departments of the local institutions of higher learning and research institutes.

In a region the management of obstetrical and gynaecologic service is conducted by a central regional hospital as there is a capacity of a deputy chief doctor on the problems of maternity and childhood. An important role belongs to the district hospitals which includes obstetrical and gynaecologic departments. They co-ordinate the work of mobile and basic women's consultation clinics.

District municipal and regional sanitary-and-epidemiologic stations participate actively in the control for the necessary sanitary and hygienic state of treatment-and-prophylactic establishments.

## TREATMENT-AND-PROPHYLACTIC INSTITUTIONS

The specialized establishments of obstetrical and gynaecologic aid include the following ones: 1) ambulatory-like (women's consultation clinics, both in the structure of a maternity hospital or polyclinic and independent); 2) maternity hospitals; 3) gynaecologic in-patient departments; 4) obstetrical and gynaecologic departments of the regional, municipal and district hospitals, large medico-sanitary stations; 5) field-sher's stations.

The ambulatory aid rendering with the **women's consultation clinics** is the main kind of obstetrical aid. The main tasks of the women's consultation clinics are as following: 1) to carry out prophylactic medical examination of pregnant women; 2) to conduct prophylaxis of maternal and perinatal morbidity and mortality; 3) to render medical aid to gynaecologic patients; 4) family planning; 5) prophylaxis and revealing of precancer and oncologic diseases; 6) active visiting of the patients at their homes; 7) sanitary-and-educational work; 8) organization of maternity schools; 9) invalidity examination.

A women's consulting clinic organizes its work by rendering medical aid to the population of certain districts. Medical aid is conducted by district doctors. There should be till 3,000 women of reproductive age on one district if a consultation is organized at a medical-sanitary station of an enterprise their number should be till 1.500 of the workers.

**Organization of medical aid to pregnant women and puerperae.** Prophylactic medical examination of a pregnant woman starts from her application to a women's consulting clinics at the early terms of pregnancy (better in the term to 12 weeks). After a profound medical examination (history, living and labour conditions obstetrical status, measuring of height, weight, arterial pressure, etc.) as well as a therapist, ophthalmologist, stomatologist, otolaryngologist and

other specialists. They clear up if a pregnant woman refers to a group of perinatal pathology higher risk. In the "Individual card of a pregnant woman and woman in labour" (form III) they compose a plan of the pregnant woman management, determine the estimated date of confinement. General blood analysis (hemoglobin (Hb), hematocrit (Hct), white blood cells, etc.), Wasserman test, HIV/AIDS-test, infection hepatitis should be performed, too. They determine blood group, Rhesus factor, under the necessity they do biochemical investigation of blood (total blood protein (TP), bilirubin, transaminases, blood sugar, creatinine, etc.). they check the urethra and cervical canal smears (gonorrhoea, trichomoniasis, mycoplasmosis, candidosis, bacterial vaginosis, etc.), do examination of feces for eggs of worms, clear up the degree of the vaginal discharges clearance. They investigate nasopharynx contents for the presence of pathogenic staphylococcus. If there are no complications of pregnancy, a pregnant woman should visit a doctor once per month during 28 weeks, twice per month at the period from 28 to 36 weeks and every week starting from 36 weeks till the estimated date of confinement. During every visit together with general obstetrical examination they check the fetus position and presentation, heart's beating, arterial pressure, body weight, height of the fundus, check glucose, protein, leukocytes, bacteria presence in urine. General blood analysis should be done 3-4 times during pregnancy and HIV-test, HBs-antigenes, Wasserman reaction, ultrasonoric fetometry are to be made twice, in the first and second halves of pregnancy.

Doctor informs gravida about physiologic changes in her body, necessity to observe the regime of labour and rest, rational nutrition and possible complications symptoms.

As the need arose, a pregnant woman should be hospitalized at an in-patient department of a lying-in hospital. They should pay attention at such gravida's complains as vaginal leukorrhoea, bleeding, uterine contractions, edemae, head ache, dizziness, sleeplessness, irritation. A pregnant woman has a right to be converted to an easy work, released from night shifts, business trips and for antenatal and postnatal leave. At 30 weeks of gestation a doctor at woman's consultation clinics gives her "A card for change" (form 133/b). After labour they recommend to start medical supervision not later than 10-12 weeks after discharge from an obstetrical in-patient department.

**Organization of gynaecologic aid.** Gynaecologic diseases are revealed during medical examination of women who has referred to women's consultation clinics independently as well as during medical prophylactic examinations. For each woman they fill in a patient's card (form 025/b). As from 18 y. o, the women dwelling or working in the region of the women's consultation clinics service should undergo prophylactic gynaecologic examination. During these examinations they do cytologic, colposcopic investiga-

tions, examine mammary glands. The data obtained are to be put into "Control card of the dispensarial supervision" (form 30/b).

**Obstetrical and gynaecologic in-patient departments.** A typical obstetrical and gynaecologic in-patient department should have the following units: 1) room for admission and sanitary inspection; 2) physiologic unit (with rooms for an admission and discharge, puerperal and postnatal rooms); 3) observation unit (with rooms for an admission and discharge, puerperal block, postnatal isolation block); 4) pathological pregnancy unit; 5) unit for newborns; 6) therapeutics and diagnostic units or rooms (laboratory, X-ray, physiotherapy, functional diagnostics, etc.); 7) auxiliary services. The total amount of obstetrical beds in a lying-in-hospital is determined on 8.8 beds per 10,000 of population basis. It is recommended to locate a gynaecologic in-patient department in a separate building; it should have an admitting office of its own.

The structure of an obstetrical in-patient department provides to allocate 50–55% of beds for postnatal wards of physiologic unit, 30% of beds for the unit of pathology of pregnancy and 20–25% of beds for the observation unit. The number of reserve beds comes to 10% of the total amount. Sanitary norm per one maternal bed is equal to 7.2 m<sup>2</sup>. In a unit for newborn infants the number of beds should account for 105–107% of their number in a postnatal unit. The newborn wards should be located in physiologic and observation units. Sanitary norm per one newborn infant bed comes to 3 m<sup>3</sup> and in observation unit and ward for premature infants it comes to 4.5 m<sup>3</sup>. In specialized obstetrical in-patient departments they develop the units for resuscitation and intensive care of newborns.

Recently they adopt a mutual stay of a puerpera and a newborn infant in a lying-in-hospital. It aids in reducing of an infant's and medical personnel contacts, stimulates mother's lactation and an adaptation period course of a newborn infant. Contraindications to mother and child mutual stay during postnatal period are preeclampsia, extragenital diseases at the stage of decompensation, operative interventions at delivery, precipitated or prolonged labour, amniotic fluid free period more than 18 h, increase in a lying-in woman body temperature during delivery, premature birth, intrauterine fetal hypoxia, hypotrophy of the II–III degree, asphyxia at labour, birth injury, developmental anomalies, intrauterine infection, haemolytic disease of a newborn.

*Observation department* has a sanitary inspection room of its own in the structure of a block for admission and sanitary inspection, puerperal block, postnatal ward and isolation block. Newborn infants being born outside an in-patient department (at home) or converted from physiologic department because of a mother's disease are to be kept here as well as the infants being born by women who are in obser-

vation department, neonates with the signs of intrauterine infection and body mass less than 1,000 g. Newborn infants with pyo-septic diseases are converted to pediatric hospitals immediately after diagnosis confirmation.

An obstetrical in-patient department quality of work depends on the organization and interaction of all its components.

*Block for admission and sanitary inspection* consists of a filter and sanitary inspection rooms (separate for physiologic and observation units). In the filter they take a patient's history, make an examination of a gravida (take her body temperature, pulse, examine the state of ostium of the uterus), decide either she should be admitted at physiologic or observation department. After filter passing, a pregnant woman comes to sanitary inspection room of the department where she will be hospitalized to. In a sanitary inspection room a pregnant woman is examined by a midwife or doctor on duty. Her cleansing is performed, medical documentation is drawing up, "History of labour" (form 96) and "Register of a pregnant woman and woman in labour admission" are filled in form 2. In a room for seeing patients they do a more careful examination of a pregnant woman. Take additional history, measure arterial pressure on both arms, height, body mass, pelvic sizes, fundus height, belly circumference, refine fetal position and presentation, listen to the fetal heart sounds, find blood group and presence of protein in urine either with boiling or test with sulfosalicytic acid.

The women needed a corresponding therapy, intensive care or obeying some special regime should be hospitalized in pathological pregnancy unit. They do an examination of a pregnant woman in a room for seeing patients. In a room for medical procedures they make injections, take blood counts, intravenous manipulations.

*Physiologic obstetrical department* includes prenatal wards, obstetrical block, intensive care wards, larger and smaller operative rooms, postnatal wards, additional premises. A number of beds in prenatal wards should come to 10–12% of their total number at the postnatal department (postnatal wards allocate 50–55% of the amount of beds in an obstetrical department. The necessary sera for an urgent determination of the blood group and Rhesus factor should be in the rooms of obstetrics block. At admission they take 5–7 ml of venous blood in every pregnant woman and determine clotting time, lysis of clot.

*In prenatal ward* a doctor and midwife observes a puerpera's state of health, control her arterial pressure, character of labour activity, movements of the fetus' presenting part, its state, make anaesthesia of labour, control the state of amniotic fluid, character of discharges from maternal passages. Under physiologic course of labour they should make a record in the "History of labour" in the following manner; at the beginning of the stage of dilation every 3–4 h; after

waters breaking a record should be done every 2 h; at the end of the stage of dilation every hour. Under pathological course of labour the records should be done at the case of necessity. They do vaginal examination at hospitalization, immediately after the waters breaking and later on according to the indications. If there are bloody discharge they should do examination in a ready for use operation room and if it is possible with a previously done ultrasound investigation for the exception of placenta previa. In the in-patient department they should record the following documentation: The history of Labour (form 96), The History of a newborn infant development (form 97), The book of Labour Records (form 10), Operation Journal (form 8), The Book of Registration of Blood Transfusion (form 9).

### TREATMENT-AND-PROPHYLACTIC AID FOR WOMEN IN RURAL AREAS

Obstetrical and gynaecologic aid in rural areas is based on the same principles as in the cities. It is rendered during ambulatory-and-polyclinic receptions, in therapeutic establishments, at sanatoria and resorts and in the places of an urgent medical aid.

On the **first stage** the medical aid is rendered by medical personnel of rural medical districts (RMD), feldsher-and midwife's stations, rural hospitals, ambulatories, which mostly deal with prophylactic aid directed to prevention of pregnancy complications and gynaecologic diseases.

On the **second stage** the central regional hospitals are functioning, municipal maternity hospitals combining women's consultation clinic and departments of obstetrics and gynaecology.

The **third stage** includes district establishments, they are: district lying-in-hospitals, department of obstetrics and gynaecology of district hospitals, municipal lying-in-hospitals of district centres with the functions of a district hospital, specialized centres, consulting rooms of obstetricians and gynaecologists in a district polyclinic, state consulting centres, research institutes of obstetrics and gynaecology. The main establishment is a district hospital.

The leader of medical and preventive aid for women in rural medical districts is the chief doctor of a district rural hospital. In a region the total management is conducted by a chief doctor of a central regional hospital. This branch is headed by a free-lance regional obstetrician-gynaecologist or deputy chief doctor for the questions of childhood and obstetrics; in a district these functions fulfill chief obstetrician-gynaecologist who is a permanent employee of the department of public health of the district state administration.

The improvement of obstetrical and gynaecologic aid quality in rural area is connected with consolidation of the material and technical base of central regional hospitals, development of a net of specialized departments, their build up with modern technique and staff with a trained personnel as well as wide accessibility of the 3rd level establishments. They create resuscitation mobile brigades of an urgent medical aid on the base of district hospitals equipped with necessary technique and highly qualifies doctors.

### MAIN QUALITY INDICES OF TREATMENT-AND-PROPHYLACTIC AID FOR WOMEN

In evaluating a women's consultation clinic activity one should take into account the following indices:

- maternal and perinatal mortality rates;
- percentage of incompetent pregnancies, abortions, premature delivery;
- preeclampsiae and eclampsiae rates;
- ration of pregnancies completed with artificial abortion and labour.

**The main indices of an obstetrical in-patient department activity are:**

- maternal morbidity and mortality rates;
- perinatal and neonatal mortality rate;
- newborn infants morbidity rate;
- maternal and paediatric traumatism during labour.

**Maternal mortality rate (MMR).** It includes all cases of women's deaths during pregnancy, delivery and after them throughout 42 days excluding cases which are not connected with the generative female function (traumata, natural disasters, etc.).

Index of maternal mortality rate is a ration of a number of women dead during the period of generative fulfillment to 100,000 of alive newborn infants:

$$\text{MMR} = \frac{\text{a number of women dead during pregnancy, postnatal period, incl. 42 days}}{\text{a number of delivery with alive newborn infants}} \cdot 100,000$$

The main causes of maternity death are septic and extragenital diseases, uterine bleedings during delivery and postnatal period, preeclampsia and eclampsia, uterine rupture. It is the right organization and medical service quality of the whole female population that has a leading role in the fight with maternal death. According to WHO data maternal mortality rate is 5–15 cases per 100,000 of newborn infants. In Ukraine, according to the Ministry of Public Health data maternal mortality rate was equal to 32–



34.2 per 100,000 of alive newborn infants (1996–1998).

**Perinatal death (PD)** is a frequency of viable fetuses loss who died intrauterinely before labour or during delivery starting from 22 weeks of gestation as well as newborn infants who died during first seven days (168 h) of life. The fetus is considered to be viable if he gained the body mass 500 g and more and his body length is 25 cm and more for 22 or more weeks of gestation.

Delivery of the fetus before 22 weeks of gestation with body mass less than 500 g and body length less than 25 cm they consider to be a miscarriage. But if the fetus was born before 22 weeks of pregnancy with a mass less than 500 g and the body length less than 25 cm and he had been living more than seven days, i. e. more than a term of early neonatal period they consider him to be a newborn infant and have to register him in a registry office. The infants born alive with the body mass 500 g and more should be nursed.

Appearance of an independent outer respiration is a criterion of viviparity. If an infant had done at least one breath after being separated from a mother's body they consider him to be alive, lack of extrauterine respiration at birth or after resuscitation is a criterion of an infant to be still-born even if heart sounds are present. Still-born infants should be registered in a registry office during three days after birth and died infants during three days after their death.

PD index is calculated on 1,000 of the infants born alive or still-born infants. The following formula is used:

$$PD = \frac{\text{a number of still-born and dead during 7 days infants}}{\text{a number of infants, born alive or dead}} \cdot 100$$

PD index to 10% is considered to be a low one, 10–15% is a middle one and that of 15% and more is a high index. It depends on biologic, social and economic factors, quality and organization of a medical service. These should be taken into consideration when they plan measures for PD reduction.

For the PD causes analysis they calculate the following structural indices:

- *antenatal mortality rate (AMR)*;
- *intranatal mortality rate (IMR)*;
- *early neonatal mortality rate (ENNMR)*;
- *still-births (ST)*.

$$AMP = \frac{\text{a number of still-born infants and infants died before delivery, starting from 22 weeks of gestation}}{\text{a number of infants, born alive or dead}} \cdot 100$$

AMP prophylaxis consists of women's consulting policlinics and pathological pregnancy units work improvement, organization of perinatal centres for management of the women from the groups of a high

risk, improvement of social, economic and ecological living conditions.

IMR index characterizes the work of an obstetrical unite and it is calculated by the formula:

$$IMR = \frac{\text{a number of still-born infants, died during delivery}}{\text{a number of infants being born alive or dead}} \cdot 1,000$$

Indices of AMP and IMP constitute a coefficient of *still-births* (SB). Under modern conditions it is equal to 50–60% and is higher than PMR. It is calculated as follows:

$$SB = \frac{\text{a number of still-born infants died during pregnancy starting from 22 weeks of gestation + infants died during delivery}}{\text{a number of infants born alive or dead}} \cdot 1,000$$

Index of ENNMR amounts for 40–50% of PMR and is included in the index of pediatric mortality rate. It characterizes the activity of all obstetrical establishments (women's consulting polyclinics, obstetrical unit of an in-patient department, infants unit). It is better to calculate the index of PMR as a sum of coefficients SB and ENNMR.

$$ENNMR = \frac{\text{a number of infants died during first 7 days of life}}{\text{a number of children born alive}} \cdot 1000$$

Main diseases caused PMR are analyzed separately for still-born infants and died newborn infants. If there are two or more competitive diseases they choice only one. A disease's name should correspond to the list of class XV in the International Classification of Diseases, X edition (ICD-X).

When calculate indices of newborn infants morbidity and mortality rates, one should take into account their maturity or prematurity, body mass at birth (low body mass is the body mass less than 2,500 g, very low one is less than 1,500 g and extremely low body mass is that less then 1,000 g). From WHO data the body mass at the moment of birth is the only and most important criterion of an infant's chance to survive and develop adequately. Premature infants morbidity rate is 5–6 times and their mortality rate, especially in the infants with low body mass, 20–30 times more than in mature infants.

*Indices of the work of neonatologic service* depends on the quality of the lying-in-hospital work, especially those of an infant suite department. Below the indices of neonatologic service and formulae for their calculation are given.

*Morbidity rate of mature infants =*

$$= \frac{\text{a number of morbidity cases among mature infants}}{\text{a number of mature infants, born alive (a number of all alive infants minus a number of premature infants)}} \cdot 1\ 000$$

$$\begin{aligned} & \text{Morbidity rate of premature infants} = \\ & = \frac{\text{a number of morbidity cases among} \\ & \quad \text{premature infants}}{\text{a number of premature infants, born alive}} \cdot 1,000 \end{aligned}$$

$$\begin{aligned} & \text{Mortality rate of mature infants} = \\ & = \frac{\text{a number of died during first 7 days new-} \\ & \quad \text{born infants, born mature}}{\text{a number of mature newborn infants,} \\ & \quad \text{born alive}} \cdot 1,000 \end{aligned}$$

$$\begin{aligned} & \text{Mortality rate of premature infants} = \\ & = \frac{\text{a number of died premature newborn} \\ & \quad \text{infants}}{\text{a number of premature newborn infants,} \\ & \quad \text{born alive}} \cdot 1,000 \end{aligned}$$

$$\begin{aligned} & \text{Fatality rate of newborn infants because} \\ & \quad \text{of certain disease} = \\ & = \frac{\text{a number of newborn infants died in conse-} \\ & \quad \text{quence of a specified disease}}{\text{a number of newborn infants without this} \\ & \quad \text{disease}} \cdot 1,000 \end{aligned}$$

$$\begin{aligned} & \text{Survival rate of premature newborn infants} \\ & \quad \text{with a low body mass} = \\ & = \frac{\text{a number of premature newborn infants} \\ & \quad \text{with body mass 500–1,000 g, survived and} \\ & \quad \text{gained body mass more than 2,500 g dis-} \\ & \quad \text{charged from a hospital}}{\text{a number of premature newborn infants} \\ & \quad \text{with body weight 500–1,000 g born alive}} \cdot 1,000 \end{aligned}$$

It is the index of premature infants survival rate that characterizes the work of a neonatologic service especially pronouncedly.

*Infantile mortality rate (InMR).* It is infants mortality rate during the first year of life. InMR index is one of the most important criterion in the population health level estimation and it reflects both quality of life in general and pediatric service work efficacy. Index of pediatric mortality rate not higher than 10% is considered to be a low one, index of 10–15% is a medium and index more than 15% characterizes high level of pediatric mortality rate. The greatest amount of infants die in the neonatal period that is why, besides mortality rate index during the first year of life they calculate mortality rate index during the first month of life, i. e. during the first 27 days 23 h 59 min, it is so called neonatal mortality rate (NMR).

$$\text{IMR} = \frac{\text{a number of infants died during} \\ \text{the 1st year of life}}{\text{a number of infants born alive} \\ \text{during a year}} \cdot 1,000$$

$$\text{NMR} = \frac{\text{a number of infants died at the} \\ \text{age to 27 days}}{\text{a number of infants born alive}} \cdot 1,000$$

Infants mortality rate during succeeding 11 months of their life is considered to be postneonatal mortality rate. The main reasons of pediatric mortality rate are newborn infants diseases of respiratory and digestive tract and infections.

**Gynaecologic in-patient department activity indices.** The main indices of gynaecologic in-patient aid are operative activity, distribution of the patients according to certain pathology, postoperative complications rate, postoperative gynaecologic fatality, etc. These indices should be estimated separately for the department of operative and conservative gynaecology.

## SPECIALIZED OBSTETRICAL AND GYNAECOLOGIC AID

Ambulant and polyclinic specialized aid is rendering during specialized receptions in large women's consulting clinics (on the problems of infertility, immaturity gynaecologic endocrinology, pediatric gynaecology, cervical pathology) and in day in-patient departments. It is permitted to make pregnancy artificial interruption by vacuum-extraction at early terms, perform uterine content aspiration for cytomorphologic examination, metrosalpingography, hysteroscopy, cervical biopsy, uterine cervix curettage in the case of its removal, removal of small vaginal cysts, laser therapy of inflammatory and precancerous diseases of uterine cervix and vagina in these establishments.

The operations mentioned above should be registered in "The journal of ambulant operations registration" (form 069/b).

**In-patient specialized aid** is rendering by specialized departments of lying-in-hospitals, multi-field hospitals, clinical bases of research institutes, departments of obstetrics and gynaecology of medical institutes, institute of Academy of Medical Sciences of Ukraine.

Obstetrical in-patients departments are specialized in extragenital pathology, prematurity of pregnancy, infectious and inflammatory diseases, immunoincompatible pregnancy, congenital and hereditary pathology.

There are the following specialized directions in gynaecologic practice: infertility and auxiliary reproductive technologies, endocrine pathology, pediatric gynaecology and gynaecology of teen-agers, oncology, pyo-septic, operative and endoscopic gynaecology, etc.

It may be advantageous to organize specialized intradistrict departments for pregnant women with neuroendocrinal pathology, diabetes mellitus, cardiovascular diseases, kidneys, as well as departments for artificial insemination and extracorporal fertilization.

Specialized aid of full value in obstetrics and gynaecology may be realized under the condition of

sufficient joint and collaboration of obstetrical and gynaecologic establishments with all services of health care. It should be done by obstetricians and gynaecologists and professionals in allied specialties (pediatricians, therapists, neuropathologists, endocrinologists, psychotherapists, etc.) on all stages of a woman's life and at the period of her generative function fulfillment. There is specialized obstetrical and gynaecologic aid rendering by obstetricians and gynaecologists (prematurity and immunoincompatible pregnancy, postnatal pyo-septic diseases, pediatric gynaecology) and specialized aid rendering by other specialists (cardiologists, endocrinologists, neuropathologists, etc.) together with obstetricians and gynaecologists.

**Perinatal care of the fetus** is a basis of modern obstetrical service activity. Recently they organized centres for perinatal and prenatal fetal care. They have modern possibilities of prenatal diagnosis and treatment and fetus therapy in pregnant women from the groups of higher risk (chorion biopsy, amniocentesis, cordocentesis).

## FAMILY PLANNING

"Family planning" means a complex of social, economic, cultural, educational, medical, religious and other measures directed for the female reproductive function care. They includes the terms of children's birth, their number, use of contraceptives for undesirable pregnancy prophylaxis.

Family planning is a vital problem because of the following reasons:

- a great number of pathological labour (nearly 80% in this country);

- birth of premature with developmental defects and sick children (in this country 20–80% of newborn infants have deviations in the state of their health from the moment of their birth);

- great shifts of perinatal (from 5‰ in developed to 140‰ in backward countries) and maternal death (respectively from 10–12 to 623 cases per 100,000 newborn alive infants);

- nonuniform increase in population on the globe (positive, 1.73% in the world and negative in Ukraine and other countries of the former U. S. S. R.). According to the data of Z. A. Skiriak-Nizhnick (1996), a number of spontaneous abortion increased 4–6 times for the last 10 years in Ukraine, a number of congenital developmental defects increased thrice at the background of double increase in total morbidity rate among the children of early age. Throughout a year nearly 50,000 of women have an immature pregnancy. In the last 10 years a number of severely immature children increased to five times. Gynaecologic morbidity rate increased to 35% in the last 15 years. In this country they perform nearly 70,000 of arti-

cial abortions annually, i. e. 65–70 per a thousand of the women of reproductive age. For comparison this index accounts for 10 cases per one thousand of women in Canada and 5.6 cases in the Netherlands. Among the reasons of maternal fatalities the share of abortions makes up 23% and there is no tendency to its decline (R. V. Bogatyriova, 1997).

As social conditions do not favour the increase in birth rate, reduction of reproductive losses among desirable pregnancies acquires a special meaning (A. M. Serdyuck, A. I. Timchenko, 1997).

When planning a family, the following recommendations of WHO should be taken into account:

- a woman's optimum child-bearing age should be in the limits of 18–35 y. o. and the first child should be born in 18–25 y. o. as the majority of infants with developmental malformations are born in elderly women (especially after 40 y. o.) under influence of hazard factors, existing during pregnancy (ionizing radiation, physical, chemical influences, etc.);

- optimum interval between child-bearing is 2–4 years;

- following by a woman nutrition regime and peculiarities during pregnancy;

- proper behaviour (harmful habits), hygiene before conception and during gestation period; ability to use contraceptives, chosen individually; sanitation of the future parents before conception;

- prophylactic medical examinations of a pregnant woman and timely admission of a patient to an in-patient department for labour and delivery is an obligatory condition of a favourable pregnancy outcome, the fetus and newborn infant development.

Breast feeding has a lot of advantages over the artificial feeding, especially in the first six months of an infant life and every woman who is going to become mother should remember about it. The first or late abortion, abortion due to Rh-conflicted pregnancy, a great number of sexual partners, sexually transmitted diseases may become a reason of generative function loss. The first pregnancy in women aged 30–35 y. o. and more as well as at the age under 18 may cause much more complications and completed with an operation of caesarean section (B. M. Ventkovsky, 1997).

In Ukraine only 174 from 1000 women of reproductive age use mechanical contraceptives and 34 women use oral contraceptives for pregnancy prevention, i. e. much less than in the economically developed countries (R. V. Bogatyriova, 1997). A real situation taking place in the country was a reason of creation of the National programme "Reproductive Health".

Family planning is the main task of the state and has to influence on its demographic policy efficacy, decrease in maternal and perinatal morbidity and mortality rates.



## ANALYSIS OF REASONS AND PROPHYLAXIS OF MATERNAL AND PERINATAL MORTALITY RATES

**Maternal mortality rate prophylaxis.** Annually 500,000 women die due to different obstetrical reasons all over the world. Analysis of maternal mortality rate reasons proves that its structure is of a rather stable character. As to the data of the Ministry of Public Health of Ukraine in 1998 bleedings occupied the first place among the fatalities reasons, toxicoses (gestoses) took the second place and on the third place were postnatal pyo-septic diseases. Prophylaxis of maternal mortality rate starts from girls' health care. Recently due to the changes taking place in the social behaviour of the youth, liberalization of sexual relations they mark the increase in a number of inflammatory diseases as compared with the West European countries through sexually transmitted infections, and menstrual function disorders.

*Maternal mortality rate prophylaxis* connected with septic complications lies in 1) decrease in a number of criminal (back-street) abortions; 2) improvement of family planning; 3) possibility to make therapeutic (justifiable) abortion at early terms of pregnancy according to a woman's wish; 4) timely diagnosis and treat of inflammatory complications; 5) obeying of sanitary-and-epidemiologic regimes in obstetrical establishments; 6) sanitation of infection foci in pregnant women from the groups of higher risk; 7) following of asepsis and antisepsis under delivery management and conditions of all operative interventions; 8) reduction to a minimum a number of vaginal examinations during labour and delivery.

*Prophylaxis of maternal mortality rate, related to obstetrical bleeding, uterine rupture, embolism caused by amniotic fluid* includes the following: 1) revealing of the high risk groups (labour anomalies, a scar on the uterus, metabolic diseases, big fetus, preeclampsia, multiple pregnancy, hydramnion, blood system diseases); 2) round-the-clock readiness of a lying-in-hospital and operation theatre to render urgent medical aid (qualified medical staff, bank of blood and its substances, necessary remedies, equipment for haemotransfusions, laparotomia); 3) careful medical observation for the puerpera.

*For the prophylaxis of maternal mortality rate* as a consequences of extragenital pathology it is necessary 1) to send pregnant women in specialized centres; 2). timely to decide a question about the possibility of pregnancy bearing in severe and decompensated forms of pathology; 3) to improve qualification of the therapeutists, obstetricians and gynaecologists, efficacy of their joint activity in pregnancy and delivery management in such groups of patients.

*Prophylaxis of maternal mortality rate as a consequence of preeclampsia and eclampsia* includes

the following measures: 1) timely hospitalization of pregnant women to obstetrical in-patient department of the 3rd level, where they are treated in the wards of intensive care with an adequate timely delivery; 2) a detailed analysis of all cases of late hospitalization; 3) doctors' skills improvement.

**Prophylaxis of perinatal mortality rate.** The causes of pediatric mortality rate conditionally may be divided into two large groups (I. S. Smeyan, 1997); endogenous (diseases of newborn infants, congenital developmental malformations) and exogenous (diseases of the respiratory tract, infectious disease, incidents, poisonings, traumata). Fatality as a consequence of endogenous reasons takes place during first days after the child's birth and mainly results from fetal and maternal pathology during pregnancy. The main fetus newborn infant diseases which may cause fatality are acute respiratory viral infections, pneumonia, infections of skin and subcutaneous fatty tissue, congenital anomalies, birth injury of brain or spinal cord, asphyxia, respiratory distress syndrome (hyaline membranes disease, idiopathic respiratory distress syndrome), congenital pneumonia, massive aspiration syndrome, other respiratory disorders (pneumothorax, pulmonary bleeding, primary atelectasis), intrauterine infections, sepsis, fetal and newborn infant bleeding, intraventricular bleedings, haemolytic disease from isoimmunization, other kinds of perinatal jaundices, haemolytic and digestive disorders, and etc.).

According to the data of prospective, randomized, controlled and multicentral study done by British scientists (E. Alberman et al., 1997), 10% of newborn infants fatalities are connected with delivery, 64% of them are connected with the fetus and the rest are maternal; the main causes of stillbirths is asphyxia (in combination with birth injury or without it), congenital malformations of development and intrauterine infections of the fetus.

Mother's diseases causing to the fetus pathological development are as following: extragenital diseases, pregnancy complications (late toxicoses of pregnant women — gestoses), isthmocervical insufficiency, premature rupture of amniotic membranes and etc., abnormalities of position, fetus presentations, clinically contracted pelvis, disturbances of labour activity, delivery involving surgery and etc., pathology of placenta and umbilical cord (presentations, placenta separation, morphofunctional changes of an afterbirth, prolapse and abnormalities of the umbilical cord, chorioamnionitis).

Children's health and perinatal mortality rate are closely connected with the mother's age and health and the interval between childbirths. According to WHO data, the lowest perinatal mortality rate is observed among the women who gave birth to a child at the age from 25 to 34 y. o.

During postnatal period of life endogenous causes of mortality are replaced by exogenous ones connected with the factors of the environment (condi-

tions of feeding, quality of family care for an infant, quality of medical supervision). If recently they managed to achieve some positive changes in infants mortality rate reduction stipulated by exogenic reasons and first of all by infectious, parasitic diseases, diseases of respiratory and digestive tract, then for endogenic mortality rate reasons reduction it is necessary not only a significant progress in public health care development but positive changes in ecology, reproductive health, social conditions of life.

Revealing and treatment of women with extragenital pathology before fertilization and at early terms of pregnancy especially in the case of metabolic diseases is of great importance for prophylaxis of perinatal mortality rate.

Pregnant women with risk factors should be examined for availability of diabetes melitus obligatory. Starting from the first visit of a pregnant woman to the women's consultation clinic (this visit is very desirable at the term before 12 weeks of pregnancy) they clear up all possible risk factors of perinatal pathology, work out an individual plan of a pregnant woman management. Prophylactic hospitalization in an in-patient department of pregnant women with abnormalities of position, presentation, contracted pelvis, late toxicosis (preeclampsia), extragenital pathology, prolonged gestation, hydramnion, hypotrophy of the fetus, a scar on the uterus after caesarean section, aggravated obstetrical history (still births, birth injures, early neonatal death) is of a great importance.

Present time they reveal somatic pathology in every third pregnant woman. A number of anaemias increased 6 times as against 1985 (N. G. Goida, 1997). In spite of the fact that a number of caesarian sec-

tions has increased 10 times for the last 20 years, they did not manage to achieve a significant decrease in perinatal mortality rate. Taking into account all mentioned above, professional skills of medical doctors, improvement of the fetus and newborn infants state diagnostic, management of delivery, substantiated usage of caesarian section has an important meaning for the further reduction of perinatal mortality rate.

A correlation between main and minor diseases of mother and fetus allows to make a conclusion that all cases of perinatal death may be divided into conditionally preventing (25–40%; improvement of the work of women's consultation clinics and lying-in-departments, organization of neonatal service) and conditionally unpreventing (developmental malformations of the fetus, pathology of placenta and umbilical cord). Correction of the latter is possible under the conditions of fundamental and applied knowledge in perinatology development, improvement of social and economic population living conditions.

The quality of public health care reflects the level of prosperity of population in every country, the degree of its social protection, is a detector of political and economic situation in the society.

New economic conditions of activity, adoption of positive world experience should lead to the change of traditional structure, development of new subdivisions and establishments which in its turn will favour their greater free access for population and improvement quality of treatment-and-prophylactic aid.

#### RECOMMENDED READING

4; 5; 19 (4–25); 21 (5–52).



## Chapter 2

# DEONTOLOGIC AND PSYCHOSOMATIC ASPECTS OF OBSTETRICS AND GYNAECOLOGY

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### MEDICAL ETHICS AND DEONTOLOGY IN OBSTETRICS AND GYNAECOLOGY

**Medical deontology** is a body of moral and ethic standards and principles of a medical person behaviour at the performance of his professional duties.

**Medical ethics** covers a wide range of problems. It is a teaching about a medical person moral, his interactions with patients, colleagues, society. Medical ethics is considered to be a historically shaped code of moral standards, requirements to behaviour which should be characteristic to the representatives of medical profession.

The main principles determining doctor's moral make up has been forming and improving during centuries, and they depended on social-and-economic conditions of a country, national and religious traditions. A prominent role in determining the main points of medical ethics and deontology belongs to the great Hippocrates, a founder of scientific medicine, his pupils and followers.

A considerable contribution into "deontolization" of medical activity had been done by prominent figures of domestic and Russian medicine V. P. Obraztsov, N. D. Strazhesko, N. N. Diterikhs, N. I. Kolomiychenko, N. M. Amosov, Ye. I. Likhtheinshtein, I. P. Pavlov, N. I. Pirogov, N. N. Petrov, V. M. Bekhterev, K. I. Platonov and Zemskie doctors. Moral and ethical principles of obstetrics and gynaecology has been reflected in "The Hippocrates' Oath" and in pre-revolutionary Russia in "The Faculty Promise". The problems of medical ethics are widely discussed at different medical arrangements. In some districts medical societies composed their own professional ethical codes, i. e. "Medical Ethics" worked out by the doctors from Uman' (1903).

"The Hippocrates Oath" is a base of "The Genevian Doctor's Oath" adopted by WHO in 1948 and "The Doctor's Oath". Representatives of none of peaceful profession give an oath and this emphasizes

a unique peculiarity of a doctor's activity based on an integral unity of humanism, civilian duties and high professional skills. One should regard deontology specifically for each specialty as each medical specialty has its specific methods and ways as, for example, it is in obstetrics and gynaecology. It is a doctor who has to have a leading role in implementation of principles of deontology. A doctor's breakage of medical deontology rules may cause iatrogenic diseases, that is why it is extremely important to follow the main principle of deontology "do not make harm to a patient at diagnosis and treatment".

The profession of obstetrician and gynaecologists requires a deep psychological contact with a patient and humane attitude to her. The first meeting is very important for the establishment of such a contact. In the course of the meeting a doctor should realize how a patient treats him and do everything possible to arouse her confidence. On a skillful medical approach exactly during the first meeting depends their further relations and the doctor's possibility to take case history. A careful history taking and a patient's complaints clearing up has a key role in diagnosis of the disease and allows to design the plan of treatment. It is necessary during the very first meeting with a doctor to bring a patient relief and firm belief in recovering. A doctor's outward appearance and his clothes irreproachable neatness should be his distinctive features. In the majority of the university clinics in USA a male doctor should come to the work only in white shirt and a female doctor should wear a dress, not trousers. During every meeting a doctor should shake his patient's hand, wish her a good day and introduce oneself during the first meeting.

A visual contact with a patient as well as a skill not only to listen but manage a patient's narration is of a great importance. In the consulting room, where a patient is examined they should support optimal temperature of air, there should not be strangers and outside talks in.

A doctor should be widely educated person, during a talk he should take into account a cultural level, occupation and psychological state of a patient. So,

some patients need enormously business type of history taking, another prefer soft approach, some patients need firm and even strict tone.

On no account, a doctor should not neglect modern methods of investigation, recommendations of colleagues and more, he should organize consultations with the aim to achieve the best treatment results for his patients. When take a history, doctor should clear up if a patient was under medical supervision, what was the diagnosis and what treatment was conducted.

Obstetrician-gynaecologist should control any word uttered, be collegial, he should not criticize the recommendations of other doctors at the presence of a patient as it may have negative influence for a patient's health. Besides, it may happen that a patient he has treated would continue her treatment in his colleague. An important question of medical deontology is a problem of medical secret. On the one hand, a doctor should not hide from his colleagues mistakes, especially, if it concerns a crime, he should register infectious and venereal diseases and on the other hand he should strictly follow a medical secret.

Obstetrician-gynaecologist does not have a right to divulge a secret of adoption, tell a husband about the details and volume of the operation having been performed without a woman's agreement, inform a husband about impossibility to restore a wife's menstrual function as well as about congenital abnormalities, uterus extirpation, sexual life continuation. With the aim to keep a medical secret a doctor has a right to indicate another diagnosis with a special code in a sick-leave certificate and a real diagnosis may be indicated only in the certificate given for the presentation to another medical establishments. A principal proposition, prohibited nurses and junior nurses, to give any information about a patient to her relatives and friends is very important.

It is not unusual that the violation of medical secret takes place during examinations of a chief doctor or head of a unit when a doctor in charge tells about a woman's disease at the presence of other patients.

That is why it is more ethic to examine the patients whose management requires special attention but who need not a consultation in a separate room. Discussion of a patient's state after examination should be done without her presence.

Such an obligatory stage of an examination as a gynaecologic one needs special psychological approach. It should be done in a confidential atmosphere. Before an examination or some manipulation on a woman's body considering her natural shyness it is advisable to tell her what exactly and for what you are going to do.

In USA for example, a patient lying in gynaecologic armchair for a usual examination should be completely covered with a sheet, except the genitals. So, she feels herself to be dressed, defended and can relax effectively what is a necessary condition for painless and qualitative examination. When examin-

ing a patient of reproductive age one should go into a problem of contraception and give her necessary recommendations. A pregnant woman requires special care during examination.

Profession of a doctor is a creative labour, as every day a lot of different tasks arise before him, for their decision he should have independent thinking and be able to foresee consequences of one's recommendations and actions. Only serious and intellectual doctor with necessary tact can establish a good contact and confidential relations with a patient as without a treatment should not be effective.

In case of revealing in a patient condition requiring a surgical intervention a doctor should optimistically substantiate its necessity and help his ward to find confidence in a favourable outcome of an operation, exclusion of post-operative disturbances in her sexual function.

In an in-patient card it is necessary to substantiate the necessity of operation and choice of surgical intervention method. The postpone off an operation affects a patient negatively, that is why such situations should be avoided and if it has happened so (performance of an urgent operation to another patient, unprepared operative theatre) they should conduct psychological rehabilitation. It is very nice if a patient confides in a doctor, agrees to one or another intervention. At the same time it may happen that due to her low cultural level a patient refuses an operation which is vitally necessary for her (disturbed extrauterine pregnancy, obstetrical bleeding, uterine rupture, peritonitis). A doctor has no right to obey a patient's will or opinion of a less experienced specialist against his own persuasions or knowledge. In such cases he has a right to fulfill an urgent operation without a patient's agreement and if possible inform about it her husband or relatives.

One should try to perform surgical intervention in young women as organ-preserving operations. Before their performance it is necessary to clear up if a patient wants to preserve her reproductive function. They should not foresee the outcomes of every surgical interventions, it is better to recommend a patient to refer a surgeon in the case of any complications. If there is a necessity to send a patient to oncologist-gynaecologist, one should emphasize that is done with the aim to complete a patient's full examination, further analysis of all the data necessary, making right diagnosis and prescription of an appropriate treatment.

Some patients need especially attentive attitude and first of all puerpera with still-birth or developmental abnormalities in their infants or those women whose infants died after birth.

At the same time there is a specific category of patients whose behaviour is untactful, who violate the regime of a medical establishment, tranquillity of other patients, who do not want to fulfill doctor's prescriptions and recommendations. Such facts should be reflected in a patient's history. They should conduct explanatory conversations with such patients and

if it is in vain it is possible to discharge them from an in-patient department for the further treatment in an out-patient unit.

The job of an obstetrician-gynaecologist has its peculiarities in clinics and medical establishments where students' and interns' and advanced training of doctors' takes place. The analysis of medical errors (during morning rounds, pathomorphological conferences, meetings of societies of obstetricians and gynaecologists) is very important from both scientific and practical point of view. In every case they should determine what it was, either diagnostic error, doctor's negligence, crime, unrendered aid, wrong tactics or an incident, independent on a doctor. As N. I. Pirogov emphasized a doctor had to confine and gave publicity to his errors and their consequences for the warning of the less experienced colleagues and avoiding them analogue troubles.

The discussion of case histories with the demonstration of a patient during lectures delivery in large auditorium is absolutely warrantable. It will be more effective to demonstrate necessary visual materials (slides, flip-cards, transparencies, photos, results of instrumental investigations) after learning a patient's case history. A creative use of an international experience favours humanistic methods of medical students teaching in Ukraine.

The patients' right for confidence and keeping of medical secret should be taken into consideration when they conduct the course of clinical training. Training of future doctors on anatomic phantoms is the most important component of humanistic approach to patients as first of all it diminishes disturbances and risk for a patient, preserving her from manipulations done by an unqualified specialist and, secondly, reduces time of training and makes this process easier, promotes to acquire practical skills by the probationers.

They may allow a student (an intern) to conduct some procedures on a patient only if he had demonstrated "a conscientious competence" and some degree of "inconscientious competence" on a phantom, i. e. professional skills in performance of some habits. A clinical practitioner may supervise an operation, assist a surgeon or conduct some procedures independently if he has a patient's permission. A patient has a right to refuse to get such medical services. In such a case the procedure (operation) should not be postponed for the next day but should be done by a clinical teacher. Clinical teacher of a department should be discreet both during training of the probationers and discuss their work with the patients. Sharp negative remarks are inadmissible as they may cause nervousness both in a patient and a doctor. For keeping a medical secret they should conduct discussions during clinical trials in a calm surrounding when the strangers and patients are absent, without mentioning patients' families and given names.

They should keep the main principles of medical deontology when conduct researches and publish articles in the journals. Publication of the unchecked

or checked incompletely data, or data containing little material is very harmful. Medicine main goal is to serve people, cultivate ideas of humanism. Medical profession requires from every specialist deep knowledge, wholehearted return of forces, energy for the sake to help a patient and save him from sufferings.

## PSYCHOSOMATIC APPROACH IN OBSTETRICS AND GYNAECOLOGY

The main points of psychosomatic medicine as a teaching about the unity of a patient's soul and body in the media of social interactions, in which the interactions between a patient and a doctor are those between two personalities and they are closely connected with the main problems of deontology. Recently psychosomatic medicine and complex approach to a patient became a point of wide discussions which is probably connected with an introduction in Germany and Austria a new medical specialization in psychosomatic (psychotherapeutic) medicine. It was a consequence of a growing non-compliance of the state of art in medicine, connected with its significant financial limitations and reflected in the opinions of many patients and doctors dealing with practical medicine and medical education. It was speculated by expression of points of view of doctors and patients as to the essence of medicine, estimation of interaction peculiarities in the duet "doctor-patient". That is why not in vain they call the relations between a doctor and patients the main and significant element of medicine of the future.

During gynaecologic consultation communication of a doctor and patient relates three spheres of her life: 1) biological (anatomic and physiologic); 2) emotional and personal; 3) interactive and social.

*Biological sphere.* It refers to a gynaecologist, either a man or a woman, as a specialist in the field of anatomy and physiology of genitals who knows of their structure and functions disturbances. Using his knowledge, doctor estimates objective data in comparison with pathophysiologic understanding of disease, establishes diagnosis, based on casual intercommunications and makes decisions about corresponding treatment. Thus, natural-and-scientific explanations of events, objective data of examinations on a functional language and generally used observations and appropriateness predominate in this sphere. In this case there is a great difference between a doctor and patient as to the level of their competence.

*Emotional-and-personal sphere.* During a gynaecologist's consultation a patient does not rely only on doctor's professional skills but that he perceives her as a separate personality, a unique human being. A

woman survives a gynaecologic reception as a personal meeting and suffers different emotions during it: offences appear, thoughts, associations connected with subjective feelings and referred to her body, especially genitals. For a patient her genitals always associate with self-estimation, sexual identity, sexual emotions, sense of pleasure, wish, love, as well as with a feeling of shame and fault, disgust, disappointment, humiliation, etc.

A doctor cannot watch such phenomena objectively, it is a patient's competence, but therewith he should be delicate partner, well-wishing listener and support a patient in every possible way.

*Interactive-and-social sphere.* When comes to a consultation, a patient brings her own social vital situation either realizing or not realizing it. Each of the female vital phase (teen-ager, labour, menopause, old age) is formed by political and social conditions where she is with their typical course and possible conflicts which may be survived like a crises.

A doctor is a part of this social surrounding. He is a social partner who accompanies a patient and helps her with recommendations which requires a lot of responsibility. During an ordinary consultation a doctor tries to classify patient's symptoms and complaints as he understands a disease. Psychosomatically educated doctor tries to systematize these complaints and problems by their priority and severity, then inquires a patient about her understanding of the illness. Thus, the reason of frequent relapses of vulval candidosis may be a patient's sexuality which she experiences but feels little emotional satisfaction, difficulties with prophylaxis, frustration, disappointments. Fear before relapsing disease, fear to become "dirty", shame and fault may aggravate a disease. All these factors complicate a patient's prophylactic apply to a doctor under candidosis relapse. During consultation together with a medicamental treatment a doctor includes in therapy recommendations as to a patient's behaviour and accompanying emotions. The aim of the treatment at this stage is to remove fear, sense of own fault, strengthen a patient's self-reliance, teach her methods of prophylaxis. All these determine interactive-and-social sphere.

*Psychoendocrine interactions.* The point of coupling of the categories of survived and metabolic processes lies in limbic and hypothalamic systems which integrates information from CNS. Based on these data, hypothalamus passes to pituitary body and its subordinated metabolic centres regulating impulses. Substrate of ties is mediator, catecholoeestrogens releasing-hormones and gonadotrophins. Thus, emotional stress caused by unfavourable influence of surrounding and frustration, changes hypothalamic pulsative secretion of gonadotrophin-releasing-hormone (GRH) as a result of which decrease excretion by pituitary body of pholytrophin and horionic somatotrophin. Hypogonadotrophic signal stimulates ovaries too weakly and as a result the development of foliculli and creation of ovarian steroids decreases. It leads to a slight

prolyferation of endometrium and development of clinical signs of oligo- or amenorrhoea. From its side, peripheral steroids do not act only as positive or negative reverse tie in the limits of hypothalamo-pituitary-ovarian regulation, but acts to metabolism and presynaptic secretion of mediators and central peptides.

Oestrogens, for example, stimulate enzymes taking part in serotonin formation. That is why hypoeostrogenia may lead to serotonin contents decrease in central neurotic synapses which will favour clinical signs of depression. Such complex interactions take place in women at the disturbances of the menstrual cycle, specifically at secondary amenorrhoea, insufficiency of lutein phase of the cycle, hyperprolactemia, hyperandrogenia, annovulation, premenstrual syndrome, dysmenorrhoea, after labour as well as at the period of menopause.

*Psychovegetative interaction.* The cross point of categories of survived and vegetative (regulative) reactions is in limbic-hypothalamic sphere which is connected with adrenal glands and peripheral vegetative centres. Informative substances of this regulative system are catecholamines and cortisol.

Thus, psychoemotional stress causing fear or helplessness leads to increased secretion of catecholamines with changes of peripheral blood supply and vascular spasm (vasoconstriction). Peripheral vascular dilation may be a cause of parametric pain (chronic pelvic pain) or in hypogastric area if the organ is not damaged. Increased frequency of impulses of sensitive fibres in the lesser pelvis may be perceived as strong pain and increase psychoemotional stress.

Another example may be a situation when psychoemotional stress, e. g. chronic sexual conflict and sexual frustration which are followed by state of higher tension and loss of possibility to relaxation may as a consequence of chronic relieves of peripheral vegetative centres lead to discharging of the threshold of neuro-muscular membranes, e. g. urine bladder.

Clinical consequences of this state are irritation of urine bladder with premature first vesical tenesmus, decreased capacity of urine bladder and decrease in its sphincters tonus, obstruction of the neck of the urinary bladder. Sensation of frequent tension in the urinary bladder together with decrease in its capacity leads to very hard psychoemotional consequences, connected with shame, helplessness, anger which intensify psychic stress, has negative influence on the possibility to sexual emotions and delight, i. e. complicates a human being's vital situation.

The interactions mentioned above have a meaning when these symptoms and diseases as chronic hypogastric pain, incontinence of urine, chronic pain or pruritis without visible reasons, disturbances of the womb functions in early and late terms of pregnancy appear.

*Psychoimmunologic interaction.* The basis of relation between psychic feelings and immune system is in either activation or desactivation of immunocompetent cells. Informational substances connect-



ed with this signal get into hypothalamus which via corticotrophin (adrenocorticotrophic hormone, ACTH) influences adrenal glands activity. Reinforced excretion of glycocorticoids causes immunosuppressive action. Besides, there is a connective link between sympathetic nervous system, catecholamines, spleen and lymphatic nodes. Decrease in norepinephrine level in immunocompetent tissues is in an inverse relationship from immune reactions intensification. "Transmitting substances" are lymphokines, catecholamines, cortisol, etc. in this interaction between systems. "Transmission of information" between individual feeling and immune reaction follows the pattern of renewal, i. e. immune reactions are memorized and forgotten. Thus, stress leads to increase in cortisol excretion which causes macrophages' activity inhibition and slackening of immune reactions. In so doing, reproduction of tumoral cells takes place. They may observe these processes in displasia and tumour of the neck of the uterus, uterus and ovaries, mammary gland carcinoma, chronic urogenital infections.

## PSYCHOSOMATIC DIAGNOSIS

Somatic diseases entail emotional and social consequences. Gynaecologic diseases have especially negative influence on a woman's feeling of self-estimation (self-respect), partnership, sexuality, it is a reason of heavy crises, losses and defeats (abortion, fetal death, malignant neoplasms). Psychosomatic diagnosis is directed to clearing up of emotional and social consequences of a somatic disease symptoms and account them in general picture of disease.

**Factors of biography.** Loss of relatives in relatives in childhood, rape, violation of permitted limits in sexual relations, other social-related traumata become initial conditions for the development of heightened sensibility (patients with chronic low abdomen pain, chronic disorders of the menstrual cycle, premenstrual syndrome, chronic pruritis of skin).

**Chronic emotional disorders** are closely connected with metabolic disturbances and infertility. Under chronic fear influence such syndromes as physical dysmorphia, mastodynia, pain syndromes, climacteric complications. In obstetrics this fear reflects by premature or false labour pains, functional disorders in labour and postnatal period.

**Chronic unsettled conflicts** (between a desire to have children and self-realization, dependence and independence, etc.) take place in the limits of conflict of pregnancy and manifest themselves as uncontrollable vomiting of pregnant, development of gestoses, postnatal psychosomatic disturbances, may be observed in infertile pairs.

Factors, specific for certain vital phases, are revealed in difficulties of a woman's adaptation to her body structure changes during different periods of life (juvenile, reproductive, premenopause and men-

opause). It is fear before loss of identity, conflicts between instinctive needs and ideal norms, loss of the sense of life. All these may lead to constant complications in communication with social surroundings, depression, hopelessness and create a negative background upon which malignant diseases, especially mammary gland cancer often appear.

## PSYCHOSOMATIC TREATMENT

Medical aid will always be more effective at preliminary psychotherapeutic influence. During gynaecologic consultation a doctor may use psychotherapeutic factors: care of a patient, continuity of observation, collaboration with a patient in establishment, understanding and solution of her problems, its further analysis and checking by reality, interpretation of interdependency between physical reactions and unrealized wishes and fear.

One should always remember that women come to gynaecologist with the highest degree of confidence to him. Confidential relations between a patient and a doctor are important interpersonal factor which helps a doctor not only to explain the nature of the disease existed in a woman and her attitude to it deliberately but favours to decrease feeling of despair and inconsolability in a woman. Attention and care shown by a gynaecologist to a patient are important therapeutic factors helping a woman to gain emotional balance lost, mobilize her forces for treatment and recovery.

Doctor-gynaecologist supervises a woman at different periods of her life. In this case "a biographic tie" between a doctor and a patient appear and it important for understanding of specific possibilities for the solution of an individual's problems.

A doctor should help the patients who cannot have children to realize the reasons of their infertility, understand protective function of definite physical symptoms for to get them back vital balance.

Some symptoms and cases of painful syndrome in women to a certain degree are connected with their specific adopted erroneously and wrong behaviour, e. g. urinary bladder function disturbances, sexual disorders conditioned by nutrition and others which may be modified by a doctor.

In many situations during pregnancy, postnatal or postoperative period as well as in malignant diseases a woman has a need to communicate with her social surroundings and fulfillment of this wish should not be only her personal care but a matter of her partner, her family.

All these measures are directed to assuming by a patient competence in her vital situations which will improve her emotional and physical health and if it is possible to banish psychosocial pathogenic factors.

## RECOMMENDED READING

19 (4-25); 31; 5 (560-596); 44.

## Chapter 3

# CLINICAL ANATOMY OF THE FEMALE GENITAL TRACT AND GYNECOID PELVIS

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## FEMALE GENITAL TRACT

The female genital tract is divided into external and internal genitalia.

To the external genitalia (*organa genitalia feminina externa*) they refer: the external genitalia (*puddendum femininum*) or vulva (*vulva*), pubic mound or mons veneris, large pudendal and small pudendal lips, clitoris, hymen (*hymen*), inlet to the vagina and its glands; female urethra (Fig. 1).

**The pubic mound** (*mons pubis, mons Veneris*) is the lowest part of the anterior abdominal wall, the spherical fat pad above the pubic symphysis (*symphysis pubica*) covered by skin with hair. Hair appearance and fat sediment on the pubic mound takes place at the beginning of puberty. The upper limit of hair forms a horizontal line in women (the female type) and in men the hairy integument is located along the white line as a stripe or in a form of a narrow

triangle with its apex near the umbilicus (the male type). In women hair grows down along external surface of the large pudendal lips (triangle with an apex below). The appearance of the pubic hair changes with a woman's vital phases. It does not exist in girls before puberty, in reproductive age it varies very much by thickness, length and coloration, in menopause hairy integument becomes sparser. The skin of the pubic mound contains sudoriferous and sebaceous glands. Quantity of subcutaneous fat depends on heredity, age, diet and, possibly, on steroid hormones influence. From the right and left side of the pubic surface there are pubic tubercles (*tubercula pubica*). They are description points for determination of the external openings of the inguinal canals where round ligaments of the uterus come from.

**Innervation** of the pubic mound is maintained by the branches of the ilioinguinal-genitofemoral nerves.

**Blood supply** proceeds through the external genital arteries and veins. The inguinal lymph nodes ac-

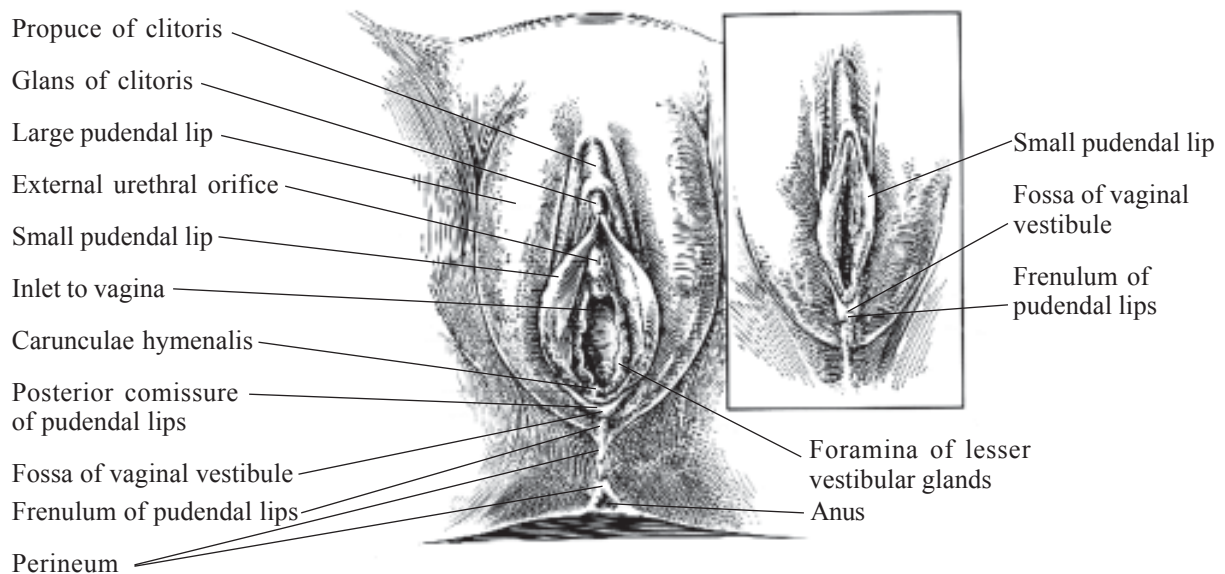


Fig. 1. External female genitalia

accumulate lymph from the genital area and the surface of abdomen. Cross lymphatic circulation has an important clinical meaning, as the spread of the female genitalia (vulva) cancer takes place through the inguinal lymph nodes both with the direction of lesion and in a reverse one.

**Clinical meaning.** Dermatitis, pediculosis (*phthirus pubic*) may evolve in the area of the pubic mound.

Edema of the pubic mound may appear secondary as a consequence of infection, trauma, cancerous infiltration of the lymph nodes. Cancer of vulva may spread on the pubic mound.

**The large pudendal lips** (*labia majora pudendi*) are two folds of skin with connective and adipose tela, numerous vascular plexi descending from the pubic mound to the perineum by either side of the pudendal slit (*rima pudendi*) and forming anterior and posterior junction of the lips. The large pudendal lips as a rule join in nulliparae but after each labour the distance between them increases and in aged women their atrophy takes place. The skin on the lateral (external) surface of the large pudendal lips is covered by hair and pigmented, on the medial (internal) surface it is smooth, very thin, and looks like mucous membrane. It contains a lot of sudoriferous and sebaceous glands, their secretion renders a specific smell to the area of genitalia. The secretion of the sudoriferous glands which are innervated by the sympathetic nervous system (SNS) moistens the pudendal lips and protects them from irritation by vaginal discharge. The secretion of the glands is regulated by hormonal and psychogenic stimuli, its discharge decreases in aged women. In the bulk of the large pudendal lips on the border between their medial part and low one third on either side there are the greater vestibular glands (the Bartholin's glands) of 10–15 mm in length and 7–10 mm width. Their duct opens on the inner surface of the labia minora in the entrance to the vagina. In the fibrous fibers of the upper part of the large pudendal lips the round ligament of the uterus, which locates in the inguinal canal ends. After repeated labour the large pudendal lips protrude less and they undergo atrophic changes during menopause. A little to the internal part from posterior junction the frenulum is stretching. The frenulum is a thin bridge, skin fold between junction of the labia minora and the large pudendal lips which as a rule ruptures during first labour. To the internal part from the frenulum behind the hymen there is a small recess, the fossa of the vestibule of the vagina (*fossa vestibuli vaginae*). From the point of view of anatomy there is the central tendon of the perineum (*centrum tendineum*, Fig. 2) between the frenulum and anus. It is on the line conditionally joining the tubers of the ischium and is the basis of two (conditionally) triangles, the first one is the urogenital triangle where the urogenital diaphragm locates and the anal triangle where the pelvic diaphragm is situated. Together they form perineum (*anatomical*, Fig. 2).

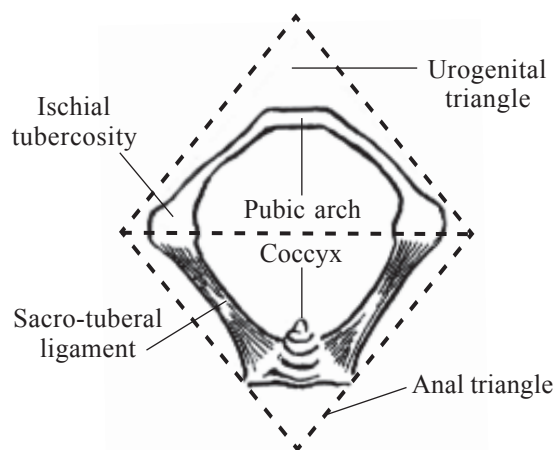


Fig. 2. Anatomical perineum

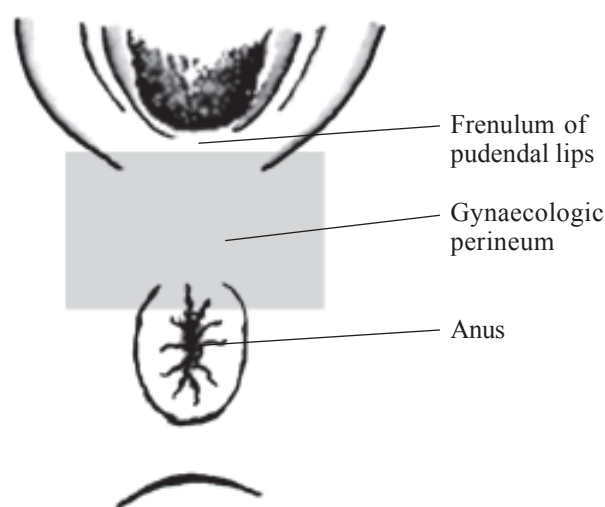


Fig. 3. Gynaecologic perineum

Clinically between the frenulum of the pudendal lips and the anus they discern *gynaecologic* (anterior) perineum (Fig. 3).

**Innervation.** The large pudendal lips are innervated by ilioinguinal and genital nerve anteriorly, and laterally and posteriorly by a branch of femoral cutaneous nerve.

**Blood supply** of the large pudendal lips is effected by the internal (from the internal iliac artery) and external genital (from the femoral artery) arteries. Venous blood outflows by the internal and external genital veins.

**Clinical meaning.** The large pudendal lips have no any special functions. Cyst of the inguinal canal may occur, sometimes it is diagnosed as an indirect inguinal hernia by error. The large pudendal lips may stick together at vulvites in girls. As a consequence of an influence of external force (trauma) or complicated labour the hematomae may form. The tumour of apocrine sudoriferous glands, hydropadenoma, malignase very rarely.

Cysts of the sudoriferous glands are benign, but they may infect rather often.



**The small pudental lips** (*labia minora pudendi*) are two small, narrow and thin (there is no adipose layer) folds of skin between the labia majora and the vaginal opening. As a rule, they are covered by labia majora. The labia minora have sudoriferous glands, smooth muscular and elastic fibres and a lot of veins. They are extremely sensitive due to the presence of a number of nervous endings. On the outside the labium minora are lined with stratified squamous epithelium, pink in color, they have no sudoriferous glands and hair follicles. During puberty the sebaceous glands form, they may infect at this period and atrophy during menopause. At the upper part each labium minora is divided into two less folds which encompass the clitoris from aloft form the prepuce (*praeputium clitoridis*) and on the underside the frenulum of the clitoris (*frenulum clitoridias*). In the low part the labia minora become thinner, coalescing with the inner surface of the labia majora and forming a small cross partition, the frenulum of the labia-minora (*frenulum labiorum pudendi*).

**Innervation** of the labia minora is effected by the ilioinguinal, genital and rectal nerves.

**Blood supply** of the labia minora is effected by the internal and external genital arteries.

**Clinical meaning.** The labia minora close the vaginal entrance. They increase as the response to the stimulation by ovarian hormones and without oestrogen stimulation the atrophic changes take place in it. Squamous cell carcinoma of vulva often starts from the labia minora, exactly from the sebaceous glands. Stick together of the labia minor in girls is an evidence of their inflammation (vulvitis), their symphysis may be an evidence of sexual differentiation disorders.

**The clitoris** is homologous to the penis cylindrical erectile body 2–3 cm in length, located in the anterior corner of the genital rima, between the labia minor. The head of the clitoris is nearly 0.5 cm in diameter, covered by squamous epithelium with the a numerous nervous endings and sebaceous glands. The clitoris is attached to the low part of the pubic symphysis by *lig. suspensioium clitoridis* and consists of two corpi cavernosum. During sexual excitement they observe their erection and as a consequence of it the vaginal entrance narrows. The corpi cavernosum comes from the low edge of the descending branches of the pubic bones, unite in the middle and form the body of the clitoris. The end of the clitoris is surrounded by the edges of the labia minora, their anterior edge forms the prepuce of the clitoris and both posterior edges form its frenulum (*frenulum clitoridis*). Because of numerous vessels and nerves clitoris is extremely sensitive, its friction causes orgasm. The clitoris is the main erogenic zone in women.

**Innervation** of the clitoris is effected by the ilioinguinal and genital nerves.

**Blood supply** of the clitoris is effected by its arteries, the branches of the inner genital artery (*a. pudenda interna*).

**Clinical meaning.** Cancer of the clitoris is met very seldom, early metastatic spreading is inherent in it and it involves wide excision. Inguinal and femoral lymph nodes are damaged first, as a rule.

**The vestibule of the vagina** (*vestibulum vaginae*) is a triangle-shaped cavity, formed from the urogenital sinus and limited at the top by the clitoris, laterally by the labia minora, and inferiorly and posteriorly by the posterior commissure of the pudental lips and the vaginal vestibule. Its bottom is the hymen. The vestibule vagina is lined with thin squamous epithelium. Six orifices open into it, they are: the urethra, the vagina, two ducts of the greater vestibular glands and two ducts of the smaller vestibular glands.

In the vaginal vestibule under the clitoris the outer **orifice of the urethra** (*urethra feminina*) is located. It may be of different form (round, compressed, with two lateral lips) while usually it looks like a turned over letter “V”. It, like the whole urethra, is lined with transitional epithelium and as a consequence has more intensive pink color than the mucous of the vaginal vestibule covered with squamous epithelium. Low two thirds of the urethra are located directly over the anterior vaginal wall. The urethral diaphragm supports the urethra position.

**Innervation** of the urethra is effected by the genital nerve.

**Blood supply** to the urethra is the internal genital artery and vein.

**Clinical meaning.** One may observe vegetation of the urethra mucosa, planocellular and transition-cellular carcinoma, developing from urovestibular zone may occur. Just below the orifice of the urethra there are two small openings of **the smaller vestibular (paraurethral, the Skene’s) glands** (*glandulae vestibularis minores*, Fig. 4, a.).

These glands are homologous to the prostate (*prostata*). Their ducts are lined with transitional epithelium. They have common with the urethra innervation and blood supply.

**The greater vestibular glands** (*the Bartholin’s glands, glandulae vestibulares majores*) are homologous to the Cowper’s glands (bulbourethral glands) in men. They lie on the postero-lateral surface of the vaginal opening. Their ducts open on either side of the hymen in the vaginal vestibular (Fig. 4, b). Each gland has a narrow duct approximately 2 cm long and partially covered with cavernous tissue, bulbs of the vestibular (*bulbi vestibuli*, Fig. 5) located from the both sides of the vagina between skin and m. *bulbospongiosus*. They are homologous to the bulbs of the penis. Viscous greyish mucoid secretion of these glands has alkaline reaction, it excretes at press, sexual excitement and supports normal moistness of the mucosa of the vaginal orifice.

Columbar epithelium of the excretory ducts of these glands is a primary focus of infection for gonococci. The Bartholin’s glands are not palpated in healthy women.



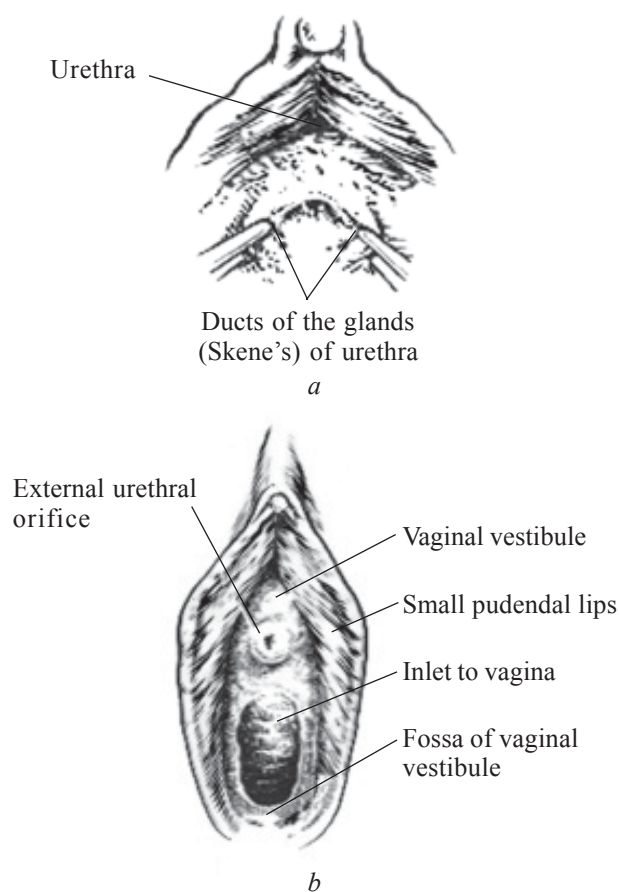


Fig. 4. Vaginal vestibule. Ducts of the glands: a — of lesser vestibular (Skene's); b — of greater vestibular (Bartholin's)

**Clinical meaning.** Bartholinitis is an often complication of sexually transmitted diseases and especially hemorrhage. Abscess of the greater vestibular gland (the Bartholin's) needs a surgical intervention and under relapsing the cyst's marsupialization should be performed.

The hymen is a thin elastic duplicate of mucosa covered with squamous epithelium which as a rule

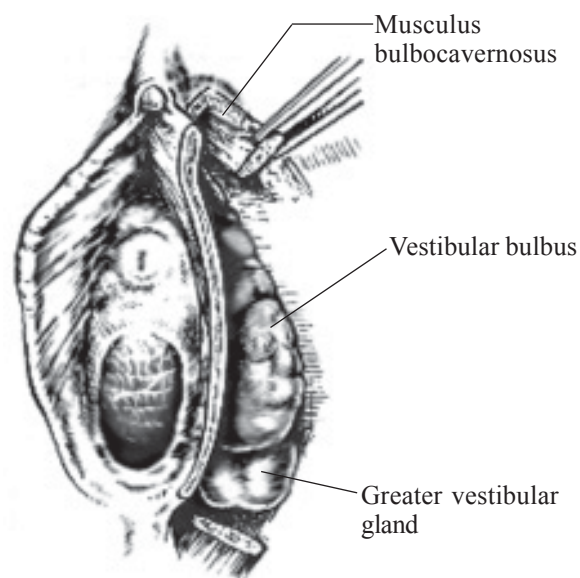


Fig. 5. Greater vestibular gland (Bartholin's), bulb of vestibule

partially closes the vaginal orifice. It has one (rarely several) excentric opening for the outflow of the menstrual blood. Rarely the hymen has no an orifice. During first sexual contacts the hymen usually tears slightly, mainly inferiorly and laterally and after labour only its remnants may stay, papillae of hymen (*carunculae hymenalis*, Fig. 6).

**Innervation and blood supply** of the hymen are effected by the genital and inferior rectal nerves, arteries and veins.

**Clinical meaning.** Rigid hymen may cause pain during sexual contacts which requires its dissection (surgical defloration).

**The female internal genitalia** (*organa genitalia feminina interna*) consist of the vagina, the uterus, the Fallopian tube and the ovaries.

**The vagina** (*vagina*) is a tubular muscular-connective structure joining genital area with the uterus located between the urethra and the urinary bladder

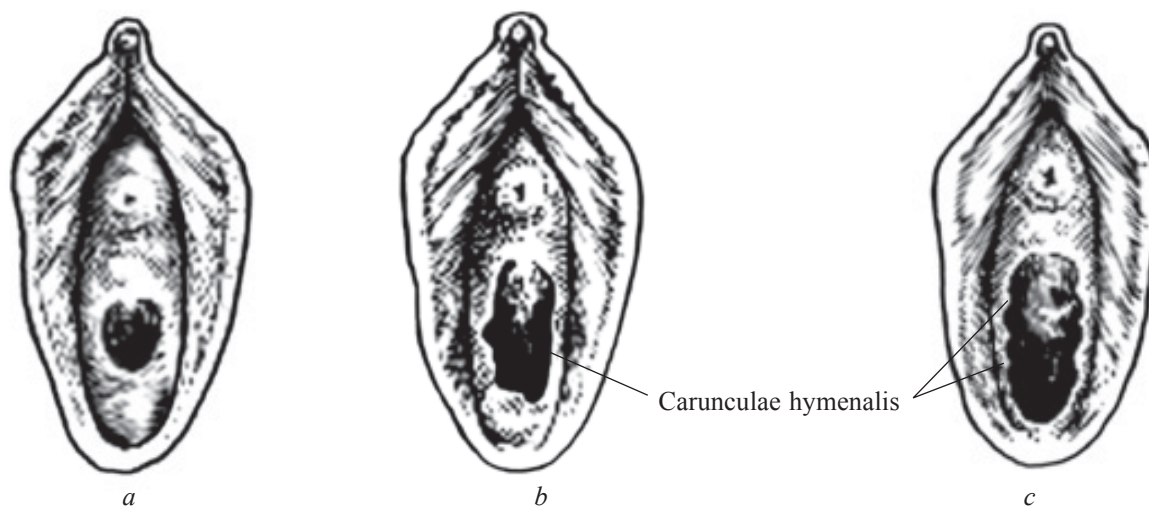


Fig. 6. Hymen: a — intact; b — after coitus or application of tampons; c — after delivery

anteriorly and the rectum posteriorly. Its length along the anterior wall is 7–8 cm and 9–10 cm along the posterior wall. The vagina is narrowed near the hiatus, upwards it widens and ends with the vaults of the vagina. The vagina is a polyfunctional organ, it is an excretory organ of the uterus, the female organ of copulation and part of labour canal. Its upper part is formed from the Müller's ducts, and the low one from urogenital sinus. Anteriorly the vagina is separated from the bladder and the urethra orifice by the vesicovaginal septum, posteriorly it is limited from the rectum by the recto-vaginal septum. The superior one fourth of the vagina is separated from the rectum by the dome-shaped pocket of the peritonium, the rectouterine (Douglas') pouch. The superior part of the vagina encompasses the uterus' cervix and forms the anterior, posterior and two lateral vaults.

The vaginal walls, anterior and posterior, consist of muscular fascicles, connective tissue and mucous membrane. The muscular fascicles of the vaginal anterior wall spread on the muscular layer of the urethra and the muscular fascicles of its posterior wall — on the inferior part of the rectum. The thickness of the vaginal wall is approximately 3 mm.

The vaginal wall consists of the three layers. The mucous membrane of an adult woman vagina is lined with stratified squamous epithelium, it is comparatively smooth on the lateral walls and forms anterior and posterior transversal folds (columnae rugarum) which allows it to stretch well in labour.

The vaginal connective tissue is rich in blood vessels and contains lymph nodes. The vaginal mucous membrane is pale pink and during pregnancy it is cyanotic, it is glands-free. The vaginal discharges, contain alkaline secretion of the cervix, desquamous epithelial cells and bacteria. Epithelium of the vagina is rich in glycogen which transforms into lactic acid under the influence of normal vaginal flora (Doderlein's bacilli). That is why pH of the vagina is acid (approximately 4.5) what is a protective barrier against infections.

**Innervation** of the vagina comes from the genital and rectal nerves and pelvic sympathetic plexus.

**Blood supply** of the vagina is effected by the vaginal branches of the uterine artery which supply blood to its upper one third. The middle one third of the vagina is supplied by blood from the inferior vesical arteries; its low one third is supplied from the middle rectal and inner genital arteries. The venous plexis is located around the vagina, the veins pass along arteries to the inner iliac vein; the veins of the low one third of the vagina go to the femoral arteries.

**Lymphatic drain** of the low one third of the vagina as well as the genital area is effected in the direction of the vaginal lymph nodes and the middle and upper one third of the organ in the direction of the iliac lymph nodes.

**Clinical meaning.** The vaginal discharge (leukorrhoea) is a frequent complication, symptom of local

or systemic diseases. The most frequent reason of the vaginal discharge is an infection of the low parts of the reproductive tract. Other reasons may be either oestrogenic or psychogenic stimulation or deficiency of oestrogens as a result of senile atrophic vaginitis. Metastatic cancer of the vagina is met more often than primary one.

**The uterus** (*uterus, s. metra, hystera*) is an unpaired cavitory muscle organ located in the pelvic cavity between the urinary bladder anteriorly and the rectum posteriorly (Fig. 7).

The uterus consists of two parts: the upper, the body of the uterus (*corpus uteri*) and the low, the neck of the uterus (*cervix*). The upper part of the body is called the fundus of the uterus (*fundus uteri*) and in the cervix they distinguish supravaginal and vaginal parts (Fig. 8). There is the isthmus of the uterine (*isthmus uteri*) between its body and cervix, the clinical title is orificium internum uteri (some authors distinguish the anatomic and histologic internum uteri, Fig. 9). The uterine wall consists of three layers, the internal mucous membrane (endometrium), the middle, muscular layer (myometrium), the external serous membrane (perimetrium).

The uterine mucous membrane has two layers, the basal layer and the functional layer.

**The neck of the uterus** (*cervix*) is conic-shaped in a nullipara and 2–4 cm long with an average caliber of 2.5 cm. The canal of the neck of the uterus (*canalis cervicalis uteri*) has a rounded orifice (*ostium of the uterus*) which has anterior and posterior lips. Approximately a half of the length of the cervix is accounted for its supravaginal portion to which the urinary bladder is attached anteriorly. The vaginal portion of the cervix to the uterine orifice is lied with

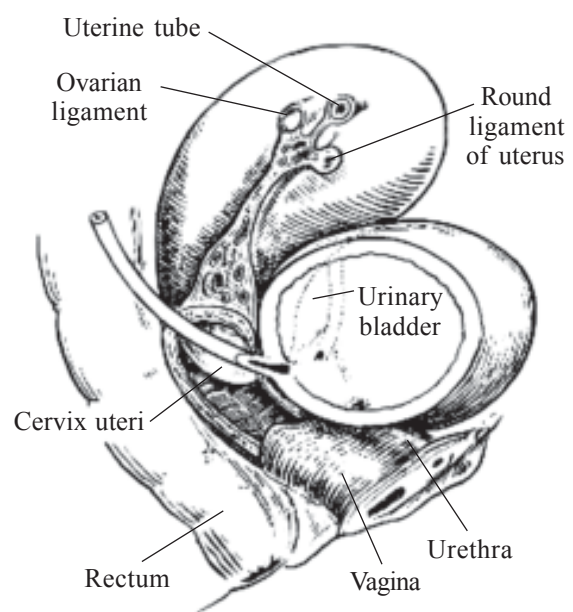


Fig. 7. Topographic anatomy of vagina and uterus

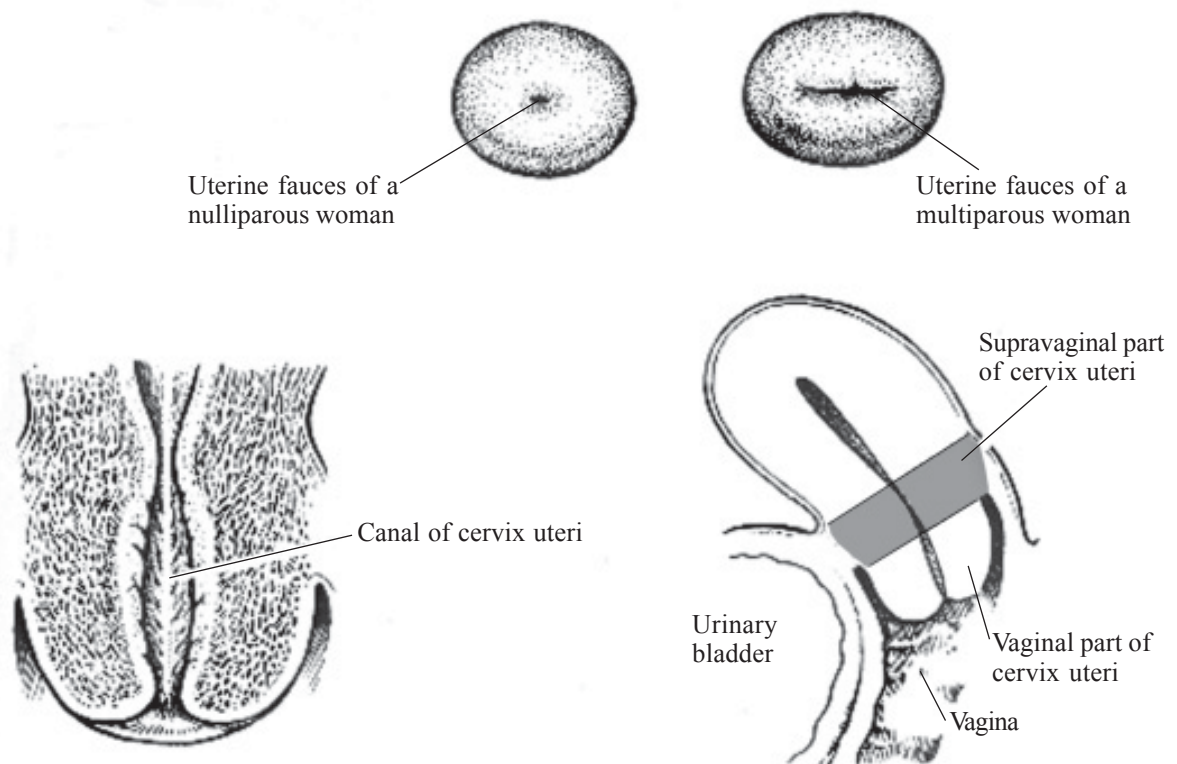


Fig. 8. Cervix uteri

squamous epithelium, the canal of the cervix with columnar secretory epithelium, its glands, mucous exocrinocytes, produce mucus. Apart from the epithelial layer of the canal, the cervix by 85% consists of connective tissue and by 15% it consists of circular muscular fibers which merge with myometrium superiorly. The uterine body, vice versa, consists by 85% of muscular fibers and only by 15% — from connective tissue. The anatomic structure of the cervix changes during pregnancy and labour. Traumatic damages during labour cause changes connected with its location and form. The uterine orifice becomes slot-like (see Fig. 8). The uterine cervix is held in its position due to the pubocervical, sacrouterine and transversal (cardial) ligaments (Fig. 10).

Cervical innervation comes from the second, the third and the fourth pair of the sacral nerves and the pelvic sympathetic plexus.

**Blood supply** is effected by the uterine, ovarian and internal genital arteries and veins. In reference to the pelvic axis the uterus is curved forward (*anteflexio*) in most cases or (rarely) backward (*retroflexio*). the body of the uterus is bent forward (*anterversio*) in reference to the cervix too. The peritoneum covers the posterior surface of the urinary bladder, turns to on the level of the isthmus on the uterine and forms the vesicouterine pouch (*excavatio vesicouterina*). Encompassing the uterus from behind, the peritoneum comes down the cervix, covers the posterior vault of the vagina and turns to on the rectum, forming the rectouterine pouch (*excavatio retrouterinae*, Douglas' pouch). Laterally the rectouterine pouch is limited

by the rectouterine folds (*plicae rectouterinae*) of the peritoneum which stretch to the lateral surface of the rectum and are the uterine fixating apparatus. The fascicles of smooth muscles (*mm. rectouterini*) pass in these folds. From the both sides of the uterus the peritoneum forms the folds, the right and left broad ligaments of the uterus located in the frontal plane. This ligament forms the mesosalpinx relating to the Fallopian tube, and relating to the ovary it form the

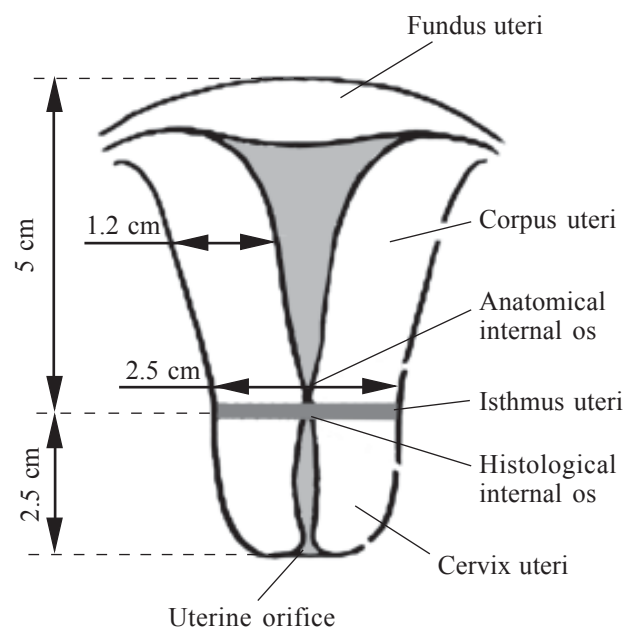


Fig. 9. Structure and sizes of the uterus



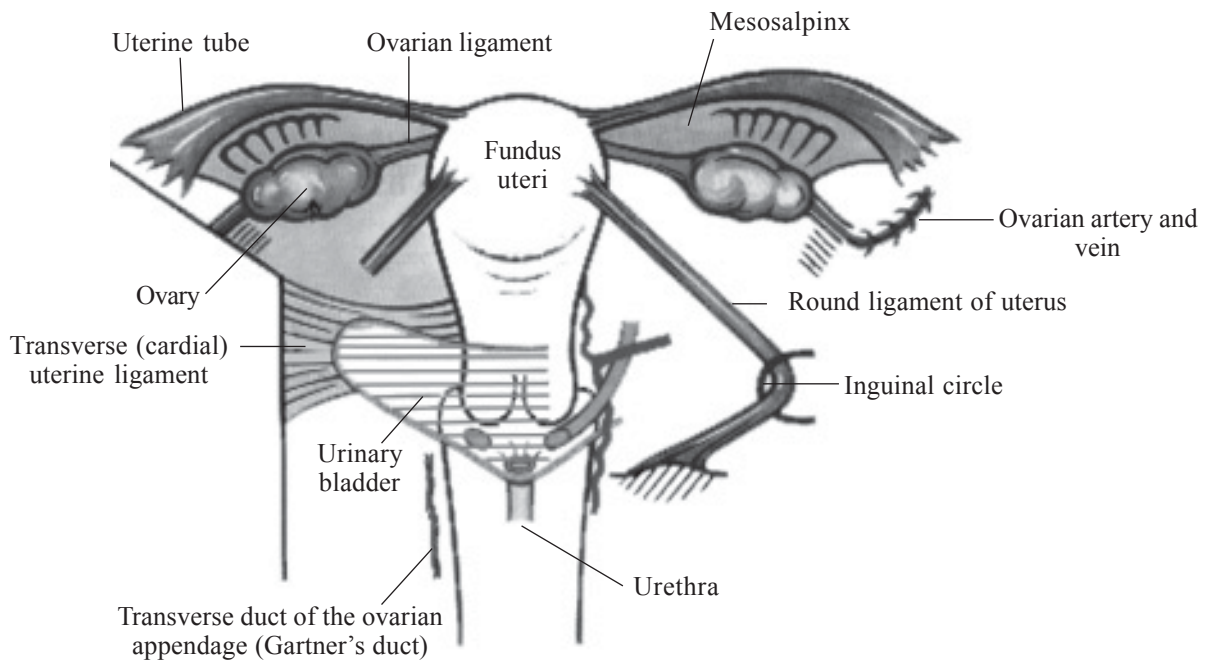


Fig. 10. Topographical anatomy of the uterus and its appendages

mesovarium and relating to the uterus — mesometrium. Part of the broad ligament of the uterus fixating its cervix is called the transversal (cardial) ligament of the uterus. The anterior layer of the large ligament of the uterus covers the round ligament of the uterus (*lig. teres uteri*) which stretches from the corner of the uterus, passes via the deep inguinal ring, comes up to the pubic symphysis and fixates on the pubic mound (see Fig. 10).

The uterus **blood supply** includes the uterine, ovarian arteries and the arteries of the round ligament of the uterus. The uterine arteries (*a. uterina*) run from internal iliac artery (*a. iliaca interna, hypogastrica*) the ovarian — from the aorta, and they

enter the broad ligament of the uterus via the ligament which supports the ovary. The uterine artery stretches along the uterine rib; on the level of the orificium internum uteri it divides into two branches, ascending and descending one which in their turn give a branch to the broad and round ligament, Fallopian tube, ovary and superior portion of the vagina. At the distance of 1–2 cm from the uterus the uterine artery crosses with the ureter (Fig. 11) and gives it a branch (*rami ureterici*).

The ureters cross with the ovarian vessels, located above them on the level *lin. innominata*. They go retroperitoneally to the broad ligament of the uterus, attaching to its posterior layer then descending enter

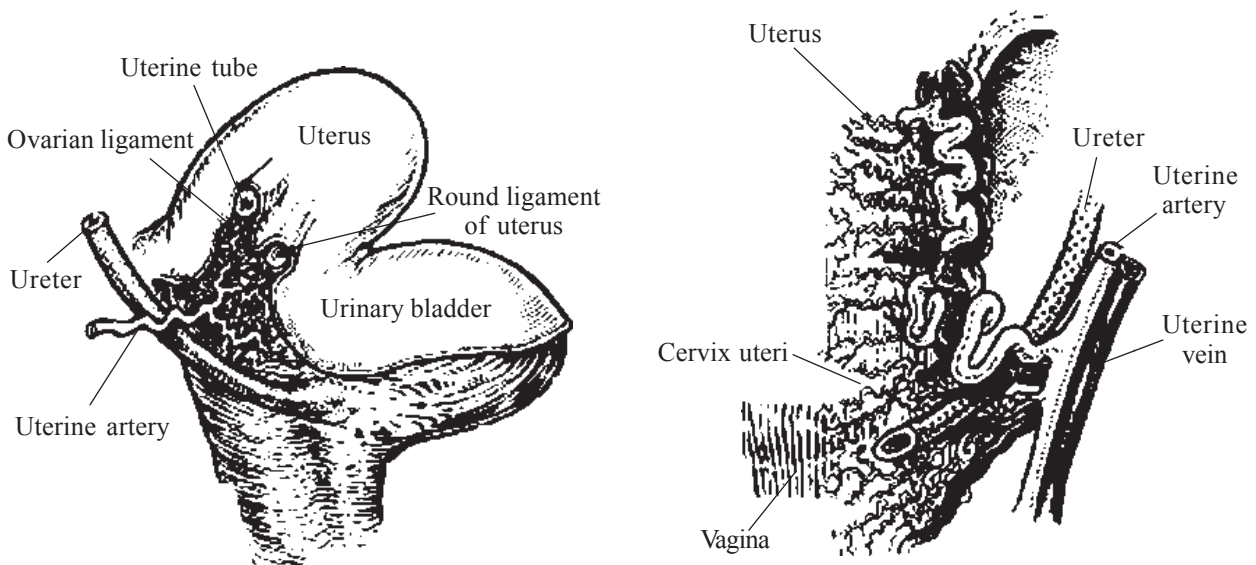


Fig. 11. Correlation between the uterine vessels and ureter



into the parametrium behind the uterine arteries crossing it transversally. Then the ureters almost close adjoin to the anterior vault of the vagina and come to the cervix before the urinary bladder (from the right to 102 cm; from the left to 2–3 cm).

The uterine veins form the uterine venous plexus located on either side of the cervix and in parametrium. It anastomoses widely with the vaginal venous plexus, veins of the external genitalia and other veins of the pelvic organs. The outflow of the venous blood is effected along the uterine veins to the internal inguinal and along the ovarian veins to the inferior vena cava. Lymph outflow from the uterus into the superficial inguinal nodes, external iliac, lateral sacral, paraaortal and paracaval lymph nodes.

The uterine innervation is effected mainly by sympathetic nervous system. Parasympathetic nervous system is represented by the branches of the middle inferior pelvic plexus and by the second, third and fourth pairs of the sacral nerves.

**Clinical meaning.** The uterus is one of the organs of the female reproductive function. The development or acquired defects (for example, Ashermann's syndrome) may be the reason of the reproductive function disturbance. Endometrium is the most frequent localization of cancer in women. Benign tumoral processes, leiomyomae and adenomyosis, develop often in myometrium.

To the uterine appendages (*adnexa uteri*) they refer Fallopian tubes and ovaries. The Fallopian tube (tuba uterina, salpinx, fallopian tube) is a pair organ stretching from the uterus to the ovaries, it performs transportation of the ovocytes into the cavity of the uterus. It is approximately 10 cm long, its caliber differs from 0.5–10 mm to 5–8 mm in different por-

tions. They differentiate the uterine portion of the tube (the narrowest portion, isthmus (*istmus*), ampule and infundibulum (the broadest portion; Fig. 12).

The wall of the tube consists of three membranes, external (serous), middle (muscular) and internal (mucous). The serous membrane of the uterine ligament which forms the mesosalpinx. There is the subserous layer of connective tissue under serous membrane. It contains vessels and nerves. The muscles of the Fallopian tube consists of the internal circular and external longitudinal layers which supply its peristaltic contractions. The mucous membrane of the uterus forms longitudinal tubular folds (*plica tubarial*) and it is laid with monostratal columbar ciliated epithelium with goblet glands. The infundibulum of the Fallopian tube (*infundibulum tubae uterinae*) is the broadest portion of the tube. There is an orifice opening into the peritonium with a caliber from 5 to 10 mm in it. There is a great number of the fimbriae of the tube (*fimbria tubae*) around the opening. The largest fimbria is called the ovarian fimbria (*fimbria ovarica*). These structures may form small fimbrial cysts, hydatids, which are mesonephral by origin. Such rudimentary formations as epoophoron and its longitudinal duct (ductus Gartneri) and paraophoron (Fig. 13) start from mesonephros. Distention intraligamental and nearovarian cysts and malignant tumors can form these formations.

**Blood supply** of the tubes runs from numerous anastomoses between the uterine and ovarian arteries and veins (Fig. 14).

**Innervation** of the Fallopian tubes is effected by the branches of the pelvic and ovarian parasympathetic and sympathetic ligaments.

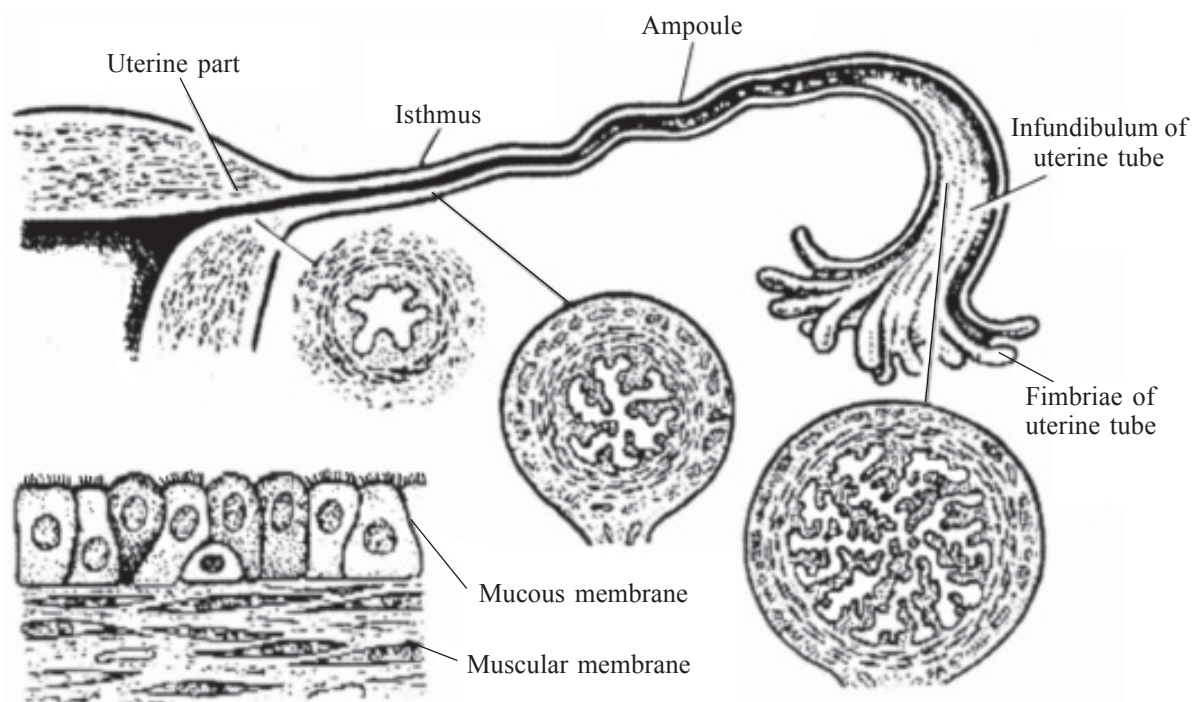


Fig. 12. Uterine tube

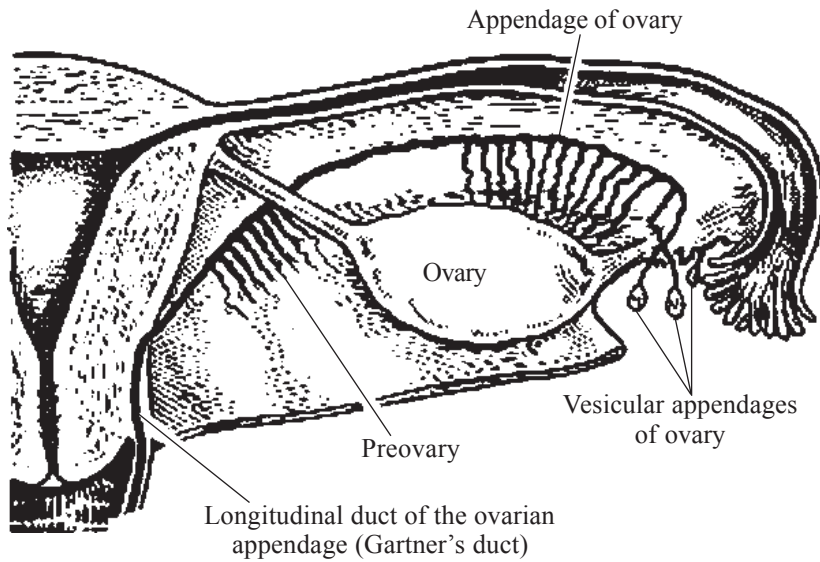


Fig. 13. Rudimental formings of the uterine appendages

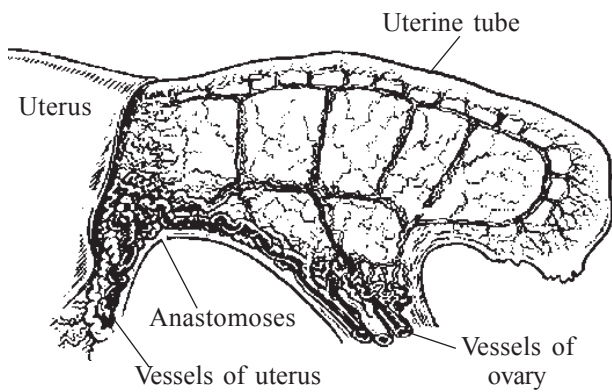


Fig. 14. Blood supply of the Fallopian tubes

**Clinical meaning.** Tubal pregnancy, salpingitis (mainly of gonococcal and chlamydial etiology), perisalpingitis (often of streptococcal etiology) are the most often pathological process in the Fallopian tubes. Tubal deformity with formation of commissures because of infection may be the reason of infertility. Primary tubal cancer is met very rarely.

**Ovary** (ovarium, oophoron) is the female sexual gland, a pair oval organ. Its sizes vary during reproductive period, it is 2.5 cm to 5 cm long; 1.5 to 3 cm broad and 0.6–1.5 cm thick. After menopause the ovarian sizes decrease significantly. The ovary is attached to the broad ligament of the uterus with the mesovarium. During the uterine corner it is connected by the proper ovarian ligament (*lig. ovarii proprium*), with the pelvic lateral wall by the suspensory ligament of the ovary (*lig. suspensorium ovarii*).

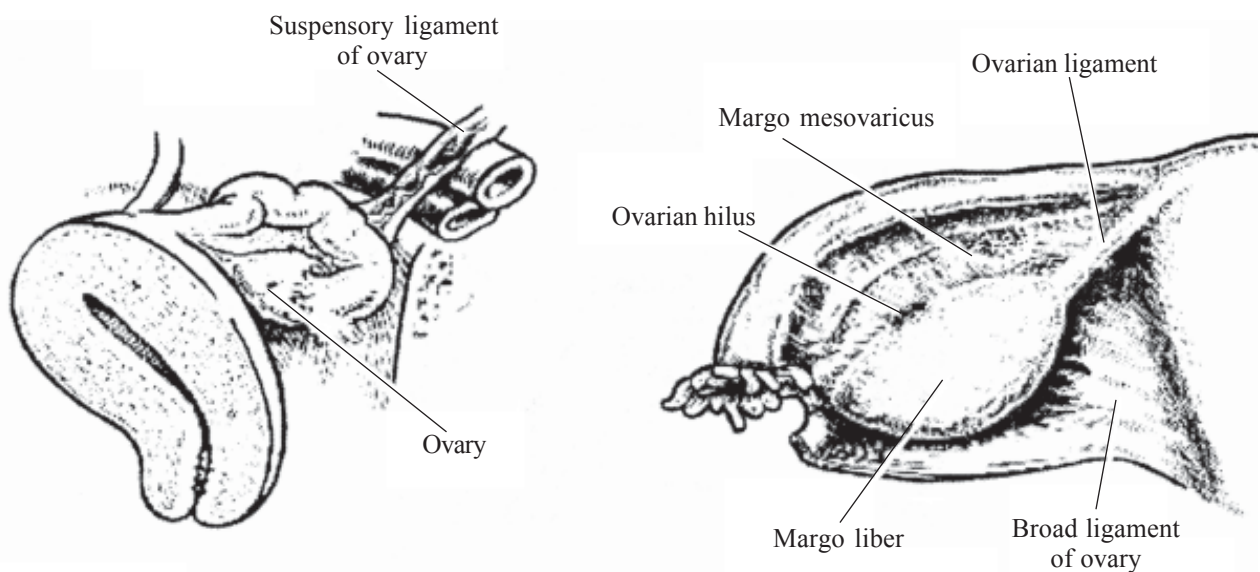


Fig. 15. Ovary

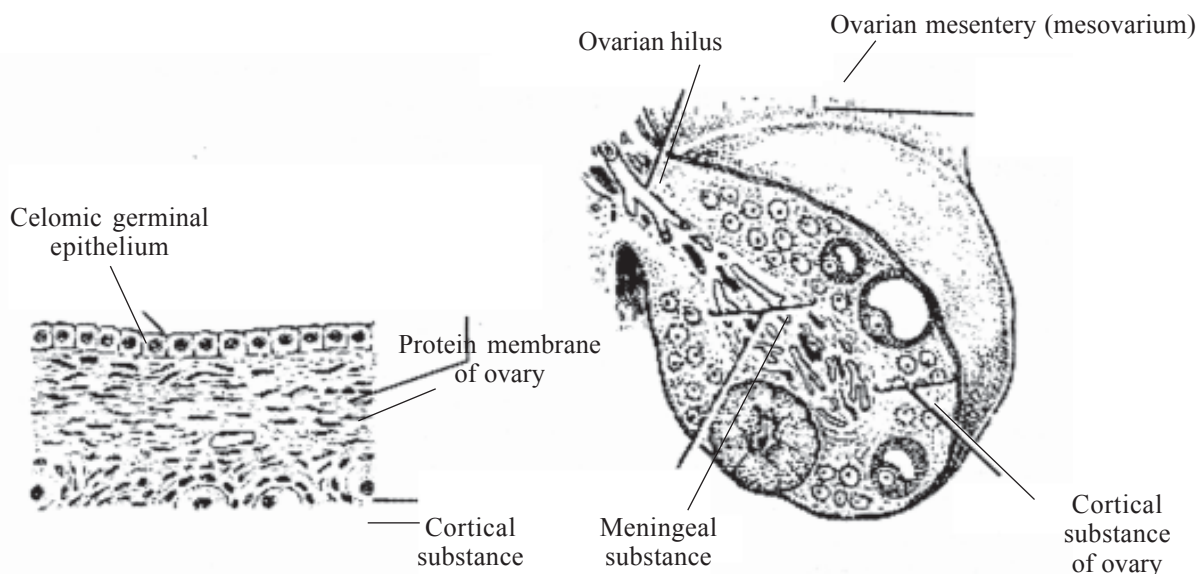


Fig. 16. Structure of ovary

They distinguish two surfaces in the ovary, the internal surface facing to the abdominal cavity and the external surface facing to the pelvic wall; two ends, the uterine and pelvic; two margins, the convex free (*margo liber*) and mesovarian (*margo mesovaricus*). In the area of the mesoovarian margin the ovarian hili are located (*hilium ovarii*), the vessels and nerves enter the ovary via them (Fig. 15).

On the ovarian section one can see the external layer, a cortical substance of the ovary and the internal layer, a medullar substance of the organ (Fig. 16).

The external layer, laid with the germinal epithelium is called the tunica albuginea. The ovarian stroma is located under it (*stroma ovarii*), it is the area of follicles, of different stages of development. There are vessels and nerves in the ovarian stroma, as well. The free surface of the ovary is laid with monostratal cubical epithelium. The follicles increase as they mature.

Tertiary (dominant, Graafian) follicle reaches the ovarian surface, ruptures, pushes out the ovum via stigma and then it luteinizes through the retention of the follicular liquid and forms the corpus luteum, the function of which is the progesterins secretion and the organism preparation for the impregnated ovum implantation. The hormones secretion (mainly progesterins, oestrogens and androgens) is effected by endocrinocytes (luteinocytes and thecal endocrinocytes) of the corpus luteum. In the course of time the corpus luteum hyalizes and forms the white body (*corpus albicans*, Fig. 17). A newborn girl has 100,000 of primary (primordial) follicles, but only 400 of them can mature. But in every cycle during the reproductive period several follicles can start to develop and produce hormones. Later on they will be subject to atresia and parasympathetic cholinergic innervation.

Its **blood supply** runs from the ovarian and uterine arteries which form numerous anastomoses. The ovarian artery is derived from the abdominal aorta, the left ovarian artery starts from the left renal artery. The ovarian veins enter the vena cava inferior, the left ovarian vein enters the left renal vein (Fig. 18).

**The ovary drains** out the retroperitoneal, paraaortal lymph nodes.

**Clinical meaning.** The function of the ovaries is the production of hormones and development of the ovum for fertilization and pregnancy. Benign and malignant tumors often develop in the ovary. The ovarian torsion may result in its necrosis. Infectious damages of the ovary may develop in climacterium. Physiologic position of the female internal genitalia is kept by fixating, supporting and suspending apparatuses. Supporting the uterus and uterine appendages in physiologic position, they afford their mobility in

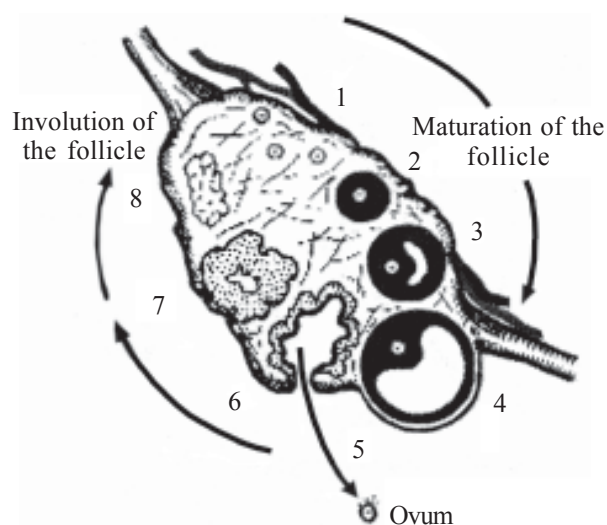


Fig. 17. Ovarian cycle



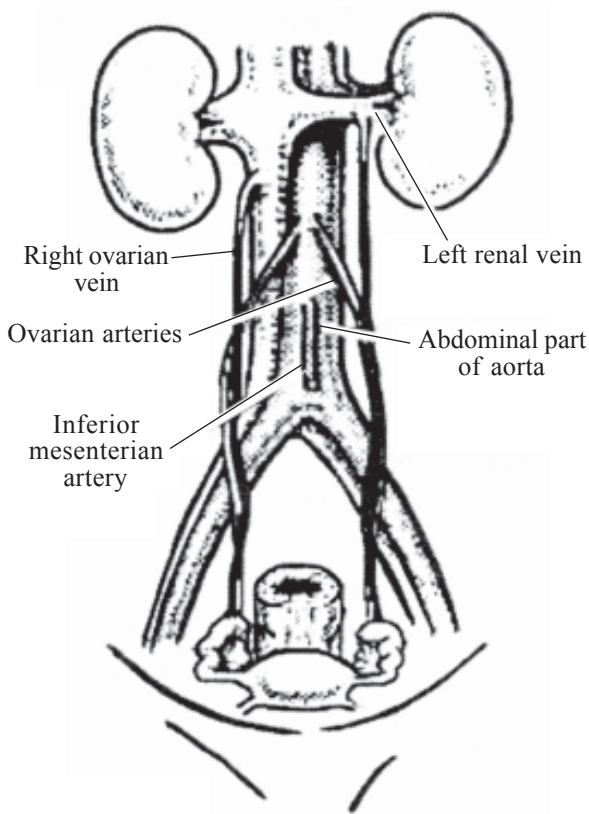


Fig. 18. Blood supply of the ovaries

considerable limits, what is important for normal development of pregnancy and course of labour.

**The suspending apparatus** of the uterus and uterine appendages consists of the following pair ligaments connecting these organs with one another and with the pelvic walls (Fig. 19):

1) the broad ligament of the uterus (*lig. latum uteri*), which leads to the lateral walls of the pelvis and there turns into parietal peritonium, form the mesometrium, mesosalpinx, and mesovarium;

2) the suspensory ligament of the ovary (*lig. suspensorium ovari*) is an external portion of the large ligament of the uterus which runs from the ovary to

the lateral pelvic wall. The ovarian vessels pass in it (*a. et v. ovarica*);

3) the proper ovarian ligament (*lig. ovarii proprium*) runs in the depth of the posterior layer of the large lig. of the uterus and goes from the uterine margin of the ovary to the uterus. The ligament contains smooth muscular fibers, it is crossed with the ovarian branches of the uterine arteries and veins;

4) the round ligament of the uterus (*lig. teres uteri*).

Subperitoneally there is the layer of the fatty tissue, parametrium, between the layers of the broad ligament of the uterus as well as around the cervix and the vagina.

The uterine **fixating apparatus** contains the following ligaments formed from smooth muscular and connective tissue:

1) the mesometrium (*mesometrium*, the transversal, main lig. of the uterus) encompasses the cervix from the isthmus; the fibers turn into the pelvic fascia which fixates the uterus to the pelvic fundus;

2) the pubovesical muscle (*m. pubovesicalis*) runs in the depth of the rectouterine folds (*plica rectouterina*) which go posterior surface of the cervix to the lateral surface of the rectum.

During pregnancy the suspending and fixating folds are stretching and afford the uterus mobility.

**The supporting apparatus of the female external genitalia** is formed by a group of muscles and fasciae which constitute the perineum (*perineum*) or the pelvic fundus. The perineum is divided into the anterior part, the urogenital diaphragm (*diaphragma urogenitale*) and posterior part, the pelvic diaphragm (*diaphragma pelvis*).

The *urogenital diaphragm* is formed by two layers of the perineum, they are the deep and superficial layers.

The *deep layer* of the perineum (*spatium perinei profundum*): 1) the muscle-constrictor (sphincter) urethrae (*m. sphincter urethrae*); 2) the deep transversal muscle of the perineum (*m. transversus perinei profundus*); 3) the muscle, compressor of the urethra;

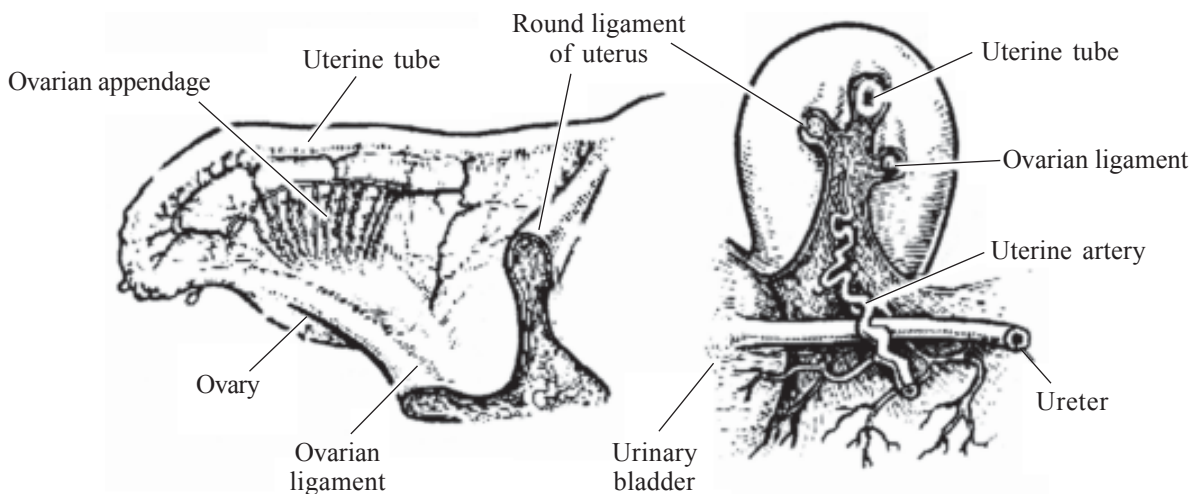


Fig. 19. Uterine ligaments



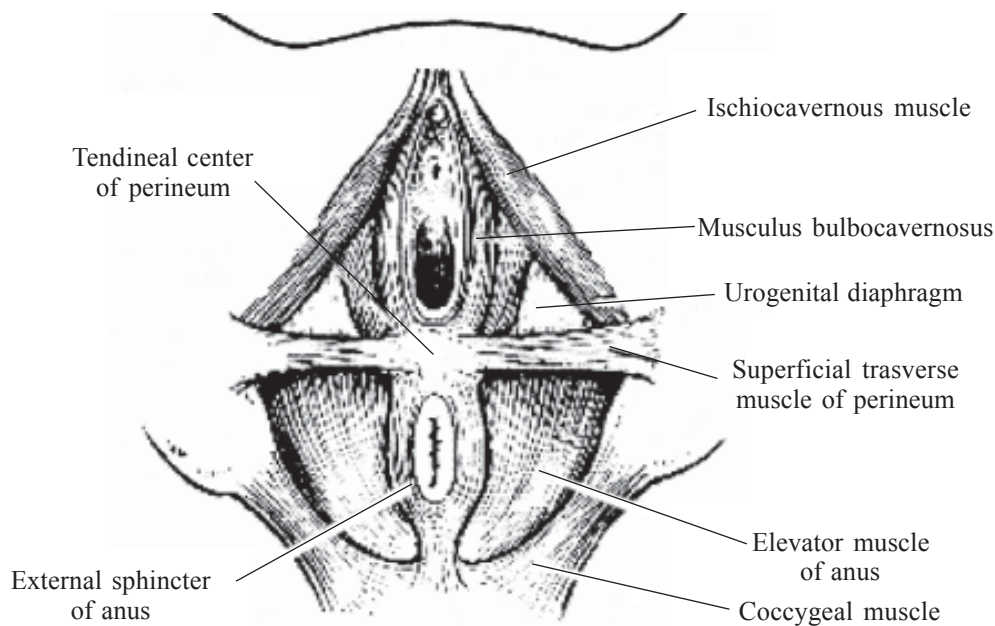


Fig. 20. Muscles of perineum (pelvic floor)

4) the muscle, sphincter urethra vaginal (*m. sphincter urethrovaginalis*).

The superficial layer of the perineum (*spatium perinei superficiale*, Fig. 20):

- 1) the superficial transversal muscle of the perineum (*m. transversus perinei superficialis*);
- 2) the musculus ischiocavernosus;
- 3) the musculus bulbospongiosus.

The pelvic diaphragm (*diaphragma pelvis*) is formed by:

- 1) muscular levator ani. It, in its turn, is formed by the pair crurae of free muscles, pubococcygeal muscle, puborectal muscle, iliococcygeal muscle;
- 2) musculus coccygeus;
- 3) external muscle, the sphincter of the anus and ligaments and fasciae.

As a result of perineum trauma during labour it is the pelvic diaphragm that is damaged. During reconstructive operations of the perineum one should try to reconstruct these muscles carefully as they have the greatest meaning for the keeping of physiological position of the female internal genitalia.

The perineum (the pelvic fundus) is formed by two diaphragms, the urogenital and pelvic.

The muscles of the perineum form three layers.

**The first layer** of muscles, superficial, is formed by four muscles which join in its tendinous centre (*centrum tendinum perinei*), they are: the external muscle, sphincter of the anus, it encompasses the anus orifice and attaches to the coccygeal bone. Anteriorly, on either side of the vaginal vestibule the musculus bulbospongiosus lies; on either side from the tendinous centre of the perineum the superficial transversal muscle of the perineum is located (*m. transversal perinei superficialis*). The musculus is-

chiocavernosus, located between the clitoris and the tuber of the ischium, is in this layer, too.

**The second, deep layer** of the muscles of the perineum is a part of the urogenital diaphragm which is located between the pubic arch anteriorly and tendinous centre of the perineum posteriorly. This pair deep transversal muscle of the perineum (*m. transversus perinei profundus*) and the sphincter of the urethra, their fascicles surround the urethra and vaginal introitus.

**The third, upper layer** of the muscles of the perineum is formed by a pair muscle, musculus levator ani. It is the longest and the strongest muscle among all the muscles of the pelvic diaphragm. Its crura encompasses the urethra and vagina, elevates the anus, strengthens the pelvic fundus, contracts the vagina.

All three layers of the pelvic fundus form strata on one another as a tile, it affords their stretching during the fetus motion and the possibility of the further contractions.

All muscles of the peritoneum are covered with fasciae. Their functions are very important. The perineum supports the inner organs, conduce to their normal position. The specific role has the musculus levator ani. During its contractions the sexual cleft compresses the rectum and vagina narrows. The muscles of the perineum take part in the regulation of intraabdominal pressure together with the diaphragm and the muscles of the abdominal wall.

During the expulsion of the fetus all three layers of the muscles of the perineum stretch and form a broad canal which continues the bony labour canal.

After the birth of the newborn the muscles contract and get into initial position.

## GYNECOID PELVIS

### BONY PELVIS

The bony pelvis has an important role in obstetrics as it is a constituent part of labour canal through which the fetus passes during labour. It forms a strong support for the soft tissues of labour canal and determines its size and direction during labour. Unfavourable conditions of the intrauterine development, diseases of childhood and puberty, traumata, tumors exostoses can deform the bony pelvis.

Differences in form of the female and the male pelvis appear already during puberty. The bones of the female pelvis are thin, the plane of the lesser pelvic inlet has an outline of a transversally narrowed

oval as in the male pelvis it is funnel-shaped. The female pelvis is lower, broad and capacious as against the male pelvis; the pubic symphysis is shorter. The female pelvis cavity is broader on the direction to the outlet it widens through the larger distance between the tubers of the ischium and considerable concavity relative to the external margin of the pubic arch. The subpubic angle is larger in women (90–100°) than in men (70–75°). The iliac bones are located slopely-inclinedly.

The pelvis of an adult person is made up of four bones: two hipbones, one sacrum and one coccygeal, they all are strongly united.

The **hipbone** (*os coxae*) to the age of 16–18 years old consists of three bones, they are: the iliac bone (*os ilium*), the ischial bone (*os ischii*) and the pubic bone (*os pubic*). These bone form the cotyloid cavi-

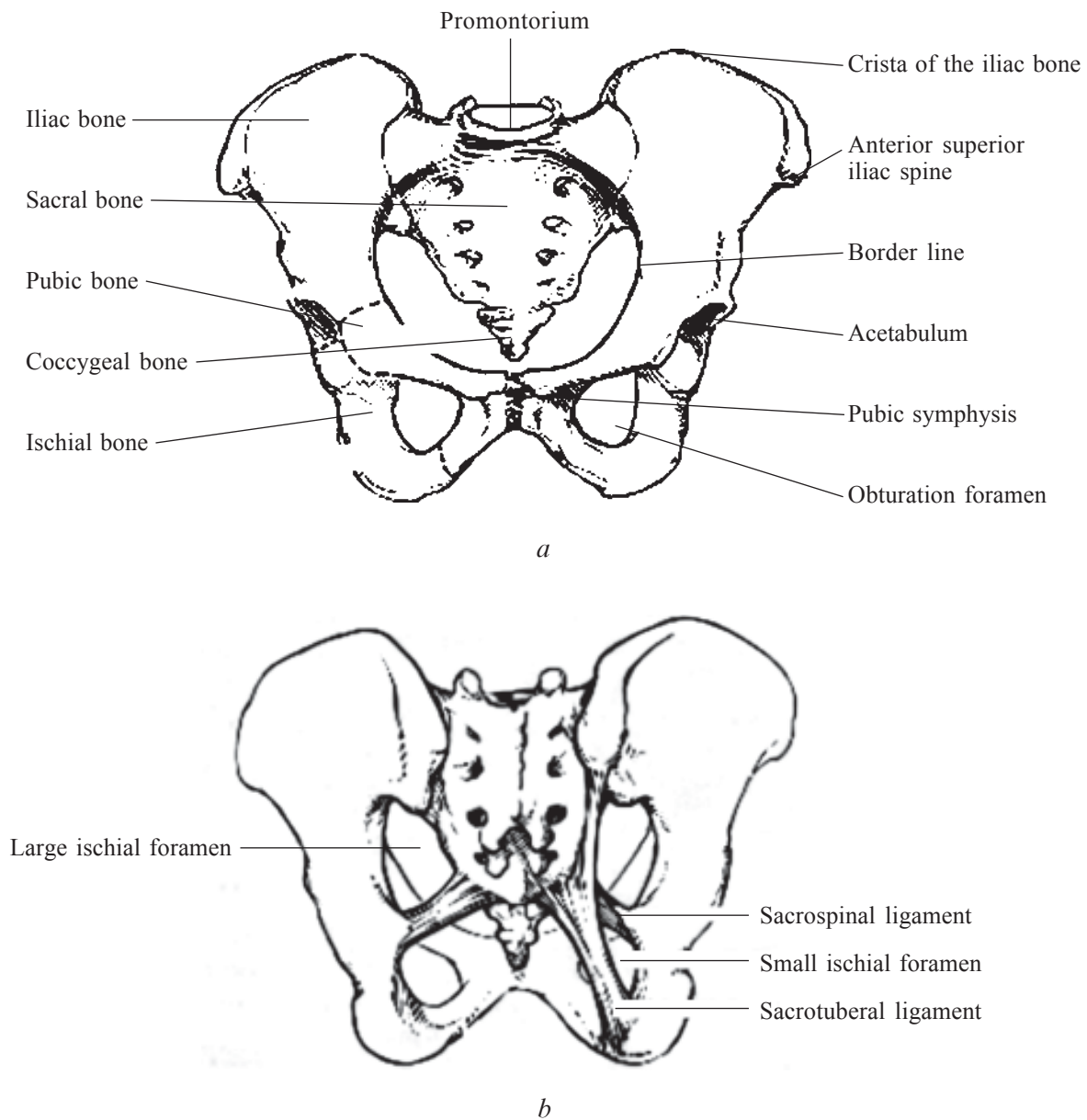


Fig. 21. Pelvis:  
 a — bones (front view); b — main ligaments and foramina (back view)

ty (*acetabulum*). On completion of the puberty they form a single bone, a hip bone (Fig. 21, a).

**The sacrum bone** (*os sacrum*) is formed by five (rarely six) firmly joined with one another vertebrae. In an adult person they constitute a unified, integral bone with uniformly concave anterior surface.

By means of the cartilage the first vertebra of the sacrum bone is joined with the last (fifth) lumbar vertebra. The junction of the last lumbar and the first sacrum vertebra forms a prominence-promontory (promontorium). To the low narrowed end of the sacrum bone **the coccygeal bone** (*os coccygis*) which usually consists of 4–5 knitted vertebrae is joined by the mobile joint. The locomotion of this articulation allows the coccygeal bone to deviate to 1–1.5 cm during labour. The sacrum bone is joined with every iliac bone by the cartilaginous interlayer, sacroiliac articulations (*articulationes sacroiliacae*) which are flat joints with a very limited locomotion. The sacrum bone is joined with the hipbone by two ligaments, lig. sacrospinale which runs from the sacrum posterior surface to the sciatic spine and lig. sacrotuberale, it goes from the sacrum posterior surface to the tuber of the ischium. These ligaments, curving the lesser and greater sciatic notches form the greater and lesser sciatic foramens (foramen ischiadicum majus et minus, Fig. 21, b).

On **the iliac bone** they distinguish the upper flaring portion of the ilium (*ala ossis ilii*) and the lower portion, the body of the ilium (*corpus ossis ilii*). At the place of their joining a curve is formed, it is called the arcuate (semicircular, terminal) line (*linea arcuata*). On the iliac bone there are several prominences, they are of great importance for the pelvic sizes measurement. Anteriorly: the front upper iliac spine (*spina iliaca anterior superior*), a little lower — the front lower iliac spine (*spina iliaca anterior inferior*); posteriorly, the back upper iliac spine (*spina iliaca posterior superior*) and lower, the back lower iliac spine (*spina iliaca posterior inferior*).

**The ischial bone** forms the inferio-posterior one third of the hip bone. Its consists of the body (*corpus ossis ischii*) which takes part in the formation of the cotyloid cavity and the branch (*ramus ossis ischii*), together they comprise an angle with an enlargement on its apex, it is the tuber of ischium (*tuber ischiadicum*). This branch joints with the lower branch of the pubic bone. On the posterior surface the branch has prominence, the sciatic spine. On the ischial bone they distinguish two notches, they are the greater sciatic notch (*incisura ischiadica major*) and the lesser sciatic notch (*incisura ischiadica minor*).

**The pubic bone** forms the anterior pelvic wall. It consists of the body (*corpus ossis pulvis*) and two branches, the superior, horizontal (*ramus superior ossis pubis*) and the inferior, descending one (*ramus inferior ossis pulvis*). The branches of the pubic and ischial bone form an oval foramen (*foramen obturatorium*). The body of the pubic bone comprises a

part of the cotyloid cavity. At the place of the iliac and pubic bone joining there is the iliopubic eminence (*eminentia iliopubica*). Along the superior margin of the superior branch of the pubic bone the body crest, terminating on the body by the pubic tubercle (*tuberculum pubicum*) is located. The right and the left pubic bones form the pubic articulation, pubic symphysis, by their horizontal and low branches. Inside the pubic symphysis there is a small cavity slit, covered with a liquid. During pregnancy this cavity enlarges. The low branches of the pubic bones form an angle, so called the pubic arch (*arcus pubicus*).

## GYNECOID PELVIS: OBSTETRICAL ASPECT

From the obstetrical point of view the division of the whole pelvis into two parts, the greater and lesser pelvis, is very important. The border between them serves the border line (Fig. 21), promontory — posteriorly and the crests of the pubic bones and pubic symphysis, anteriorly. The imaginary plane being drawn through these description points is called the plane of inlet into lesser pelvis.

The great pelvis constitutes a semicircumference and cannot create any obstacles at labour. By its sizes one can to degree judge about the lesser pelvis sizes which are difficult to measure.

They determine the following sizes of the greater pelvis:

1) distantia interspinosa. It is the distance between the antero-superior iliac spines, from 25 to 26 cm;

2) distantia intercristarum. It is the distance between the most remote points of the iliac crests, 28 to 29 cm;

3) distantia intertrochanterica. It is the distance between the most remote points of the acetabular fossae and is equal to 31–32 cm;

4) conjugata externa (effective obstetrical conjugata, Bodelock's conjugata). It is external direct antero-posterior size of the pelvis from the fossa formed by the spinous processes of the last lumbar and the first sacral vertebra to the most promoted point of the symphysis, it is equal to 20–21 cm.

The lesser pelvis is the bony portion of labour canal. Its posterior wall is formed by the sacral and coccygeal bone, the lateral walls are formed by the ischiatic bones, the anterior one — by the pubic bones with pubic symphysis. They distinguish the upper superior margin of the pubic symphysis, pubic crest, posteriorly with the promontory of the sacrum and laterally with the border lines. They discern four classic planes of the lesser pelvis cavity (Fig. 22, a).

**The plane of the lesser pelvis inlet** is separated anteriorly by the superio-internal margin of the pubic symphysis and superio-internal margin of the pubic



bones, posteriorly and laterally as the plane of the external orifice. This plane has a form of a transversely narrowed oval. They determine three diameters in it: the direct, transverse and oblique (left and right, Fig. 22, b).

*The true (obstetric) conjugata vera* is the direct diameter of the lesser pelvis inlet. It is the distance from the superio-internal margin of the pubic symphysis and to the sacral promontory, equal to 11 cm. The distance between the superior margin of the symphysis and sacral promontory is called anatomic conjugata (*conjugata anatomica*), it is equal to 11.5 cm.

*The transverse diameter* is a distance between the most remote points of the border line (13–13.5 cm).

*The oblique diameter* is a distance between the sacroiliac joint from one side and the iliopubic eminence from the opposite side (12–12.5 cm). The right oblique diameter is measured from the right sacroiliac joint, left — from the left.

The plane of the broad portion of the lesser pelvis cavity is limited by the middle of the internal surface of the pubic symphysis anteriorly, laterally by the middle of the cotyloid cavity, posteriorly by the place of the II and III sacral vertebrae joint. In the broad part of the lesser pelvis they discern the direct (direct conjugata, 12.5 cm) and transverse diameters (12.5 cm).

The plane of the narrow portion of the lesser pelvis cavity is limited by the low margin of the pubic symphysis anteriorly, laterally by the spines of the

ischiatric bones, posteriorly by the sacrococcygeal joint. In this plane as well they distinguish *the direct* (11.5 cm) and transverse (between the spines of the ischiatic bones — 10.5 cm) diameters.

The plane of the low pelvic orifice (outlet of the lesser pelvis) is limited by the low margin of the pubic arch anteriorly, laterally by the tubers of the ischium, posteriorly by the tip of the coccygeal bone.

The direct diameter of the plane is 9.5 cm but when the fetus is passing through labour canal this size may be increased 1.5 or 2 cm, because of the mobility of the coccyx, so it may be equal to 11–11.5 cm.

The transverse diameter is a distance between the internal surfaces of the tubers of the ischium, it is equal to 11.0 cm.

Thus, in the plane of the lesser pelvis inlet the transverse diameter is the greatest, in the broad part the direct and transverse diameters are equal and in the narrow part of the lesser pelvis cavity and in the plane of outlet the direct diameters (*conjugatae*) are the greatest.

*The pelvic axis*, or pelvis guiding line is a line joining the middle of the direct diameters of the lesser pelvis all planes (Fig. 23). It is curved in the direction to the sacrum and coccygeal bone.

In the erect position of a pregnant woman the intersection of the plane of the inlet with the horizontal line forms an angle of the *pelvis inclination* of about 45–60° while in a non-pregnant woman it is not more

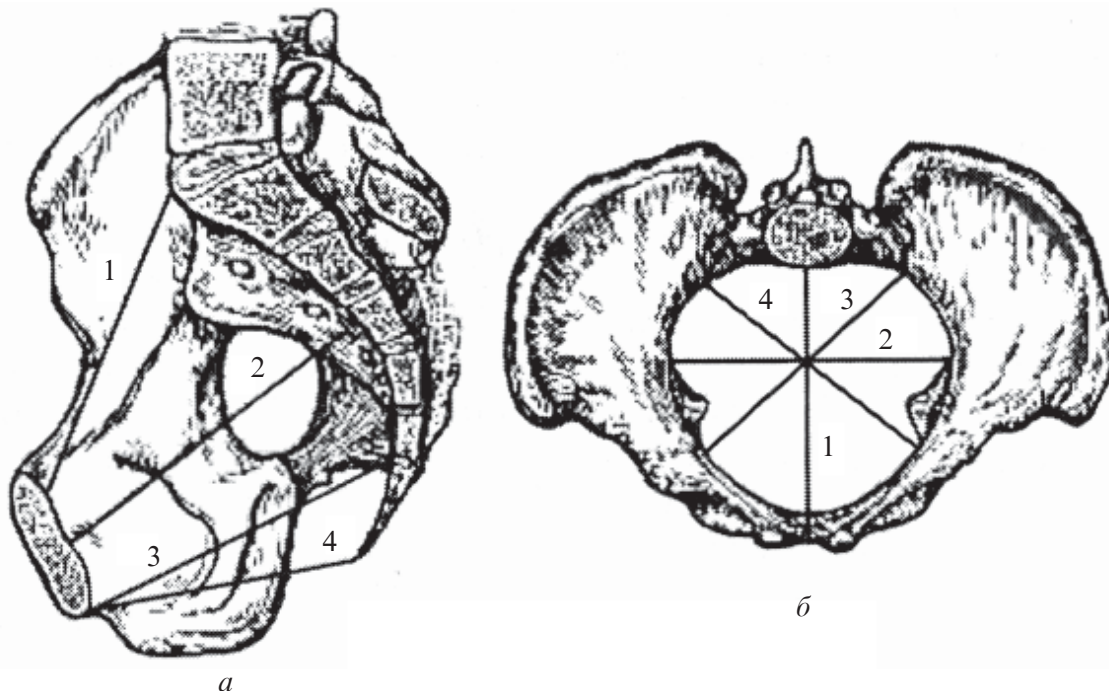


Fig. 22. Planes and sizes of lesser pelvis:

- a* — classical planes and straight conjugates of lesser pelvis;  
 1 — true conjugate (plane of the inlet of lesser pelvis); 2 — cavity of the wide part of the pelvic cavity (middle conjugate); 3 — cavity of the narrow part of the pelvic cavity; 4 — foramen of the inferior outlet of lesser pelvis;  
*b* — plane of the inlet of lesser pelvis; 1 — straight diameter (true conjugate); 2 — straight diameter; 3 — left oblique diameter; 4 — right oblique diameter



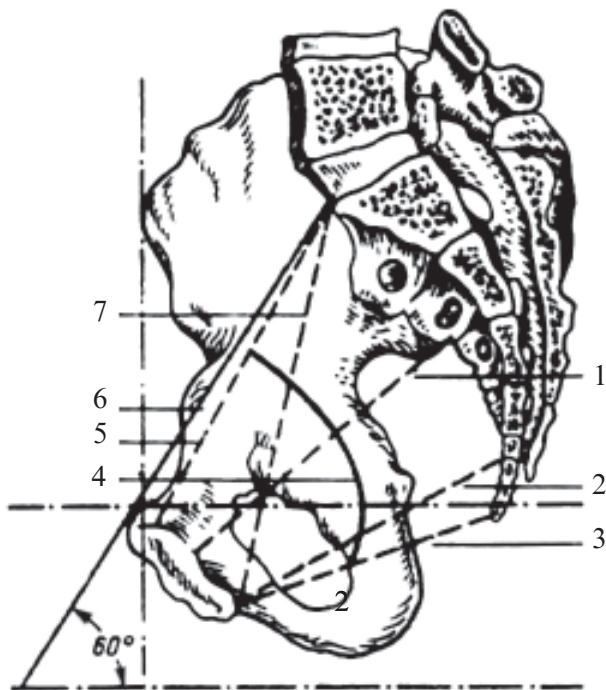


Fig. 23. Pelvic axis and angle of the pelvic slope. Straight diameter (conjugate) of the plane of lesser pelvis: 1 — of wide part (middle conjugate); 2 — narrow part; 3 — outlet (inferior orifice) of lesser pelvis; 4 — pelvic axis; 5 — lesser pelvis inlet (true conjugate); 6 — superior foramen of lesser pelvis (anatomical conjugate); 7 — diagonal conjugate; 60° — angle of the pelvic slope

than 45–46°. Small angle of the pelvis inclination does not prevent the fetus head fixation, the great angle may cause the head's engagement anomalies. Changing the pelvis inclination by changing the woman's in labour body position, one can manage the delivery course to some degree. Thus one can decrease the angle of pelvis inclination by lifting the upper part of the lying-in woman body, bending her legs in knee and femoral joints and with their adduction to the belly, and by putting a polster under the sacrum.

It is very important to take into account the individual peculiarities of the female pelvis. Caldwell and Moloy allowed to determine the pelvic type according to the form of the anterior and posterior segments of the plane of the inlet (Fig. 24). the shape of the posterior segment determines the type of pelvis, the shape of the anterior segment helps to determine its mixed types.

*The gynecoid* is the pelvis with nearly equal dimensions of the anterior and posterior segments. It has anatomic characteristics of the female pelvis, this pelvis is best suited for the childbearing.

*The anthropoid* pelvis differs from the other types in that the antero-posterior diameter of the inlet exceeds the transverse diameter, it has a shape of narrowed and prominent.

*The android* is the pelvis with the decreased posterior segment as compared to the anterior segment, that bounds the space for the fetus head.

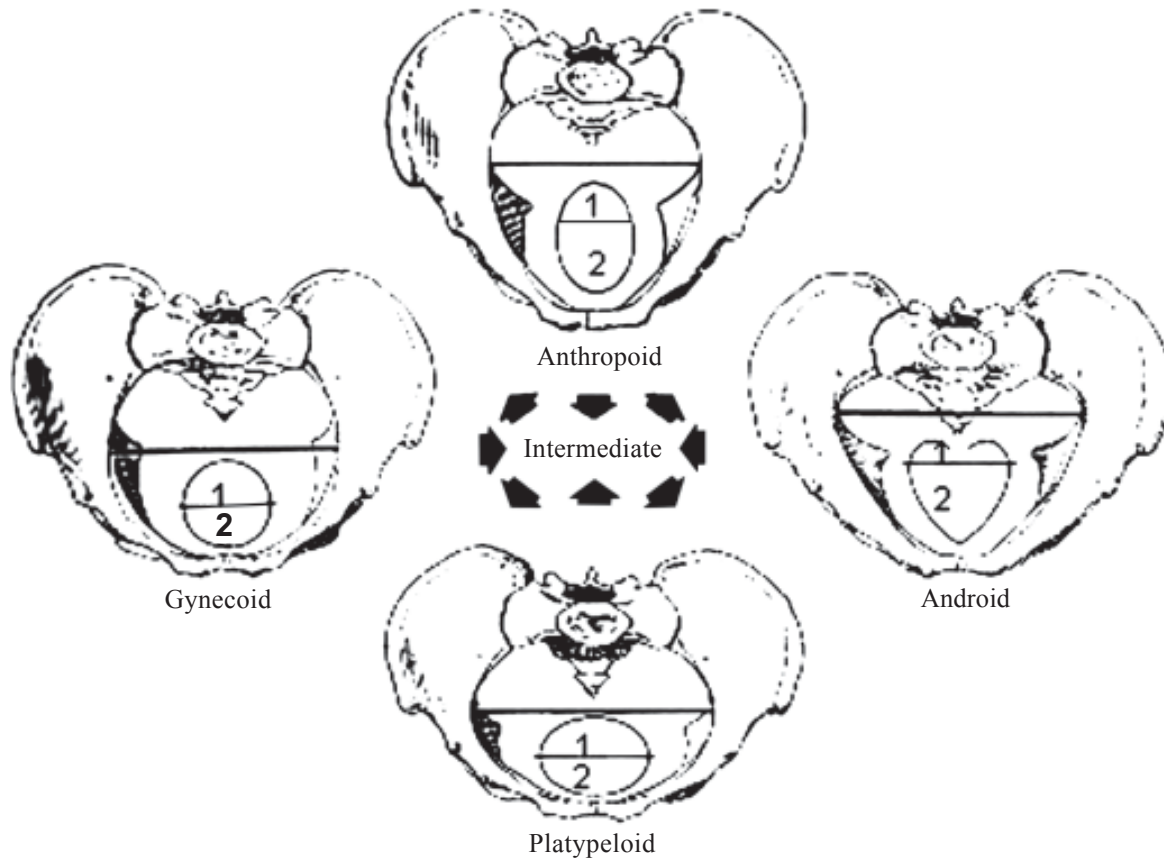


Fig. 24. Types of the pelvis by Caldwell and Moloy and corresponding forms of the plane of lesser pelvis inlet: 1 — posterior segment; 2 — anterior segment

The extreme degree of discrepancy between the anterior and posterior segments dimensions is very unfavourable for delivery through the natural passage-way.

The *platypelloid* is the pelvis with the short direct and broad transverse diameter. In clinical practice the mixed type is met more often than “the pure” type. Obstetrically, the most important dimension is the diagonal conjugata (*cojugata diagonalis*), the distance between the low margin of the pubic symphysis and sacral promontory (see Fig. 23), this dimension gives an idea of the lesser pelvis capacity.

The prognosis as to childbearing through the natural passageways is favourable if the diagonal conjugata is more than 11.5 cm. The dimension of the true (obstetric) conjugata is determined by subtraction of 1.5–2 cm from the dimension of the diagonal conjugata.

#### RECOMMENDED READING

3 (25–52); 5 (15–36); 6 (11–20); 11 (100–103); 22 (1–240); 30 (343–360); 46 (25–59); 47 (25–59); 48 (4–11); 50 (1–4); 51 (1–4); 55 (35–43); 56 (35–43); 60 (37–67). 61 (37–67).

## PHYSIOLOGY OF THE FEMALE REPRODUCTIVE SYSTEM

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### NEUROHUMORAL REGULATION OF THE FEMALE REPRODUCTIVE FUNCTION

**Menstrual cycle** is a complex of cyclic functional processes in the female genital system on the background of total functional changes in the female organism (reproductive, cardio-vascular, neuroendocrine, and etc.). Their external display is menstruation, periodic bleeding from the uterus.

Physiologic menstrual cycle includes *three components of cyclic changes*:

- 1) in the system hypothalamus — pituitary body — ovaries;
- 2) in hormones-related organs (the uterus, Fallopian tubes, vagina, mammary glands);
- 3) in functional condition of neuroendocrine, cardio-vascular and other regulative systems of an organism.

The changes in the female organism are *of two-phase character* during menstrual cycle. It is connective with the growth and maturation of follicle, ovulation and development of the corpus luteum in the ovaries. The most promoted cyclic changes take place in endometrium. Every normal menstrual cycle is a preparation of the female organism to pregnancy. Fertilization and pregnancy take place as a rule in the middle of the menstrual cycle (14 days) after the rupture of the tertiary (dominant) follicle (*ovulation*) and exit from the ovary the ovum, prepared for fertilization. While this takes place the deviations in terms from 8 to 20 days. If fertilization does not take place at this period, the ovum perishes and endometrium functional layer rejects and *menstrual bleeding* starts. The first day of bleeding which defines the onset of the menses defines the first day of the menstrual cycle and the day before the next bleeding episode defines the last day of the cycle. Normally it ranges from 21 to 35 days and standard menstrual cycle length for women is 28 days (*ideal menstrual cycle*). Menstrual flow typically lasts from 2 to 8 days (on average 4–6 days) which depends on the velocity of

endometrium regeneration and as a rule there is relative constancy in the cycles for any one person. The menstrual cycle may be irregular during 2 years after menses beginning (menarche) and three years before menopausal period. *Menstrual discharge* consist of the mixture of endometrium, fragments and different amounts of liquid, sometimes with clots, blood (25–100 ml).

The beginning of menstrual function (the first menses appearance is called menarche) varies from 10 to 16 years old (the mean age is 12–13 years old) and is one of the most notable changes of puberty. Over the ensuing five years the menstrual function regulates and later on it takes place steadily over a length of 23–28 years of a woman reproductive life. Lack of menses (*physiologic amenorrhea*) they observe in women at pregnancy and breast feeding of an infant.

At the menses cessation (climacter, premenopausal period) the progressive fading of the menstrual function takes place, it is absent completely at the period of aging (*menopause*).

The reproductive system activity is directed to the preservation of the species existing (i. e. its reproduction) and it causes the extreme safety of the system's functioning. The reproductive system as well as other systems of an organism is a functional system. Hierarchic principle of the reproductive system functioning consists of *five central and peripheric levels of regulation* interacting with one another on the principle of a feedback.

**The first level of regulation** lies in *an influence on the target tissues* (genitalia, mammary glands, hairy follicles, skin, bones, fat tissue). In the cells of these organs and tissues there are receptors sensitive to sex hormones. The contents of the steroid receptors in endometrium may change according to the phase of menstrual cycle. Cytosolic receptors specific for estradiol, progesteron, testosteron are present in the cytoplasm of the target organs cells. Steroid molecule is captured by cytosolic receptor and this complex is transported to the nucleus of a cell. In the nucleus a new complex with a nuclear albuminous receptor is formed (Fig. 25). This complex combines

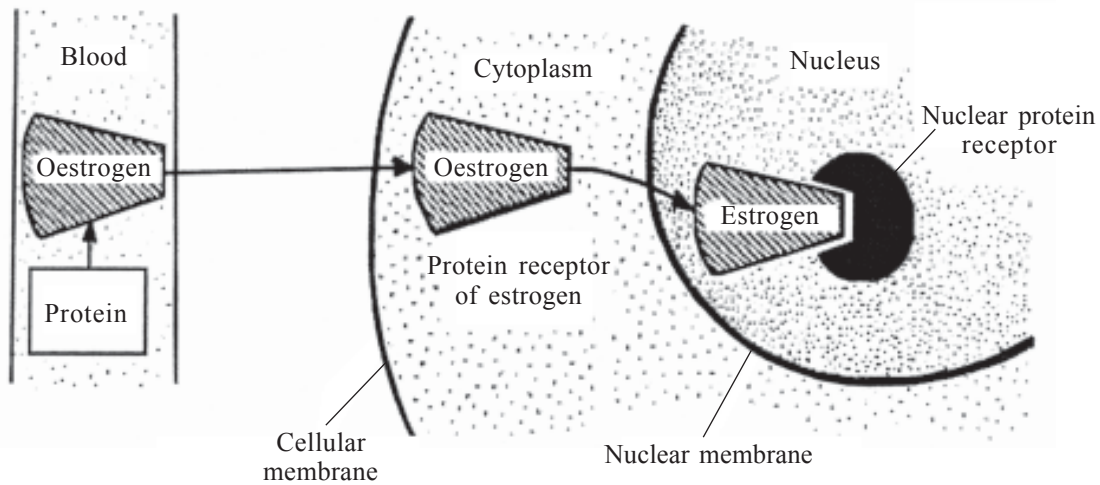


Fig. 25. Correlation of steroid hormone with a cell of the target-organ

with chromatin, regulating the transcription processes. To the first level of the reproductive function regulation they refer cyclic adenosine monophosphate (cAMP) and prostaglandins which play a role of inter-cellular regulators.

**On the first level of regulation** the cyclic changes taking place in the endometrium are the most promoted. These are changes of the endometrium preparation to the menses. They may be divided into *four phases*: follicular (proliferative) phase, phase of the corpus luteum (secretion), menstrual phase (bleeding), postmenstrual (regeneration).

**Follicular (proliferative) phase** is a phase of follicles maturation. It starts days 5 to 14 of the cycle and lasts during 11–17 days (on average 14 days).

Under influence of an increasing concentration of estradiol at the *early* (days 5 to 7) and *middle* (days 8 to 10) stages of follicular phase the growing of the uterine glands and stroma of the endometrium basal

layer takes place (Fig. 26). The glands of endometrium look like direct or curved tubes; spiral arteries of the basal zone are developed insufficiently. At the *late follicular stage* (days 11 to 14) the curvature of the endometrium glands increases, they produce a great number of mucus rich in glycogen and fat. The spiral arteries of the basal layer reach the endometrium surface, they are curved to some extent. The net of agyrophilic fibers is concentrated in stroma round the uterine glands and blood vessels. The thickness of the endometrium *functional layer* is 4–5 mm at the end of follicular phase. The body basal temperature is less than 37°C at this phase.

**The corpus luteum** (lutein secretion) phase lasts 13–15 days (on average 14 days) and it is connected with the corpus luteum function. The uterine glands epithelium (corpus luteum) starts to produce secret, containing acid glycosaminoglycans (mucopolysaccharide), glycoproteins, glycogen. At the *early phase of*

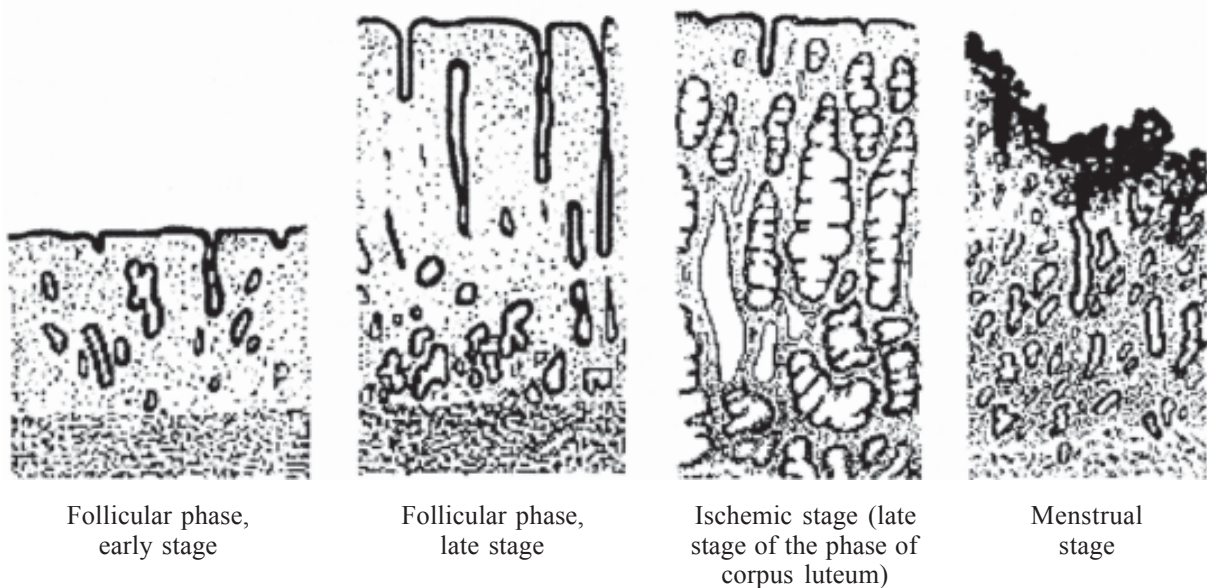


Fig. 26. Cyclic changes in endometrium during the menstrual cycle



*the corpus luteum* (days 15 to 18) the first signs of secretory transportations appear. The uterine glands become curved, their orifices are widening. In the functional layer of endometrium one can observe focal bleeding, connected with short-term decrease in oestrogens level during ovulation.

At the middle stage of the corpus luteum phase (days 19 to 23) the thickness of the endometrium functional layer grows to 8–10 cm due to progesterone highest concentration and increase in the oestrogen level (see Fig. 26). The uterine glands contain a secret rich in glycogen and acid glycosaminoglycans. The highest level of secretion is observed at 20th–21st days of the cycle. At the 20th day in the endometrium they determine the maximal concentration of proteolytic enzymes. At the 20th–21st days of the cycle in the endometrial stroma decidual transformations, glycogen appears in decidualocytes cytoplasm. Due to such transformations in the functional layer of the endometrium they distinguish two zones: compact (*stratum compactum endometriale*) and spongy (*stratum spongiosum endometriale*) zone. The spiral arteries become very curved and form the glomes over the whole functional layer. In the middle stage of the corpus luteum phase *blastocyst implantation* takes place. The best conditions for it are in the functional endometrium at days 20 to 22 of a 28 menstrual cycle (days 6 to 8 after ovulation). *The ischemic phase or late stage of the corpus luteum* is connected with the onset of the corpus luteum regression, hormones concentration produced by it decline and are characterized by the endometrial trophicity disturbance, its ischemia (if blastocyst implantation did not take place) and progressive increase in degenerative changes in it. Its thickness is less than 20–30% as compared to the middle phase. The granules containing relaxin are releasing from the granular cells of the endometrium. Relaxin causes the melting of the agyrophilic fibers of the endometrial functional layer, fostering menstrual rejection of the endometrium. On days 26 to 27 of the cycle in the compact layer they observe lacunar trichangiostasia and focal haemorrhage into stroma.

**The phase of menstruation (bleeding)** comprises *desquamation of endometrium*. Because of the corpus luteum regress and corresponding drastic decrease in hormones concentration, endometrial ischemia, arteriospasm, haemostasis, thrombi formation takes place; the vascular permeability increases, haemorrhage into stroma takes place, they observe leukocytic infiltration. After a prolonged angiospasm the parietic vasodilation sets in and overflow with blood followed by the rupture of the walls. Necrobiosis of the tissue, *desquamation* of the necrotized portions of the endometrium functional layer, menstruation which ends as a rule on the 3rd day of the cycle takes place.

**Postmenstrual phase (regeneration)** takes place at days 3 to 4 of the cycle after the rejection of the

endometrium necrotized functional layer. Normally, epithelization of the endometrium whole surface takes place at the 4th day of the cycle.

Hormonal background changes influence on the state of the Fallopian tubes, cervix and vagina.

*Changes in the cervix* during the menstrual cycle take place mainly in its glands at the period of the follicular stage. Cervix secretory activity is the highest at ovulation because of oestrogenic stimulation. The quality of cervical mucus (liquid, transparent) is of great importance for spermatozoones penetration into the cervical canal and uterine cavity. At ovulation, the mucus captured with forceps is stretching from 8 to 10 cm (*symptom of mucus stretching*). When dried, one can observe the cervical mucus arborization on the slide, i. e. drawing of a fern is seen, so called *ferning*. The uterine orifice looks like a pupil (*symptom of pupil*) during ovulation, its diameter widens to 1–3 mm. The pupil's symptom presence is indicative of a large production of oestrogens by the ovaries. After the corpus luteum formation the uterine orifice closes, the amount of mucus in the cervical canal appreciably decreases, it becomes thick and opaque (Fig. 27). Under oestrogenic hormones increased level they observe predominance of the superficial polygonal cells in the *vaginal smears* taken at the follicular stage.

The cells of the intermediate layer are elongated and have large nuclei. They prevail in the corpus luteum phase in response to progesterone effect. Increase in superficial cells level is indicative of sufficient oestrogen influence. Lack of superficial and intermediate cells and revealing of parabasal cells with a small amount of cytoplasm and large nucleus in women of reproductive age is indicative of oestrogen pronounced shortage.

**Ovarian cycle. The second level of the reproductive system regulation** is depicted by the **ovaries**. The cyclic changes in the ovaries are called **ovarian cycle**. They distinguish two phases of the ovarian cycle, they are: *the follicular phase* when a part of primordial follicles develops and the phase of *the corpus luteum (corpus luteum)* when an endocrine gland, *the corpus luteum* is forming from the cells of the tertiary follicle (Graafian vesicle) thecal endorhynocytes (follicle in which ovulation had taken place). From the group of growing follicles one (rarely two) follicles are evolved and it develops the following stages: primordial — primary — secondary — tertiary (Graafian vesicle).

*Primordial follicle* is covered with one layer of the follicular epithelium cells (granular layer) and surrounded with basal membrane (Fig. 28).

Before sexual maturation the number of primordial follicles is 100–400 thousand in both ovaries. And 95% of all primordial follicles break down during the reproductive period, approximately 2% accomplishes the stage of primary and secondary follicles, fewer than 400 of them develop to tertiary folli-

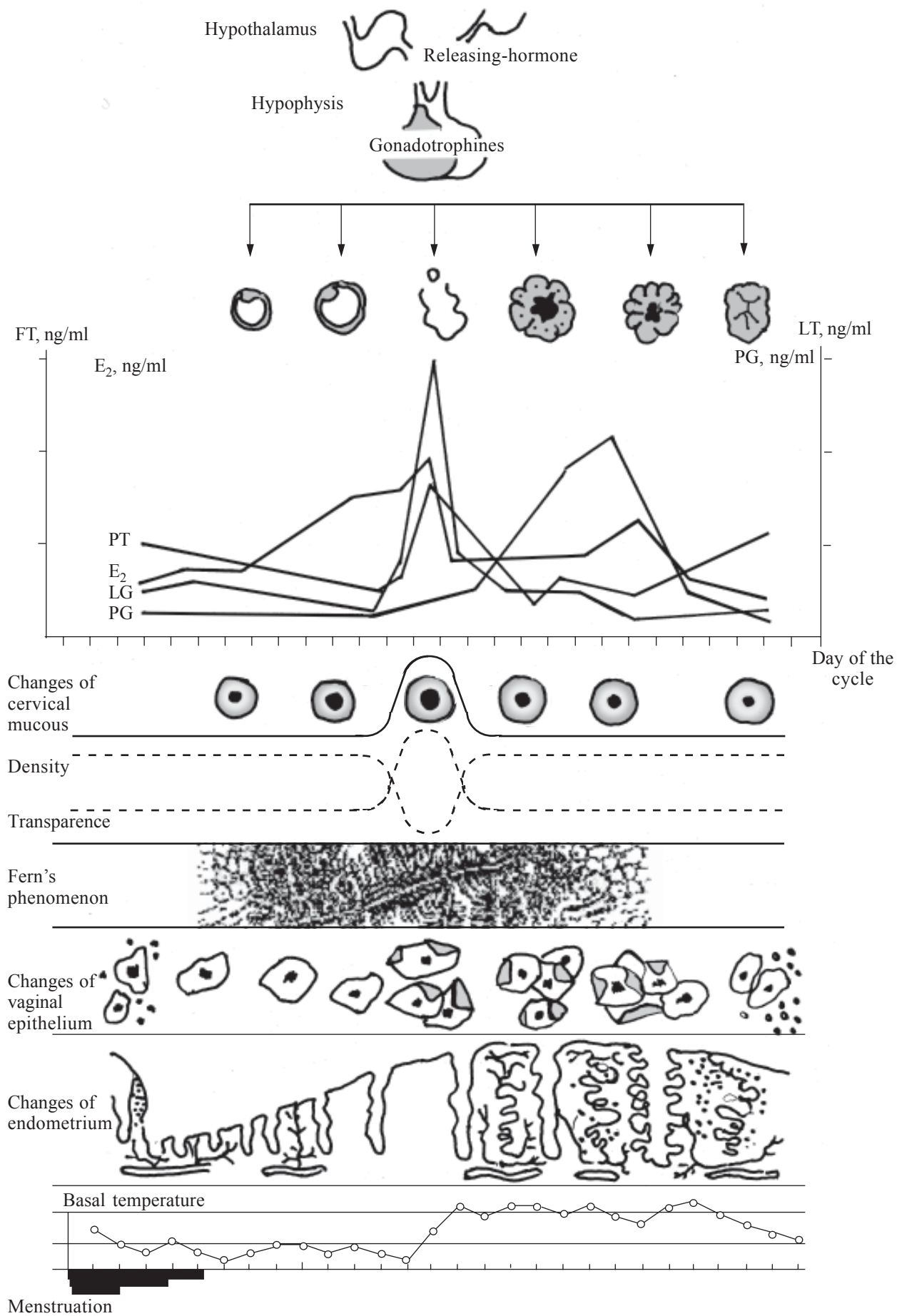


Fig. 27. Effect of the sex hormones on cyclic changes of the female genitalia:  
 FT — follitrophin; LT — lutrophin, E<sub>2</sub> — estradiol, PG — progesterone

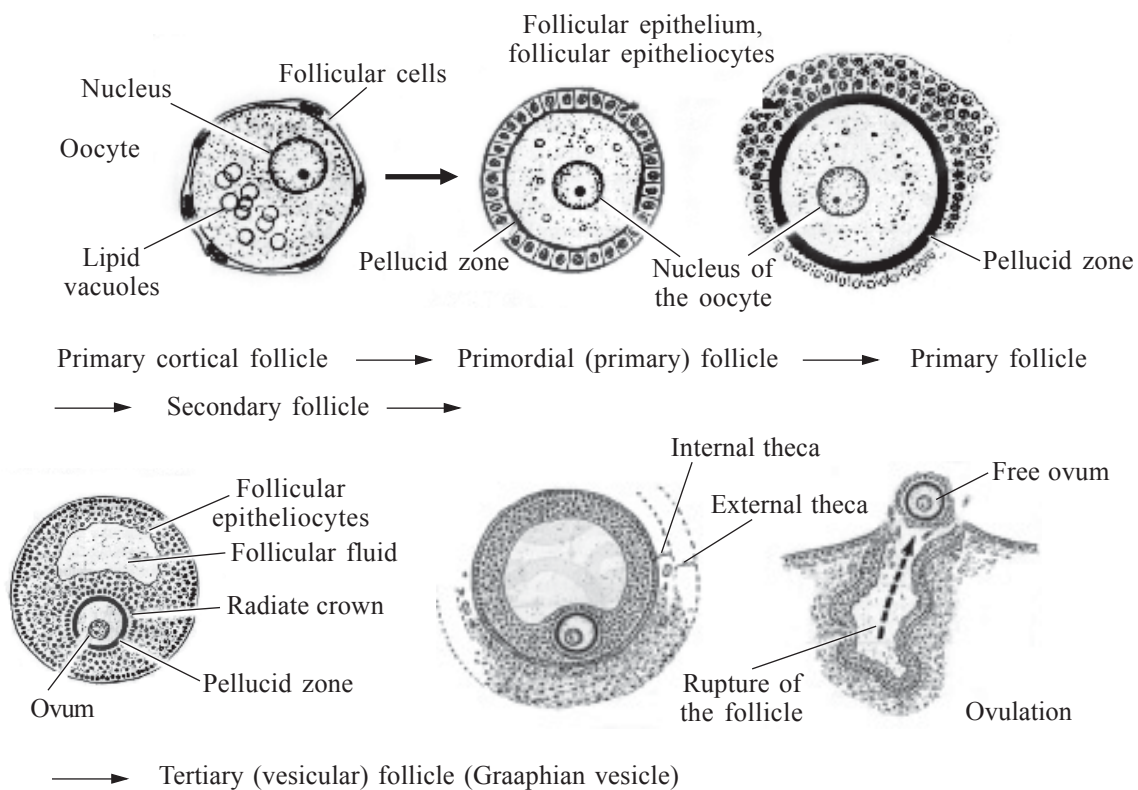


Fig. 28. Stages of follicle development

cle and ovulate. The rest undergo atresia. Risk of genetic defects development increases with the mother's age, it may be explained by a very prolonged period of oocytes life to fertilization (40–50 years).

In every cycle 3–30 primordial follicles transfer to the phase of growth under follictrophin (FT) influence and derive *primary follicle*. Follicular epitheliocytes (granular cells) contain receptors to FT, oestrogens and testosterone. FT induces aromatase synthesis which transforms testosterone and other steroids in oestrogens. Oestrogens (often 17  $\beta$ -estradiol) stimulate follicular epitheliocytes proliferation and expression of new FT receptors and steroids. Testosterone inhibits follicular epitheliocytes proliferation.

*Secondary follicles* go on growing and due to it dominant tertiary follicle (Graafian vesicle) forms. Stroma around it differentiates in external and internal theca (theca externa, theca interna). Theca externa is being formed by thecal endocrinocytes, they synthesize androgens: theca interna is being formed by connective tissue with interstitial endocrinocytes. Between follicular epitheliocytes a cavity is forming, so called follicular cavity filled with follicular liquid due to secretion and lysis of follicular epitheliocytes and transudate from the blood vessels.

Oocyte is being passed with follicular liquid to the periphery where 17–50 rows of follicular epitheliocytes surround it. The *oocyte-carrying tubercle* appears. In the tertiary follicle the oocyte is surrounded by a vitreous membrane transparent zone (zona pellucida). Lutrophic receptors appear in theca interna. The last-mentioned stimulated synthesis of androgens

(androstendion and testosterone) in the thecal endocrinocytes. Androgens from the theca externa penetrate into follicular epitheliocyte via basal membrane by diffusion. There androgens turn into oestrogens by the enzyme aromatase. The content of oestrogens increases significantly in follicular liquid. Increase in estradiol contents in the blood potentiates secretion of lutrophin by adenohypophysis and inhibits secretion of FT.

*Tertiary follicle* (Graafian vesicle) grows rapidly (diameter from 200  $\mu\text{m}$  to 1–2.5 cm) first of all through the accumulation of follicular liquid in its cavity, i. e. follicular cavity. At the last stages of development typical changes of hormones contents in blood take place. So, FT stimulates transport of liquid to follicular cavity and induces expression of lutrophin receptors on follicular epitheliocytes. Lutrophin initiates luteinization of follicular epitheliocytes and production of progesteron. Peak of oestrogens is observed for 24–36 h before ovulation and peak of lutrophin for 10–12 h before it. It could be derived from the fact that high content of oestrogens under the influence of gonadoliberin–luliberin adenohypophysis fortifies secretion of lutrophin. The safest sign of ovulation is the lutrophin level upgrading, it starts for 28–36 h before ovulation. *Ovulation* takes place approximately in 2 weeks from the beginning of the cycle (often on 11–12 and 13 day of the cycle). But one should remember that even in the case of a 28 day cycle ovulation is possible between days 8 and 20.

The first division of oocyte meiosis culminates on completion of 36 h after an establishment of maximal



Table 1. **Contents of gonadotrophin in the blood in accordance with the dynamic of the menstrual cycle**

Gonadotrophin	Contents of gonadotrophin in accordance with the phases of the menstrual cycle, U/l			
	Menstruation	Follicular Phase	Ovulation	Lutein Phase
FT	10 (3–13)	8 (3–15)	20 (4–32)	5 (2–0)
LT	8 (3–12)	8 (6–14)	65 (43–88)	8 (2–13)

concentrations of lutrophin and FT. The second vision of meiosis finishes not earlier than fertilization occurs. Ejection of lutrophin stimulates luteinization of follicular epitheliocytes, synthesis of progesterone and prostaglandins in endocrinocytes — luteocytes — of a follicle.

Tertiary follicle gets thin and ruptures under influence of prostaglandins and proteolic enzymes of follicular epithelium.

On the place of the ruptured tertiary follicle *corpus luteum* is forming, its cells (endocrinocytes of the corpus luteum, luteocytes) synthesize progesterone, estradiol, androgens and inhibin. Progesterone influences significantly on endometrium and myometrium both during usual menstrual cycle and because of blastocyte implantation. If implantation of blastocytes does not occur, the cyclic (menstrual) corpus luteum functions to the completion of the cycle. The level of progesterone is maximal in 8–9 days after ovulation, approximately it corresponds the implantation time.

Thermogenic effect of progesterone promotes the body basal temperature increase not less than 0.33°C and this effect lasts to the termination of the corpus luteum phase. The corpus luteum of a full value may be formed only if there is a sufficient amount of follicular epitheliocytes with a great contents of lutrophin receptors in the tertiary follicle. The corpus luteum gets accustomed to the reverse development at 2–3 days before the next menstruation and turns into the white body of the connective tissue (*corpus albicans*).

*The corpus luteum of pregnancy* functions actively in the first half of pregnancy and its involution starts. The bloom (significant increase) of the corpus luteum supplies chorionic gonadotrophin due to the action of lutrophin receptors. In the second half of pregnancy the main function of the corpus luteum (synthesis of progesterone) is fulfilled by placenta.

The source of steroid hormones synthesis is cholesterol forming from the lipoproteins of low density. It finds its way into the ovary with the flow of blood. Follicitrophin, lutrophin and enzymic systems, aromatases take part in the synthesis of steroids on the first stages. Androgens are synthesized by thecal endocrinocytes under lutrophin influence and with the flow of blood find their way into follicular epitheliocytes where they form albuminous hormone, inhibin, which retards releasing of FT. In follicular liquid, corpus luteum, uterus and uterine tubes oxytocin is present. It has luteolytic effect and leads to the corpus luteum regress. In the corpus luteum of a preg-

nant woman the content of relaxin increases, it promotes ovulation and has a tokolytic influence on myometrium.

**III level of regulation** is presented with the influence of the *anterior part of pituitary body* (adenohypophysis). In adenohypophysis secretion of gonadotrophin (thyrotrophin, TT), somatotrophin (somatotrophic, ST), corticotrophin (adrenocorticotrophic, ATCH), melanotrophin (melanocytostimulating, MCH) and lipotrophin (lipotrophic, LPH) takes place; LT and FT belong to hormones-glycoproteins, PrL is a polypeptide.

The ovary is a target-organ for FT and LT. FT stimulates the follicle's growth. Follicular epitheliocytes proliferation, formation of LT-receptors on their surface, activates enzymes aromatasa. LT-receptors have thecal endocrinocytes and follicular epitheliocytes. LT stimulates synthesis of androgens in thecal endocrinocytes (thecaluteocytes) and luteinization of follicular epitheliocytes (granuloluteocytes) and their synthesis of PH. PrT stimulates mammary glands growth and regulates lactation. Increase in PrT level inhibits steroidogenesis in ovaries and development of follicles.

Disturbances of thyroid and adrenal glands work may cause disturbances of ovulation, too. Indices of FT and LT content in different phases of the cycle are shown in table 1.

**IV level of reproductive system regulation** is *hypophysotrophic zone of hypothalamus*: ventrolateral, dorsomedial and arch-shaped nuclei where gonadotrophic releasing-hormones are produced (GT-RH), they stimulate excretion of LT and FT by adenohypophysis (Fig. 29).

GT-RH of hypothalamus from arch-shaped nuclei along axons of the nerve cells find their way into terminal endings which have a strong tie with the capillaries of medial eminence of hypothalamus. The capillaries form portal circulatory system which joins hypothalamus and pituitary body. The possibility of blood transfer to both sides, which is very important for the mechanism of feedback is a characteristic property of this system. Neurosecret of hypothalamus performs biological influence on the organism by different path ways. The main pathway is parhypophysial. It is effected by veins running to the sinuses of the dura mater and from them into circulation. Transhypophysial pathway runs via system of the portal vein to the front vein of the pituitary body. Reverse influence on hypophysis is effected via vertebral arteries.



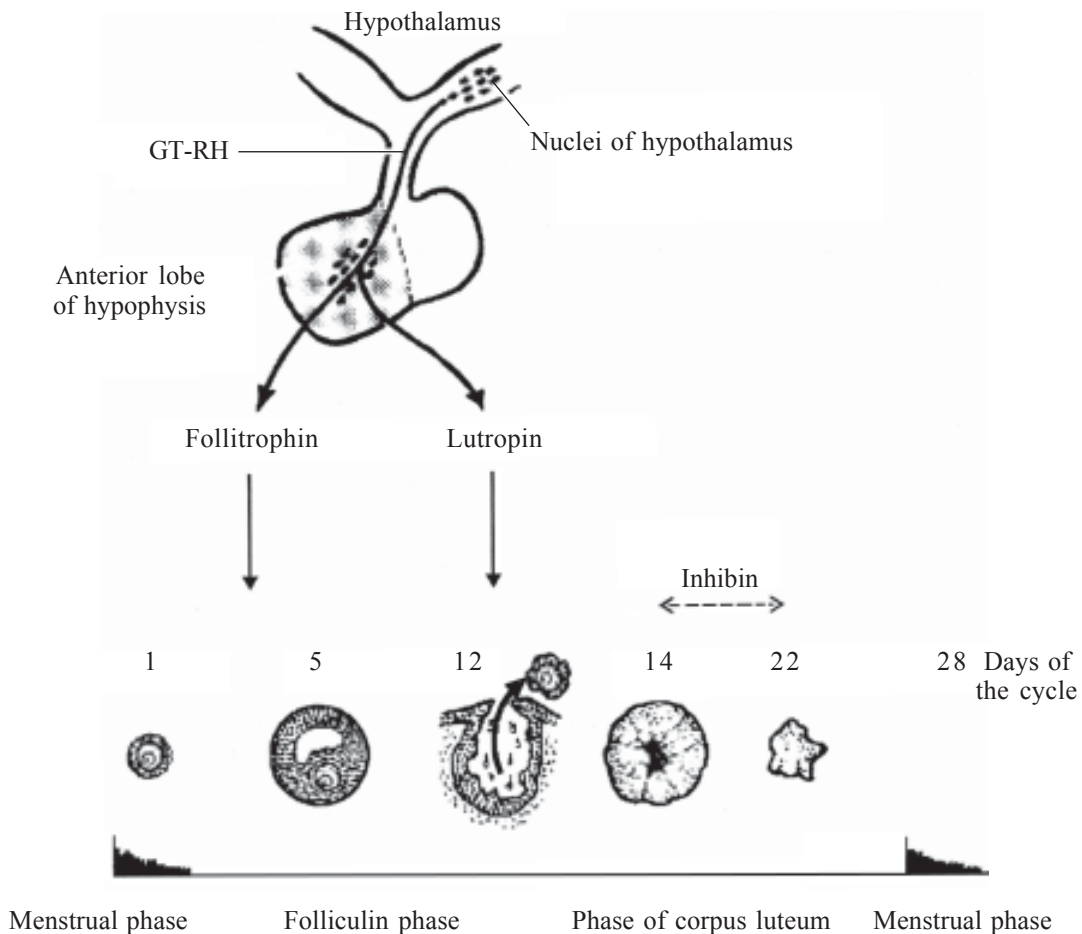


Fig. 29. Scheme of IV level of regulation of reproductive system

Secretion of GT-RH is of a cyclic character. Peaks of the highest secretion of hormone with duration of some minutes is replaced by 1–3 h intervals of significantly low secretory activity. This rhythm of secretion is called circhoral rhythm. It forms at puberty and is an index of hypothalamus neurosecretory structures maturation. Circhoral secretion of GT-RH induces hypothalamus-pituitary-ovarian system. Excretion of LT and FT by adenohypophysis takes place under influence of GT-RH.

Frequency and amplitude of GT-RH secretion regulates the level of oestrogens. Given high content of oestrogens (corpus luteum phase of ovarian cycle), low secretion intervals last 2–3 h. An acute lowering of oestrogens level at the end of every cycle stimulates neurosecretory cells of hypothalamus to secretion of GT-RH with time interval of an hour (the beginning of the new cycle).

GT-RH join with specific receptor on the cellular membrane of the target-cells; with the help of G-albumine adenylate cyclase activates.

Due to its intracellular content of cAMP increases and it leads to secretion of gonadotrophin by adenohypophysis. Ejection of hormones from secretory granules-depot takes place primarily, then synthesis of hormones starts which immediately release into blood channel. Sharp increase in GT-RH content leads

first to a rapid (during 30 min) increase in FT and LT level in the blood serum and then to slow (during 90 min) release of LT. During low content of oestrogens GT-RH stimulate FT synthesizing cells, and with high content, it stimulates LT releasing cells. Due to a prolong action of high dosages of luteal phase the saturation of receptors takes place and it causes suppression of FT and LT secretion.

Regulation of PrL liberation is effected mainly by dopaminergic structures of hypothalamus.

Dopamine suppresses liberation of PrL by adenohypophysis. Dopamine's antagonists reinforce PrL liberation. There are nonhypophysial sources of PrL secretion as well.

**V level of the reproductive system regulation** is presented by *suprahypothalamic structures of brain*. They percept the impulses from the surrounding by interoreceptors and pass them via systems of neurotransmitters into neurosecretory nuclei of hypothalamus. In the regulation of hypothalamic neurons function, producing secret GT-RH, the key role has dopamine, norepinephrine and serotonin. Function of neurotransmitters is fulfilled by neuropeptides, with morphine-like action (opioid peptides), *endorphins* and *enkephalins* which regulate gonadotrophic function of pituitary body. Endorphins suppress secretion of LT and its antagonist, naloxon, drastically

reinforces secretion of GT-RH. *Endorphins* suppress synthesis of dopamine which in its turn promotes stimulation of PrL secretion. The menstrual cycle is controlled by cerebral cortex, amygdaloid body and limbic system. Experimental irritation of amygdaloid nucleus causes ovulation. Due to stress conditions suffered by a woman, changes of climatic and geographic zones, rhythm of labour, disturbances of ovulation occur. Menstrual cycle disturbances are connected with changes of synthesis and secretion of neurotransmitters in the cerebral neurons.

Thus, the female reproductive system is a super-system and its functional condition is determined by feedback with its composing subsystems. In the system regulation may be performed by a long pathway of feeding back (ovary — nuclei of hypothalamus; ovary — hypophysis), short pathway (front lobe of pituitary body — hypothalamus) and ultrashort (GT-RH — nervous cells of hypothalamus). Feedback may be either positive or negative. So, the presence of low level of estradiol in early follicular phase leads to increase in LT liberation by pituitary body (negative feedback), and presence of ovulatory peak of estradiol leads to ejection of FT and LT (positive feedback). This hierarchial (hypothalamus — pituitary body — ovaries — uterus) and self-regulating (ovaries — hypothalamus and pituitary body) system functions during the whole reproductive period of a woman's life, from the first menstruation to menopause.

Aside from cyclic changes in the system hypothalamus — pituitary body — ovaries and in the target-organs cyclic changes take place in the state of many systems of organism (a menstrual wave) during menses. In healthy women they are in physiologic limits.

So, in *sexual tracts* oestrogens stimulate the cellular growth and vascularization as PH increases secretion of the uterine glands. In cervix secretion of glands increases under influence of oestrogens that creates corresponding conditions for penetration of spermatozoones as PH increase the density of cervical mucus. In the vagina the growth of epithelocytes with accumulation in them glycogen takes place under influence of oestrogens.

In *mammary glands* the fiber layer of the duct system and pigmentation increases under influence of oestrogens. PH stimulates the growth of alveoli of mammary glands, the development of the secondary sexual characters is controlled by oestrogens.

*Cardio-vascular system.* Oestrogens favour relaxation of smooth muscles of vascular wall and their dilation, it improves microcirculation and has some protective effect in the development of arterial pressure. Oestrogens of PH (to a lesser degree) carry out retention of NaCl and liquid in an organism.

*Nervous system.* In follicular stage of the menstrual cycle a woman is more active, energetic and self-confident. Influence of PH on the female organism is characterized by decrease in physical activity,

fatigue and some depression. In follicular stage tonus of the parasympathetic part predominates, and in the corpus luteum phase tonus of the sympathetic part of the vegetative nervous system predominates.

*Osteal system.* Oestrogens promote calcium retention in bones, closure of epiphysal areas inclined to growth during puberty.

## PHYSIOLOGIC CHANGES IN A FEMALE ORGANISM IN DIFFERENT AGE PERIODS

In the female life they distinguish several periods for which definite anatomical-and- physiologic features are typical. They are:

- 1) childhood (period of prepuberty);
- 2) puberty;
- 3) reproductive period;
- 4) period of cancellation of menses (climacteric);
- 5) menopause.

**Childhood (period of prepuberty)** lasts to 8 years. During this time specific ovarian functions do not manifest, while synthesis of oestrogens takes place. Ratio between the length of the neck and the uterine body is 2 : 1 by the end of the first year of life; 1.5 : 1 at five years and 1.4 : 1 at the age of eight years old. The vagina is narrow, epithelium consists of parabasal cells. Extragenitalia are shaped but there is no hairy integument. GT-RH, formed in hypothalamus, is of a very limited amount, FT and LT are synthesized and ejected in pituitary body. A gradual development of feedback starts. Immaturity of the hypothalamo-pituitary — ovarian system manifests in increased sensitivity of the pituitary body front lobe and neurosecretory nuclei of hypothalamus to estradiol (5–10 times higher than at the reproductive period). Small doses of oestrogens suppress secretion of gonadotrophin by adenohipophysis. By 8 years all five levels of hypothalamic-pituitary-ovarian system has been shaped in girls, but its activity is regulated only by the mechanisms of negative feedback. The estradiol level is low, the maturation of follicles takes place rarely. Secretion of GT-RH, LT and FT is casual, secretion of neurotransmitters is slight.

**Puberty.** This period is a transitional one between childhood and maturity. It is a period of accelerated growth, sexual maturation and deep psychologic changes. Typical changes begin at the age 8 to 13 years old and lasts 3–4 years (to 17–18 years old). Physical development of the female organism and its reproductive system completes at this period.

From 8 years the uterus starts to grow. By the age of 12–13 years old an angle, opened anteriorly (anteflexion) forms between the body and cervix of the uterus, the uterus acquires physiological position, deviating anteriorly from the pelvic axis (anteversion).

The ratio between the length of the body and cervix of the uterus is equal to 3 : 1.

*In the first stage of puberty* (9.5–13 years old) the mammary glands increase their sizes (telarche) and it completes by 14–17 years of age. Development of the mammary glands may be assymetric. By this time the pilosis of the pubis, started at the age of 10.5–12 years old, has completed. The surface cells are forming into the vaginal epithelium, the change of micro flora is characterized by the appearance of lactobacilli. Hypothalamic structures mature, circadic (daily) rhythm of GT-RH secretion is attained, reinforces and synthesis of gonadotrophin becomes rhythmic. Increased excretion of FT and LT stimulates synthesis of oestrogens by the ovaries, and a number of receptors of sexual hormones increases in all organs of the reproductive system. High level of estradiol in the blood stimulates ejection of gonadotrophin which in its turn favours completion of follicles maturation and ovulation. This period completes with the first menstruation (menarche).

*In the second phase of puberty* (14–17 years old) the maturation of the hypothalamic structures, regulating function of the reproductive system, completes. The circchoral rhythm of GT-RG secretion sets; excretion of FT and LT by adenohipophysis increases, synthesis of estradiol by the ovaries reinforces. Mechanism of the positive feedback is forming. In the girls aged 10–14 years old acceleration of the growth under influence of estradiol, somatotrophin, androgens of ovaries and adrenal glands is observed. In the boys this jerk of growth is caused by the action of somatotrophin and testosterone and takes place two years later than in the girls. In 13–16 they observe peaks of LT in the blood and the menstrual cycle becomes ovulatory. 20% of girls aged 17–18 years old may not have ovulation. In 11.5–15 years old a girl acquires the female design of the body. The course of these period may be disturbed by inner (heridity, constitution, body mass, state of health) and outer (climate, height above sea-level, lighting, nutrition) factors.

Reproductive period lasts from 16–17 to 45 years. Function of reproductive system is directed to regulation of the ovulatory-menstrual cycle, provision of optimal conditions for reproduction, pregnancy and breast feeding of an infant. Fading of the reproductive system lasts to 45 years of age, hormonal — to 55.

**Cancellation of the menses (climacteric, premenopause)** is a shift period between ovulatory cycles and menopause, it starts approximately at the age of 45 years and lasts to the menopause. In this period functional activity of ovaries is decreasing progressively. Hypothalamus sensitivity to oestrogens increases, rhythmical synthesis and excretion of GT-RH stops step by step. Mechanism of the negative feedback disturbs, excretion of gonadotrophins increases (from 25 years of age — LT, from 40 years of age — FT). Disturbance of hypothalamus func-

tion reinforces changes of gonadotropic function of adenohipophysis, follicular- and steroidogenesis in ovaries as well. Formation of catecholamines in the brain tissues increases. The amount of estradiol receptors decreases in hypothalamus, pituitary body and target tissues. Age-related changes take place in dophamin- and serotoninergic neurons of hypothalamus, suprahypothalamic structures. The process of oocytes death and atresia of primordial follicles accelerates. Decrease in estradiol synthesis by ovaries damages ovulatory ejection of FT and LT, ovulation does not take place and the corpus luteum does not form. Gradually hormonal production of the ovaries decreases and menopause sets.

They distinguish the following phase of menses cancellation (climacteric phases):

1) hypoluteal (anovulatory cycles with decreased production of progesteron);

2) hyperoestrogenic (anovulatory cycles with the signs of relative hyperoestrogeny);

3) hypoestrogenic (hypergonadotrophic). Early atrophy of follicles, reinforced secretion of gonadotrophins, different climacteric symptoms and amenorrhea are typical for this phase;

4) ahormonal (function of ovaries ceases, a small amount of oestrogens is synthesised by adrenal glands, production of gonadotrophins reinforces).

**Menopause** starts with the last in a woman's life menstruation. It takes place at 47–52 years of age and lasts to the end of the life. The age when menopause begins is hereditary determined and does not depend on the beginning of the menstruations, social and economic status, race, height and a woman's body mass. Smoking as a rule accelerates the beginning of menopause. Menstruations stop suddenly rarely, as a rule a period of cancellation, i. e. irregular menses preceeds menopause. Cancellation of the menses is caused by disturbance of cyclic gonadotrophic function of pituitary body and increase in secretion of follitrophin and lutrophin. There are no strict limits between the phase of the menstrual cycles. During this period both endocrine and somatic and psychological changes take place in the female organism.

The level of LT increases thrice and the level of FT increases 14 times during menopause as compared with their secretion in reproductive period. In time the formation of dophamin, serotonin and epinephrine decreases. The main way of oestrogens (estron) synthesis becomes the extraovarian one (i. e. from androgens). Aromatization of androstendion in oestrogens takes place in adipose tissue, bones, muscles, skin and brain. In due course the mass of the uterus and ovaries decreases.

#### RECOMMENDED READING

3 (25–52); 5 (15–36); 15 (12–31); 17 (735–749); 22 (143–170); 41 (45–97); 50 (14–60); 51 (1–4).

### UNDERSTANDING OF EMBRYOGENESIS. FETUS DEVELOPMENTAL STAGES

Understanding of the peculiarities of embryonic period is very important in perinatology, because a number of anomalies of the fetal development start from the disturbances of gametogenesis, fertilization (*fertilisatio*) or implantation. Incomplete invasion of trophoblast in maternal blood vessels in a period of implantation may increase the risk of preeclampsy and intrauterine growth restriction.

**Embyogenesis** is a development of an organism from the fertilization till its birth. A multicellular organism develops from fertilized ovum (zygote) not only by the way of the increase in the cells amount, but also thanks to *determination*, i. e. the choose of the one way of development from all possible. Determined cells *specialize*, acquire a certain structure and ability to perform definite functions — differentiation occurs, morphogenesis (hysto- and organogenesis) takes place.

Intrauterine or prenatal development, which starts from the moment of the ovum's fertilization, lasts — for 266–280 days. There are 3 periods in human embryogenesis.

**The first period — preembryonic (initial)** lasts after the fertilization during the 1st week of pregnancy. Fertilization and implantation are the critical moments of this period.

**The second period — germinal (embryonic)** starts from the 2nd (forming of the primary strip) and lasts till the 8th week of pregnancy. The germ (embryo) is a constellation of the cells or a creature — preembryo, which forms at the stage of the primary strip. Some authors consider that a product of the zygote's differentiation till the stage of the forming of the primary strip should not be called an embryo; proembryo, *concept* (conceptus), preembryo are considered to be more correct in this case. Cleavage of the germinal cells, their migration and differ-

entiation of the organs (*organogenesis*) occur during this period. *This is the most important period of the intrauterine existing (life)*. Exogenous harmful factors can break the normal morphogenesis, what leads to the appearing of the serious congenital developmental defects. At the end of this period an embryo transforms into the fetus with a typical for a child configuration.

**The third period — fetal**, starts from the 9th week of pregnancy and lasts up to the child birth; it is characterized by the general growth and organogenesis, in particular by the development of the central nervous system (CNS). *Placentation* is the critical moment of this period.

**Critical periods of development.** The concept of the critical period of development was introduced in 1921 by K. Stockard and further developed by P. G. Svetlov. Individual development, by P. G. Svetlov, consists of the stages, each of them starts with the critical period, after which the differentiation and growth stages follow. Critical periods are characterized by the highest sensitivity to the influence of unfavourable factors of the environment. Period of fertilization and embryo itself in the periods of **implantation** on the 7th–8th day of embryogenesis (**the first critical period**) and **placentation** on the 2nd–8th week of development (**the second critical period**), which conforms with the period of organogenesis, are mostly affected owing to the action of the injurious agents. Embryotoxic effect of the injurious factors of the environment (chemical agents, ionizing radiation and others) is a characteristic feature for the first critical period, teratogenic influence — for the second one.

In implantation an influence of the harmful factors either leads to the death of the embryo or does not cause the disturbance of the embryonic cycle at all (if the blastomeres, capable to polypotent development preserve in enough amount). As the result of the injury of the embryo in the periods of implantation and organogenesis the anomalies of such organs, which are in the process of active differentiation and development in this period, form. That's why under



a short influence of teratogenic factor single anomalies of development form, during long-timed — multiple ones. The 15th–20th week of gestation (intensive development of the brain) and the 20th–24th week (forming of the main functional systems of the organism) are considered to be the *critical periods of the fetal development*.

## GAMETOGENESIS

Sex cells (gametes), unlike the somatic cells, contain haploid set of chromosomes. Male sex cells (gametes) have chromosomes X or Y, female — only chromosomes X.

**Gametogenesis.** Primary sex cells in fetal period differentiate in *ovogonia* in the ovaries or in *spermatogonia* — in testicles. There are some stages, which occur on the way from ovo- or spermatogonia to gametes, during which the meiosis occurs: 1) division, cleavage (reproduction); 2) growth; 3) maturation; 4) forming, (this stage in ovogenesis is absent). Spermatogenesis (forming of the male sex cells — spermatozoons or spermias) starts from the period of puberty and lasts till the old age of the human. The lasting of development of the mature spermatozoons from the initial cells, spermatogonia, is nearly 72 days.

Ovogonia transfer into the stage of reproduction, forming primary oocytes, in the ovaries, which differentiate. The stage of development stops to the 7th month of the intrauterine development; in prophase I (of the meiotic division I) primary oocytes become membrane-shaped, which consist of follicular epitheliocytes; that means that *primordial follicles* form. These follicles come into the period of rest, which lasts till the pubertal period. The quantity of primordial follicles in a newborn girl is nearly 2 mln.

Two divisions take place consecutively during the meiosis. During the division I some important processes occur: genetic recombination by crossing-over between maternal and paternal homologous chromosomes; the decrease in the chromosomes' amount, content of DNA and ploidy; intense synthesis of RNA. Meiotic division I completes after luteinizing hormone reaching peak. *Fertilization* is the signal for the finishing of the meiotic division II. *Secondary oocyte* divides with the forming of the mature ovum (haploid set of the chromosomes X) and second polar body.

Spermatozoons with the different sexual chromosomes (X or Y) form in the process of meiosis.

## GAMETES TRANSPORT, FERTILIZATION AND IMPLANTATION

**Transport of spermatozoons.** Alkaline medium of spermatozoons protect them temporarily from the acid medium of the vagina. The majority of spermatozoons become immobile within 2 h. The most mobile ones penetrate through the mucous plug of the cervix (during 90 s after ejaculation). Uterine con-

traction promotes spermatozoons moving upwards — to the upper reproductive tract. After insemination spermatozoons get in the Fallopian tubes in 5 min, where they can stay for 85 h after the sexual contact. Only less than 100 of spermatozoons from 200–300 mln, which get into the vagina, reach the ovum. The death of the majority of spermatozoons occurs in the vagina, besides, as the result of phagocytosis in all parts of the reproductive tract, as well as while moving along the Fallopian tubes to the abdominal cavity.

*Capacitation* is the process of transformation of spermatozoons, their acquiring of hyperactive abilities for penetration into the ovum. Beside of intensifying of the spermatozoons' mobility, the process of capacitation includes also the change of their superficial characteristics (liquidation of the plasmatic seminal antigens, modification of their superficial charge, decrease in the receptor mobility). This process is related to the decrease in the stability of cytoplasmatic and external acrosomal membranes. Further modification of the membranes of capacitated spermatozoons occurs near the ovum or during their incubation in the follicular fluid. The decay or amalgamation of cytoplasmatic and external acrosomal membrane (acrosomal reaction) occurs. Acrosomal reaction is characterized by the flow of the calcium ions ( $\text{Ca}^{2+}$ ) and depends from calcium-binding protein — calmoduline. Acrosomal reaction can be induced by glycoprotein of pellucid zone (zona pellucida) of the ovum —  $\text{ZP}_3$ , which is a spermal receptor, which leads to the elimination of the acrosomal enzymes (hyaluronidase, neuroaminidase-like factor, acrosine and others), contributing to the penetration of the ovum by spermatozoon. Thus, capacitation prepares the spermatozoons to acrosomal reaction and then to penetration of zona pellucida of the ovum.

Transport of the ovum takes place in the period which lasts from the ovulation to the penetration of the ovum in the uterus. Ovum can be fertilized only at the early stage of its location in the Fallopian tube.

Ovary and distal part of the Fallopian tube of mice and rats covered by the common sac, which contains fluid. An ovulated ovum is transmitted by the fluid flow to the fimbrial part of the Fallopian tube. In primates an ovulated ovum adheres to the surface of the ovary. Ciliae of the ampullar part of the Fallopian tube (fimbriae tubae) are in constant move over the ovary, trying to catch the ovum. Penetration of the ovum in the lumen of the Fallopian tube is provided by constriction of the muscular fibres of the ciliae (fimbriae), which contributes to its contact with the surface of the ovary. Cases of women's fertilization, which have only one ovary and one Fallopian tube, located from the opposite sides confirm the possible variations of this mechanism. The disturbance of the ovum's transport may occur in connection with congenital deficiency of the fimbriae of the Fallopian tubes (*Kartagener's syndrome*). Muscular constrictions of

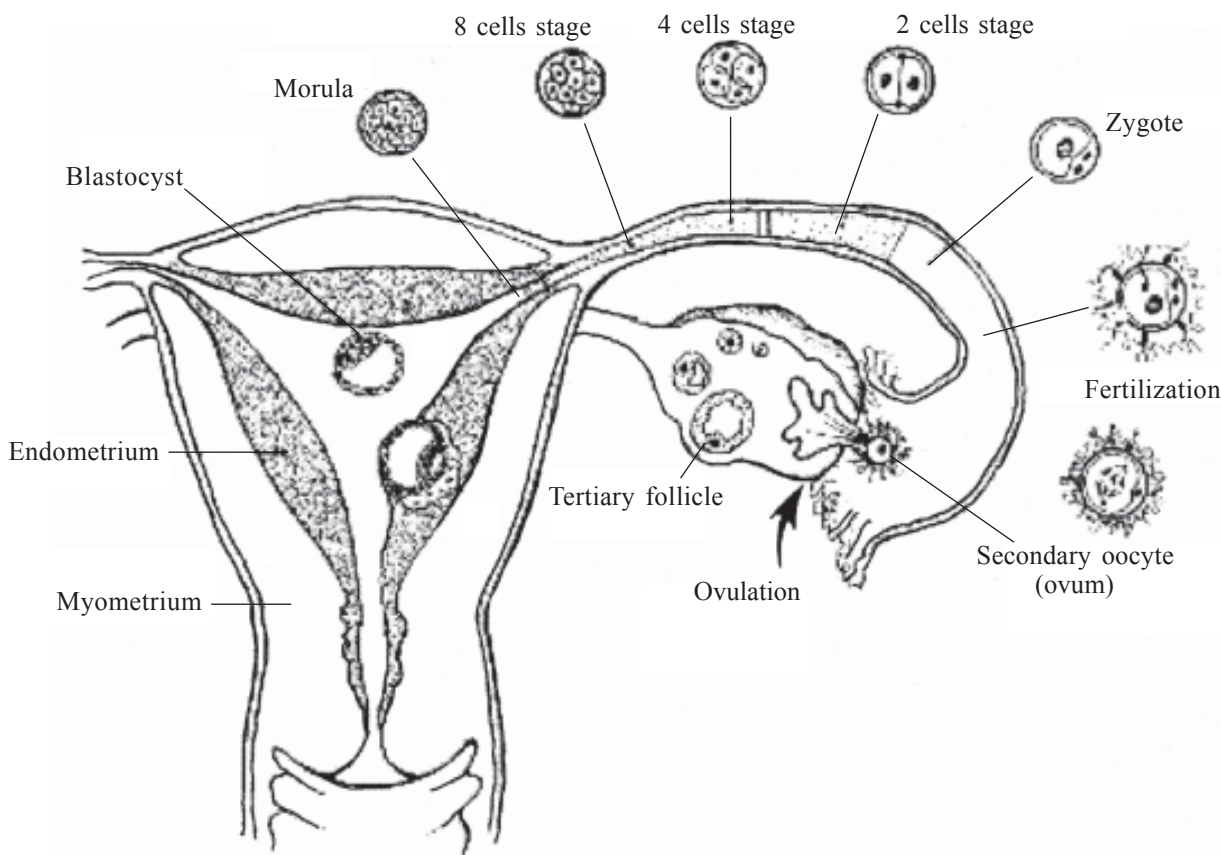


Fig. 30. Ovulation, fertilization and development of blastocyst during the first week

the Fallopian tubes occur chiefly in the “forward-backward” direction.

Transport of the gametes, which occurs during the 1<sup>st</sup> week after ovulation, is shown at the fig. 30. Mainly, transport of the ovum in the Fallopian tube lasts nearly 3 days.

## FERTILIZATION

Transport of the ovum through the ampulla to the isthmus of the Fallopian tube lasts approximately 30 h. In the isthmus the ovum stays for the same term, and then begins to move quickly over the tube. Its move is provided by peristaltic constrictions of the Fallopian tube, fibrillation of the ciliae (fimbriae) of its epithelium, as well as moving of the secretory fluid. The first cellular division of the zygote — the cell, which forms as the result of *fertilization* of the ovum by spermatozoon, — occurs approximately in 24 h, the next one — in 12 h. Synthesis of DNA and protein starts in the zygote. Germ (embryo) gets into the uterus on the stage of *morula* (from 16 to 32 cells-blastomers). When morula reaches the uterus, the cavity, filled with fluid, forms around it, which transforms the morule in the blastocyst. The blastocyst differentiates on the *internal cellular mass* (embryoblast), which gives the beginning to the embryo (for some stages), and trophoblast — a precursor of the chorion of placenta. The embryo is considered to be

a fetus after the finishing of the embryonic period (8 weeks).

Synchrony of the changes in the endometrium and development of the fertilized ovum is an important condition for the beginning of pregnancy. Morphological changes, which are important for successful implantation of the blastocyst, occur in the mucous membrane of the uterus during each menstrual cycle. If cyclic changes of endometrium pass ahead the development of the ovum, the fertilization can fail. Experimentally fertilization and development of the fetal ovum in women may occur in the uterine cavity till the necessary changes in endometrium take place. This fact refutes the speculative conceptions, according to which contraceptive effect of the drugs that accelerate the transport of the ovum to the Fallopian tube, is related to that, that the ovum gets into the uterus at the time, when the endometrium is not ready to take it. The complexity of the human reproduction problem is experimentally proved by the fact that ectopic pregnancy (is rarely observed in animals) does not occur after occlusion of the Fallopian tubes in woman right after the fertilization; the embryo develops to the stage of blastocyst and then degenerates.

An optimal time, during which the ovum can be fertilized till its death, is approximately 12–24 h. In programs of fertilization *in vitro* oocytes are cultivated no longer than 36 h. The period of the capacity of spermatozoons for fertilization, as a rule, does not

exceed 48 h. They may preserve mobility even after the loss of ability for fertilization.

*Pellucid zone* (zona pellucida) around the ovum from the moment of ovulation till implantation produces three glycoproteids: ZP<sub>1</sub>, ZP<sub>2</sub> and ZP<sub>3</sub>. Acrosome of the intact spermatozoon has a specific binding proteid ZP<sub>3</sub>. Pellucid zone contains specific receptors for spermatozoons. Penetration of the pellucid zone occurs quickly and may be accelerated by protease of acrosine, which is contained on the spermatozoon's internal acrosomal membrane. There is a point of view, accordingly to which the most important factor, which influences the penetration of zona pellucida, is a mobility of spermatozoons.

Dissociation, removing of the cells of the radiant mitra, which surround the ovum, and lysis of the pellucid zone occur thanks to the influence of specific enzymes. The ovolemma of the ovum at the place of spermatozoons detachment forms a tuberculum, where it gets. The dense membrane — membrane of fertilization, which prevents the penetration of the other spermatozoons, and is a protective mechanism against polyspermy and polyploidy, forms due to the cortical zone of the ovum. Nuclei of the male and female gametes transform into pronuclei, draw closer and fuse. *Zygote* forms, and till the end of the first day after fertilization the cleavage starts.

*Sex of a future child* depends on the combination of sex chromosomes in zygote. If the ovum is fertilized by spermatozoon with the sexual chromosome X, two X-chromosomes will be in diploid set (46 chromosomes), and the female fetus will develop. If fertilization of the ovum occurs by spermatozoon with the sexual chromosome Y, a combination of sexual chromosomes XY forms in zygote, and the fetus of the male sex will develop. The amount of spermatozoons with X- and Y-chromosomes is equal, but mass of the X-chromosome is greater, that's why spermatozoons, which contain Y-chromosome, are more mobile. In connection with greater sensitivity of the male fetuses to the injurious factors, there are less newborn boys than girls: 100 boys are born for every 103 girls.

**Cleavage.** *Zygote* divides into the cells — *blastomeres*. The cleavage of the zygote is complete, asynchronous; it occurs with the speed of nearly 1 cleavage a day. The first cleavage occurs in 30 h after fertilization, as the result of which the cells — blastomeres form, at first — two, then — three, and in 4 h the stage of the four blastomeres occurs. All main types of RNA synthesize on this stage. During 1–2 days the division occurs slowly, then — quickly, and on the 4th day the germ contains 16–32 blastomeres. In 50–60 h it looks like a dense vesicle — the morule, and on the 3rd–4th day the forming of the blastocyst begins; it locates for 3 days in the Fallopian tube, and in 4–4.5 days it consists of 32–64 cells, has a well developed trophoblast and contains a cellular mass (embryoblast) inside. In 5.5 days the blastocyst en-

larges as the result of the increase in the cells' amount up to 128 and intensified absorption of the secret of the uterine glands by trophoblast, as well as due to active producing of the fluid by trophoblast. In 5–5.5 days blastocyst reaches the uterus, and on the 6th–7th day its implantation (nidation) — germ ingrowth in the uterine wall by the interstitial type occurs.

**Preimplantational losses.** Anomalies of caryotype in the fetus occur as the result of the unseparation in the anaphase of the sexual chromosomes in the process of meiosis of the female sex cells. Because of this two X-chromosomes (XX) get into one sex cell, and none (00) into the other one. During the fertilization of such ovums pathological caryotypes may form: XXY (Klinefelter's syndrome), X0 (Turner's syndrome), XXX (superfemale), 0Y (unviable).

The using of the sensitive hormonal tests for diagnosing pregnancy gives us an opportunity to make a conclusion, that 25–40% of preembryos (concepts) are lost to the moment when it is possible to detect them by the clinical methods. The survival rate of the embryo after the fertilization *in vitro* is also less than *in vivo*, and only 10% of embryos implant in the uterus. Such a high incidence of pregnancy fail may be a variant of biological selection against anomalous gametes during the reproductive process. On example, spermatozoons with morphological disturbances are less capable to penetrate the cervical mucosa.

After clinical confirmation of pregnancy the incidence of spontaneous abortion in the postimplantational period is nearly 15%. Chromosomal anomalies exist approximately in 50–60% of these cases, i.e. 7.5% of the human concepts are anomalous. At the same time chromosomal anomalies among the newborns compose only 1 in 200, which proves the existence of the mechanism of selection on the early stages of human pregnancy.

Protective mechanisms against anomalous caryotype, which exist *in vivo*, are absent during the fertilization *in vitro*. On example, filtrating effect of the cervical mucosa and uterotubal connection *in vitro* cannot remove the anomalous spermatozoons. Besides, the risk of the ovum's penetration by more than one spermatozoon increases (4% against 1–3% *in vivo*).

**Implantation** (Fig. 31) is considered to be a process of the blastocyst's attachment to the uterine wall. The process of susceptibility of the uterus to the blastocyst's attachment is restricted as for its place and the time (some hours). Implantation starts in the period between the 6th–7th day after the fertilization and after 2–3 days after the moment when fertilized ovum reaches the uterus (nearly the 21st of the menstrual cycle). Hypertrophy and hyperaemia of the uterine mucosa contributes to implantation. Directly after the implantation zona pellucida disappears, and blastocyst, which in this time contains from 107 (8 germinal and 99 trophoblastic) to 256 cells, attaches by adhesion and invasion to the endometrial epithelium. As a rule implantation takes place in the upper



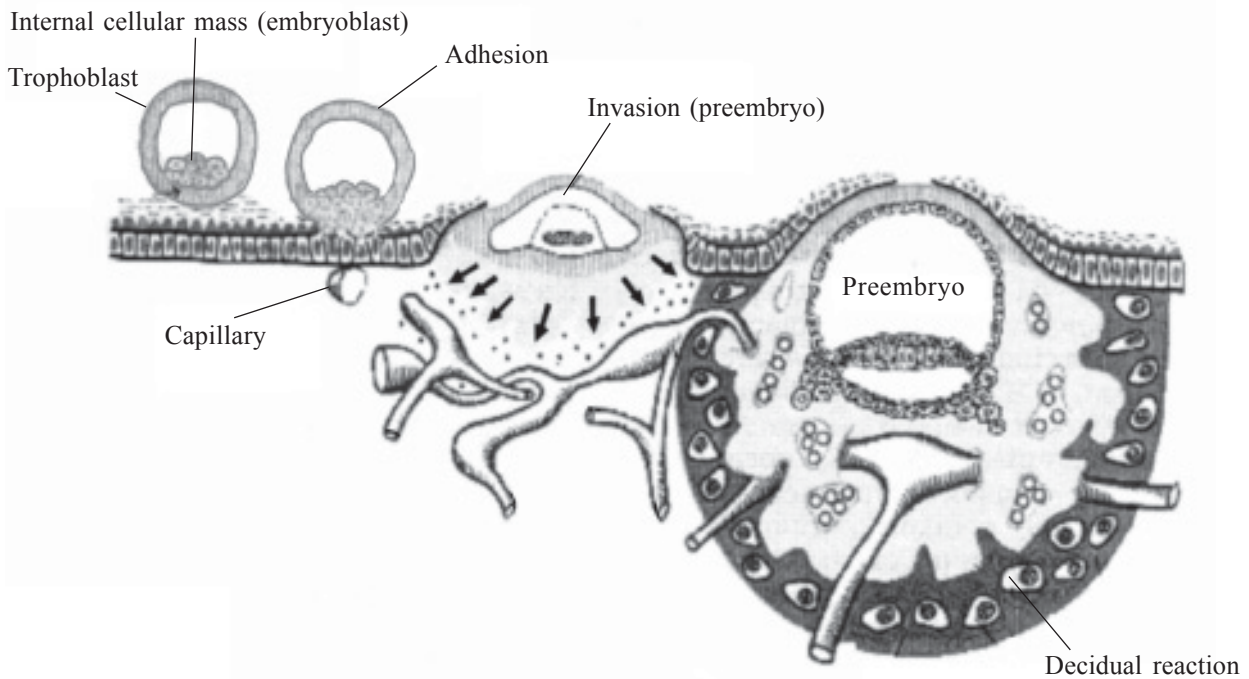


Fig. 31. Implantation

part, and rarely — on the posterior wall of the uterus.

*There are 2 stages of implantation:* adhesion and invasion (penetration). On the stage of adhesion trophoblast attaches to the wall of the uterus and begins to differentiate in cytotrophoblast and syncytiotrophoblast (symplasto- or plasmodiotrophoblast). During the *invasion* syncytiotrophoblast, producing the proteolytic enzymes, destroys the uterine mucosa. During this the villi of the trophoblast, which immerse into the endometrium, gradually destroying the epithelium, connective tissue and walls of the vessels, form; as the result of this the direct contact of the trophoblast with the blood of the maternal vessels is established, and haemotrophic type of nutrition (the true interfimbrial space, which contains the maternal blood, forms) is provided. The regions of the haemorrhages form around the germ. The trophoblast is provided by the nutritional substances and oxygen, which come from the maternal blood. At the same time the decidual cells rich in glycogen are intensely forming from the cells of the uterine connective tissue.

After the embryo is immersed into the implantational fossa, it is filled with the products of the destroying of the maternal tissues. The period of implantation (as well as fertilization) is *the first critical period* of the preembryo development. Haemotrophic type of nutrition is accompanied with the transfer to the new stage of embryogenesis — intensive development of the extragerminal organs and the second phase — morphogenesis (gastrulation).

## GASTRULATION

**Gastrulation** starts at the end of the 2nd week of pregnancy; its principle is in stratification and morphogenetic transfers. A single-layered blastocyst transforms in bi-, three-layered blastula, celoblastula, gastrula. There is no strict time border between the forming of the blastocyst and gastrula. Cellular mass of the one blastocyst, surrounded by the tissues of trophoblast, differentiates into germinal mass, then into the blastodisk. Till the end of the second week of pregnancy at the stage of three-layered blastocyst the lower part of the blastodisk differentiates into the germinal endoderm, and upper — into the germinal ectoderm. Two layers of the trophoblast — cytotrophoblast and syncytiotrophoblast — are the sources of the forming of the further placenta. Among all placental components trophoblast is the most variable by structure, function and development. The invasivity of the trophoblast contributes to the adhesion of the blastocyst to the uterine wall (the surface of the endometrium); its role in supplying fetus with nutritional substances is confirmed by its name, the function as an endocrine organ during pregnancy consists in adaptational physiological changes of a maternal organism during the whole period of pregnancy. Craniocaudal size of the embryo enlarges during the gastrulation; in the cranial part the blastodisk grows and the chord forms. The first tissue-specific genes activate with the beginning of the gastrulation. Then, during the 3rd week of pregnancy, the determination of the third layer of the germinal cells — mesoblast (spinal string and lateral mesoderm) occurs at the site



of the bilayered blastodisk. *The primary germinal leafs*: ectoderm, mesoderm and endoderm form by the complex ways of transformation (invagination, migration, involution) of the cells. Neuroectoderm, from which nervous tissue and epidermis originate, form out of the external layer, *ectoderm*; the skeleton, muscles, connective tissue, system of the blood and its circulation form out of the middle germinal layer, *mesoderm*; digestive glands, epithelium of the digestive and respiratory tract are the derivatives of the internal layer, germinal *endoderm*.

The appearing of the axial complex of the germs is an important result of gastrulation: 1) neuroectoderm, strip, which transforms in the nervous lamina (plate), neural sulcus and neural tube — the germ of the nervous system; 2) *chordomesoderm* (spinal string, chord), located under neuroectoderm; 3) *mesoderm*, which locates laterally from the both sides.

Two weeks of the prenatal development — is a period of the forming of the primary strip of the blastodisk — is considered to be a critical point for the further **neurulation** (from 16 till 23 days) — forming of the nervous system. That's why the embryologists consider it expedient from the ethic point of view to restrict by this period the performing of the scientific researches of the human embryos, which received by the extracorporal fertilization. Reproductive technology came across the numerous moral and juridical problems, the solving of which is carried out by special groups of experts on ethics of extracorporal fertilization and transplantation of the human embryos (bioethics).

So, the embryonic period starts from the third week after ovulation and fertilization. The majority of the clinical tests on pregnancy, which are based on the determination of the level of human chorionic gonadotrophin (HCG), give the positive results. The blastodisk is clearly determined, somites and nephrotome form from the mesoderm, that means that the differentiation of the germ's body and its separation from extraembryonic organs start. Chorionic sac is 1 cm in diameter in this period. At the end of the 4th week, after ovulation, the diameter of the chorionic sac is 2–3 cm, and the embryo's length is 4–5 mm.

**Germinal ectoderm**, the external germinal leaf, is the starting point of the epidermis; epithelium of the skin and its derivatives (hair, mammary, sebaceous and sweat glands), a part of epithelium and gland of the oral cavity, enamel (of the teeth), stratified epithelium of the anal fossa, epithelium of the urinary and seminal ducts develop from the ectoderm.

All parts of the central and peripheral nervous system, contractile epithelium of the iris of the eye, pigmental epithelium and others form from the epithelium of the neural tube.

**Endoderm**, an internal germinal leaf, is not homogenous: its anterior part is a material of ectoderm,

forming a *prechordial lamina*, and the rest part is an intestinal endoderm. Epithelium of the respiratory tract and lungs, the major part of the mucous membrane of the mouth and pharynx, glandular tissues of hypophysis, thymus, thyroid and parathyroid glands, as well as epithelium and glands of the esophagus develop from the prechordial lamina. Epithelium and glands of the stomach, intestine and bile ducts, liver, glandular epithelium of the pancreas form from the *intestinal endoderm*.

**Mesoderm**, a middle germinal leaf, at first is a preaxial — by metamerely located from the both sides of the chord *somites*, which with the help of the segmental crura (nephrotomes) connected with ventral unsegmented parts of the mesoderm — *mesodermal lateral lamina*. At the end of the 5th week of development, when the embryo's length is 11 mm, 43–44 pairs of the somites form. Each somite, except first two, differentiates into three parts: 1) *dermatome* — dorsolateral part, which is the mesenchymal germ of the connective tissue of the skin; 2) *sclerotome* — mediaventral part, which is the starting point of the cartilage and osseous tissue of the skeleton (from it in time cartilages, ribs and scapulas form); 3) *myotome* is a germ of the skeletal muscles, which locates between the dermatome and sclerotome.

*Nephrotomes*, the germs of the genital tract, locate from the main cauda of the germ's corpus. Historical way of the evolution of excretory organs in the vertebral animals is clearly observed in its embryonic development.

*Mesoderm of the lateral lamina* (unsegmented part of the mesoderm) forms the secondary cavity of the body (celom) and from the both sides divides into two leafs: 1) somatic (*parietal*) *mesoderm*, which adjoins to the ectoderm (from the side of the abdominal cavity), and mesoderm (*visceral*), which forms a serous membrane of the inner organs. Celom is a starting point for the pericardial, pleural and abdominal cavities.

Dendritic cells, which fill all the space between the germinal leafs, embryonic germs and its extraembryonic parts, forming mesenchyma, determine from the both leafs of the mesoderm of the lateral lamina. Mesenchyma at first performs a trophic function — brings the nutrition substances to the different parts of the germ. Blood, haemopoietic tissues, lymph, lymph nodes and spleen develop from it.

The heart, cortex of the adrenal glands, stroma of the gonads, connective and smooth muscular tissue of the inner organs and blood vessels form from the ventral mesoderm. Fiber connective tissues, which differ by the structure and quantity of the intercellular substance and cells (ligaments, joint bursae, tendons, fasciae, cartilages and bones), start from the mesenchyma.

## EXTRAGERMINAL ORGANS

During the phase of gastrulation **extraembryonic organs**, which provide necessary conditions for the development of the fetus, form: 1) chorion; 2) amnion; 3) allantois; 4) yolk sac. These provisory organs form from the membranes of the germ, connect it with the mother's organism and perform some specific functions.

Cells of extraembryonic hypoblast do not take part in the forming of the fetal structures; their derivatives are represented only as extraembryonic (provisory) organs. The extraembryonic ectoderm takes part in forming of the chorion and amnion; the extraembryonic mesoderm forms internal layer of the yolk sac and allantois. It forms the cavity of the chorion. The extraembryonic mesoderm divides on the internal and external layers (actually for the internal layer of the chorion and external layer of the amnion, yolk sac and allantois).

**Trophoblast** takes part in the forming of amnion and chorion, which with time becomes the part of the fetus. It consists of the two layers: internal (cytotrophoblast) and external (syncytiotrophoblast). *Cytotrophoblast* (Langhance's layer) contains the cells which intensively reproduce. *Syncytiotrophoblast* is a typical syncytium — a highly colloid multinuclear structure, which forms as the result of the cytotrophoblast cells fusion.

**Amnion** — amniotic cavity, filled with amniotic fluid, forms the folds: main, lateral and caudal. The amnion is connected with the corpus (body) of the germ from the abdominal part. The amnion enlarges in sizes, and till the end of the 7th week its connective tissue begins to contact with the connective tissue of the chorion. Amnion's epithelium transfers on the umbilical cord and in the region of the umbilical ring connects with ectodermal cover of the embryo's skin. Amniotic fluid, protecting the germ from shaking, gives an opportunity to the fetus to move, prevents the adhesion of the fetal parts with adjoining tissues and penetrating of the harmful agents (microorganisms and others) to the fetus. The fetus swallows the amniotic fluid, which gets into its intestine; the fetus excretes also the urine into the amniotic fluid. The increase in the amount of amniotic fluid (hydramnion) can combine with anencephaly and atresy of the esophagus; the decrease in its quantity (olygoamnios) — with the agenesis of the kidneys, intrauterine growth restriction, syndrome of amniotic membranes (even antenatal amputation of the parts of the fetus may occur because of the severe long-term olygoamnion as the result of the forming of amniotic adhesions).

**Yolk sac** is a part of the primary intestine, which locates outside of the germ. Its wall consists of two layers: internal layer — from extraembryonic endoderm and external one — from extraembryonic mesoderm. Folds of the amnion compress the yolk sac, a

thin septum is formed, which connects it with the cavity of the primary intestine — yolk crus. This structure becomes longer and contact with the crus of allantois. Extraembryonic mesoderm is a place of embryonic haemopoiesis. Blood isles and stem haemopoietic cells form in the wall of the yolk sac. Some of them differentiate in the cells of the blood and primary blood vessels. The connection between the corpus of the embryo and chorion is provided with the vessels, which grow into the wall of the allantois, and also villi of the chorion. Nutrition and breathing of the embryo is performed by chorio-allantois. Primary villi are washed by the maternal blood. The yolk sac participates in the nutrition and breathing of the embryo for a short time; its main role is haemopoietic. Gradually the yolk sac displaces, occupying space in the cavity between the mesenchyma of the chorion and amniotic membrane. As a haemopoietic organ it functions till the 7th–8th week of gestation, then it undergoes a reverse development. The remains of the yolk sac as a composites of the umbilical cord later look like a narrow tube.

Extraembryonic endoderm is a source of the primary sex cells. They migrate to the germs of the genitalia, where differentiate in the gametes.

**A sign of the yolk duct (Meckel's diverticulum of the ileum).** The yolk crus and crus of the allantois with their vessels form allanto-intestinal diverticulum (abdominal pedicle), which starts from the embryo in the region of the umbilical ring. The yolk duct, as a rule, completely closes till the end of the 3rd month of development. Approximately in 2% of the cases (more often in men) the ceccal process of the ileum a sign of the yolk sac (Meckel's diverticulum of the ileum) remains. On the pick of development of the yolk sac its blood vessels are separated from the uterine wall by a thin layer of the tissue, which gives an opportunity to the embryo to absorb nutritive substances and oxygen from the uterus. Later the yolk sac decreases quickly and locates in the region of allanto-intestinal diverticulum.

**Allantois.** A small growth, formed from extraembryonic endoderm and mesoderm, — an allantois forms in the posterior wall of the yolk sac on the 16th day. A distal part of allantois gradually enlarges and transforms into a sac, which connects with the intestine with the crus. In the human allantois reduces on the 2nd month of embryogenesis. However, participates in the forming of the vascular system of the placenta. During anomalies of development of the urinary bladder it is necessary to take into account, that proximal part of the allantois participates in its forming.

**Placenta** realize a connection between the fetus and the mother's organism and consists of the maternal part (the basal endometrium, the main separating membrane — decidual membrane) and fetal part (placental disk — villiar chorion, which is a derivative of the trophoblast and extraembryonic

mesoderm — epiblast). Forming of the placenta begins from the moment of the blastocyst's implantation, which firstly "floats" in the uterine cavity for 1.5–2 days. Implantation occurs on the 20th–21st day of the normal menstrual cycle or in 5.5–6 days after fertilization when the functional layer of the endometrium is the thickest. During the implantation the blastocyst intimately contacts with epithelium of the uterine mucosa, forming a typical fissure-like connections between trophoblast and endometrium. Under the influence of the uterine secret, which contains  $\beta$ -glycoproteins, the pellucid membrane resorbs, and blastocyst attaches to the endometrium usually by the pole, on which its internal cellular mass is concentrated (embryoblast). During 2 days the blastocyst completely deeps into the uterine mucosa. *The main detachable (decidual) membrane* forms along the whole endometriums length, but at the beginning it begins to develop on the region of implantation. Till the end of the 2nd week endometrium is completely substituted by the main detachable membrane; there are spongy and dense (compact) zones in it. Soft spongy zone contains the remains of the endometrium's glands.

Forming of the chorion is carried out by the junction of the trophoblast and extragerminal mesoderm during the three periods: the previlliar period (7th–8th day of development); period of the forming of the villi (till the 50th day) and period of cotyledons' forming (the 50th–90th day). In the *previlliar period* in the process of implantation cells of the trophoblast proliferate and the cytotrophoblast forms, on the external margine of which syncytiotrophoblast — the derivative of the cytotrophoblast locates. On the early stages of implantation the trophoblast does not have promoted cytolytic qualities, and the blastocyst plunges between the cells of the superficial endometrial epithelium without destroying it. In the future the cytolytic activity of the trophoblast increases, in the tissues of the endometrium the cavities form called lacunas, which contain maternal blood. The lacunas are divided with the septi, which consist of the cells of the trophoblast (*primary villi*). After the forming of the lacunas the trophoblast of the blastocyst becomes the chorion; the villiar period of the placental development starts.

The *primary* (the accumulation of the cells of cytotrophoblast, surrounded by syncytiotrophoblast), the *secondary* (even distributed on the whole surface of the fetal ovum) and the *tertiary* (with blood vessels) villi appear consecutively in the period of the forming of the villi. The period of appearing the tertiary villi (from the 3rd week of development) is called placentation. The villi, turned to the main separating (decidual) membrane, are supplied with the blood from the vessels not only of the chorial mesoderm, but also the allantois. The period of the junction of the branches of the umbilical vessels with the local net of the

blood circulation coincides with the beginning of the heartbeat (the 21st day of development); blood circulation starts to take place in the tertiary villi. Vascularization of the chorion's villi, as a rule, finishes till the 10th week of pregnancy. The *placental barrier* also forms to this term.

The process of development of the villi is unequal. So, the villi, turned to the capsular part of the main separating membrane, develop to a lesser extent and gradually disappear, that's why in this part the chorion is called the smooth one. Stroma of the *smooth chorion*, turned to the capsular part of the main decidual membrane, contains a few blood vessels.

Stem villus and its branches form *cotyledons* — structural-functional units of the formed placenta.

### ORGANOGENESIS. FORMATION OF FETUS ORGANS AND SYSTEMS FUNCTIONS

Neurulation completes and organogenesis starts on the 4th week. The germs of the extremities and foundations of the main systems of the organs form in this period, though the process of their growth and formation of the functions goes on during fetal and postnatal periods. According to the clonal theory of development, any tissue or organ starts from the small group of the clones, each of them forms from its stem cell. On the early stages of the formation of the general plan of the body the mesoderm, which is the primary carrier of the positional information, plays a very important role. The inductive cooperations have a significant meaning in the organogenesis.

Organogenesis starts with the beginning of the differentiation of the neural tube and system of the blood circulation. Form of the embryo as the result of the somites' forming becomes more promoted. Below the germ of the head of the embryo, the gill system locates, which exists for a short time. The blood circulates over very thin vessels. Till the end of the 4th week the embryo enlarge three times, and main structure of it may be detected. Embryo in the period of organogenesis is very affected by the influence of teratogenic factors. The majority of the congenital maldevelopments appear exactly at this time.

Very important transformations occur during the 2nd month of pregnancy because of the fast cellular proliferation and differentiation. The sizes of the embryo enlarge during this time approximately 5 times, and its mass — 40 times. CNS, digestive tract and system of the blood circulation develop rapidly. The face, which forms around the oral fossa, looks like the face of the child during this period. Extremities grow; there are 3 segments in them, fingers differentiate. The end of the 8th week after the fertilization or the 10th week after the last menstrual cycle, as a



rule, is considered the *end of the embryonic period* and the beginning of the fetal one. The body length of the fetus is 4 cm in this period. The main embryo's organs, which in future continue to grow and mature, are formed approximately on the 56th day of development. The formation of the functions of the fetal organs and systems starts at the embryonic period, but intensively proceeds at the fetal period of development.

**Cardio-vascular system and blood** originate from the mesoderm. Their differentiation begins very early (the 18th–19th day) from the group of mesenchymal cells, which cover the yolk sac. The main structures differentiate till the end of the 5th week. First *blood isles* in embryonic mesenchyma form in a 19-day embryo. *Haemopoiesis* in the liver starts on the 2nd, in the spleen — on the 3rd, in the bone marrow — on the 4th–5th months of pregnancy. The red bone marrow and lymph nodes are the main places of the haemopoiesis. Active function of the spleen as a haemopoietic organ (forming predominantly of the lymphocytes, and also erythrocytes and cells of the myeloid row) starts from the 5th month of pregnancy. Erythrocytes appear in the blood on the 7th week of development, cells of the myeloid row — on the 12th week, lymphocytes — on the 16th week, thrombocytes — after the 20th week of pregnancy. During the first 20 weeks of pregnancy erythrocytes have nuclei, which to the moment of birth are only in 0.1% of the erythrocytes of the fetus. The amount of the erythrocytes of the fetus from the 8th week till labour increases from 1 mln to the 4.5–7.5 mln in 1 ml (the amount of the erythrocytes increases by 0.5 mln in 1 ml each 4 weeks). haemoglobin in the blood of the fetus increases from 100 g/l (till the 4th month) to 150–160 g/l (till the birth). Besides it has more affinity with oxygen than the mother's one. The blood gets an ability to coagulate till the 20th week of pregnancy; till the end of the 24th week prothrombin and other coagulants, as well as free heparin are detected in it.

The heart begins to form on the 3rd week; it becomes four-chambered by the 8th week. Palpitation appears on the 21st day of development.

The external embryonic *vascular system* reaches the internal embryonic vascular system and connects with it approximately to the beginning of the 4th week. Accordingly with the functions of the embryo, fetus and newborn the cardio-vascular system undergoes important transformations. According to the metabolic needs of the fetus and newborn, three systems of the blood circulation form progressively: 1) the system of the yolk blood circulation; 2) the system of the placental circulation, which starts from the allantoic blood circulation; 3) own system of the blood circulation of the fetus and newborn. Due to the fact that during the intrauterine life the fetus is supplied with oxygen is performed by placenta, but not by the lungs, a double system of the blood circulation, which

has completely formed till the end of the 2nd month of pregnancy, does not function till the moment of the child's birth. Two anatomical structures (oval foramen and arterial duct) permit the major part of the blood to get directly from the right atrium to the left, passing the vessels of the lungs. During the birth of the child the pulmonary breathing begins to function, after which the oval foramen and arterial duct close.

**Nervous system.** The brain, spinal cord (spinal marrow) and peripheral nervous system originate from the ectoderm. The differentiation of these structures begins from the 17th day of pregnancy, the period of neurulation, when the neuroectoderm, which separates from the primary ectoderm (epidermis and some organs of sensitivity form from it), develops. The neuroectoderm, located over the spinal tube, is a starting point of the neural tube, which restricted from the lateral sides by the nervous toruses.

The *cephalic neuropor* (the cephalic ending of the neural tube) with its anterior foramen is larger than the *caudal* one, which from the beginning opened and restricted by the posterior foramen of the neural tube. Enlargements as a prosencephalic (anterior), mesencephalic (middle) and rhombencephalic (posterior) meningeal protuberance form on the cephalic ending of the neural tube before the closing of the anterior foramen on the 25th day of pregnancy. In a week 5 protuberances form: from the anterior meningeal protuberance — telencephalon and diencephalon; the middle meningeal protuberance (it does not divide); rhombencephalon, which contains metencephalon and medulla oblongata, develop from the posterior protuberance. Meningeal protuberances, especially derivatives of the telencephalon — hemispheres of the encephalon — undergo (endure) the stages of the repeated improvement.

As the result of proliferation of the cells of the telencephalon, it surrounds the diencephalon. Physiological development occurs synchronically among with the histogenesis: it starts from the spinal cord, then continues in the derivatives of the posterior meningeal protuberance and reaches its pike with the beginning of the activity of the cortex of the encephalon. Primary nuclei and conductive tracts of archencephalon form till the end of the 7th week of pregnancy. The motor reflexes, predominantly generalized, appear in the fetus on the 2nd month of pregnancy. The elementary forms of the motor activity are observed till the end of embryonic development; the grasping reflex appears on the 11th week. The forming of the main functional systems of the organism of the fetus finishes till the 24th week of pregnancy.

The differentiation of the *cortex of the brain* occurs in the period between the 3rd and the 6th months of pregnancy. It is characterized by the complex migration of the cells, which leads to the forming of the six cellular layers. The processes of the neurons ap-



pear approximately on the 6th month of pregnancy, and different types of the cortical structures completely form on the 7th month. Till the moment of birth the major part of 9–15 billions of the cortical neurons already exists in the cortex of the encephalon, and only neuroglial cells continue to reproduce even after the child's birth.

Parts of the central nervous system are enough mature functionally and can provide the necessary (however not quite perfect) adaptation of the organism till the 23rd–24th week of the intrauterine development.

**Sense organs.** Neurosensor integration is provided by the complete cooperation of the sense organs and CNS, which have the common origin from the ectoderm. Local paired thickenings of the ectoderm, except those, from which organs of taction and vision generate, form in the cephalic part of the embryo; these structures are organized directly as the result of lateral protrusion into the base of the further prosencephalon. Each placode forms from the group of the cells, from which accordingly with the determined function specific organ develops. In the mature fetus sense organs are developed differently: gustatory, sensitivity to the touch and temperature are well developed; pain sensitivity, audition and vision, which has a restricted sensitivity to the light, are developed incompletely.

Functional system of sucking forms in the period from the 9th till the 24th–25th week of pregnancy, when the coordination of the swallowing and respiratory movement occurs.

**The face of the fetus** forms around the oral fossa from the 5 mesodermal facial protuberances, which gradually smooth down. The upper part of the face forms from the parietonasal protuberance, which appears as the result of the protrusion of the telencephalon. The fundus of the primary mouth — oral fossa — is formed by the two mandible protuberances. The lateral limits of the oral fossa (two maxillary protuberances) develop from the first branchial arch. Two ectodermal thickenings — the nasal placodes, from which the future nose and olfactory fossae generate, form at the end of the 4th week on the frontonasal protuberance. The face of the fetus is enough differentiated till the beginning of the 10th week.

Endocrine glands are found on the 1st–2nd month of pregnancy and begin to function till the end of the 20th–21st week. The forming of the follicles of the thyroid gland with organization of the colloid in them occurs from the 3rd month of pregnancy; thyroxin begins to produce on the 4th month. The differentiation of the cells of adenohypophysis starts on the 7th–8th week of pregnancy; synthesis of corticotrophin reaches the level of the newborn till the 20th–21st week. Adrenal glands of the fetus are larger than in adults, and almost completely consist of the cells of the cortical substance. Cortical substance of the adrenal glands begin to function from the 3rd month

of pregnancy, the meningeal one — after the child's birth.

The primary isles of the pancreas form on the 10th–14th week of pregnancy;  $\alpha$ - and  $\beta$ -endocrinocytes are already detected to this moment. After the 4th month all primary isles are substituted by the secondary ones, which consist predominantly of the  $\beta$ -cells. Insulin begins to produce from the 10th–14th week of pregnancy.

Endoderm is the origin of the **digestive tract**. Mesoderm, from which the connective tissue, muscles and serous membranes form, locates from the internal side of the endoderm. At first the **digestive tract** is closed by the oral-pharyngeal and cloacal membranes, which resorb on the 4th and 9th weeks of pregnancy.

**Liver** of the fetus at early terms of pregnancy performs the haemopoietic function. The red bone marrow performs this function from the 5th month of pregnancy, and the metabolism, predominantly of glycogen from the glucose, which gets through the placenta, occurs in the liver. Glycogenase and hexogenase are the main enzymes of the liver at this time. The depot of the glycogen at first forms in the placenta, and from the 10th week in the liver, lungs, heart and brain of the fetus. During the hypoxic conditions the anaerobic lysis of the glucose can perform. Lactic acid is the final product, as the result of the increase in its content in the blood the metabolic acidosis occurs. Fructose and galactose either are not used by the fetus or used in small amounts. Amino acids get from the maternal organism, and only a few amounts of them can synthesize by the fetus. Anabolic metabolism of the fetus is very intensive. Adipose acids and lipids get to it through the placenta. During hypoxia the fetus at first uses a free adipose acids of the mother (predominantly oleic), then — its own (predominantly palmitinic). In the placenta under the influence of lipoproteinase the conversion of the adipose acids and triglycerids occurs, after what they get to the fetus. Ferrum deposits in the liver during the last months of pregnancy. The glands of the mucous membrane of the intestine produce the enzymes, which digest the amniotic fluid, from which the primary fecal masses form (meconium).

**The respiratory tract** as a digestive one has a double origin — from the endoderm and mesoderm. The endoderm gives the beginning to the tracheobronchial, alveolar epithelium and supplying glands. The cartilage structures, smooth muscles and vascular system are derivatives of the mesenchyma.

The development of the respiratory tract starts from the 3rd week of pregnancy. The laryngo-tracheal depression and two crests form: tracheoesophageal and lateral esophageal. The laryngotracheal tube is separated from the esophagus by the tracheoesophageal septum. Two pulmonary germs separate from the trachea. Unsuccessful dividing of the laryngo-tracheal depression causes the forming of the atresia of

the esophagus or esophago-tracheal fistula. The pulmonary germs by the consecutive dividing form the primary bronchi (between the 5th and the 16th week), which develop till the 6th month of pregnancy. This bronchial tree, surrounded by mesenchyma and vessels, differentiate in the alveoli.

The lungs are able to function after the 6th month of pregnancy. At the same time with the respiratory tract its regulation structures develop: the respiratory center in the CNS forms till the 21st–22nd week. Starting from the 22nd–24th week of development the fetus constantly makes the respiratory movements; by their character we can make the conclusion about its condition. The respiratory movements are performed when the rima glottides is closed, that's why the massive aspiration of the amniotic fluid does not occur. The small amount of the amniotic fluid, which gets into the alveoli, is a source of the surfactant, which is necessary for the development of the respiratory function of the newborn. The sufficient oxygen supply of the fetus is provided by the development of the vascular system of the villi of the chorion, intensity of the utero-placental blood supply, permeability of the placental barrier for oxygen and other substances, enough quantity of erythrocytes and haemoglobin of the fetus.

The nutrition of the fetus is performed through the placenta, which is permeable not only for the necessary substances from the mothers blood, but also performs the fermentative (enzymatic) conversion of the proteins, lipids and carbohydrates, which is necessary for their assimilation by the fetus.

**The urinary tract.** The kidneys are formed from the interstitial mesoderm, which is situated between the somites and mesoderm of the lateral lamina. Two transitional structures: pronephros (pionephros) and primary kidney (mesonephros) forerun the residual kidney (metanephros). Urogenital excretional tract, the ducts of which are called accordingly to the ducts of the primary kidney (mesonephral of Wolf's canals) or paramesonephral (Müllerian) ducts. The residual kidney begins to differentiate on the 5th week of the fetus development. The nephron is the main structural-functional unit; it forms till the 9th–10th week. The placing of the nephrones in the kidney of the fetus is more compact than in the adult one; the filtration surface of the renal bodies is comparatively small, renal secretory canals are short, loops of the nephrones are not developed. The protein-free fluid starts to get into the renal pelvis on the 11th–12th week. A 6 month fetus excretes the urine into the amniotic fluid.

**The gonads (honada)** form from the primary sex cells of two types (they can be detected on the 21st day of the embryo's development in the wall of the umbilical vesicle near the allantois) and the nutritional supplying cells (systenocytes) in the testes and ovarian folliculocytes — in the ovaries. They start from the thickening of the mesonephros, which is called

the genital torus. The primary sex cells settle down in the genital torus on the 6th week of pregnancy. The primary funiculi (cords), which later transform in the spermatic cord (funiculus) in men and meningeal substance of the ovaries in women, form as the result of the proliferation of the sex cells. Till the 7th week the gonads and urogenital ducts (two ducts of the primary kidney) have the same morphological structure in the embryo of the different males. After the 7th week depending of the chromosomal set the gonads differentiate in the testes or ovaries.

The differentiation of the urogenital tract of the male embryo (the duct of the primary kidney) and regression of the paramesonephral ducts occur under the influence of androgens of the fetus.

In the female embryo caudal segments of the two paramesonephral ducts fuse, forming the one medial utero-vaginal canal. The medial septum disappears at the end of the 3rd month of development of the fetus. The superior part of the utero-vaginal canal forms the epithelium of the uterine mucosa. Terminal ending of this canal forms the epithelial vaginal lamina. The cephalic part of each paramesonephral duct transforms into the Fallopian tube.

The ducts of the primary kidney and the primary kidney itself regress. The differentiation of the external genitalia occurs during the 3rd month of pregnancy.

The beginning of the ovogenesis in the fetal ovaries occurs between the 11th and 12th weeks of the gestational age, when the meiosis starts. The primary oocytes stay in dormancy till the pubertal period (appearing of ovulation). The primary (primordial follicles) form in the ovaries on the 4th month of pregnancy; on the 5th month their growth and atresia begin. At the end of pregnancy the ovaries of the fetus contain the numerous quantity of the atresed follicles. Each ovary has 7 mln of the sex cells between the 15th and 20th week of gestation. Their number decreases to 2 mln of the primary oocytes as the result of the degeneration. Nearly 40 thousand of the primary oocytes stay in the ovaries till the beginning of the pubertal period; and only 400 of them transform into the secondary oocytes, ovums, ovulation of which occurs monthly during the reproductive period.

**The skeleton, muscles and extremities** develop from the preaxial mesoderm. The mesoderm of the lateral lamina lyses, differentiates, undergoes the metameric segmentation and forms 44 pairs of the somites. The central cavity (myocele) of the each somite differentiates, and on its internal side there is a group of the cells, which migrate in the direction to the spinal cord (chorda dorsalis) and the vertebral column forms in future.

The primary germs of the extremities develop from the mesoderm of the lateral lamina — somatic (parietal mesoderm), which forms a longitudinal thickening on the ectodermal surface (Wolf's crest), which

contains of meso- and ectodermal cells. The primary upper extremities form approximately on the 24th day of the embryo's development, lower ones — on the 26th day. The main contents of the extremities have already formed till the 34th–35th day of pregnancy. The first structures of the articulations form on the 8th week, when in the germinal cartilage tissue chondroblasts appear.

**The immune system.** From the 20th week the fetus receives from the mother through the placenta immunoglobulin G (IgG), which provides the passive immunity. Antibodies against herpes virus, viruses of the flu, viral encephalitis, diphtheria, smallpox, poliomyelitis, epidemic parotitis, toxoplasmosis, and also incomplete Rh-antibodies and isohaemagglutinines can enter through the placenta. After the 20th week the fetus is able to produce the specific IgM in the conditions of the proper maturity existence.

Thus, the intrauterine development of the fetus is characterized by the constant changes: division, migration and differentiation of the cells. The main components of the cells — proteins, nucleic acids, carbohydrates and lipids — are synthesized by the embryo. The mother's organism provides the nutritional necessities of the embryonic synthesis by the placental metabolism.

Morphogenesis of preembryonic period is ruled by the sequence of stimulations, which determines the differentiation of the cells, and in future — the development of the specific organs.

The embryonic period of organogenesis is only a small part of pregnancy course. The main structures have already formed till the end of the 2nd month. But the functional development of the organs keeps on, that's why the embryo is very sensitive to the influence of the factors of the environment. During this critical period the developmental defects may appear under the affect of drugs, chemical substances or infections.

The longer fetal period is characterized by the processes of growth. Forming of the palate, differentia-

tion of the external genitalia and histogenesis of the CNS are the most important processes of this period. That's why, *during the fetal period unfavourable factors do not cause significant developmental defects. However, they can be the cause of the different deviations of the behavior reactions or disturbances of the mental development in the postnatal period.*

The cooperation of the mother and the fetus, as well as adaptation of the mother's organism to the needs of the embryo are regulated by the constant changeable hormonal process in the ovaries, hypophysis and placenta. The action of the hormones is turned on the providing the future development of the newborn, transformation of the mother's mammary gland and initiation of lactation.

### FETAL MEMBRANES

**Placenta**, or the child's place, is an extremely important organ, which connects the functional systems of the mother and fetus. The human placenta is related to the type of rejecting disk-like haemochorial villar placentas.

At the end of pregnancy the placenta weighs 500–600 g, diameter — 15–18 cm, thickness — 2–3 cm. There are maternal (turned to the uterine wall) and fetal (turned to the amnion's cavity) surfaces in the placenta (Fig. 32).

A part (cotyledon), formed by the stem villus and its branches (anchor, liber and ending villi), is the main structural-functional unit of the placenta. The mature placenta has 40–70 parts (cotyledons). In each part anchor chorial villi attach to the main separating (decidual) membrane, and stem, free and ending — are washed by the maternal blood, which circulates in the intervillous lacuna.

Intervillous lacuna consists of three parts: arterial (in the central part), capillar (in the base of the part) and venous (chorial and interpartial part). From the

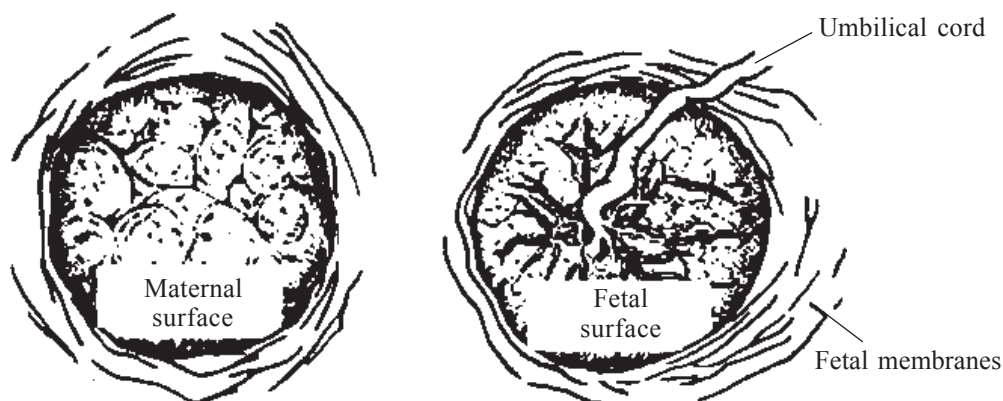


Fig. 32. Placenta



spiral arteries of the uterus the blood with the high pressure flows into the central part, passes through the capillar net into the chorial and interpartial parts, and then — in the veins, located in the base of the part and on the periphery of the placenta. Maternal and fetal blood circulations do not join with one another and are separated by the intersanguinal membrane (the placental barrier) (Fig. 33).

The *intersanguinal membrane (the placental barrier)* consists of such components: cytotrophoblast, basal membrane of trophoblast, syncytiotrophoblast (stroma), basal membrane of the endothelium of the fetal capillaries and endothelium of the capillaries. Certain changes take place in the cytotrophoblastic epithelium with the increase in pregnancy term.

The metabolism of the blood of the mother and the fetus takes place in the terminal villi through the placental barrier. The most favorable conditions for the metabolism arise during the second half of pregnancy, when capillaries move to the periphery of the villi and closely attach to syncytiotrophoblast with the forming of syncytiocapillary membranes, through which the transport of the nutritional substances and gas metabolism occur (see fig. 33).

Placenta accomplish a great number of functions.

The *respiratory function* is in the transport by the simple diffusion of oxygen from the mother to the fetus and discharge of the carbon oxide in the reverse direction.

The *function of the nutrition and excretion of the products of metabolism*. Syncytiotrophoblast produces glycoproteids, which have an ability to desaminate and peraminate the aminoacids, to synthesize their forerunners and transfer them actively to the fetus. One third of placental lipids consists of steroids, and two thirds — of phospholipids, the small part of neutral fats. The phospholipids participate in the synthesis of proteins, transport of the electrolytes, amino acids, increase the permeability of the cellular membrane of the placenta. Providing the fetus with the products of the carbohydrate metabolism, placenta

performs a glycogen-forming function till the beginning the fetal liver functioning on the 4th month of pregnancy. The glucose penetrates through the placenta by the way of simple diffusion; its major part provides the nutrition of the placenta itself. Placenta also accumulates the vitamins and regulates their entering the fetus depending on their content in the maternal blood.

The placenta with the help of the enzymes performs the *transport, accumulation and excretory functions* as to the majority of the electrolytes, including important macro- and microelements (ferrum, cuprum, zinc, manganese, cobalt, etc.).

The *Hormonal function* of the placenta consists in the synthesis, secretion and transforming of the protein and steroid hormones in syncytiotrophoblast.

Together with the fetus the placenta forms the integral functional endocrine system — the fetoplacental one. Chorionic somatomammotrophin (placental lactogene), which reflects its function, chorionic gonadotrophin — the earliest marker of pregnancy, which participates in the mechanism of differentiation of the sex of the fetus, is synthesized only in the placenta. Prolactin, which is synthesized by the placenta and decidual cells, plays the definite role in forming the lung's surfactant. Progesterone forms in the placenta from the cholesterol of the mother's blood; the synthesis and transformation of the oestrogens (estrone, estradiol and estriol), testosterone, corticosteroids, thyroxin, triiodthyronin, parathyrin, calcitonine, serotonin, relaxin and oxytocinase occur. Oestrogens of the placenta contribute to the hyperplasia and hypertrophy of endo- and myometrium.

While synthesizing the humoral factors with immunosuppressive qualities in the immunocompetent maternal cells, the placenta performs the *function of immunobiological protection of the fetus*. It is an immune barrier, which separates two genetically heterologous organisms (mother's and fetal), preventing the development of the immune conflict. Placental barrier has a selective permeability for the immune factors. Cytotoxic antibodies to the antigens of the hystocompatibility and IgG easily penetrate it.

The *barrier function* of the placenta consists in the protection of the organism of the fetus from the injury factors of the environment (microorganisms, chemical factors, medicines, etc.), but in some cases it is insufficient.

The **fetal parts of the fetal membranes** have the same anatomical-physiological origin with the placenta. **Amnion** consists of the amniotic epithelium, basal membrane and stroma, **chorion** — of syncytiotrophoblast, cytotrophoblast and amniotic mesoderm. One of the most important functions of the fetal parts of the membranes is their participation in paraplacental metabolism by the excretion, resorption and regulation of the biochemical content of the amniotic fluid. High concentration of the precursors of prostaglandins (arachidonic acid) and existence of

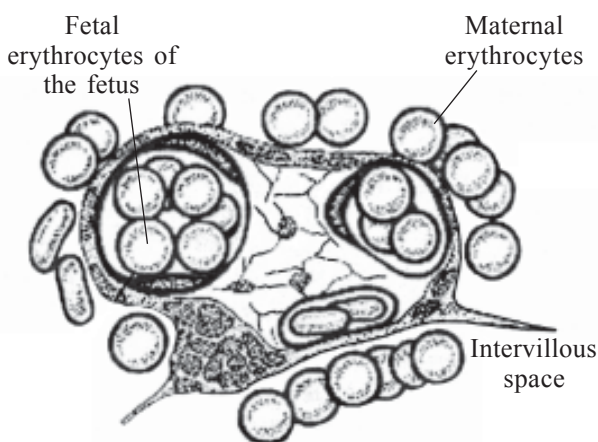


Fig. 33. Metabolism of maternal and fetal blood in the terminal villus



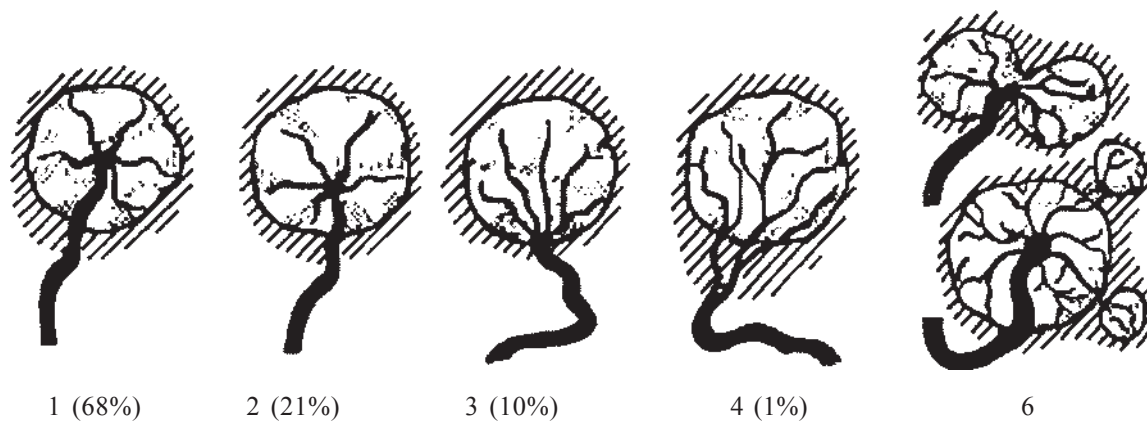


Fig. 34. Variants of attachment of umbilical cord and forms of placenta

the proper enzymes provide the participation of the fetal parts of the membranes in the mechanisms of the regulation of labour activity. The regulation of all kinds of the fetal metabolism and its energetic balance takes place in the fetal part of the membranes. The amniotic epithelium together with the main decidua membrane participates in the metabolism of chorionic gonadotrophin, corticotrophin, steroids, prolactin and relaxin. The participation in the process of foundation of the immune system of the fetus and providing its immunobiological protection is also the function of the fetal parts of the membranes. The preserving of the intact fetal parts of the membranes till the end of pregnancy, which is provided by physical-chemical condition of the amnion's stoma, has a significant meaning for the development of the fetus.

**Umbilical cord** develops from the connective tissue of the mesoderm (crus of the corpus), which joins the fetus together with the amnion and the chorion. The yolk crus, chorio-allantois and vessels also participate in the forming of the umbilical cord. All these formations are surrounded by the amniotic membrane. The yolk crus transforms into the yolk duct. The formed residual umbilical funiculus consists of the mucous connective tissue (amniotic, allantoic, yolk mesoderm — Wharton's jelly), yolk duct, allanto-intestinal diverticulum (allantoic duct), umbilical celom, amniotic epithelium, as well as of the vessels: sinister and dextral umbilical arteries and sinister umbilical vein. The mucous connective tissue consists of a great amount of hyaluronic acid, provides the turgor, performs the protective function and prevents the compression of the vessels of the umbilical funiculus, which means preventing the aggravation of the blood supply of the fetus. The wall of the vessels of the umbilical cord and amniotic epithelium have enzymatic system of the active transport, by which the umbilical cord participates in paraplacental metabolism (excretion and resorption of the amniotic fluid).

With a full-term pregnancy the length of the umbilical funiculus is 50–55 cm, diameter in the mater-

nal part is 1–1.5 cm, in the fetal part — 2–2.5 cm. The umbilical funiculus, which length is less than 40 cm, is considered to be absolutely short. The vessels of the umbilical cord — two (right and left) umbilical arteries, branches of the dorsal aorta of the fetus, and one (left) umbilical vein, which connects with the portal system of the fetus, and is topographically situated between the arteries. The total blood circulation in the system of the vessels of the umbilical cord is 500 ml/min. The systolic pressure in the arteries is 60 mmHg, the diastolic — 30 mmHg, and in the vein — 20 mmHg. The peculiarities of the attachment of the umbilical cord (central (1,2), marginal (3), membrane (4) — and forms of the placenta: bilobe (5), multilobe (with additional lobes — 6), etc.) have a significant meaning in the clinical aspect (Fig. 34).

So, as the result of the marginal and membrane attachment of the long or short umbilical funiculus, with entanglement around the fetal parts, the delivery is usually complicated by its hypoxia. Atypical placental shapes, its supplementary parts, may lead to the remaining of its parts in the uterus after the delivery and to the development of postnatal bleedings.

**The afterbirth** consists of the placenta, umbilical cord and fetal membranes. It is removed from the uterine cavity after the birth of the fetus.

**The amniotic fluid** is a biologically active medium, which surrounds the fetus, separates it from the mother's organism and performs different functions. Different structures participate in the forming of amniotic fluid depending on the term of pregnancy: trophoblast (in embryotrophic period), villar chorion (in the period of the yolk nutrition), amniotic epithelium, plasma of the mother's blood (in the 2nd half of pregnancy), kidneys and lungs of the fetus (after 20 weeks of pregnancy).

The volume of the amniotic fluid depends on the weight of the fetus and placenta and in 38 weeks of pregnancy is 1,000–1,500 ml. The amount of the amniotic fluid, which is less than 1 l, is called oligohydramnion, more than 2 l — hydramnion. The complete metabolism of the amniotic fluid occurs during

3 h. The amniotic fluid (pH 6.98–7.23) provides fetal homeostasis. The partial pressure of oxygen in it in the norm is higher than the partial pressure of the carbon dioxide (CO<sub>2</sub>). The osmotic concentration of the amniotic fluid is provided by the Natrium, potassium, calcium, magnesium, chlorine, phosphorus, ferrum, cuprum ions, as well as by glucose and urea. 17 amino acids, protein, corresponding to the blood of the fetus, products of their metabolism and re-synthesis are the components of the amniotic fluid. Phospholipids, which are the components of the cellular membrane and surfactant, have the most essential meaning among the lipids of the amniotic fluid. For the mature fetus the correlation lecithin/sphingomyelin in the amniotic fluid is not less than 2:1. The amniotic fluid participates in the metabolism of the hormones of the fetoplacental complex. Immunoglobulins of A, G, D, E classes, lysocym, β-lysines, complemen, which is the main factor of the regulation of the level of immune complexes and their elimination accumulate in the amniotic fluid.

#### FUNCTIONAL SYSTEM MOTHER — FETUS

The development of the fetus' functional systems, which provide the conditions for newborn survival, occur during the embryonic and fetal periods. The development of the functions, related to the other systems, has an important meaning for each functional system of the fetus. Afferent impulsation of the heart becomes very important for the normal development of the CNS. After the 9th week, when the motor reactions of the fetus appear, impulsation from the receptors of the skeletal muscles takes place. After the appearing of the respiratory movements (the 12th week of pregnancy), the impulsation into the respiratory centers begins. There is maldevelopment of its muscular system because of insufficient motor activity of the fetus, which combines with insufficient impulsation in the CNS. This impedes the development of the centers, which regulates the activity of the muscles and other systems of the fetus. The functional systems of the pulmonary breathing and digestion pass the periods of the training (respiratory movements of the fetus, swallowing and digestion of the amniotic fluid, coordination of these functions by CNS). The abnormalities of these processes lead to the disturbance of the fetal development and its adaptation to the extrauterine life.

A maternal organism participates in the forming and integration of the functional systems of the fetal development and its adaptation to the environment. A distinct sequence not only of development of the organs and systems of the fetus, but also of the processes of adaptation of the maternal organism accord-

ingly to the stages of the intrauterine development, is genetically determined.

Thus, the supply of the fetus with oxygen is provided by the haemodynamic functional system mother — placenta — fetus, which is a subsystem of the general functional system mother — fetus.

It develops at first in the period of the early ontogenesis. Fetoplacental and utero-placental blood circulations form in it simultaneously (at the same time). There are two blood flows (circulations) in the placenta: the flow of the mother's blood, caused by the systemic haemodynamics of the mother, and flow of the fetus' blood, which depends on the reactions of the cardio-vascular system. The maternal blood flow is shunted by the vascular system of the myometrium. 60–90% of the mother's blood gets in the intervillous lacuna at the end of pregnancy, which is caused by the tonus of the myometrium. A paravascular net, which is considered as a shunt, capable to pass the blood through itself in the conditions of the complicated utero-placental blood flow, develops in the villi around the arteries and veins. Fetoplacental and utero-placental blood circulations are closely connected; the intensity of the blood flow is equal.

**The endocrine functional system mother — fetus.** The enzymatic systems, necessary for oestrogens production, are available in the fetus (liver, adrenal glands), placenta and adrenal glands of the mother. The first stage of biosynthesis of oestrogens during pregnancy (hydroxylation of the cholesterol) occurs in the placenta, where the pregnenolone forms, which gets in the adrenal glands of the fetus, where it transforms to dehydroepiandrosterone (DEA). The latter gets into the placenta with the venous blood, where with the help of the enzymes aromatizes into estron and estradiol. After the exchange with the organisms of mother and to fetus estradiol and estron transform into estriol, the level of which is the main indicator of the endocrine function of the fetoplacental complex.

**The growth of the fetus** is an integrative indicator of its development; it is not uniform till the birth of the child. Genetically the internal potential of the growth is added by the external factors — condition of the mother and placenta (intensity of the utero-placental blood circulation). The fetus weighs 100–120 g till the end of the 16th week. Then the rate of increase in the fetal weight rises up to 85 g in a week, and from the 26th–27th week till the 37th–38th weeks it is 200 g a week. At the end of pregnancy the rate of the increase in the fetal weight slows down, which is related to the processes of placenta involution (“aging”), decrease in the intensity of the utero-placental blood circulation after the 36th week of pregnancy (physiological comparative placental insufficiency). *The correlation of the weight and length of the fetus* changes during pregnancy course. Mothers, which are tall (164 cm and higher), give birth to the fetuses with greater weight (250 g more) than those who are

short (158 cm and lower). During the next pregnancies the fetal weight, as a rule, increases. Anabolic influence on the protein metabolism is performed by the main stimulator in the fetus — insulin. The boys, as a rule, weigh more (by 150 g on average) than the girls.

### FETUS IN DIFFERENT PERIODS OF INTRAUTERINE DEVELOPMENT

A normal pregnancy lasts for 280 days or 10 obstetrical months (the first obstetrical month is equal with 28 days), or 40 weeks. The fetus, able to the extrauterine life, develops from the fertilized ovum during this period.

In the different periods of pregnancy the uterine fetus have the certain signs.

**12 weeks** — the body length is 6–7 cm, the uterine fundus is palpated over the pubic symphysis. There are centers of ossification in the bones of the fetus; the differentiation of the genitalia, fingers of the extremities begin, the movements of the fetus appear.

**16 weeks** — the body length of the fetus is 12–16 cm, its weight is 110–120 g. The sex of the fetus can be detected during the detail sonographic examination. The movements become active (the forming of the muscular system completes).

**20 weeks** — the body length of the fetus is 25–26 cm, its weight is 300 g. Skin is red, covered by lanugo. The secret of sebaceous glands is mixed with cells of epidermis, vernix caseosa is formed. Meconium is formed in the intestine. The movements of the fetus become more active, and the pregnant woman feels them. The hair appears on the head of the fetus. Cardiac tones of the fetus are heard during auscultation.

**24 weeks** — the weight of the fetus is 630–680 g. The fetal head is comparatively large, eyelashes and eyebrows are clearly detected on it. The fetus can born alive and perform the respiratory movements

**28 weeks** — the body length of the fetus is 25 cm, its weight is nearly 1,100 g. The skin is red, thin, covered with vernix caseosa. If it is born, it performs active movements, the cry is weak, but the fetus is not viable enough.

**32 weeks** — the body length of the fetus is 40–42 cm, its weight is 1,500–1,800 g. The skin remains red, and forms multiple ridges. The fetus is viable, however needs a special care.

**36 weeks** — the body length of the fetus is 45–48 cm, its weight is 2,400–2,500 g. The skin is smooth,

pink. The subcutaneous layer thickens, lanugo on the body are rare, hair on the head becomes longer. The cry is loud, eyes are open, a sucking reflex is promoted. If a special care is carried out, a viable capacity of the fetus is high.

**40 weeks** — the fetus is mature, completely developed. The body length of the fetus is 50–52 cm, its weight is 3,400 g. The fetus is usually becomes mature at full 37 weeks of gestation and since then is considered to be a term fetus. However, there is a discrepancy between the maturity and born in term.

The signs of the **mature fetus** are the following:

1. The body length (height) of the mature term newborn is on average 50–52 cm (48–57 cm), weight — 3,200–3,500 g (2,600–5,000 g and more). The body length is a more constant characteristic and shows the maturity of the fetus to the greatest degree. Genetic factors, peculiarities of the nutrition of the pregnant woman, its harmful habits (smoking, alcohol, drugs and toxic substances addiction) influence the weight of the fetus. The growth of the fetus is delayed as the result of the severe diseases of the mother. The increase in the weight of the fetus, which does not correspond to the term of pregnancy, can be related to the mild forms of diabetes mellitus in the mother (hyperinsulinism of the fetus).

The newborns, which weight is under 2,500 g are considered to be immature and those having low weight.

The newborns who have the body length over 47 cm are considered to be *mature*, under 45 cm — *immature*.

2. The chest of the mature newborn is of convex form, umbilical ring locates in the middle between the pubic mound and xiphoid process.

3. The *skin* of the newborn is pale-pink, subcutaneous layer is well developed, on the skin — only the remains of vernix caseosa, lanugo locates only on the shoulders and upper part of the back, the length of the hair on the head is 2 cm, nails reaches the fingertips.

4. *Ear and nasal* cartilages are elastic.

5. Testes in boys are lowered in the scrotum, the *small pudendal lips and clitoris are covered by the large pudendal lips in girls*.

6. *Movements* of the mature fetus are active, the *cry is loud, the eyes are widely opened*, a sucking reflex is active.

### RECOMMENDED READING

5; 11; 16; 17; 22; 24; 30; 33; 48; 54; 59; 60; 61.

## Chapter 6

# ADAPTATIVE CHANGES IN A FEMALE ORGANISM DURING PREGNANCY

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There is a concept “norm of pregnancy” in obstetrics. It is a new standard of homeostasis, on which a maternal organism is brought up during the gestational period for providing optimal conditions for development and growth of the fetus. If this condition of “heterostasis”, which is different in each trimester of the physiologic pregnancy is not taken into account or is not differed from the complications, the iatrogenic excessive or insufficient correction, which can have a reverse effect, is possible.

Transformation of the complex physiological mechanisms in a pregnant woman is regulated by the neuroendocrine system.

**Nervous system.** The increasing flow of impulsion in the CNS, starting from the moment of fertilization, leads to the appearing in it of the focus of the excessive stimulation — *a gestational dominant*. During the first 3–4 months of pregnancy the excitability of the cortex of the brain decreases, then gradually increases and again decreases at the end of pregnancy. The excitability of the inferior parts of the CNS and reflector apparatus of the uterus is decreased, which provides its relaxation and physiological course of pregnancy. Before the delivery the excitability of the spinal cord and reticular formation increases, the favorable conditions for the beginning of labour activity appear. The changes of the tonus of the vegetative nervous system (the increase in the tonus of *n. vagus*) cause in a pregnant woman the feelings of drowsiness, increased irritability, sometimes dizziness. Paraesthesiae, short-timed disturbances of the vision and audition are possible. Besides, also changes in the taste, olfaction, disturbances of salivation, nausea, decrease in the tonus of the intestine and urinary tract are also closely related to changes in the endocrine system.

**Endocrine system.** *Adenohypophysis* (anterior lobe of the hypophysis) in the period of pregnancy increases 2–3 times, its morphological restructuring occurs. During the first weeks of pregnancy the quantity of the basophilic endocrinocytes, which secrete lutrophen, increases. Beginning from the third month the secretion of prolactin by acidophilic endocri-

cytes (cells of pregnancy) increases. At the beginning of pregnancy lutrophen and prolactin stimulate the function of the corpus luteum and suppress the folliculogenesis. The production of prolactin during pregnancy increases, which promotes the preparation of the mammary glands for lactation. The excretion of follitrophen and lutrophen considerably decreases at this period, while the synthesis of corticotrophen, somatotrophen and tyrotrophen is without essential changes.

In *neurohypophysis* (the posterior lobe of hypophysis) neurohormones of the hypothalamus — oxytocin and vasopressin accumulate. The increase in the amount of oxytocine and its tonomotor effect on the myometrium depend on the content of oestrogens and serotonin, which inactivate enzyme oxytocinase, which destroys oxytocin in the blood of a pregnant woman, in the placenta.

**Ovaries.** During the beginning of pregnancy cyclic processes cease in the ovaries. The corpus luteum produces oestrogen and progesterone till the 10th–12th week of pregnancy, and from the 16th week their synthesis occurs in the fetoplacental complex. Oestrogens and progesterone cause the hypertrophy and hyperplasy of the myometrium, glandular tissue of the mammary glands. Under the influence of oestrogens the vessels enlarge, contractile proteins accumulate in myometrium (actin and myosin), the depot of the phosphorous compounds, which provide utilization of the carbohydrates by myometrium, increase. The transmitting of the nervous impulse slows under the influence of progesterone, the activity of the nervous-muscular apparatus of the uterus decreases.

In the functional system mother — placenta — fetus 90% of estriol has a fetal origin (adrenal glands and liver of the fetus), 10% form from estron and estradiol, which are synthesized by the ovaries of the mother. During the normal course of pregnancy the production of estriol gradually increases depending on the term of pregnancy and growth of the fetus. Accordingly the excretion of estriol increases: from 11.96  $\mu\text{mole/l}$  in 19–20 weeks till 66.57  $\mu\text{mole/l}$  in



38–39 weeks of pregnancy. The level of progesterone in the first weeks of pregnancy is 10–30 ng/ml, decreases on the 5th–6th week, and then gradually increases.

Synthesis and forming of the hormones of steroid and protein origin occur in the *placenta*. From the beginning of the 3rd week of pregnancy the protein hormone — chorionic gonadotrophin is synthesized. On the 5th week of pregnancy the level of its concentration in urine is 2.5–5 U/l, on the 7th — 80–100 U/l, on the 12th–13th week — 10–20 U/l. The last level preserves with some deviations till the end of pregnancy. Change of the level of CG, shifts of the terms of its maximal pick is an evidence of the disturbance of the functions of trophoblast and corpus luteum.

Chorionic somatomammotrophin (placental lactogen) is considered to be the hormone of the protein nature. It is synthesized by syncytiotrophoblast of placenta, starting from the 6th week, and its secretion lasts during the whole course of pregnancy. The contents of chorionic somatomammotrophin in the blood is maximal at the end of pregnancy (8 µg/ml) and correlates with the placental mass. It produces a contrinsuline effect: intensifies processes of glycogenolysis in the liver, lypolysis, decreases tolerance to the glucose. Melanotrophin (melanocystostimulating hormone — MSH), corticotrophin (adrenocorticotrophic hormone — ACTH), thyrotrophin (thyreotropic hormone — TTH), oxytocin and vasopressin are the protein hormones, which are synthesized by the placenta. The placenta also synthesizes some other biologically active substances, on example, relaxin, acetylcholin.

$\alpha$ -Protein, which is synthesized in the yolk sac and liver of the fetus, belongs to the glycoproteids. In the early terms of pregnancy  $\alpha$ -fetoprotein composes nearly 30% of the proteins of plasma of the fetal blood. Content of  $\alpha$ -fetoprotein in the blood of the pregnant woman increases in the period from the 10th till the 32nd–34th weeks, and then decreases.

Both the fetus and placenta participate in the forming of steroid hormones. *Estriol*, the level of which in the blood of a pregnant woman increases 5–10 folds in comparison with a non-pregnant woman, is the main oestrogen of the fetoplacental complex.

Biosynthesis of *progesterone* is provided by syncytiotrophoblast of the placenta without involving the fetus. Progesterone transforms to cortisol in the adrenal glands of the fetus. Oestrogens can synthesize from progesterone in the liver of the fetus. Placental progesterone influences myometrium predominantly in the region of placental localization, where its concentration 2 times higher than in other regions of the uterus.

*Thyroid gland*. Physiological course of pregnancy is accompanied with euthyroid condition. In 35–40% of pregnant women the thyroid gland can enlarge as the result of increasing of the follicles' amount,

content of colloid in them, as well as hyperemia and hyperplasia of the glandular tissue under the influence of increase in thyroxin and thyrotrophin production. However, the contents of hormones in the blood plasma does not change thanks to the increasing in a fixating ability of plasma proteins. During the first months of pregnancy the hyperfunction of the thyroid gland is possible, but in the second half — its hypofunction.

**Parathyroid glands.** During pregnancy a tendency to hypofunction of parathyroid glands, which can cause the disturbance of the calcium metabolism, asthmatic manifestations, feeling of pyrosis, spastic disturbances (convulsions in mm. gastrocnemius), appear very often.

In the **adrenal glands** as the result of the increasing of secretion of corticotrophin in the hypophysis hyperplasia of the cortex, increasing of the synthesis and excretion of glyco- and mineralocorticoids, cholesterol, other lipids, necessary for providing the fetal needs are observed. The synthesis of hydrocortisone, oestrogens, progesterone and androgens increases in the cortex of the adrenal glands. Morphological changes do not occur in the medullar substance. The processes of metabolism increase and pigmentation of the skin intensifies in the organism of the pregnant woman under the influence of corticotrophins and hormones of the adrenal glands.

**Organ of vision.** A pregnant woman can complain of the “macular” vision or “blinking”. This phenomenon is related to edema of the lens and if other pathological symptoms are absent (on example, preeclampsy), does not need correction.

The immune system of a pregnant woman is in condition of physiological suppression as the result of the influence of increased content of hormones and specific proteins of pregnancy — hydrocortisone, oestrogens, progesterone and chorionic gonadotrophin,  $\alpha_2$  — macroglobulin,  $\alpha$  — fetoprotein, trophoblastic  $\beta_2$ -glycoprotein and other humoral factors. The increase in the activity of the immune reactions of the pregnant woman against a background of immaturity of the immune system of the fetus, with the presence of the immune barrier (placenta, membranes, amniotic fluid), prevents the rejection of the genetically heterologous fetus. The maternal immune system in the norm is intact as for the leukocytes amount and rate of immunoglobulins. Only IgG penetrates through the placenta. Fetus begins to produce lymphocytes from the 6th week of pregnancy, and from the 12th weeks IgA, IgM, IgG, IgD, the level of which progressively elevates during pregnancy, are detected in its blood.

**Cardio-vascular system** of the mother undergoes considerable changes, which are needed for the providing of the necessary for the fetus intensity of oxygen's and nutrition substances entering and elimination of the products of metabolism. The accelerated blood volume increases on the beginning stages of

pregnancy and reaches its peak in the period from the 12th till the 24th weeks. The heart rate increases in a pregnant woman by 15 beats per a minute on average. The cardiac output elevates up to 1.5 l/min (by 40–50%). The value of cardiac output depends on the position of the pregnant woman and is maximal in the position on the left side. In the position of the pregnant woman on the back v. cava inferior is squeezed by the enlarged uterus, which prevents the outflow of the blood; the cardiac output decreases, what clinically can manifest itself as bradycardia, dizziness, decreasing of ABP (*syndrome of v. cava inferior*). The elevation of the cardiac output especially in the placenta region promotes the increase in the uterine blood circulation (500 ml/min with a full-term pregnancy). The renal blood circulation at early terms of pregnancy increases by 30%, the glomerular filtration — by 50% in comparison with the values of non-pregnant women. Blood supply of the mammary gland also intensifies, and of the brain and liver — does not undergo considerable changes. The blood circulation of the skin elevates 5–7 times. The permeability of the capillaries' walls increases for water, salts and albumins, which improves the metabolism between the blood and tissues.

Progesterone decreases the tonus of the smooth muscles, which leads to the increase in organ vascularization, dilation of the veins of the pelvis and lower extremities. As the result of such changes of the cardiac output, viscosity and peripheral vascular resistance systolic and diastolic arterial pressure during the first 24 weeks of pregnancy decreases by 5–15 mmHg and at the end of pregnancy normalizes. At the lateral position ABP is a little bit lower than in position on the back. The level of diaphragm rises, the heart moves upwards and to the left. A bend of the large vessels can lead to appearing of systolic murmur, increasing during the physical load.

During labour as the result of emotional stress and pain the cardiac output increases by 40%, ABP — by 10 mmHg in comparison with the III trimester of pregnancy.

The central venous pressure at the III trimester is 4–12 mmHg. Pressure in the veins of lower extremities during pregnancy elevates and is 7–10 mmHg, that's why in connection with the insufficiency of venous valves their varicosis may arise.

**Blood system.** The successful ending of pregnancy directly depends on the physiological increase in the volume of the blood plasma. Stimulation of the aldosteron's secretion by renin leads to the delay of the natrium in an organism. The general amount of water increases till 6–8 l, 4–6 l of which is the extracellular fluid. The volume of the plasma elevates beginning from the 6th week of pregnancy, and reaches its maximum in the period of 30th–34th week and in future stabilizes. The volume of the blood plasma increases in the cases of pregnancy by the twins, and

decreases during preeclampsy, restriction of the fetal development and more than two fetuses.

The general mass of erythrocytes elevates to a lesser degree than that of blood plasma (by 15–20% at the end of pregnancy). A so-called *physiological anaemia of the pregnant woman* develops as the result of hypervolemia and caused by this haemodilution. The haemoglobin content in connection with autohaemodilution gradually decreases till 110 g/l on the 32nd–34th week of pregnancy. The indicator of the hematocrit number can increase thanks to augmentation of the erythrocytes providing the blood plasma volume stabilization.

The amount of leukocytes increases from  $(6-8) \cdot 10^9$  in 1 l till  $10 \cdot 10^9$  in 1 l at the end of the III trimester and is  $(25-30) \cdot 10^9$  in 1 l in delivery. Erythrocyte sedimentation rate (ESR) elevates till 30–50 mm/h, neutrophilosis reaches 70%.

The blood viscosity decreases till the 20th–28th week and normalizes till the end of pregnancy.

Changes of the homeostasis system are in constant increase in haemostatic potential of the blood and adhesive activity of the thrombocytes. These hypercoagulative changes have an adaptative character, because they contribute to homeostasis, and prevent a massive bleeding during delivery and in the postnatal period. In connection with the augmentation of the potential of the blood coagulation the risk of thromboembolic complications increases two times during pregnancy and 5.5 times after delivery. The level of fibrinogen (factor I) elevates and reaches 4–5 g/l, which leads to the augmentation of its degradation products and factors VII–X content in the blood. Fibrinolytic activity of the blood plasma progressively decreases. The indices of prothrombin (factor II), factors V and XII and time of bleeding do not change during a normal pregnancy. The thrombocytes number can slightly decrease.

A healthy pregnant woman needs additional 1,000 mg of ferrum: 500 mg are used for the increasing of the number of the maternal erythrocytes, 300 mg are utilized by the fetus and 200 mg are the reserve for compensation of its physiological loss. That's why it is necessary to use ferrum prophylactically during the pregnancy course to prevent its deficiency in a maternal organism. Despite the maternal anaemia, the haemoglobin level of the fetus does not fall. A pregnant woman should use 300 mg of ferrum sulfate per day (60 mg of elementary ferrum) prophylactically for compensation of physiological requirement in it. The dose should be doubled in the patients with anaemia.

**Respiratory system.** Hyperemia of the mucous membranes of a pregnant woman is the cause of the augmentation of the nasal secretion; complicated nasal breathing (respiration) may be observed, as well as rhinitis, like to allergic one, can develop. The character of the respiration (breathing) changes, the lungs ventilation increases, which is necessary for the aug-

mented providing of the organism with oxygen and elimination of the excessive amount of carbon dioxide. Hyperventilation of the mother is the result of the progesterone influence on the respiratory centers, which allows the fetus to exchange carbon dioxide by more effective way. The respiratory volume of the lungs elevates by 35–50%, alveolar ventilation — by 65%. The rise of the diaphragm decreases the general volume of the lungs by 4–5%. Functional capacity, remaining and reserve volumes of expiration decrease by 20%. The inspiration volume reaches its maximum on the 22nd–24th week of pregnancy and elevates by 5–10%. The respiratory rate and minute lung ventilation (by 50%) elevate, as well as consumption of oxygen increases too (by 15–20%). The minute volume of respiration elevates by 26%. The tension of oxygen increases and of the carbon dioxide — decreases, the level of serum hydrogencarbonates increases too, which contributes to the development of slight respiratory alkalosis, feeling of dyspnea, decrease in the tolerance to the physical load.

**Digestive tract.** At early terms of pregnancy (from the 4th–8th till the 14th–16th week) nausea, vomiting (“morning vomiting of a pregnant woman”), changes in the taste sense and olfaction, the increasing of salivation can be observed. These manifestations are connected with the relaxation of the smooth muscles of the stomach as the result of the elevated level of chorionic gonadotrophin and progesterone in the blood. Frequent consumption of small portions of food helps a pregnant woman to get rid from these unpleasant symptoms in the majority of cases. If the mentioned symptoms do not disappear to the middle of the II trimester or they are accompanied with the reduce of the body weight, acidosis, electrolytes disbalance, “excessive vomiting of pregnancy” (hyperemesis gravidarum) is diagnosed. Such a condition requires hospitalization and infusive therapy. The important condition for the normal course of pregnancy is the eradication of the unfavourable psychological and other stress situations.

*Salivation* of pregnancy is related to the increase in the saliva production, the reaction of which becomes more acid, and complication of its swallowing in connection with nausea. The decrease in acidity of the gastric juice may occur. The increasing influence of progesterone leads to the decrease in peristalsis of the digestive canal and increase in the time of its evacuation, decreasing of the esophagus tonus. The enlargement of the gallbladder increases the risk of cholestasis and forming of the stones. The deposition of glycogen and lipids increases in the tissues of the liver, the function of the protein forming intensifies (including the production of the soluble monomers of fibrin), which causes the elevation of the haemostatic potential of the blood. The level of cholesterol, direct bilirubin and activity of the acid phosphatase (from 26 to 70 U) increase.

In connection with the enlargement of the uterus the appendix moves to the right and upwards. Hypotonia of the intestine, elevation of the pressure in the pelvic veins can cause the constipations and development of haemorrhoids in a pregnant woman.

**Urinary tract.** The enlargement of the renal pelvises (about 1 cm) under the influence of progesterone begins from the end of the I — beginning of the II trimester and normalizes after the delivery. These changes in considerable degree manifest from the right side, which is related to the greater pressure on the right ureter and right vascular plexus of the ovary, as well as with enlarged uterus, which is in the position of dextrarotation. Vesico-ureteral reflux elevates the sensitivity of the gravid to the ascending infection of the urinary tract, especially with bacteriuria.

Beginning from the I trimester of pregnancy, the speed of the renal blood circulation increases by 75%, glomerular filtration intensifies. The clearance of creatinin elevates from the II trimester till 45% and normalizes before the delivery. The level of urea and urine acid decreases. 100 ml of the fluid is filtrated additionally per one day. However, the excretion of the urine can slightly decrease. A tendency to natrium loss according to the increasing of glomerular filtration and effect of progesterone is partly compensated by augmentation of its tubular reabsorption, elevation of the level of aldosterone, deoxycorticosterone and oestrogens. Activity of renin increases 10 times, and angiotensine and angiotensinogen — 5 times in comparison with a non-pregnant woman. Healthy pregnant women are comparatively resistant to the hypertensive effect of the increasing activity of the complex rennin — angiotensin — aldosterone.

According to the increasing of speed of glomerular filtration, excretion of glucose in pregnant women considerably elevates, as the result of which glucosuria can appear. The loss of protein with the urine does not increase in the norm, but appearing of orthostatic proteinuria is possible in 20% of the pregnant women. Excretion of folates and cyanocobalamin does not increase.

**Acid-base condition.** For the normal course of the physiological processes in the organism of a pregnant woman the keeping of the acid-base condition on the proper level is necessary, which is provided by the existence of the buffer systems, ventilation function of the lungs and excretory function of the kidneys. During the increase in the term of pregnancy a tendency to the respiratory alkalosis as the result of hyperventilation manifests.

The reacher alkaline reaction of arterial blood of the mother in comparison with the blood of the fetus contributes to the elimination of hydrogen ions through the placenta. The further progress of the alkalosis is compensated by decrease in excretion of natrium ions with urine and increase in excretion of hydrogencarbonate ions, which provides a constant pH of the blood in pregnant women.



**The metabolism** during pregnancy undergoes the significant changes. The activity of phosphatases, hystaminases increases, and activity of cholinesterase decreases. The alkaline metabolism increases, the consumption of oxygen elevates, the tension of oxygen in the arterial blood decreases. A pregnant woman endures hypoxia worse as the result of increase in oxygen requirement. The elevated consumption of oxygen is compensated by augmentation of respiratory rate, lung ventilation and permeability of the bronchi. The affinity of the blood with oxygen in the fetus is greater than in the mother, hence the blood of the fetus gives oxygen to the tissues with less intensity.

The intensification of **protein metabolism** is characterized by the accumulation of nitrogen (positive nitrogenous balance) for the requirements of the fetus, placenta and lactation.

During pregnancy the level of the serum protein of the blood progressively decreases predominantly by the albumine fraction and amino acids' specific proteins of pregnancy —  $\alpha$ -fetoprotein, trophoblastic  $\beta$ -glycoprotein form.

**Carbohydrate metabolism.** The pancreas as the result of the effect of contrinsular hormones of the fetoplacental complex is in condition of hyperfunction, what can cause the disturbance of carbohydrates metabolism. Hyperplasy of  $\beta$ -cells of pancreatic isles, which at the III trimester of pregnancy release insulin 2–3 times as much than in non-pregnant women, occurs. Placental hormones (PL, PH,  $E_3$ ) have the contrinsular effect and diabetogenic influence on a pregnant woman. Besides, insulin is destroyed by insulinase, which is formed in the placenta. Pregnancy is characterized by hyperglycemia, hyperinsulinemia, hypertriglyceridemia and decreasing of sensitivity of the tissues to the influence of insulin. The average level of glyucose in the blood, which is detected in a pregnant woman by performing the analysis on an empty stomach, is lower than in a non-pregnant woman, that's why hypoglycemia and hypoinsulinemia can occur. The glucose transport from the mother to the fetus is performed by simple diffusion, as the result of which the level of glucose in the blood of the fetus depends on its level in mother's one. The fetus does not depend on the maternal insulin (it does not penetrate through the placenta) and begins to produce its own insulin from the 9th–11th week. The low level of glucose in the maternal blood is a consequence of its constant diffusion to the fetus, where glucose utilizes as the main source of energy.

**Lipid metabolism** considerably intensifies. The change of tolerance to glucose, elevation of the insulin level and the level of free fatty acids in the blood leads to deposition of fat (in the adrenal glands, placenta, mammary glands, under the skin of the anterior abdominal wall, buttocks and hips) and intensifying of spontaneous lypolysis, especially till 30 weeks of pregnancy. The elevation of the utilization of the

fatty acids in the liver and hyperinsulinemia cause the activating of the synthesis of the general lipids (by 30%), triglycerids (almost in three times), cholesterol (by 25%), lipoproteids of low and very low density. The fatty acids, cholesterol, phospholipids are utilized for the needs of the developing fetus. After the 30th week of pregnancy the transfer of free fatty acids and glucose through the placenta to the fetus increases, what leads to increase in fat depositions. The rate of lipids in the blood normalizes on the 9th–10th day of the postnatal period.

**Water and mineral metabolism.** The deposition of the non-organic substances occurs, the assimilation of the phosphorus, calcium, which are necessary for the development of the nervous system and skeleton of the fetus, ferrum (hemopoiesis, needs of a pregnant woman, fetus, placenta, myometrium, lactation) intensifies. Other micro- and macroelements (kalium, natrium, chlore, cobalt, cuprum, zinc and other), which have to get to the organism of the pregnant woman with the food, are necessary for the normal growth and development of the fetus.

The amount of *water* in a woman's organism during pregnancy in connection with the increase in the osmolarity of the blood plasma gradually augments and can reach 7–8 l. The water is necessary for the development of the fetus, placenta, forming of the amniotic fluid, enlargement of the uterus and mammary glands, supplying lactation. Mineralocorticoids and progesterone participate in the regulation of the water-salt metabolism.

The requirement in vitamins during pregnancy increases, and their prophylactical usage is recommended. The day need in ascorbic acid increases 2–3 times, which accounts for its participation in forming all elements of the fetal ovum.

**Skin.** Blood circulation in the skin increases 5–7 times. The vascular net of the skin dilate (in the region of the superior part of the chest, on the face and upper extremities); almost in each 2nd pregnant woman erythema of the palms is observed (*palmar erythema*). This phenomena is related to influence of the oestrogens; after the delivery they disappear. In the places of the most straining of the skin (in the upper abdomen, around the umbilicus, on the chest, hips, loins) very often strips of the strain form (*striae gravidarum*). They can be rose, purple or dark-blue-violet. The appearing of these strips is connected with the strain of the skin, insufficient content of elastic fibres, hypercorticism. Their appearing does not depend on the pregnant woman's weight, but with obesity, their amount, as a rule, is more. After delivery strains on the skin become white or silver, their surface becomes wrinkled. Hyperpigmentation, related to the elevation of the level of oestrogens and melanotrophin, secretion of the pigment by the cortical substance of the adrenal glands, manifests on the face, around the umbilicus, on the nipples and around them, along the white line of the abdomen and the region of



perineum. “The mask of pregnancy” on the face — chloasma — can preserve after the delivery. Skin nevi enlarge and hyperpigmentate, secretion of sweat and sebaceous glands increases, acne may appear. Hypertrichosis is observed in some pregnant women. The umbilicus smoothes and can protrude at the last month of pregnancy. The hair growth during pregnancy slows as the result of the increase in the follicles’ amount, which are in inactive phase (approximately 20%). After delivery, during 2–4 months more intensive hair shedding occurs. Their growth normalizes 6–12 months after delivery.

**Bone-muscular system.** In the period of pregnancy the compensatory sacral lordosis intensifies. As the result of this the majority of the women complains on the pains in the inferior part of the back. The influence of progesterone and relaxin causes the relaxation of the pelvic ligaments. The disjunction of the pubic bones (by 0.5–0.6 cm) begins from the 28th–30th week.

Anatomical changes, related to the growth of the uterus, consist in enlargement of the subcostal angle from 68 to 103°, the circumference of the thorax — by 6–7 cm and its diameter — by 1–2 cm, as well as in the increase in the diaphragm’s excursion with its elevation by 4 cm.

Despite of the increasing of requirement in calcium in connection with the development of the skeleton of the fetus, its level in the blood plasma is sup-

plied with the greater reabsorption in the intestine and reducing of the losses through the kidneys. The osseous mass during pregnancy does not loose.

Muscles of the anterior abdominal wall are hypertrophied. The white line extends, transforming into the broad aponeurosis. The growth of the uterus can cause diastasis of direct abdominal muscles and forming of hernia.

**Body weight** of a gravida enlarges by 10–12 kg in connection with the enlargement of the uterus, placenta and fetus, deposition of the fat, development of the mammary glands, hypertrophy of the muscles, increase in the volume of circulating blood, the fluid retention. Beginning from the 26th week of pregnancy the increase in weight rate is 350–400 g in a week. Women with large body weight before pregnancy and its adequate increase during it have more chances to give birth to children with large weight. Insufficient increase in the body weight (less than 9 kg during pregnancy) is the risk factor of giving birth to children with low body weight (till 2500 g).

**Reproductive system.** The most promoted changes during pregnancy occur in the *uterus*: its mass increases from 50–70 to 110–1,500 g, volume from 10 ml increases 500–1,000 times, its length — from 7 to 38 cm; its position and reactivity change. At the beginning of pregnancy the antelexion of the uterus occurs very often, on the 3rd month its shape grows round, then uterus becomes ovoid (Fig. 35).

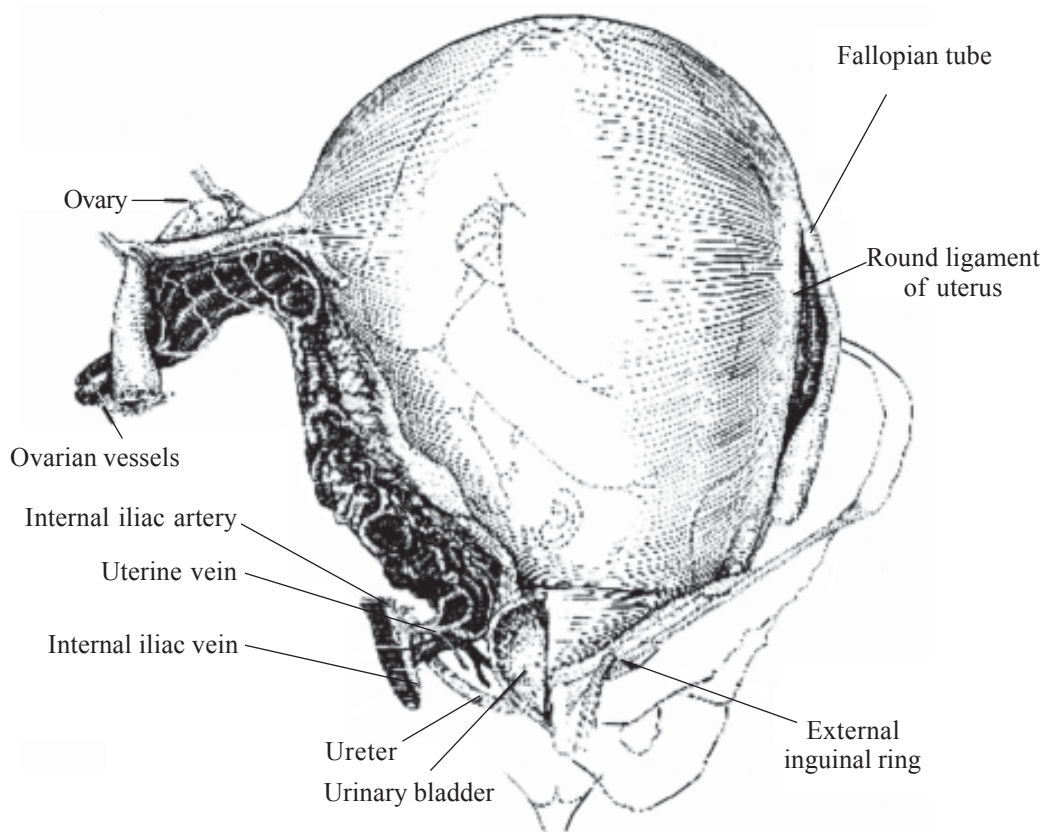


Fig. 35. Uterus during a full-term pregnancy

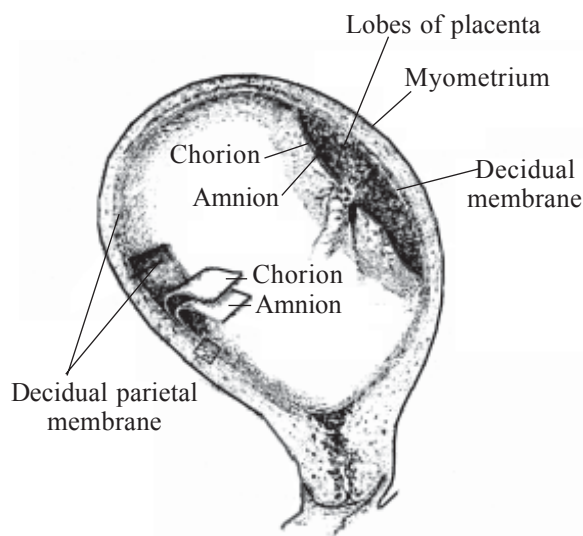


Fig. 36. Fetal membranes

The uterine mucosa is rebuilt and is now called the decidua. The angle between the corpus and cervix of the uterus enlarges till  $180^\circ$ , the uterus deviates to the right, its left rib turns to the front.

The uterus enlarges as the result of hyperplasia and hypertrophy of the muscular and argirophilic fibres under the influence of oestrogens and progesterone. The content of the contractile protein — actomyosin, as well as phosphorous compounds, glycogen, biologically active substances — serotonin, prostaglandins and catecholamines increases in the myometrium.

The uterus acquires a necessary tonus and an ability to return contraction for irritation.

The net of the blood vessels and nervous fibres enlarges; new receptors form. The flow of the blood to the uterus increases from 2% in non-pregnant women to 10% in pregnant woman and reaches 500–700 ml/min.

In the isthmus uteri the processes of hypertrophy are less expressed; it strains and from the 4th month of pregnancy contains the inferior pole of the fetal ovum (becomes a part of the place of the fetus). The amount of the elastic fibers increases in the uterine cervix; the vascular net enlarges. The cervical canal is filled with the viscous mucous (mucus plug).

Within the first months of pregnancy excitability of the uterus is decreased, gradually it elevates and reaches its maximum at the end of pregnancy. Irregular weak contractions occur during the whole course

of pregnancy and contribute to the blood circulation in the system of intervillous lacunas and in the uterus.

Hypertrophy of the ligamentous apparatus of the uterus, especially of round and sacro-uterine ligaments, contributes to the holding of the uterus in the correct position. Blood supply of the *Fallopian tubes and ovaries* increases, they enlarge and transfer from the pelvis to the abdominal cavity. Cyclic processes in the ovaries cease.

Blood supply of the *vagina* intensifies too; the hypertrophy of its muscular and connective-tissued elements occurs, which contributes to the considerable stretching during labour. Cyanosis of the mucous membrane takes place. The increase in transudation and secretion of the *cervical glands* can cause the intensification of the vaginal leucorrhoea, transfer of the simple cylindrical epithelium (endocervix) on the stratified squamous epithelium (ectocervix). The reaction of the vagina becomes more acid (3.5–6) due to increase in the content of lactic acid, which forms from glycogen of the vaginal epithelium under the influence of lactobacilli (Doderline's bacilli), which can promote the development of candidous vaginitis.

The intensification of the vascularization of the *external genitalia* can lead to vulvar veins dilation, which, as a rule, disappears after labour.

**Mammary glands.** Starting from the 6th week of pregnancy hyperplasia of the glandular tissue of the mammary glands takes place. Oestrogens stimulate the growth of the ducts of the glands, progesterone — the atrophy of the alveoli. The activation of the blood circulation of the mammary glands contributes to supplying lactation. The painfulness and excessive tenderness of the mammary glands can be one of the first symptoms of pregnancy.

Montgomery's follicles (Montgomery's glands) enlarge and overhang the surface of the skin. The colostrum production begins at the second half of pregnancy. The lactational function depends on synergic activity of oestrogens, progesterone, prolactin, placental lactogen and insulin. A female organism during pregnancy is in the condition of the considerable strain (exertion), which is determined as "a norm of pregnancy". Unfavourable facts can lead to the disturbance of adaptation of a female organism to pregnancy and development of its complications.

#### RECOMMENDED READING

3 (25–52); 5 (15–36); 11 (100–103); 22; 56; 61 (37–67)

## Chapter 7

# NUTRITION AND HYGIENE OF PREGNANT WOMEN

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The change of all processes in a female organism during pregnancy, related to the development of the new functional system mother — fetus, demands from a pregnant woman to keep the optimal conditions of nutrition, hygiene, which are very important for the normal development of the fetus, prophylaxis of the complications of pregnancy and delivery.

### DIET OF PREGNANT WOMEN

Diet during pregnancy should be balanced. Intellect and culture prevent her to use the principle “eat for two”.

Energetic value of dietary intake of a pregnant woman with an average body weight is 10,048 kJ/day (2,400 kcal/day), which is by 1,256 kJ (300 kcal) more than before pregnancy.

The increase in the weight of a pregnant woman should not exceed 9 (6.8) – 12 (13.6) kg during the whole pregnancy course and should be at the expense of the following changes: growth of the fetus (3,400 g on average), the placenta with the fetal membranes (680 g), the increase in the amniotic fluid (1,000 g), mass of the uterus (1,130 g), mammary glands (900 g), increase in the volume of circulating blood (1,600 g), accumulation of the fluid in the lower extremities (900–1,300 g). If the enlargement of the body weight does not exceed 4.5 kg till the 20th week of pregnancy, the regimen of the feeding should be changed. Insufficient feeding should be one of the reasons of complications of pregnancy and birth of the children with low weight. The increase in the body weight in the 2nd half of pregnancy should not exceed 350–400 g per a week.

It is necessary to keep the regimen of nutrition, using of optimal amount and correlation of proteins, lipids and carbohydrates, vitamins and mineral substances.

Women who had a low weight before pregnancy should increase the energetic value of the food, the diet restrictions of the nutrition ration are contraindicated to patients with obesity.

**Proteins.** The necessity in proteins is 1.3 g/kg of the body weight, and for the young women — 1.5 g/kg

of the body weight. 350 g of the protein, which are necessary for the losses during delivery, accumulate during pregnancy. Because of the improper entering of proteins, the growth of the fetus slows, anaemia can develop, the perinatal illness and lethality increase. From the first days of pregnancy an organism requires the proteins of full value, necessary for both mother and fetus. Meat, domestic bird, fish, milk, milk products, yogurts, cheeses, eggs, mushrooms, nuts and beans are the source of proteins of full value. However, it is not recommended to use fried, smoked and conserved products for pregnant women.

**Carbohydrates.** The day require in the carbohydrates during pregnancy is 350–400 g and 3–3.5 times exceeds the require in lipids and proteins. Pregnant women should get proteins from the products rich in vegetable fiber. A pregnant woman should eat bread from the coarse-ground flour with bran, cereals, fresh vegetables (cabbage, beet, pumpkin, carrot). Fruits (apples, berries, prunes), juices, stewed fruit. Besides of carbohydrates these products contain vitamins and mineral salts, which improve the function of the heart and intestine. Because of the lack of the carbohydrates glycogen and proteins are lost, and as the result of their surplus, especially refined carbohydrates (sugar, jam, sweets, confectionary) obesity develops in mother, the weight of fetus enlarges, which can cause the development of allergic diseases and diabetes mellitus. Besides, a surplus of carbohydrates among with the lack of proteins leads to decrease in the organism's resistance to infections. That's why from the 14th week of pregnancy eating of confectionary should be restricted; the quantity of sugar should not exceed 40–50 g a day; it should be substituted by honey.

**Lipids** are included in the diet of a pregnant woman in the amount of 85–100 g/day (butter, soured cream, oil). Vegetable oil contains indispensable fatty acids, which normalize the permeability of the capillaries' walls, indispensable amino acids, liposoluble vitamins retinol, tocopherol, phlochinons and calciferol. Vegetable lipids should comprise 40% of the whole amount (sunflower, maize, olive — 2 table-spoons per a day). Overusage of the soured cream,



cream and butter can cause the elevation of the cholesterol level in the blood and development of atherosclerosis. A pregnant woman should avoid eating ham, pork and mutton fats.

**Mineral substances.** Everyday require of the pregnant woman in *ferrum* is 30–60 mg. The haemoglobin level in many women can be decreased before pregnancy (ferrum loss with menstrual blood; diets; women who gave birth several times). As it known, for the forming own haemoglobin the fetus uses mother's ferrum, protein, vitamins, salts, microelements. During pregnancy, delivery and lactation a woman loses 600–700 mg of ferrum (300 mg — for the fetus needs, 150 mg — for the placenta, 100–250 — because of bleeding in labour, 100–200 mg — with milk). At the III trimester of pregnancy 200–400 mg of the ferrum transforms to ferritine in the placenta, is delivered to the fetus and deposits in the liver. Ferrum gets to the organism of a pregnant woman when eating red meat (lean ham), liver, apples, strawberries, dry fruits. Bread, beans, soy-beans, dill and salad also contain ferrum. No more than 0.5–1 mg of the total ferrum amount, used with the food, absorbs in the digestive tract. 12–18% of the ferrum absorbs from the meat, 5–11% — from the liver, from the vegetable products — only 1–5%. Thus, meat and then liver is the main products, which contain ferrum, which easily assimilates.

A necessity in *calcium* (up to 1,200 mg per a day), which is used for forming the fetal bones, considerably increases. Teeth of the mother destroy, convulsions in the *m. m. gastrocnemius* (usually at night) appear as the result of the improper quantity of calcium in a maternal organism. Milk (1.14 l of milk contain a daily norm of calcium), milky products (cheese, yoghurt, etc.) are the main sources of calcium.

As for *natrium*, the majority of authors recommend to limit its using in the 2nd half of pregnancy up to 8 g/day, and during the last months — up to 5 g/day. However, there is an opposite opinion: natrium should not be restricted, because the constant elevation of the progesterone level contributes to its elimination. The usage of diuretics during pregnancy is not explained, because they cause the decrease in volume of circulating blood.

*Water.* A pregnant woman should never suffer from thirst. The day requirement in fluid in this period is 35 g/kg of the body weight, from this quantity — 1–1.2 l of the free fluid (water, tea, juice, stewed fruit). As the result of inclination to edema pregnant women are recommended to use instead of tea and stewed fruits decoction and extracts of herbs, which have a diuretic effect (dog-rose, leafs of red bilberry, herb of bear berry, radix of licorice, equisetum arvense).

**Vitamins.** The requirement in both vitamins and mineral substances, during pregnancy increases. Retinol (vitamin A) plays a very important role in the placental forming, tocopherol (vitamin E) — in the development of the fetus, calciferol (vitamin D) — in

forming of its skeleton, and vitamins of group B and ascorbic acid (vitamin C) are necessary for the proper development of the nervous system and liver of the fetus. Folic acid (vitamin B<sub>9</sub>) is necessary for the hem forming — protein of haemoglobin, which contains ferrum. A deficiency of the folic acid can cause a suppression of erythropoiesis and development of megaloblastic anaemia, as well as complications of pregnancy (defects of the neural tube of the fetus, preeclampsy, beforehand detachment of the placenta). A daily requirement of a pregnant woman in folic acid is 800 µg, which is provided by its everyday using of 1 mg together with food, which contains ferrum and proteins. Cyancobalamin (vitamin B<sub>12</sub>) is present only in the products of the animal origin (meat, fish). Women-vegetarians should use cyancobalamin additionally (or polyvitamins). A daily norm of ascorbic acid is 80 mg. Its high doses (1g and more) can unfavourably influence the fetus. The food of coarse-ground flour, crushed cereals, beans, vegetables, fruits, meat, liver, butter, curds, as a rule, provide a pregnant woman's requirements in vitamins. Polyvitaminic preparations should be taken in winter and early spring. Pregnant women with extragenital pathology are prescribed special dietary intakes, the content of which is submitted with a doctor-therapeutist.

**Dietary habits.** During pregnancy four meals a day are recommended: 1st breakfast — at 7:00–9:00 (30% of the whole energetic value of the products); the 2nd breakfast — at 11:00–12:00 (20%), dinner — at 14:00–15:00 (40%); supper — at 18:00–19:00 (10%); before going to bed — a glass of yogurt, or herbal tea, or a decoction of the hedge rose. The last eating should be in 2–3 h before going to bed. During the beginning of the decree vacation before labour in connection with decrease in energetic requirements of the organism the energetic value of food should be reduced at the expense of flour and confectionary products.

A pregnant woman's day dietary intake should contain such products: milk — 3 glasses; meat, bird, fish, beans, nuts — 120–180 g; fruits — 60–120 g; vegetables — 90–159 g; milk products, curds — 120–180 g; porridge, bread, macaroni — 180–330 g; eggs — one egg a day (better soft-boiled); vegetable oil — 2 table-spoons; confectionary, cream, soured cream, butter — in a scanty amount.

## GENERAL REGIMEN OF PREGNANT WOMEN

Healthy women with uncomplicated pregnancy live in usual work and rest conditions. The vacation should be taken on the 4th–7th week of pregnancy to have an opportunity to rest, stay enough on a fresh air and normally eat in the period of adaptation to pregnancy. Hypodynamia and unbalanced diet cause the de-



velopment of obesity, diabetes mellitus, disturbance of the contractile activity of the uterus, (uterine inertia, afterbirth bleeding) can be the cause of the birth of the large children (weight is over 4,000 g) or with the growth restriction.

The Law of Ukraine foresees a release of pregnant women from supplementary works, night shifts, business trips; work under harmful conditions is forbidden. Besides, a pregnant woman can be offered an easier work. It is expedient to alternate work with rest every 40–50 min beginning with the first months of pregnancy. It is recommended not to make a work in inclined position. Walks in fresh air are very useful for pregnant women (2–3 h a day), especially before going to bed. A favorable psychological climate should be kept in the family, where the child will soon be born. A pregnant woman should sleep no less than 7–8 h.

**Personal hygiene.** Before a planned pregnancy and during it a woman should perform a sanitation of all foci of chronic infection (tonsillitis, caries, infections of the urogenital tract). The increase in the requirements of the organism in calcium needs a constant control over the teeth. Activization of the metabolic processes in a pregnant woman's organism requires hygienic body care (warm shower in the morning and in the evening, frequent change of linen). However, it is forbidden to take a steam bath, sauna and wash feet with hot water. The mammary glands and nipples should be washed by warm water with further rubbing with a towel (preparation of the nipple's skin to the mechanic irritation). Flat and drawn nipples need a special massage for their outstretching. The mammary glands enlarge, become heavier during pregnancy. Supporting brassiere, as well as special physical exercises for training the breast muscles: palms are periodically pressed on the level of the raised till the shoulders elbows (10–16 times) are used to prevent the unpleasant feeling and worsening of the form of the mammary glands.

It is necessary to avoid the influence of direct sun-rays. Sun bathes (10–15 min) are taken in the morning (at 8:00–11:00) and in the evening (at 17:00–19:00). Swimming in the river and sea is not prohibited during the physiological course of pregnancy.

Increasing concentration of oestrogens cause intensification of the blood supply of the genitalia, secretion of the glands, which is accompanied by the increase in vaginal discharge and contributes to the reproduction of the microorganisms. The toilet of the pregnant woman should be 2–3 times a day. Hygienic syringing during pregnancy is not recommended. Physiological increase in discharge should be differed from the symptoms of vaginitis and preterm rupture of the fetal membranes. Clothes of a pregnant woman should be comfortable and spacious, without waistbands and elastics. Beginning with the 28th–30th week of pregnancy it is recommended to wear special waistband-bandage for the decrease in load on the verte-

bral column, preventing unpleasant feelings as the result of contractions of the growing uterus, as well as for the preventing of excessive stretching of the anterior abdominal wall. Shoes should not be tight, low-heeled.

**Physical exertion.** Moderate physical exercises can be done during pregnancy. Exercises, concerning breathing, which strengthen the abdominal muscles, are especially useful. Training exercises are recommended (if there are no contraindications) from the 4th till the 7th month of pregnancy. For strengthening of the anterior abdominal wall the following exercises are recommended: throw up the hands lying on the back, and by the bent in the knees legs execute crossing movements by the left and the right legs in turn (6–16 times).

It is necessary to avoid long-timed, intensive exercises, which cause fatigue. Gymnastic exercises and physical load are contraindicated during the isthmico-cervical insufficiency, preeclampsy, menace of the preterm labour, plural pregnancy. Excessive fatigue and increased need in sleep very often worry pregnant women. These symptoms disappear in the 2nd half of pregnancy. Sleep of a pregnant woman in this period should be not less than 9–10 h a day; she should sleep in a ventilated room.

**Sexual activity** during ventilated uncomplicated pregnancy is usually permitted. The contraindications to the sexual activity are following: isthmico-cervical insufficiency, spontaneous abortion in anamnesis and preterm labour during the previous pregnancies, the threat of abortion of this pregnancy or the threat of preterm labour; preterm rupture of the fetal membranes; placenta previa; multiple pregnancy; sexually transmitted diseases. Prostaglandins of the seminal fluid and woman's orgasm can cause the uterine contractions during the sexual contact.

#### Unfavourable consequences of smoking, which occur in organisms of mother and fetus

Woman	Fetus
Decrease in possibility of fertilization	Decrease in the newborn's weight
Increase in frequency of ectopic pregnancy	Depression of the respiratory activity of the fetus
Decrease in the volume of circulating plasma	The increase in the perinatal morbidity and mortality
Increase in the frequency of late spontaneous abortions, preterm labour, preterm rupture of the fetal membranes, presentation or preterm separation of the placenta	The increase in the risk of sudden death syndrome and disturbances of development
Anemia	
Decompensation of respiratory and cardio-vascular diseases	

Obstetricians of this country recommend to abstain from the sexual contacts during the first 2–3 and the last 2 months of pregnancy for prophylaxis of inflammatory complications and preterm abortion.

**Regulation of the intestine function.** Adaptational changes of a female organism during pregnancy (mechanical pressure of the growing uterus, hypotonia of the intestine under the influence of progesterone, restriction of the physical activity) cause constipations. Regulation of the intestine function is performed by the using of a proper quantity of the fluid, products rich in vegetable fiber, performing of physical exercises (30-minute walks several times a day), as well as laxatives usage.

**Trips** are permitted, except long voyages within last months of pregnancy.

**Alcohol and smoking** should be avoided. A safe amount of alcohol, which is permitted to use during pregnancy, is unknown. It is proved that 20% of children who were born by the mothers with chronic alcoholism (women who drink 180 ml of 40% alcohol a day), had the signs of the alcoholic syndrome

of the fetus (craniofacial dysmorphism, cardio-vascular defects, anomalies of development of the extremities, pre- and postnatal growth restriction). Alcohol and tobacco have synergic effect. Narrowing of the vessels under the influence of nicotine leads to the decrease in blood supply of the uterus. Smoking is especially harmful to the women over 35 years old. The weight of the children who were born by the mothers who smoked during pregnancy, reduces by 250 g. Carbon oxide partly inactivates haemoglobin of the mother and fetus, causing the development of anaemia.

If the complications of pregnancy develop, the regimen and ration of a pregnant woman should be changed by the obstetrician-gynaecologist, and if it is necessary — by the therapist of the women's consulting clinic.

#### RECOMMENDED READING

1; 5 (15–36); 7 (353–359); 19 (460–474); 22; 56; 58 (179–202); 61 (37–67).

## THE PROBLEMS OF TERATOLOGY AND MEDICAL GENETICS

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Congenital developmental defects can be induced by genetic factors, unfavourable influence of the environment and their combination. Aggravating unfavourable ecological tendencies make the condition for the huge mutagenic effect, the result of which is the elevation of the genetic load of population, rise of the incidence of hereditary and congenital diseases.

Congenital developmental defect is a steady morphological change of an organ or an organism as a whole, which appears intrauterine and is over the borders of variability of their structure as the result of the disturbance of development of embryo and fetus. Developmental defects can be related to the influence of exogenous factors (teratogens), as well as with chromosomal, monogenic and multifactorial diseases of the newborns.

Thanks to successes of genetics and prenatal diagnosis it was established that a part of genetic factors in the structure of the causes of perinatal lethality increases. The anomalous karyotype is observed in 5–6% of the fetuses in modern population.

### ENVIRONMENTAL FACTORS INFLUENCE ON THE FETUS

Anthropogenic influence on the environment has recently become an ecological disaster. Today the humanity suffers from the consequences of the global spreading of the mutagens — pesticides, nitrates, ionized radiation, domestic and industrial chemicals, medicines. Harmful factors, which influence the fetus, can be both internal (maternal) and external.

Pregnant woman's age (35–40 years and older), extragenital diseases (on example, diabetes mellitus) are *internal factors*. *External factors* (ionized radiation, infections, pesticides, etc.) are in the environment as well as influence through a maternal organism. The consequences of this effect (slowing or intensification of development, injury of the gametes, teratogenic effect, injury of the genetic apparatus)

depend on the dose and time of the influence of harmful factors. Modern classification of teratogens is the following:

1. *Infection*: cytomegalovirus, virus of herpes simplex type 2, virus of rubella, toxoplasma, causative agent of syphilis, virus of chickenpox.

2. *Medicines, chemical substances*: alcohol, antagonists of folic acid (aminopterin), androgens, alkylated substances (busylphane), coumarine anticoagulants, diethylstilbesterol, retinal (excess), plumbum, organic compounds of hydrargyrum, phenotoin polychlorated and polybromated biphenyls, tetracycline, thalidomide, trimetadione.

3. *Physical agents*: hyperthermia, ionized radiation.

For many teratogens there is a threshold of concentration, lower of which the statistic probability of teratogenic effect is extremely low. Genetic constitution of the mothers plays an important role in the teratogenic effect.

***Infection (TORCH-infections)***. *Toxoplasmosis* (acute form) and syphilis in a pregnant woman can cause the disturbances of the growth and development of the fetus' brain. Virus of *rubella* causes the deafness, cataract, mental retardation, congenital cardiac defects. *Cytomegalovirus* can cause anomalies of CNS, deafness, intrauterine growth restriction (IUGR) of the fetus. *Herpes-viral infection* can cause encephalitis in newborns (Table 2).

***Medicines and chemical compounds***. *Alcohol* causes the disturbance of the fetal growth, is the cause of cerebral maldevelopments, congenital defects of the heart and skeleton. The amount of drunk alcohol correlates with the degree of its negative influence on the fetus. In women, who systemically used alcohol during pregnancy, in 30–40% of the cases a child with multiple defects of development and stigmas of dysembryogenesis (alcoholic syndrome of the fetus, alcoholic embryofetopathy). The incidence of alcoholic syndrome of the fetus is 1–2 cases on 1,000 newborns. 10–20% of the detected cases of the mental retardation of mild and moderate severity related to the influence on the fetus of the alcohol during the intrauterine period.

Table 2. Teratogenic effect of infection

Infection	Teratogenic effect	Explanation
Cytomegalovirus	Microcephalus, hydrocephalus, chorioretinitis, calcificates and injuries of the brain, symmetric IUGR, microphthalmia, mental retardation, deafness	The most spread congenital infection, which incidence is 40% after the primary and 14% after the secondary infection. Among infected newborns mentioned symptoms observed in 20% of the cases after the primary infection and in 8% — after the secondary infection. Effective therapeutic medicines are absent
Rubella	Microcephalus, mental retardation, cataract, deafness, congenital defects of the heart or the other organ	If a pregnant woman is affected at the I trimester the rate of the defects is 50%, in the middle of pregnancy — up to 6%. Vaccinations should be done to children and adults for prophylaxis. Vaccinations during pregnancy are not recommended. However, vital weak vaccine does not cause malformations of the syndrome of inborn rubella
Syphilis	With severe infection — edema and death of the fetus; with a mild one — anomalies of the skin, teeth and bones	The extent of the injury of the fetus depends on the time of the effect of the infection (especially if the disease lasts more than 20 weeks). Effective medicines of treatment and prophylaxis of the injuries are the penicillins. Such pregnant women compose the group of risk as for the sexually transmitted diseases
Toxoplasmosis	Possible effect on all systems, especially CNS (microcephalus, hydrocephalus, brain's calcificates, chorioretinitis). The degree of the injury depends on the disease course	The threat for the fetus occurs during the primary infection during pregnancy. Toxoplasma gondii transmits to the human with fresh meat or during the contact with fecal masses of cats. At the I trimester the incidence of the infection is 9%, and at the III — rises up to 59%. However, severe forms of the disease are observed when infection at the I trimester. Pirimetamin, sulphadiazine or spiramycine are used for the treatment
Chicken-pox	Possible effect on all organs; specific injury of the skin, chorioretinitis, cataract, microcephalus, hypoplasia of the extremities, muscles atrophy	Congenital chicken-pox (risk is 2–3%) develops as the result of the infection of the fetus between the 7th and 21st weeks of pregnancy. Varicella — Zoster immunoglobulin can be used for the treatment of the newborns, who were affected by the influence of the virus in utero during 4–7 days of pregnancy
Herpes	Increased incidence of miscarriage	Teratogenic effects of the virus of Herpes Zoster are not discovered; it can cause encephalitis of the newborns

*Alcoholic syndrome of the fetus* is characterized by the disturbances of the CNS, deficiency of the growth, facial dysmorphism and other. Dysfunction of CNS manifests itself by the retarded psychomotor development and intellect decrease, disturbances of the coordination of movements, existence of the tremor and increased excitability in the postnatal period, as well as by the syndrome of psychomotor mobility, disorganization of the structures of the brain and microcephalus. Weight and length of the body of the child after birth are lower than the norm, subcutaneous layer is insufficient. Facial dysmorphism is characterized by retraction of the middle third of the face and narrow, slightly contoured upper lip. Other anomalies can be represented by restricted mobility

of articulations, clyno — and camptodactylia of the fifth finger, anomalies of the rib's structure, developmental defects of the kidneys, the Klippel—Feil's syndrome.

There are no evidences about the safe alcohol dose during pregnancy, that's why it should not be used during pregnancy.

The majority of *drugs* penetrate through the placenta and get in the fetus' organism. If there is a necessity of any medicine prescribing during pregnancy, it should be mentioned, that the advantage of this drug should exceed the risk of its usage. On example, *acetylsalicylic acid* (aspirin) unfavourably influences coagulation system of the fetus, disturbs the connection of bilirubin with proteins, as the result



Table 3. Teratogenic effect of the chemical substances and medicines

Substance (medicines, chemicals)	Teratogenic effect	Explanation
Antagonists of folic acid (methotrexate, aminopteryne)	Increased risk of spontaneous abortions, anomalies of development	Cause up to 30% of anomalies in survived fetuses
Plumbum	Increased incidence of miscarriages and stillborn	Can negatively influence the development of CNS of the fetus
Lithium	Congenital defects of the heart, Ebstein's anomaly	At the last month of pregnancy can cause toxic effects in the thyroid gland, kidneys, nervous and muscular systems
Organic mercury	Atrophy of the brain, microcephalus, mental retardation, convulsions, spastic syndromes, blindness	In the III trimester can cause cerebral paralysis. Teratogenic effect of the organic mercury can manifest itself in the persons, who ate contaminated by methylen mercury corn and fish
Phenythoin	IUGR, mental retardation, microcephalus, dysmorphic craniofacial features, defects of the heart, hypoplasia of nails and distal phalanges	The complete syndrome is observed only in 10% of the children which were affected in utero, and almost 30% of the children have single signs. Effect can depend on the inheritance by the fetus of mutagenic gene, which cause the decrease in the production of epoxidehydrolase — enzyme, necessary for the decreasing of the level of teratogenic phenytoinepoxide
Streptomycin, kanamycin	Deafness, injury of the VIII pair of the cranial nerves	During the usage of gentamycin and vanscomycin the ototoxic effect on the fetus was not detected.
Tetracyclin	Hypoplasia of the enamel, penetration of tetracyclin in the teeth and bones, constant yellow-brown colour of the milk teeth	During the usage of the preparation in the II and the III trimesters there were no changes detected
Retinol (vitamin A) and its derivatives, retinoids	Increased incidence of miscarriages, microtrophy, defects of CNS, absence of the thymus, cardio-vascular injuries, craniofacial dysmorphism, microophthalmy, cleft palate, cleft lip, mental retardation	Local usage is not harmful

of which its using during the first and last weeks of pregnancy is prohibited. *Tetracycline* contributes to the development of the defects of skeleton and teeth. Anticonvulsants, indirect anticoagulants, antithyroid preparations, antitubercular chemopreparations, compounds, which contain iodine, plumbum, hydrargirum, lithium and contraceptives have the teratogenic effect (Table 3).

**Metabolic disturbances of the mother.** Children, who were given birth by the mothers with diabetes mellitus, are predisposed (10–15%) to the congenital defects of the skeleton and CNS development.

Hyperglycemia, which causes hypoxia of the organ, which is at the stage of development (the most active mitotic division), is the main teratogenic factor in this case. Children, who were born by the mothers, who suffer from phenylketonuria, are affected intrauterinally by the influence of increased concentration of phenylalanine's metabolites and are usually born with the defects of the heart and CNS.

The levels of *ionizing radiation* lower than 0.05 Gr, used in the medicine with the diagnostic purpose, do not have teratogenic risk for the fetus. The determined dose which the fetus can receive during the radiological procedure, should not be over 0.01 Gr (on example during intravenous pyelography the dose is 0.0041 Gr).

*High doses of ionizing radiation* cause different disturbances depending on the time of affecting a pregnant woman (Table 4).

A corresponding reaction of the embryo and fetus to the influence of injurious factor depends on the time of its influence (stage of embryogenesis) and exposition.

Regardless of the mechanism of affection the unfavorable factors of the environment can cause similar disturbances of the reproductive process: 1) disturbance of the ability to fertility; 2) monogenous defects and chromosomal anomalies; 3) spontaneous abortions; 4) congenital defects and disturbances of

**Table 4. Consequences of pregnancy depending on the effect of high doses of ionizing radiation**

Gestational age during the influence of ionizing radiation, weeks	Consequences
0–3	Absence of the effect or spontaneous abortion
4–11	Microcephaly, mental retardation, microphthalmia, cataract, IUGR
12–16	Intrauterine growth restriction
17–19	Restrictions of the growth and mental development are the same as at 12–16 weeks, but more expressed
More than 20	The same, as in the period of post-anatal influence: shedding of the hair, injuries of the skin, suppression of the bone marrow

development, IUGR of the fetus; 5) disturbance of the sexual differentiation; 6) perinatal lethality; 7) anomalies of behaviour; 8) malignization.

The most typical variants of the disturbances of reproductive process and congenital developmental defects under the influence of endo- and exogenous injury factors are represented in table 5.

### **CRITICAL PERIODS OF EMBRYOGENESIS. TERATOGENESIS**

There are 5 critical periods in human embryogenesis determined by the majority of the specialists: 1) preembryonic period (development and maturation of the gametes); 2) fertilization; 3) preimplantation and implantation; 4) organogenesis and placentation; 5) fetal period.

There are such groups of disturbances of development of the embryo and fetus: 1) gametopathias (from the injury of gametes till the fertilization); 2) blastocystopathias (from fertilization till implantation of 2-week embryo); 3) embryopathias (from 3 till 10–12 weeks); 4) fetopathias (from the 10–12 weeks till the end of pregnancy).

Teratogenic effects can manifest themselves both as anatomical defects and genetic or cytogenetic disturbances, when external factors cause genetic mutations or chromosomal aberrations. Sensitivity to the influence of teratogens depends on the ability of the mother to absorb or utilize teratogen, as well as on the level of the placental permeability, metabolism of the fetus, genetic determination and combination of different factors.

**Table 5. Influence of the injurious factors on reproduction**

Factor	Injurious effect
Ionizing radiation Acute effect, high dose Chronic effect, low doses or before pregnancy	Microcephalia, IUGR, mental retardation Dawn's syndrome
Plumbum High dose Chronic effect, low doses	Infertility, spontaneous abortions, IUGR, arrest of the psychomotor development, epilepsy, stillborn Decreasing in the intellect, congenital hardships with speaking, deficiency of the attention
Plumbum/ Arsenic	Spontaneous abortions, low body weight, congenital defects
Polychlorated biphenyles High doses Chronic effect, low doses	Neuroectodermal dysplasy, anomal calcification of the bones Low body weight, microcephalia
Medicines for inhalation narcosis (chronic influence, low doses)	Spontaneous abortions, congenital defects
Organic solvents Chronic effect, high doses Chronic effect, low doses	Disturbances of development, facial dysmorphism, IUGR (corresponding to alcoholic syndrome of the fetus) Spontaneous abortions, defects of development, cleft palate and lip

### **GENETIC MECHANISMS OF INHERITED AND CONGENITAL PATHOLOGY**

Different forms of normal and anomal phenotypic variability are caused by one or several factors: 1) cytogenetic disturbances (change of the amount and structure of chromosomes); 2) monogenic (mendelating diseases as the result of mutations in one genome locus); 3) polygenic (multifactorial diseases as the result of injury of several genes); 4) environmental factors.

Genetic information of the human is coded by the consequence of nucleotides (adenine, guanine, thimine, cytosine) in the DNA. It contains in 46 chro-

mosomes, 22 pairs of which — autosomic and 1 pair — sexual chromosomes (XX or XY).

*Chromosomal disturbances* can be quantitative (abnormal amount of chromosomes) and structural (anomalies of the chromosomes' structure). The disturbance of the normal amount of chromosomes in a haploid, or diploid cell, not multiple to haploid, is called *aneuploidia*. The existence of a supplementary chromosome (autosome or sexual chromosome) is called *trisomia*; the increase in the amount of the sexual chromosomes — *polysomia*; absence of the one chromosome — *monosomia*; the increase in the haploid sets in one cell (more than 2) — *polyploidia* (triploidia, tetraploidia). The main reason of the disturbance of ploidity is a double fertilization. Structural disturbances of the chromosomes of somatic cells can not be accompanied by phenotypical deviations (polymorphism) or can relate to phenotypical changes (deletion, duplication, translocation, inversion, etc.).

The presence of the cellular lines with different genotypes, formed from one zygote, i. e. *mozaicism*, as a rule, accompanies by phenotypical disturbances. If there are cells in an organism, which start from different zygotes, i. e. *chimerism*, the disturbance of the sexual differentiation occurs (*hermaphroditism*).

*Monogenic (Mendel's) disturbances* are connected with the mutation of the gene in one locus and are not usually accompanied by the structural disturbances of chromosomes, but cause different pathological conditions, influencing the process of reproduction. Both genes and chromosomes, are always paired (maternal and paternal origin) and place in the identical locuses on homologic chromosomes. Not less than 2 *alleles* (of different conditions) are in each autosomic gene. The pathological condition of the gene is called *mutant*. Identical alleles of the both homologous chromosomes determine homozygosity, and different alleles — heterozygosity. Alleles, which manifest themselves in a heterozygote condition, are called *dominant*, in a homozygote one — *recessive*.

Inheritance of the mendelating signs (transmitting of the mutant genes hereditary) depends on whether these signs are dominant or recessive, and on gene localization, which controls the sign (on autosome or sexual chromosome). *Inheritance can be autosome — dominant, autosome — recessive, X-linked dominant, X-linked recessive and Y-linked*. A possibility of the phenotypic manifestation of a mutant allele, i. e. frequency of manifestation of inherited sign in carriers of this mutant gene, is called penetrance.

The frequency of transmission of **autosome-dominant mutant** gene to the descendants is 50%. One allele can cause several phenotypic manifestations (*pleyothropy*). The degree of phenotypic manifestation of the mutant gene (*expressivity*) can proceed to different extent. Autosome-dominant allele can manifest itself only in persons of the same sex. It is known about 700 diseases of autosome-dominant type of inheritance, which influence the reproduc-

tive function or have various degree of manifestation.

**Autosome-recessive signs** manifest themselves only in persons, homozygous by this allele, when both alleles of this genetic sign are identical mutations. Recessive sign manifest in children, whose parents were heterozygotic carriers of one mutation; in this case penetrance is 25%. In general, frequency of the appearing of mutant gene depends on correlation of homo- and heterozygotes, which is determined by Hardy—Weinberg's law. According to this law, rare recessive diseases appear as the result of disturbances of heterozygotes, which phenotypically are normal beings. Homozygous condition on recessive genes almost always manifests phenotypically. It is known over 500 autosome-recessive diseases of the human. The majority of enzymopathias are caused by recessive (autosome or X-linked) genes.

A mutant recessive gene on the X-chromosome manifests in all males — carriers of this gene (heterozygosity), when females are always homozygous on this allele. The X-linked recessive allele is inherited from phenotypically normal (heterozygous) females, whose male children will be ill, and female children — heterozygous carriers, as well as from the injured males (their girls will be heterozygous carriers, and boys — healthy). There are nearly 100 X-linked diseases with a recessive type of inheritance, mainly without connection with sexual development (hemophilia, etc.).

**X-linked dominant heritability** of the mutant allele realizes by the father (to daughters, but not sons) and mother (50% of the descendants independently from the sex). There are few X-linked dominant diseases, but they often influence the reproductive function (on example the Stein—Leventhal syndrome).

Polygenetic or multifactorial heritability has its peculiarities. Multiple congenital anomalies, heritability of the normal anatomical or physiological variations (age of menarche, peculiarities of the menstrual cycle) can not be explained by the laws of chromosomal or genetic disturbances. The repeated risk of the multiple congenital anomalies of development is 2–5%, but not 25%, as in autosome-recessive type, or 50% — in the autosome-dominant type, which is related to phenomenon of polygenetic character of heritability or continuous changeability of the sign. Polygenetic sign is controlled by several genes, and its constant changeability occurs under the influence of the external factors. During the multifactorial heritability both environmental and genetic factors participate in the forming of the defects. Continuous variation of the sign can be connected with the effect of more than one gene or more than two alleles of the same locus, as well as gene with combination of the environmental factors.

Hair colour, body weight, AP, peculiarities of metabolism, and others refer to constantly changing normal signs of such kind of heritability. Defects of poly-

genetic, or multifactorial heritability have, as usual, one system of organs. Defects of the neural tube, clefts of the face, defects of the heart, intestine, kidneys, talipes, congenital thyroid dislocation, etc. are the most frequent isolated developmental defects of polygenetic-multifactorial heritability.

Within last decades the rate of congenital developmental defects increased 7 times. The major amount of congenital diseases is caused by monogenetic pathology, i. e. Mendel's diseases, which influence reproduction. The most frequent are following: haemoglobinopathias, disturbances of homeostasis, neurologic, cardio-vascular, respiratory, endocrine diseases, diseases of kidneys, connective tissue and skeleton.

Congenital pathology is closely related to reproductive function. Chromosomal anomalies manifest in 0.5–0.7% of the newborns, but they are the case in 50–60% of spontaneous abortions and more than 5% of stillborns. Trisomias (21, 13, 18, 8, 22, 14, 9), triploidias and tetraploidias, syndromes of deletion are the most frequent. Many congenital anomalies are accompanied by mental retardation.

A lot of gynaecological diseases occur under the influence of mutant genes or have multifactorial origin (anomalies of development of the sexual organs, endocrine disturbances, endometriosis, tumors). Disturbances in the system of the sexual chromosomes often cause the disturbance of the sexual differentiation (pseudohermaphroditism), enzymatic disturbances of the biosynthesis of steroid hormones. Pathology of reproductive function can be related to influence of teratogenetic factors, genetic disturbances, their combination with multiple developmental defects (Shereshevsky—Turner's, Klinefelter's, Kallmann's syndromes, etc.).

**Dysplastic signs and syndromes.** *Dysmorphism* is a disturbance of the form or structure of the organs or parts of the body in the period of their development. *Dysplasy* is morphological changes, which is out of the norm. They are divided into malformations, deformations and disruptions. *Malformations* are the congenital developmental defects (CDD), which occur as the result of irregular forming of the structures (manifestation of the genetic or chromosomal anomalies, multifactorial diseases, teratogenetic effect). *Deformations* are the congenital developmental defects, which occur as the result of mechanic effect on the normally developing fetus. Deformations can cause anomalies of development or tumors of the uterus, olygoamnios, can be the cause of multiple pregnancy. Insufficient mobility of the fetus (neuro-muscular diseases, anomalies of the intrauterine position of the fetus) can lead to the development of deformation. *Disruptions* are the congenital developmental defects, which occur as the result in the normal organs under the influence of infection, mechanic injuries (amniotic septum) or vascular occlusion.

*Minor anomalies of development* (congenital defects, which do not require medical or cosmetic correction) are stigmas of dysembryogenesis (syndactylia, curvature of the digitus minimus, anomalies of the concha auricularae).

Modern methods of prenatal diagnosis should be developed and improved to prevent the birth of the children with CDD. They are: genetic amniocentesis, biopsy of the chorion and trophoblast, cordocentesis, genetic researches, early diagnosis of biochemical diseases.

## GENETIC COUNSELING AND PRENATAL DIAGNOSIS

Genetic consulting is necessary for revealing the risk of childbirth with genetic and congenital defects. During the consultation the doctor tells the pregnant woman about methods of contraception, necessity of the induced abortion, sterilization, possibility of the artificial fertilization as well as determines the carrier of the mutant gene.

Prenatal diagnosis detects the existence of CDD or a genetic disease of the fetus at early stages of its development. Early detection of congenital developmental defects helps to make a decision about the abortion or preparation of the family to the birth of a sick child. 1 of 8–10 families needs the prenatal diagnosis.

Methods of the prenatal diagnosis: ultrasound examination, genetic amniocentesis, biopsy of the chorion and trophoblast, cordocentesis (blood from the umbilical cord), blood analysis (detection of  $\alpha$ -feto-protein level), fetoscopy.

*Ultrasound examination* is a harmless uninvase screening method of examination of the fetal condition. Ultrasound examination, without other special needs, is performed twice: from the 16th till the 24th week (detection of developmental defects) and from the 32nd till the 36th week of pregnancy.

The main obstetrical indications for ultrasound examination are the following: 1) early identification of the uterine pregnancy; 2) examination of sizes and growth of the embryo, fetus and amnion; identification of the multiple pregnancy, including conjoined twins; 3) detection of the location, presentation and position of the fetus; feto- and placentometry; 4) detection of the anomalies of development of the fetus and placenta (hydatidiform mole); 5) identification of the heterologous bodies in the uterus (intrauterine spiral).

With the help of ultrasound examination it is possible to detect heart tones starting from the 7th week of development, movements of the body — from the 8th week, movements of the extremities — from the 9th week.

During ultrasound examination defects of the neural tube, digestive canal, kidneys, cardiac and pulmonary systems are usually detected.



**Defects of development of the neural tube** (cleft of the vertebral column — spina bifida, anencephaly, encephalocele, hydrocephalus, microcephalus) appear as the result of multifactorial influence with the rate (1–2) : 1000 of the born alive (in the USA — 6,000 children per a year). The highest incidence of the birth of the children with the defects of the neural tube is in Ireland (9.7%), the lowest — in Japan (0.9%).

The possibility of childbirth with defects of the neural tube is represented in table 6.

**Anencephaly** (incidence in population is nearly 1%) is a defect of the closing of the anterior part of the neural tube, which is characterized by complete or partial absence of the brain, its meninges, fornix of the cranium and skin. Closing of the neural tube occurs between the 20th and 28th day of pregnancy. This defect is multifactorial, and both genetic and external factors can participate in its development. Anencephaly can combine with spina bifida, omphalocele, cleft of the face. Ultrasound examination of anencephaly should be performed beginning from the end of the I trimester of pregnancy.

Risk of the neural tube defect in future pregnancies is 2–3%. There are literature data, which evidence about the existence of X-linked anencephaly. The leading *factors of risk* of the birth of children with defects of the neural tube: deficiency of the folic acid, using of its antagonists (methotrexate), diabetes mellitus of the mother, hyperthermia. Level of  $\alpha$ -fetoprotein in the serum of the mother's blood is detected for screening diagnosis of the neural tube defects. Anencephaly is a lethal defect: nearly 50% of the children are stillborn, others die at the early neonatal period.

**Hydrocephalus** appears in 1:2000 of the newborn and in 90% of the cases is connected with Arnold—Chiari's malformation. *Internal hydrocephalus* is accumulation of cerebrospinal fluid in the system of ventricles of the brain, predominantly in lateral ventricles; *external hydrocephalus* — in subarachnoidal and subdural spaces. In 43% of the children hydrocephalus can be related to sylvian aqueduct stenosis. This

aqueduct joins III and IV ventricles of the brain; it develops on the 6th week of gestation. Tumours, haemorrhages, infections or genetic syndromes can be the causes of its stenosis. 38% of children suffering from hydrocephalus have a "mixed" type: it is caused genetically (Dandy—Walker's syndrome) in 13%, a secondary one, which appears because of anatomical reasons, occurs in 6%. Autosome-recessive type of heritability, X-linked type of heritability (during sylvian aqueduct stenosis), atresy of the cerebellum, trisomia of the 13th and 18th pairs of chromosomes are the genetic causes of hydrocephalus. Intrauterine infections (cytomegalovirus, toxoplasmosis, rubella, etc.) can cause obliteration of subarachnoidal space. The variability of causes of hydrocephalus explains an unequal risk of the repeating of the defect during future pregnancies (0–25%). In 20% of the boys with X-linked sylvian aqueduct stenosis deformation of the thumb is observed. Ultrasonic picture of hydrocephalus can detect the following: considerable enlargement of the head of the fetus as the result of promoted hydrocephalus; enlargement of the lateral and III ventricle because of sylvian aqueduct stenosis, deformation of the middle structure of the brain.

Complications, related to clinically narrow pelvis, may appear in labour in hydrocephalus. For conformation of the diagnosis vaginal examination during labour helps to detect wide sutures and fontanelles, soft thin bones of the fetal head. For accelerating the delivery obstetricians of this country perform operations, which destroy the fetus: puncture of the head by the trochar or large needle with evacuation of the fluid, if necessary — craniotomy and cranioclasty. caesarean section is performed in the USA if delivery through the natural maternal passages is impossible.

**Meningocele** is a protrusion of the meninges and meningeal substance of the spinal cord as the result of incomplete closing of the vertebral arches, which leads to the development hernial haustum (diverticulum) through the defects of the vertebral column (spina bifida). The defect develops mostly in the lumbosacral region of the vertebral column (Fig. 37)

Table 6. Risk factors of birth of children having the neural tube defects

Factors of risk	The rate of a sick child birth, %
One of the parents is ill	5
One previous child is ill, parents healthy	5
Two previous children are ill	10
Three previous children are ill	21
Defect in one of the parents and in one child	13
Defect is in relatives of the secondary degree of the consanguinity	1

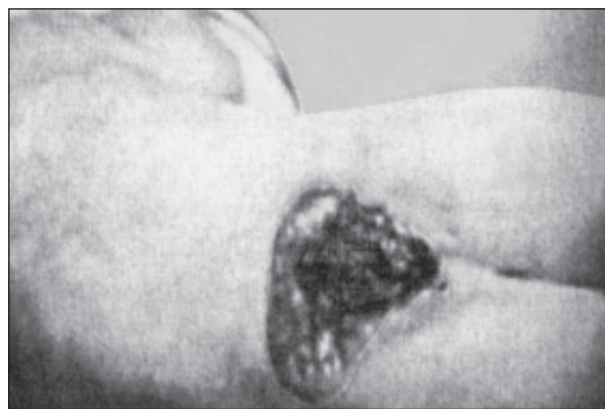


Fig. 37. Meningocele in the lumbar region

This defect is easily diagnosed with ultrasound examination, beginning with the II trimester of pregnancy, and, as a rule, do not influence the delivery.

The loss of all functions of the spinal cord is observed below the place of injury during the meningo-mielocoele. Hydrocephalus, especially in combination with the Arnold—Chiari's syndrome, is a frequent complication during this defect.

**Closed mielocoele** has a better prognosis and can proceed without the elevation of the level of  $\alpha$ -feto-protein. The cause is a cleft of the spinal cord (without cerebrospinal hernia), which is observed in 20% of the cases in population.

**Microcephalus** is a decrease in the fetal head sizes as the result of hypoplasia of the encephalon. Isolated microcephalus occurs with the rate of 1:10,000 of the newborns. It usually combines with other anomalies (over 300 sporadic, genetic and chromosomal syndromes). Isolated forms of microcephalus may inherit by autosome-recessive and autosome-dominant types. This multifactorial defect can be caused by known teratogen (cytomegalovirus, toxoplasmosis, rubella, ionizing radiation, hypoxia, alcohol, chemical preparations, etc.). During a full-term pregnancy the decrease in the fetal head circumference lower than the 5th percentile for this gestational age in comparison with the abdominal circumference is detected on a sonogram.

**Encephalocele** is a hernia of the encephalon. This is outpouching of the cranium's content (Fig. 38)

The rate is 1:2,000 of children born alive.

**The syndrome of caudal aplasia/dysplasia (regression)** is characterized by complete or partial aplasia (agenesis) of the distal part of the neural tube, which leads to the distal agenesis/dysgenesis, related to anomalies of the lower extremities, digestive tract and urogenital system.

If defects of the neural tube are suspected, level of  $\alpha$ -fetoprotein with the help of immunoenzymatic method (the rate of false-positive results is 0.1–0.2%) is detected. If the level of  $\alpha$ -fetoprotein is elevated 1.5–2 times the supplementary methods are used: 1) ultrasound examination for evaluating the term of pregnancy, diagnosis of a multiple pregnancy and



Fig. 38. A stillborn (28 weeks) with encephalocele in the occipital region.

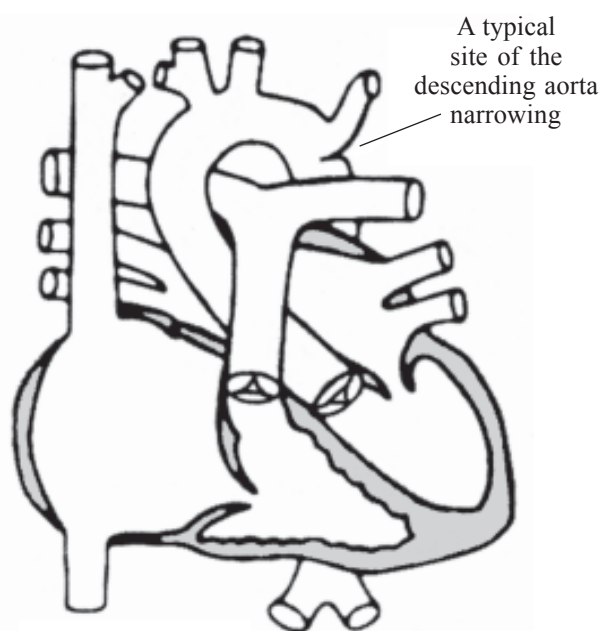


Fig. 39. Coarctation of the descending aorta (usually occurs at the site of attachment of the arterial duct)

detection of the placental localization for performing amniocentesis; investigation of the cerebrospinal canal, sizes of the head and ventricles of the brain, sizes and defects of the abdomen; 2) detection of the level of acetyl-choline-esterase in the amniotic fluid.

**Defects of development of the cardio-vascular system** occupy the second place (3–8%) after the defects of the neural tube and are one of the main causes of the 1st year children death. 40% of the cases combine with anomalies of other systems, predominantly digestive tract and urogenital systems; 30% — with chromosomal anomalies (Dawn's syndrome and other trisomias). The most frequent are such anomalies: cardiomegaly, dextrocardia, dextroposition, open arterial duct and oval foramen, coarctation of the aorta (Fig. 39), defects of the cardiac septa and valves of the heart, stenosis of the pulmonary artery, hypoplasia of the left ventricle; tetralogy of Fallot, aneurisms, etc.

Ultrasonic diagnosis of the congenital heart disease improves by using modern sonographic appliance, M-echocardiography. Optimal terms for screening examination — 18–28 weeks of pregnancy. Anomalies of the frequency of heartbeat and heart rhythm of the fetus (brady- and tachycardia, extrasystole) in every second case can be related to the congenital heart disease.

**Defects of development of the digestive canal and abdomen** observe with the rate 1 : (250–5,000) of the newborns (ascites, atresy of the esophagus, duodenum, small and large intestines, anus (Fig. 40); diaphragmal hernia, defects of the anterior abdominal wall — without forming of the hernial sac (Fig. 41); umbilical hernia). Atresy of the small intestine

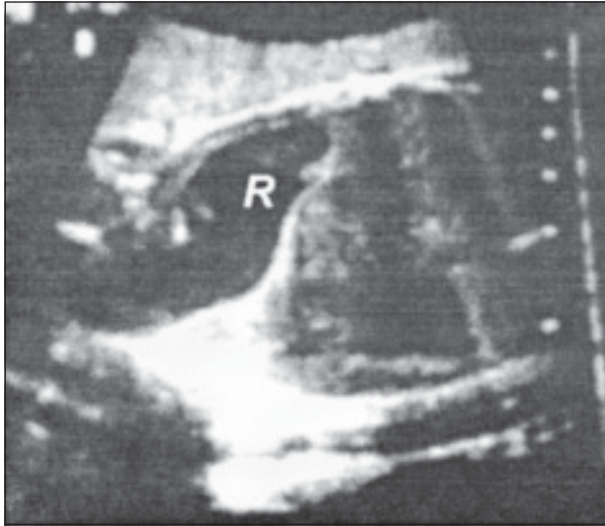


Fig. 40. Dilation of the sigmoid colon and rectum (R) during anal atresy



Fig. 42. A newborn with isolated omphalocele



Fig. 41 Fetus (22 weeks) with isolated defect of the abdominal wall (without forming of the hernial sac)



Fig. 43. Sonogram of unilateral multicystic dysplasia of the kidneys

can combine with trisomias of the 13th and 21st pairs of chromosomes, with the congenital heart disease.

**Diaphragmal hernia** is accompanied by the dislocation of the organs from the abdominal cavity to the thoracic cavity (stomach, intestines and sometimes kidneys). **Omphalocele** (Fig. 42) — umbilical hernia — it is a hernial sac, covered with amnion, mesoderm (Wharton's jelly) and peritoneum.

**Defects of the urogenital system development** — is a classical Potter's syndrome (agenesis of the kidneys, hypoplasia of the lungs, other maldevelopments), infantile polycystic disease of the kidneys, multicystic dysplasia of the kidneys, extrophy of the urinary bladder, hydronephrosis-hydrourether, cysts of the ovaries, sacro-coccygeal teratoma, etc.

**Multicystic dysplasia** of the kidneys manifests the most often (1 in 1,000–5,000 newborns), can be *unilateral* (80% cases; Fig. 43) or *bilateral*.

The cause is unknown. Such conditions appear as the result of the early obstructive uropathia. This defect can associate with the defects of the neural tube and digestive tract.

**Infantile polycystic renal disease** is an autosomal-recessive genetic disease (the rate is 1:20,000–1:50,000 of the newborns). The majority of the fetuses are stillborn or die during the first year of life. If such children live until the pubertal period, they require the transplantation of the kidney.

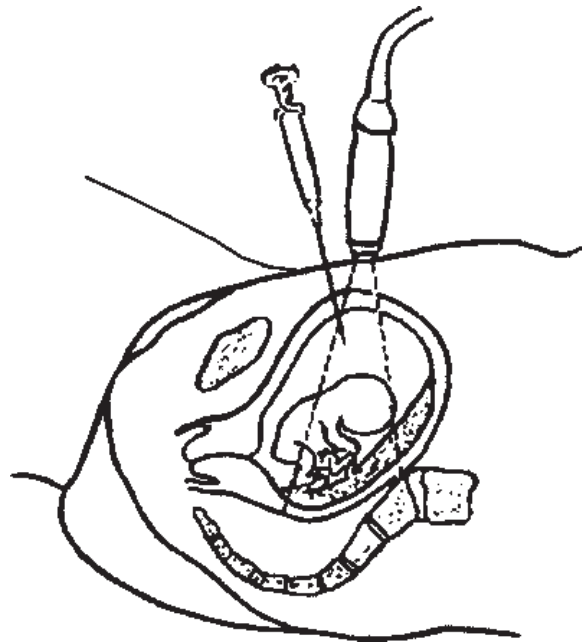
Defects of the face and neck, skeleton and extremities, hygromes, teratomas, syndrome of amniotic septa refer to other anomalies of development.

The congenital *anomalies of the osseous system* are the following: **amelia** (aplasia of all extremities), **focomelia** (underdevelopment of the proximal parts of the extremities), **aplasia of one of the bones of crus and forearm**, **chondrodystrophies**, **combined syndromes**. Anomalies of the fingers are the following: **syndactylia** (amalgamation and reducing of fingers number), **polydactylia** (increasing in fingers number), **hemimelia** (absence of a part of the extremity), **amalgamation of the lower extremities**. **Adhesion of the fetuses** by the head, chest, abdomen and buttocks can take place in uniovular monoamniotic twins. Ultrasound reveals the con-



**Conditions related to anomalous level of  $\alpha$ -fetoprotein**

High level of $\alpha$ -fetoprotein	Low level of $\alpha$ -fetoprotein
Defects of the neural tube, skin; teratoma, hygromas; disturbance of osteogenesis; necrosis of the liver	Chromosomal trisomias
Incomplete abortion	Gestational trophoblastic disease
Obstruction of the esophagus, intestine, urinary tract, nephrosis, anomalies of development of the kidneys, extrophy of cloaca	Death of the fetus
Oligoamnios	Large body weight of the mother
Low body weight of the fetus or mother	Mistaken decrease in gestation
Multiple pregnancy	
Mistaken increase in gestation	



*Fig. 44. Amniocentesis under the sonographic control*

joined twins at the end of I — beginning of the II trimester of pregnancy.

**Detection of the level of  $\alpha$ -fetoprotein** in the blood serum of the mother and in amniotic fluid at the period of 16–18 weeks of pregnancy is an important method of prenatal diagnosis. The protein  $\alpha$ -fetoprotein is of the fetal origin. It produces by the yolk sac, and from the end of the I trimester — by the liver of the fetus. Maximal concentration of  $\alpha$ -fetoprotein in the fetus is in the period of the 13th week of pregnancy. The elevation of the level of  $\alpha$ -fetoprotein 2.5 times in comparison with the average number of the term of pregnancy can be the evidence of developmental defects of the neural tube, anterior abdominal wall and other systems, as well as about the separation of the placenta. The decrease in the level of  $\alpha$ -fetoprotein (not less than 2 times in comparison with average values of such term of pregnancy) is observed during chromosomal trisomias (on example, the Dawn's disease), trophoblastic disease, death of the fetus, especially in combination with increase in the level of chorionic gonadotrophin of the human.

Anomalous levels of  $\alpha$ -fetoprotein observe in 5% of the cases.

**Amniocentesis** is a transabdominal aspiration of the amniotic fluid by a thin needle for sampling and examining the cells of the fetus (Fig. 44).

The cells of the fetus, which were taken during amniocentesis, are cultivated for detection of the chromosomal anomalies. Amniocentesis can be performed in the period of 12–18 weeks (optimal term — 14–18 weeks), when the amount of amniotic fluid is enough and it is possible to perform artificial abortion.

The indications (recommendations) for the performing of genetic amniocentesis:

- 1) age of the mother is over 35 years (increased risk of trisomias);
- 2) chromosomal anomalies in the previous child;
- 3) presence in one parent of a balanced translocation or inversion (there are children in the family with balanced translocation, mental retardation);
- 4) three and more spontaneous abortions;
- 5) defects of the neural tube in the family anamnesis;
- 6) one of the parents is a carrier of X-linked or autosome-recessive anomalies.

The genetic amniocentesis gives an opportunity to perform chromosomal analysis, determine the level of  $\alpha$ -fetoprotein, perform the analysis of the cellular content, DNA, biochemical markers, determine the sex of the fetus (it is important with presence of the X-linked diseases of the mother).

Contraindications to the amniocentesis conducting:

- 1) laparotomy in anamnesis;
- 2) possibility of abortion;
- 3) a uterine tumor.

The risk of amniocentesis conducting for the fetus (1.5–5%) should be less than the risk of the child birth with anomalies.

Complications with amniocentesis may be the following: 1) trauma of the fetus, placenta, umbilical cord or maternal organs; 2) infection; 3) threat of abortion, beforehand rupture of the amniotic membranes and preterm labour. Amniocentesis should be performed under an ultrasonic control for the decrease complications incidence. Parents should be notified about a possibility of the complications and a written



consent for performing this procedure should be taken. A single dose (300 mg) of anti-D-immunoglobulin is injected to unsensitized Rh-negative women during the amniocentesis to avoid Rh-immunization.

**Biopsy of the chorion** and examination of the trophoblast, which are usually performed at the I trimester of pregnancy (9th–11th week), which are the alternative to amniocentesis, are the modern method of prenatal diagnosis of congenital developmental anomalies. Procedure is performed by transabdominal or transcervical method (Fig. 45, *a, b*).

Technique of *chorion biopsy* is alike to the technique of amniocentesis, with the only difference, that the villi of the chorion are examined. Biopsy of the chorion till the 9th week of pregnancy is dangerous, because it is related to the risk of reduction of the

extremities in the fetus. The possibility of diagnosis of chromosomal anomalies at the I trimester, which gives an opportunity to interrupt pregnancy by artificial abortoin, is an advantage of the chorion's biopsy. The chorion cells taken during biopsy are investigated for the detection of the chromosomal set, DNA, enzymes, sex of the fetus and haemoglobinopathias. Bleedings, the brake of the intactness of the fetal membranes and infection are the complications of this procedure similar to amniocentesis. Much more greater risk of the spontaneous abortion (1–3%) than during amniocentesis is a serious disadvantage of the procedure, which explains the popularity of amniocentesis.

Ultrasound examination is performed before the manipulation, the distance between the isthmus uteri and inferior part of the chorion is measured for the detection of the direction and depth of application of the special forceps for biopsy or catheter for aspiration.

*Contraindications of the chorion biopsy are following:* the degree of the vaginal cleanliness over II; RW- and HIV-infection positive reaction; analysis, which confirms the pathological change in the blood and urine of a pregnant woman.

**Fetus blood analysis by way of cordocentesis.**

Developing of the method of transcutaneous puncture of fetal umbilical cord led to the significant changes of diagnosis and treatment of the fetus with abnormal conditions. Despite of complexity of the procedure, there are still more indications to its performing. Aspiration of the blood from the umbilical cord by the control of sonography for diagnosis of haemoglobinopathy, haemophilia, Willebrand's disease, immunodeficient conditions is a method of cordocentesis. Besides of diagnosis of genetic and metabolic anomalies, cordocentesis is used in large obstetrical clinics and perinatal centers for treatment of the fetuses with isoimmunization by Rh-factor (replacing transfusion of the blood to the fetus), intrauterine hypoxia (injection of drugs in the umbilical cord). The most severe complication, which occurs as the result of this procedure, is an injury of the fetus with further bleeding (2–3% of cases).

**Fetoscopy** is a visualization of the fetus and amniotic uterine content with the help of microscope. The method is based on using of thin optofiber laparoscope, which is injected by the local anesthesia and ultrasound control through the anterior abdominal wall in the uterine cavity. The diagnostic value of the procedure should always exceed the potential danger for a pregnant woman and fetus (risk of abortion — up to 12%). Examination of the parts of the fetal body is performed during fetoscopy; visualization of the expressed defects (polydactyilia, meningomielocele, etc.) is possible; also taking of the blood (cordocentesis) or epidermis for chromosome analysis and diagnosis of hereditary diseases (on example, ichtiosis, muscular dystrophy) is performed as well.

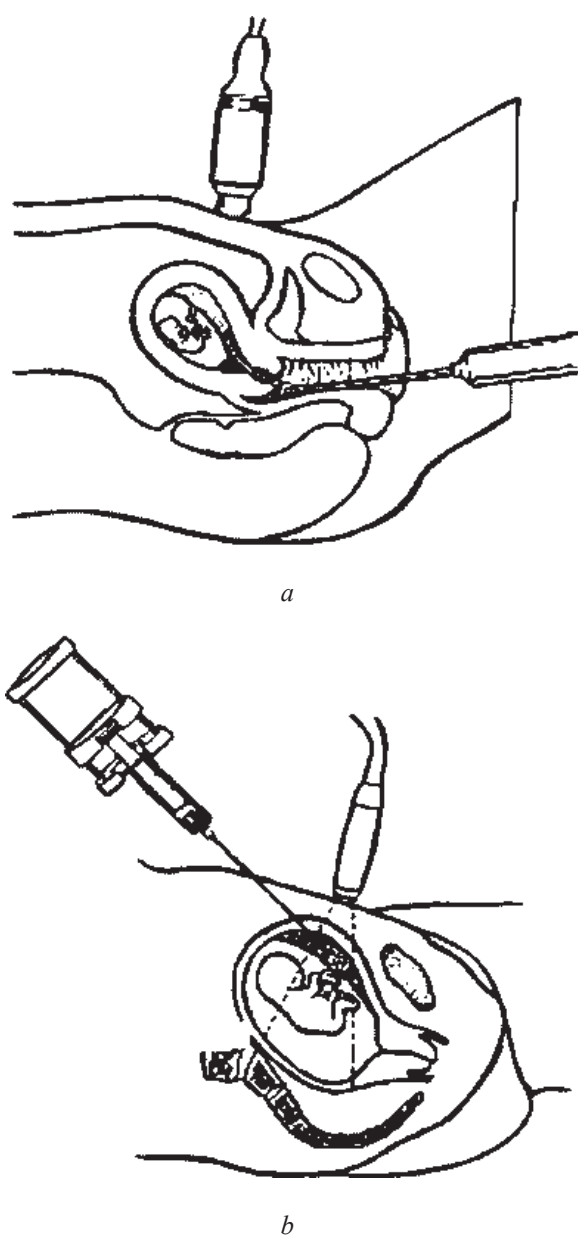
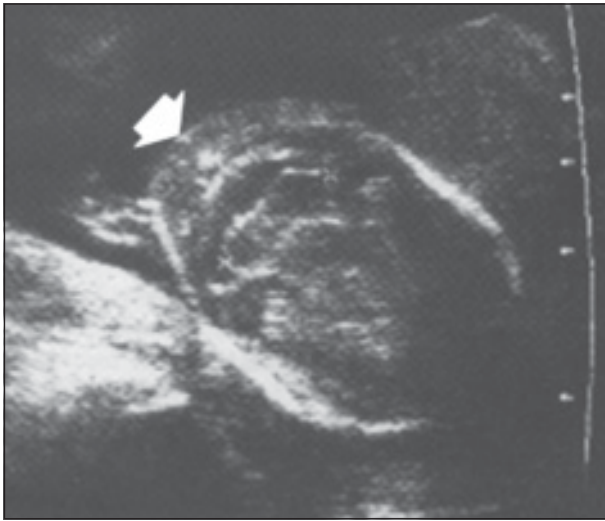


Fig. 45. Methods of chorion biopsy:  
*a* — transcervical; *b* —transabdominal



a



b

Fig. 46. Dawn's syndrome:  
a — thickening of the cervical fold on sonogram;  
b — hypoplasia of the middle third of the face, short nose, small extremities in a 23-week fetus

**Chromosomal trisomias** are cytogenetic diseases which are most often detected with the help of prenatal diagnosis.

**The Dawn's syndrome (trisomia-21; Fig. 46, a, b)** is the most frequent cytogenetic pathology, which appears in 1 of 600 children, which are born alive.

With the aging of the mother, especially after 35 years, the incidence of the Dawn's syndrome sharply increases and is 1 : 100–1 : 300, and in women after 40 years old is 1 : 40–1 : 60.

Children with trisomias of the 21st chromosome in 95% cases have supplementary chromosome, in

4% — unbalanced translocation and in 1% — mosaicism. Such children are usually mentally retarded and their intellect is decreased. The congenital heart disease is the most frequent somatic pathology in the patients suffering from the Dawn's syndrome. The thickness of the cervical fold of the fetus is measured during the ultrasonic screening at 13th week of pregnancy. Its thickening is related to the Dawn's syndrome in 40% of cases; congenital heart diseases are detected in 50%. The other sonographic markers of trisomia-21 can be the following: atresy of the duodenum, omphalocele (this defect is more typical for trisomia-21 and -18); decrease in the length of the hip and arm; moderate enlargement of the pelvic system of the kidney; flattened face; short middle phalange of the V finger; isolated pleural exudates and ascites (5%); non-immune edema of the fetus; hyperechogenous intestine, insignificant lateral ventriculomegaly.

The volume of the amniotic fluid, as a rule, normal; the placenta is without pathological changes. The growth of the fetus is normal or the IUGR is observed, sometimes — brachycephaly. Hydramnios, which can cause the preterm labour, develops as the result of duodenal atresy.

15–20% of the Dawn's syndrome cases reveal the decreased level of  $\alpha$ -fetoprotein in the mother's blood serum. A possibility of the Dawn's syndrome incidence in the fetus is less than 5% with the low level of  $\alpha$ -fetoprotein in the blood serum of a pregnant woman, but its normal level in the amniotic fluid.

Delivery with the Dawn's syndrome is performed depending on the obstetrical situation. Identification of developmental anomalies and karyotyping are performed in the postnatal period. Such patients, as a rule, can live till 50 years.

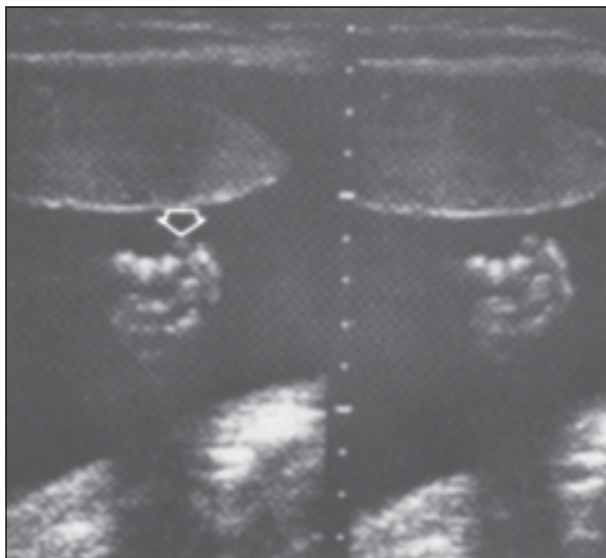
**The Edward's syndrome (trisomia-18; Fig. 47, a, b)** is the second by incidence trisomia, which is characterized by numerous congenital developmental defects, IUGR, microcephalus, congenital heart diseases (80%).

Its rate is 1 : (3,000–5,000) of the live-born children. Anomalies of the extremities, micrognathia, the congenital heart diseases, tetralogy of Fallot, transposition of the vessels, coarctation of aorta); omphalocele (25%), defects of the neural tube (20%); diaphragmal hernia (10%), etc. are detected by ultrasound examination. During the sonography in every second case the early forming of IUGR — till the 18th week of pregnancy is observed. Cysts of chorioid plexus, enlargement of the major cerebral cistern, micrognathia, anomal position of the fingers are the markers during the thorough ultrasound examination. The Edward's syndrome is a lethal defect: 90% of the newborn die on the 1st year of life.

**The Patau's syndrome (trisomia-13)** is the third trisomia by incidence. Multiple congenital maldevelopments of nervous, digestive, cardio-vascular systems, anomalies of the face and extremities (Fig. 48) are its characteristic features.



a



b

Fig. 47. Edward's syndrome (trisomia-18; 47, XY, +18):

a — newborn: round face, short nose, clenched fists;  
b — sonogram of the hand of the fetus: clenched fists, covered by III finger



Fig. 48. Fetus (19 weeks) with Patau's syndrome (trisomia-13; 47, XY, +13)

The rate of trisomia-13 is 1 : 5,000–1 : 10,000. The risk of defects recurrence during the future pregnancies is 1:100. Such condition is lethal: 70% of the children are stillborn or die within first 6 months of their life; 85% — die during the first year of life. Survived children have very bad prognosis: promoted mental retardation, disturbances of audition, vision, convulsions, attacks of apnea, disturbances of feeding, etc.

**Triploidia** is a rare lethal chromosomal anomaly (chromosomal number is 60 instead of 46). Severe growth restriction injures mostly skeleton of the fetus than the head. Triploidy is observed in 1–2% of the human embryos, but their majority eliminates during the spontaneous abortions. In 60% of the cases the triploid embryo develops as the result of fertilization by two spermatozoones, in 40% of the cases — by the fertilization of diploid ovum. The developmental defects of this pathology are: hydrocephalus, holoprosencephalus, defects of the neural tube, hypertelorism, clefts of the palate and lip, syndactyilia of III–IV fingers, the congenital heart diseases. Expressed intrauterine growth restriction of the fetus forms very early — from the 12th–14th week of pregnancy. Olygoamnios is often observed. The placenta is usually enlarged (Fig. 49), with multiple cysts (as in incomplete hydatidiform mole), but can have a normal structure along with enlarged volume.

**Anomalies of the placental development:** placenta with accessory lobes, changed forms (ovoid, beanlike, horseshoe, annular placenta); placenta biloba. Fenestrated or film-like placenta forms as the result of the vascularization disturbance.

**Anomalies of the umbilical cord:** presence of the third accessory or only one umbilical artery, two separated vascular fascicles (bundles), atypical vascular anastomoses. **Long** umbilical cord is the one longer than 70–80 cm, **absolutely short** — less than 40. **True nodes** of the umbilical cord develop at early

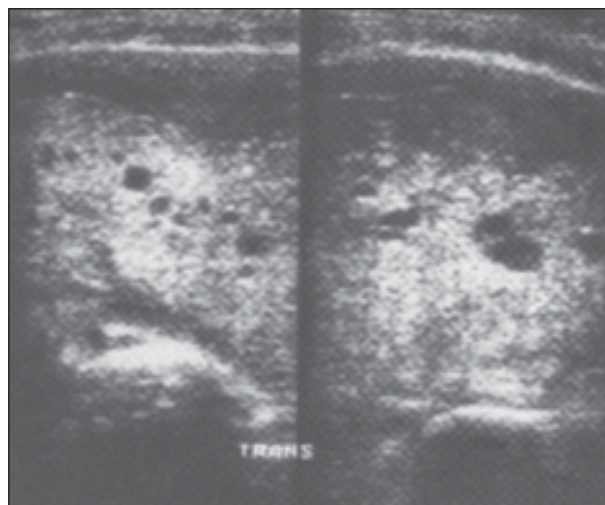


Fig. 49. Enlarged placenta has multiple cysts as the result of triploidia (69, XXX)



terms of pregnancy (mobile fetus); *pseudonodes* — as the result of varicosis of the umbilical vein or accumulation of mesoderm (Wharton's jelly).

Disturbances of the metabolism of lipids, aminoacids, carbohydrates and glycosaminoglycanes are the **congenital disturbances of metabolism**. Majority of them inherit as X-linked recessive or autosome-recessive signs and accompanied by severe mental retardation, invalidity and death in the early childhood. These monogenous diseases, which appear on the base of genetic and punctual mutations are very rarely observed. However, they considerably influence the level of neonatal and children's morbidity and mortality rate.

The most meaningful groups of congenital diseases, related to disturbances of the metabolism, are the following:

1) mixed group: cystic fibrosis, congenital hyperplasia of the adrenal glands; congenital hypothyroidism, lactacidosis, deficiency of  $\alpha$ -antitrypsin;

2) disorder of the carbohydrate metabolism: galactozemia, fructozemia, glycogenosis;

3) disorder of the bilirubin metabolism: Dubin—Johnson's, Rotor's, Gilbert's, Crigler—Nair's syndromes;

4) disorder of the aminoacids metabolism: phenylketonuria, the disease of the maple syrup, tyrosinemia, glutare acidemia, pyroglutamine acidemia, homocysteinuria, non-ketone hyperglycinemia;

5) disorder of the organic acids metabolism (organic acidemia): propionic, methylmalonic, isovaleric acidemia;

6) disorder of the urine synthesis: deficiency of carbamylphosphatesynthetase, ornithinetranscarbomilase, argininsuccinatsynthetase, argininesuccinase, arginase.

The level of activity of specific enzymes, contents of amino acids, hormones, identification of the pathological products of the metabolism in the amniotic fluid are necessary to detect while diagnosing congenital metabolic disorders.

**Cystic fibrosis** (cystic fibrosis of the pancreas) is the most wide-spread hereditary disease, related to the disturbance of the metabolism. The disease rate is 1:1600 of the born alive, and frequency of heterozygous carriage of the mutant gene is 1:20. The disease inherits by the autosome-recessive type. Exocrine glands, which produce mucus of the high viscosity, are affected, which leads to the most profound injury of the digestive and respiratory tract.

**Congenital hyperplasia of the adrenal glands** (congenital adrenogenital syndrome) is the most frequent cause of hermaphroditism in girls. This disease inherits by the autosome-recessive type; The incidence in population is 1:15,000 of the born alive. The congenital deficiency of the enzyme 21-hydroxylase is the primary biochemical defect in 90–95% of the cases. The secretion of corticotrophin by hypophysis increases as the result of insufficiency of syn-

thesis of cortisol by the mechanism of the reverse connection, which leads to hyperplasia of cortical substance of adrenal glands.

The increase in the androgens synthesis by the adrenal glands cause a virilizing effect and reproduction disorders.

Tay—Sachs disease, Lesch—Nyhan syndrome and Duchenne muscular dystrophy are the most severe metabolic disturbances.

**Tay—Sachs disease** is a disturbance of the lipid metabolism; promoted deficiency of  $\beta$ D-hexomindase A is its characteristic feature. The threat of a sick child birth from the parents, both carriers of this disease, is 1:3,600 (disease inherits by the recessive type).

**Lesch—Nyhan syndrome** is a rare X-linked disturbance of the protein synthesis, caused by the influence of hypoxanthine-guanine-phosphoribosil transferase. The syndrome is characterized by excessive purines synthesis, very early manifestation and aggressive course.

**Duchenne's muscular dystrophy** is a congenital paralysis of the muscles of the upper extremities and shoulder girdle. Death occurs under 20 years.

**Preimplantational methods** are the newest in prenatal diagnosis, with the help of which the diagnosis and prenatal therapy of the fetus with congenital metabolic disorders are possible: biopsy of the polar body, aspiration of 1–2 cells of a 6–8-cell embryo (at the age of 2–3 days), biopsy of trophectoderm of a 5–6-day embryo.

The necessity of such early diagnosis is related to the possibility of prenatal treatment (on example, prescribing of dexamethazone if 21-hydroxylase insufficiency).

## MEDICAL COUNSELING

Medico-genetic consultations play a very important role in revealing hereditary pathology and preventing the birth of a sick or unviable child. They are: building of the genetic tree of the persons who get married; investigation of sexual chromatin; dermatoglyphics; karyotyping.

The *indications* to the performing of medico-genetic consulting are the following:

— prognosis of children birth with congenital maldevelopments in one or both future parents;

— mental retardation, including in combination with other anomalies of development of one or both future parents;

— disturbances of the physical development and growth of the children, deformation of the body and extremities, obesity, reduce of the visual and auditory acuity, blindness, deafness, disturbance of olfaction;



- convulsions, hypo- and hypertonus of the muscles, photosensitivity, jaundice;
- intolerance of some food products and medicines, disturbance of the digestion, frequent vomiting, diarrhea, fatty fecal masses, hepatosplenomegaly, malabsorption syndrome;
- urolithiasis in children, unusual colour and odor of the urine;
- frequent and long-lasting diseases of bronchi and lungs resistant to therapy;
- presence of the signs of the Shereshevskiy—Turner, Klinefelter's syndromes, Dawn's disease;
- primary amenorrhea, insufficient development of the secondary sex signs, delay or preterm sexual

development in combination with mental retardation;

- sexual differentiation disorder; primary infertility (except anomalies of genitalia development, hormonal causes, infertility of the partner);

- habitual abortions or repeating stillborns (except infections, hormonal insufficiency);

- Rh-conflict.

#### RECOMMENDED READING

7 (353–359); 13; 17 (701–764); 19 (460–474); 22; 33; 38; 39 (227–252); 47 (8–24); 49; 51; 52 (99–121); 54; 56; 59; 61.

## Chapter 9

# DIAGNOSIS OF PREGNANCY

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### DIAGNOSIS OF EARLY PREGNANCY

Making of correct and timely pregnancy detection is very important to preserve the woman's health. Incorrect diagnosis of pregnancy, from the one hand can emotionally hurt the woman and lead to unnecessary surgical interventions (laparoscopy when suspecting ectopic pregnancy; curettage of the uterus), and on the other hand — late diagnosis can cause fatal consequences (extrauterine pregnancy, prescribing of embryotoxic or teratogenic drugs). The key for the early pregnancy detection is a thorough collection of anamnesis and physical examination of woman for the timely using of the most sensitive and correct methods of instrumental diagnosis: ultrasound examination and determination of the level of chorionic gonadotrophin of the human in the blood serum and urine (precision is 98–99%). The determination of the level of  $\alpha$ -sublevel of chorionic gonadotrophin of the human in the blood serum helps to diagnose pregnancy till *the delay of the next menstruation*.

Correct *clinical diagnosis* of pregnancy earlier than the second menstruation fails is possible only in 2/3 of the patients.

According to the classical school of obstetrics *clinical criteria* of pregnancy are divided into hypothetical, probable and authentic.

The woman's subjective feelings of female and objective symptoms, which manifest themselves in her organism, except the change of the genitalia, refer to **hypothetical signs of pregnancy**. They are following:

- 1) salivation, nausea, vomiting, change of the appetite, gustatory likings (to the spice, sour, salty food; the need to use clay, chalk); intensification of the olfaction, insusceptibility of some smells and dishes (meat, tobacco smoke); dyspeptic disturbances, feeling of heavy load in the hypogastrium, constipation;

- 2) functional changes of the nervous system: irritability, increased tiredness, tearfulness, estrangement, sharpening of audition;

- 3) frequent urination;

- 4) swelling and painfulness of the mammary glands;

- 5) change of the metabolism: intensified deposition of fat in subcutaneous layer of the anterior abdominal wall, which causes enlargement of the abdomen; pigmentation of the nipples and peripapillary circles, white line of the abdomen, face; appearing of the strips of pregnancy (*striae gravidarum*).

Objective changes of the genitalia and mammary glands refer to **probable signs of pregnancy**. The complex of these signs gives an opportunity to detect pregnancy. However, these symptoms may be evidence of some gynaecological diseases. Such symptoms are:

- 1) cessation of menstruations during the reproductive period;

- 2) changes in the uterus (enlargement, softening, change of the form, intensification of the contractions during bimanual examination); cyanosis of the vestibule of the vagina and cervix of the uterus; enlargement of the mammary glands and discharge of the colostrum;

- 3) positive laboratory reactions.

To reveal the probable signs of pregnancy the detail questioning of the woman is carried out, her mammary glands and external genitalia are examined, as well as bimanual vaginal (pelvic) examination for the detection of the change of the sizes, form and consistence of the uterus is conducted.

Diagnosis of early pregnancy is based upon the all present possible signs, including test of chorionic gonadotrophin of the human and ultrasound examination. The diagnosis of pregnancy in doubtful cases is confirmed during the repeated examination in 2 weeks.

**The vaginal signs of pregnancy** (Fig. 50) are the following:

- 1) softening and cyanosis of the vaginal mucosa (manifests on the 6th week) and of the cervix (from

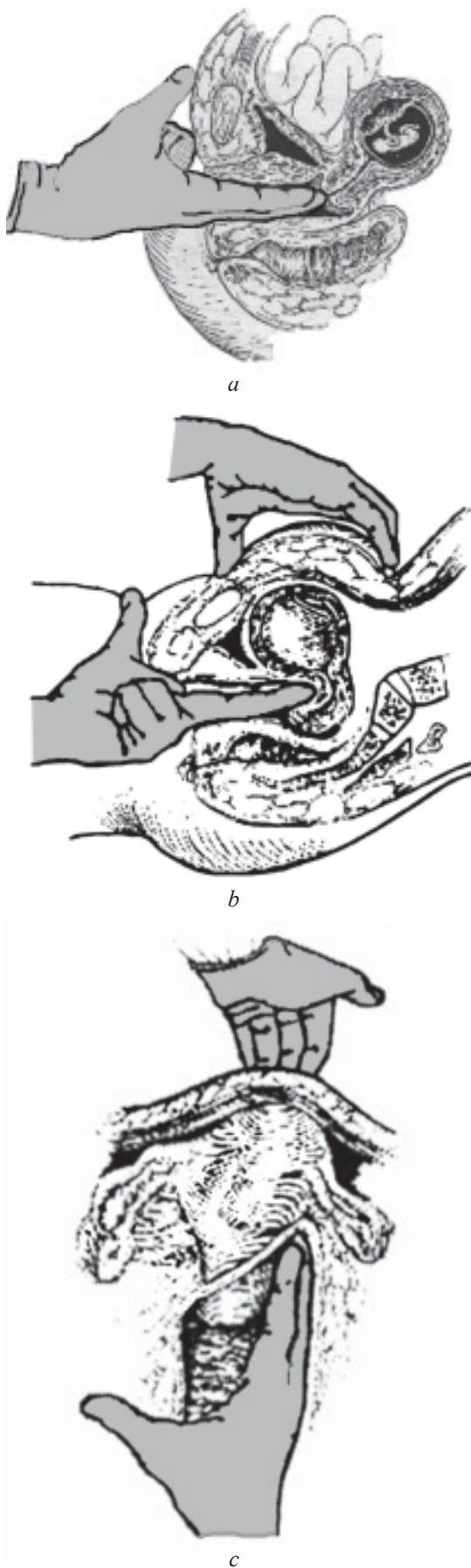


Fig. 50. Signs of pregnancy:  
*a* — Scrobanskii's; *b* — Horvitz—Hegar's; *c* — Piskaček's

the 4th–5th week if there are no infections and cicatricial changes) — *Scrobanskii's sign* (Fig. 50, *a*)

2) excessive mobility of the cervix during the vaginal examination (*Gubarev—Gauss' sign*);

3) softening of the isthmus of the uterus between the 5th and the 6th weeks (*Horvitz—Hegar's sign*; Fig. 50, *b*), easy flexion of the uterus to the front as to the cervix is possible nearly the 7th–8th week;

4) a crest-like outpouch along the middle line of the corpus uteri, which does not transfer to the fundus, posterior surface and cervix (*Henter's sign I*);

5) hyperanteflexion of the uterus, connected with the softening of its isthmus (*Henter's sign II*);

6) uterine contraction “under the fingers” during bimanual examination (*Snegerev's sign*);

7) softening and enlargement of the fundus uteri in the region of implantation on the 5th–6th week (*Piskaček's sign*; Fig. 50, *c*).

The earliest term of pregnancy, which is diagnosed according to the sizes of the uterus during the bimanual examination, is 5 weeks. By this time the uterus enlarges, becomes more round. In the term of 8 weeks it is alike a goose egg or woman's fist; in 12 weeks — sizes of a man's fist and reaches the pubic symphysis.

Observing the basal temperature (absence of its decrease), colpocytologic investigations (predomination of the intermediate cells, caryopicnotic and eosinophilic indices — 15–20%) are **the accessory methods of the diagnosis of pregnancy**, which do not have an independent meaning.

**Laboratory tests for pregnancy detection.** The definition of the level of chorionic gonadotrophin of the human in the blood plasma and its excretion with urine are the main laboratory hormonal pregnancy tests. The level of HCG is detected with 3 types of immunological and biological tests: 1) the test with agglutination delay; 2) radioimmune analysis; 3) enzyme-connected immunoenzymatic analysis.

*The level of HCG in the blood* elevates till the 60th–70th day of pregnancy, then decreases till the 100th–130th day (Fig. 51).

A molecule of HCG consists of 2 subunits —  $\alpha$  and  $\beta$ .  $\beta$ -subunit of HCG is specific for pregnancy.  $\alpha$ -HCG appears in the blood on the 8th–9th day after ovulation, possibly in the day of blastocyst's implantation. The determining of the 1,500–2,500 mU/ml of HCG in the blood corresponds to the 3rd–4th week of pregnancy. The increase in the level of  $\beta$ -HCG can occur also as the result of embryocellular choriocarcinoma.

Excretion with the urine of 1,500 U/l of HCG corresponds to the 5 weeks of pregnancy, 10,000 U/l — 6 weeks, 15,000 U/l — 7 weeks of pregnancy.

*The content of HCG in the urine* increases gradually, reaching the maximum by the 10th week of pregnancy (80,000 U/ml), then decreases till 10,000 U/ml nearly 19th week. The second peak of HCG in urine is in the period of 30th–32nd week (20,000 U/ml)

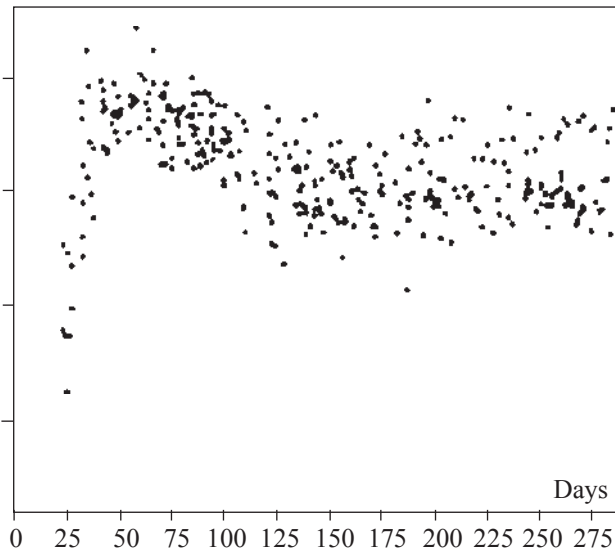


Fig. 51. The level of HCG in the blood plasma during a normal single pregnancy

with the further reduction till 10,000 U/ml. On this level HCG excretes with the urine till the end of pregnancy. Falsely positive results are possible because of the high content of protein in the urine.

Biological methods of diagnosis on the level of HCG (Gally—Mainini, Aschheim—Zondek, Friedmann's reactions) are not used in modern practice.

It is needed only 2–2.5 min for the performing of the investigation with the help of express tests—diagnosis on HCG (qualitative method).

**The authentic signs** of pregnancy are made during the examination of the fetus (auscultation and registration of the palpitation of the fetus, palpation of its parts, studying of its movements).

A woman begins to feel **the movements of the fetus** between the 16th and 20th weeks of pregnancy (first pregnancy — usually near the 20th week, consecutive pregnancy — on the 18th week)

**Heart tones of the fetus** can be detected by the instrumental methods (electrocardio-, phonocardio-, cardiography) at 12–14 weeks, by auscultation — at 17–19 weeks of pregnancy.

**Ultrasound examination.** US with the using of abdominal sensor reveals the uterine pregnancy is diagnosed after the 6th weeks after the first day of the last menstruation, and with the help of vaginal detecting element — in 5 weeks. At this period the fetal ovum is visualized as a hypoechoic mass, which is near the fundus of the uterus (*white gestational ring*), has a round form and 3–4 mm in diameter. The embryo and its cardiac activity should be visualized since the 6th–8th week of pregnancy. US helps to diagnose the threat of abortion (hypertonus of the uterus, detachment of the chorion) and to determine a possibility of its preserving. The correct detection of gestation of the fetus is an advantage of US at the I trimester.

## DIAGNOSIS OF LATE PREGNANCY

Diagnosis of late pregnancy is based on its authentic signs and data of ultrasound fetometry. Detection of the term of pregnancy in everyday practice is maintained on the base of anamnestic data (delay of menstruation, date of the first movements of the fetus).

Gestational (menstrual) age of the fetus is counted out beginning with the first day of the last menstruation. Data of the objective examination play an important role for determining the term of pregnancy: the height of the fundus of the uterus above the pubic symphysis, the circumference of the abdomen of the pregnant woman, the length of the fetus, size of its head. During the first 3 months the uterus is in the pelvic cavity, and its sizes are measured by the bimanual vaginal examination. After the 12th week the fundus of the uterus is palpated through the anterior abdominal wall, that's why the term of pregnancy is detected by the height of the uterine fundus standing above the pubic symphysis or by the position of the fundus as for the umbilicus and xiphoid process (Table 7). During the normal single pregnancy in the period from 16th–18th till the 36th week the height of the uterine fundus standing above the pubic symphysis in centimeters should correspond with gestation in weeks ( $\pm 3$  weeks).

At 40 weeks the circumference of the abdomen of a pregnant woman is over 90 cm, umbilicus protrudes, at 32 weeks the circumference of the abdomen is 80–85 cm, and the umbilicus flattens.

If the height of the uterine fundus is more than that one for gestation, the incorrect definition of the term of pregnancy, or multiple pregnancy, hydramnios, hydatidiform mole can be assumed. If the height of the uterine fundus is lower than the proper one, mistaken determining of the gestation terms, oligoamnios, IUGR or death of the fetus and hydatidiform mole should be refuted.

Table 7. **The position of the fundus of the uterus in the early terms of pregnancy**

Period of pregnancy, weeks	Position of the uterine fundus
12	Above the pubic symphysis
15	In the middle between the umbilicus and pubic symphysis
20	On the level of the umbilicus
28	6 cm higher the umbilicus
32	6 cm lower the xiphoid process
36	2 cm lower the xiphoid process
40	4 cm lower the xiphoid process



The women, who give birth for the first time and repeatedly, have certain peculiarities in height of the uterine fundus standing during a full-term pregnancy. The women, who give birth for the first time, have an elastic abdominal wall, which counteracts the uterus and prevents it from moving to the front. The intrauterine pressure rises. The lower segment of the uterus develops, presenting head presses or even fixes by a minor segment to the entrance of the pelvis, the uterine fundus lowers down. The women, who give birth for the second time, have a less elastic abdominal wall and does not counteract to the growing uterus. The uterus moves to the front and stretches the abdominal wall, as the result of which the abdomen protrudes to the front and down, and fetal head keeps mobile above the plane of the entrance to the pelvis.

## DEFINITION OF THE LABOUR DATE

A **supposable date of labour** (SDL) in practical obstetrics is counted starting with the 1st day of the last menstruation, by the Naegele's formula (for a 28-day menstrual cycle) as follows:

**SDL = (FM + 7 days) – 3 months + 1 year,**

where FM — first day of the last menstruation.

Episodes of mild bleeding should be taken into consideration as the last menstruation. At the I trimester 25% of the pregnant women have a mild bleeding from the maternal passages (in half of the them the spontaneous abortion takes place, in the others — pregnancy in progress). The majority of the women give birth in 2 weeks after the supposable date of labour, which depends on the course of the menstrual cycle and hereditary predisposition. Usually pregnancy lasts 260–289 (280) days (10 obstetrical months with 28 days in them), or (40±2) weeks.

The determination of the true period of pregnancy complicates because of the absence of the possibility to detect the day of ovulation. The postovulatory phase after each cycle lasts for 14 days. The period of pregnancy increases approximately by 1 day of each of the days of the menstrual cycle, which is longer than 28 days. On example, if the menstrual cycle lasts for 35 days, ovulation occurs on the 21st day, that's why labour will be a week later.

A supposable date of labour can be calculated by *the sensation by a pregnant woman of the fetal movements*: in women who give birth for the first time 22 weeks are added to this date, who give birth at the second time — 24 weeks are added.

A supposable date of labour is calculated depending on *the date of the first visit of a pregnant woman*

*to the women's consultation clinic* (making the diagnosis of pregnancy). In this case the mistake will be minimal if the woman visited it till the 12th week of pregnancy.

A supposable date of labour can be detected by *the date of the beginning of prelabour vacation*, adding to it 10 days. Special obstetrical calendars make significantly easier and fasten the detection by the doctor of the term of pregnancy and labour.

Method of ultrasound diagnosis helps to determine the pregnancy term, especially if it is impossible to establish the date of the last menstruation. At the I trimester the data of the average diameter of the fetal ovum, coccygo-parietal diameter of the embryo are used; biometry of the fetus (fetometry) with measuring of biparietal size of the head, circumference or diameter of the abdomen, length of the hip are performed at the II trimester. At the II trimester the term of pregnancy with using fetometry is detected with an accuracy ±7–10 days, at the III trimester — ±12–14 days.

**Determining of the prelabour vacation term** is easy if the diagnosis of pregnancy is early and appeal of the pregnant woman to the obstetrical observing in the women's consultation clinic before the 12th week of pregnancy. The list of disablement concerning pregnancy and labour is given for the term of 126 calendar days, beginning with the 30th week of pregnancy (70 days before labour and 56 days after labour). If labour were complicated or 2 and more children were born, the accessory list of disablement is given for the term of 14 calendar days. During labour, which occurred before the 30th week of pregnancy and completed with the birth of the alive child, list of disablement is given by a medical-prophylactic organization, in which the woman has given birth, for 140 calendar days, and if the child died in labour, it is given for 70 calendar days.

**Signs of the former labour** are valuable for clinical practice and forensic medical examination. Signs of the former labour are following: white strips (old silver strips) of pregnancy, decrease in the tonus of the anterior abdominal wall, deep ruptures of the hymen, ruptures (cicatrices) of the perineum, gaping of the pudendal fissure, wider vagina, old ruptures of the cervix, as the result of which ovoid shape of the uterine foramen (in women, who don't give birth) becomes fissure-like or star-like.

## RECOMMENDED READING

3 ((99–104); 5 (15–36); 7 (353–359); 22; 56; 61 (37–67).

## Chapter 10

# OBSTETRICAL EXAMINATION

When making the diagnosis of pregnancy **obstetrical examination** is performed, which includes gathering the anamnesis, objective examination, external and internal obstetrical examination, auscultation of the fetus. Gathering **anamnesis** is performed according to the card of the pregnant woman (passport data, complains, conditions of the work and everyday life, heredity, former disease, menstrual, secretor, reproductive functions, the course of the previous pregnancies, peculiar features of the present one).

**Objective examination** (Fig. 52) is carried out according to generally accepted methodics (evaluation of the temperature of the body, pulse, AP, examination of the skin, scleras, oral cavity).

After the examination of the pregnant woman according to the general rules the condition of nervous, cardio-vascular, respiratory, urinary systems and digestive tract is examined. Systolic murmur along the left edge of the sternum during pregnancy is a normal phenomenon.

Blood and urine is taken from the pregnant woman for the clinical analysis; serologic reactions of syphilis and HIV-infection are performed; colpocytologic, bacterioscopic and, if required, bacteriologic examination of the urine and vaginal discharge are performed.

Therapeutist, dentist, otorhinolaryngologist and ophthalmologist examine a pregnant woman to detect the diseases which can influence pregnancy or can complicate in connection with it, as well as for the detection of the focuses of the chronic infection and their in-time sanation. During each visit to the women's consultation clinic a pregnant woman is weighed, her ABP is measured, the analysis of the blood and urine is performed. In the 1st half of pregnancy, if there are no complications of its course, it is recommended to visit a doctor 1 time a month, in the 2nd half — two times a month, and from the 32nd week — every week.

**External obstetrical examination** includes **examination of a pregnant woman** (height, body weight, constitution, stoutness, condition of the abdomen and mammary glands). There are 4 stages of obesity of a

pregnant woman: I — weight is over than normal by 10–29%; II — by 30–49%; III — by 50–99%; IV — by 100%.

During examination of the pregnant woman a suspicion on pelvic structure abnormalities (disturbance of the height, curvature of the spine, infantilism, drooped or sharp abdomen), symptoms of the complications (paleness, yellowness of the skin, sclera and mucous membranes, a globe-chaped abdomen — hydramnion (?); transverse or oblique ovoid — disturbance of the position of the fetus (?), etc.) can appear. Edema of the feet and crura during the day

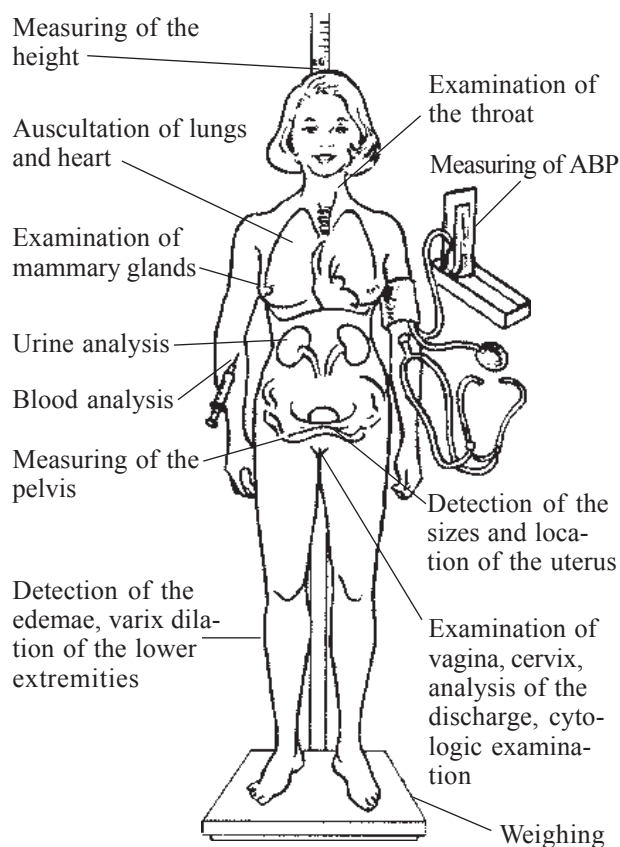


Fig. 52. Objective examination of a pregnant woman

(especially in the evening) is not considered to be a pathology. Generalized edema of the face, hands, abdomen and crura are considered to be pathological. Attention is paid on the hair (pubic, along the white line of the abdomen, on extremities, face). Hyperandrogenism can be the cause of threat of abortion, incomplete pregnancy, anomalies of the contractile activity of the uterus in labour.

Elevation of ABP over 140/90 mmHg or systolic pressure by 30 mmHg and diastolic by 15 mmHg and over in comparison with their level before pregnancy is the evidence of preeclampsy development (hypertension caused by pregnancy).

**Pelvic examination** is based on measuring four sizes of the major pelvis — external distances (distantia interspinosa, distantia intercrystalis, distantia introtrochanterica), diagonal conjugate (see chapter 3). The accessory measurings are performed:

- 1) sizes of the inferior foramen (outlet) of the pelvis: direct — 9.5 cm (11 cm) and transverse diameter — 11 cm;
- 2) height and thickness of the pubic symphysis (3.5–4.0 and 1.5–2.0 cm)
- 3) circumference of the wrist (Solovyov's index — 14–16 cm);

4) Michaelis' rhomboid (longitudinal size — distantia Tridondani — 11 cm; corresponds to the true conjugate); diametrical — 9 cm (the sum of both sizes is the length of the external conjugate);

5) subpubic angle (90–100°);

6) angle of the pelvic slope — the angle between the horizontal plane and plane of the inlet to the pelvis (55–60°);

7) circumference of the pelvis (80–90 cm);

8) lateral Kerner's conjugate (14.5–15 cm);

9) oblique diameter of the pelvis: the right one should correspond to the left one;

10) Vasten's and Zangemeister's signs (negative);

Taking into consideration that the external conjugates only approximately can witness about the pelvic volume, in modern obstetrics during the estimation of the pelvic sizes; the size of the diagonal conjugate is measured (11.5–13 cm in the norm; Fig. 53, *a*), as well as sizes of the plane of the inferior foramen (outlet) of the pelvis (Fig. 53, *b*).

**Examination of the abdomen.** Circumference of the abdomen is measured on the level of the umbilicus by a centimeter strip (in a full-term pregnancy — 90–100 cm), height of the fundus uteri — by a centimeter strip or pelvimeter above the pubic symphysis.

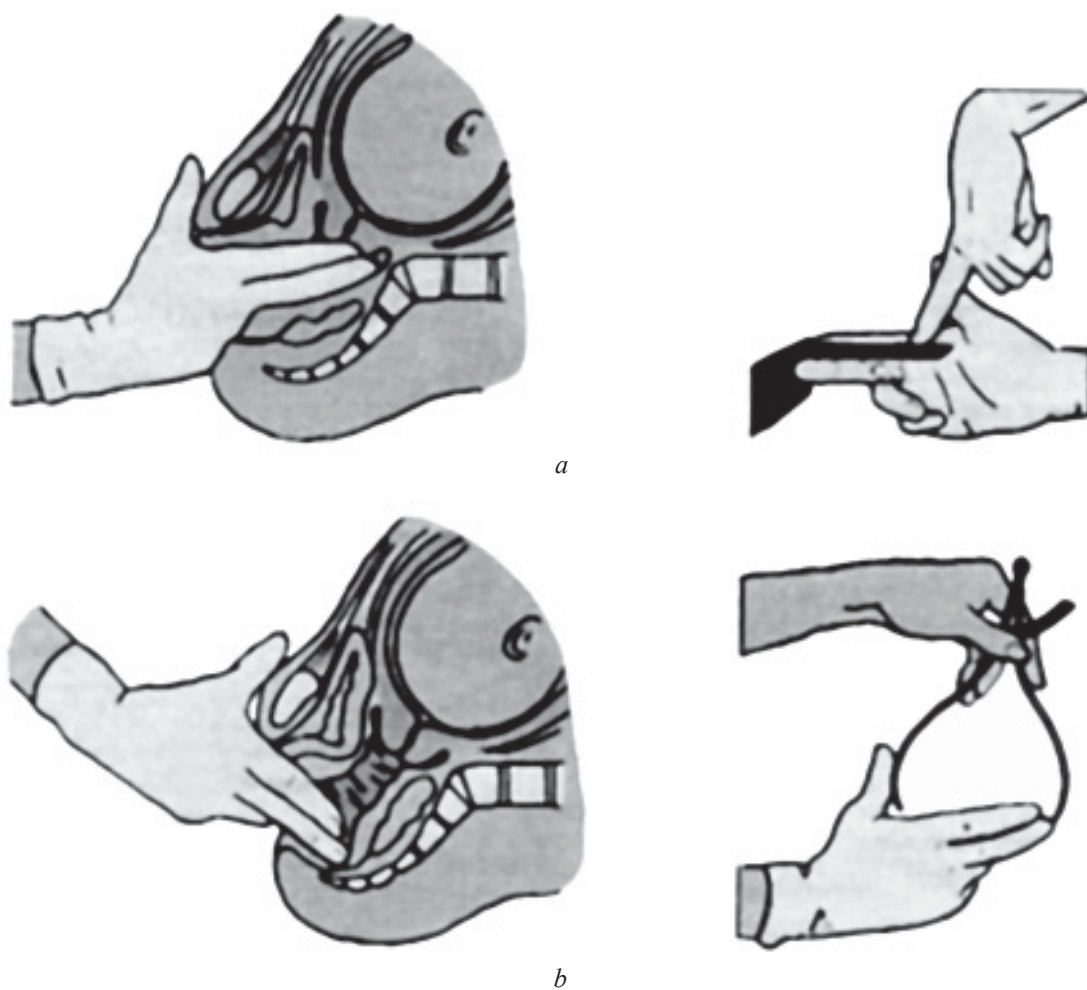


Fig. 53. Measuring of the diagonal conjugate (*a*) and direct conjugate of the inferior foramen of the pelvis (*b*)

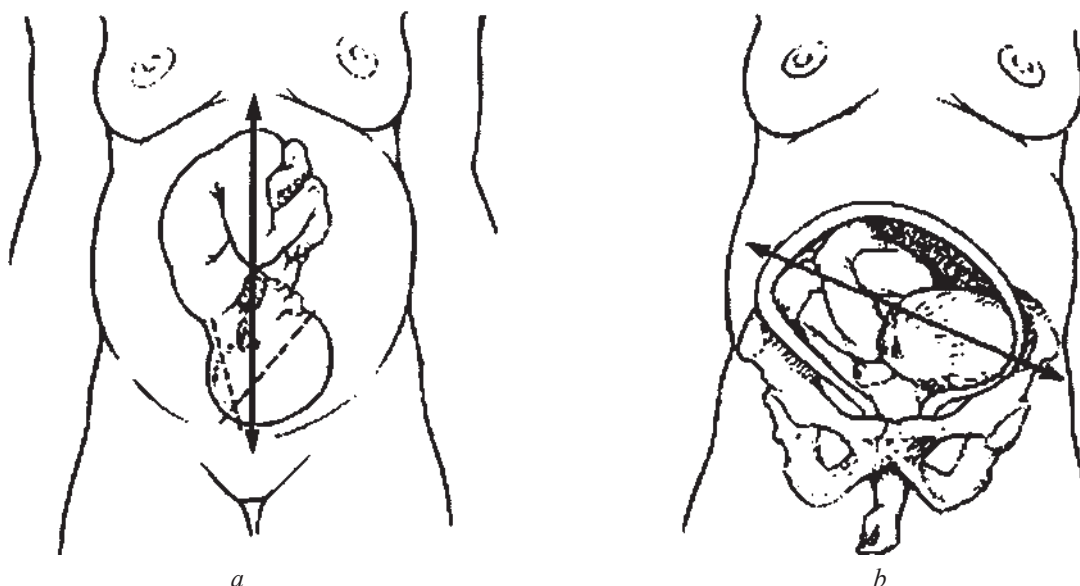


Fig. 54. Lie of the fetus:  
a — longitudinal; b — oblique

*Palpation of the abdomen* is the main method of the **external obstetrical examination**. A woman should lie on a couch on her back with legs bent in hips and knee joints for reducing the load on the anterior abdominal wall and uterus; the doctor should be on the left hand from the pregnant woman. The urinary bladder and rectum of the pregnant woman should be emptied. During palpation the condition of the anterior abdominal wall, elasticity of the skin, thickness of subcutaneous layer, condition of the rectal muscles of the abdomen (their divergence, presence of the hernia of the white line), condition of postoperational cicatrices, as well as presence and size of the uterine myomatous nodes are detected.

For the determining of the fetus position such terms are used in obstetrics: lie (situs), position (positio), kind (visus), arrangement (habitus) and presentation (praesentatio) of the fetus.

*Lie of the fetus* is a ratio of the axis of the fetus to the length of the uterus (Fig. 54, a, b).

With longitudinal (normal) position (99%) the axis of the fetus and length of the uterus coincides, with a transverse one — cross at a right angle, with oblique — on the sharp.

*Position* of the fetus is a ratio of the back of the fetus to the left or to the right wall of the uterus.

At the I position the back of the fetus turned to the left uterine wall (2/3 of the cases), at the II position — to the right wall (1/3 of the cases). During the transverse and oblique lie of the fetus its position is detected by the head location: the head is on the left — I position, on the right — II position.

*Kind* of the fetus is a ratio of its back to the anterior or posterior wall of the uterus. In the straight kind the back is turned to the anterior uterine wall, in the posterior — to the posterior one.

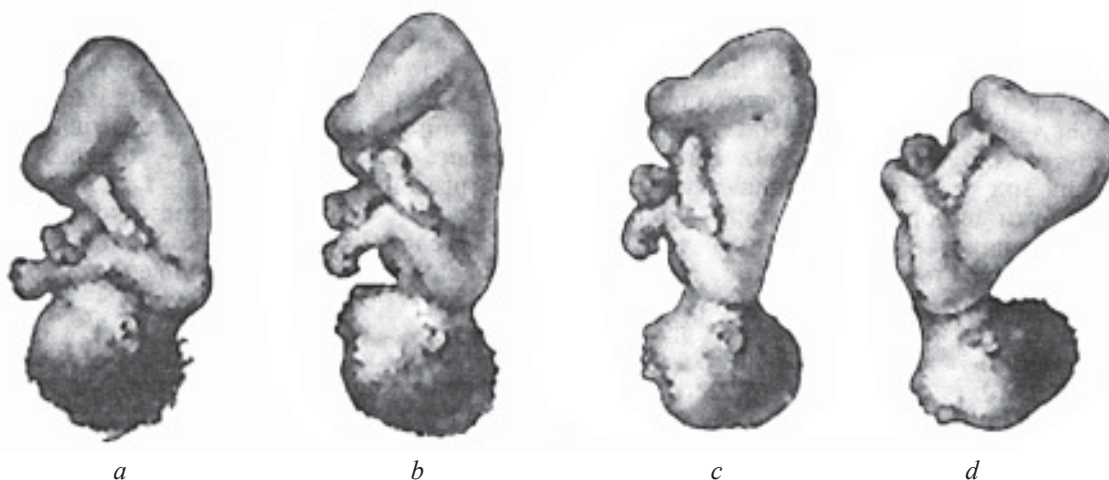


Fig. 55. Cephalic presentation of the fetus:  
a — vertex (head is bent); b — presentation of bregma; c — brow; d — facial



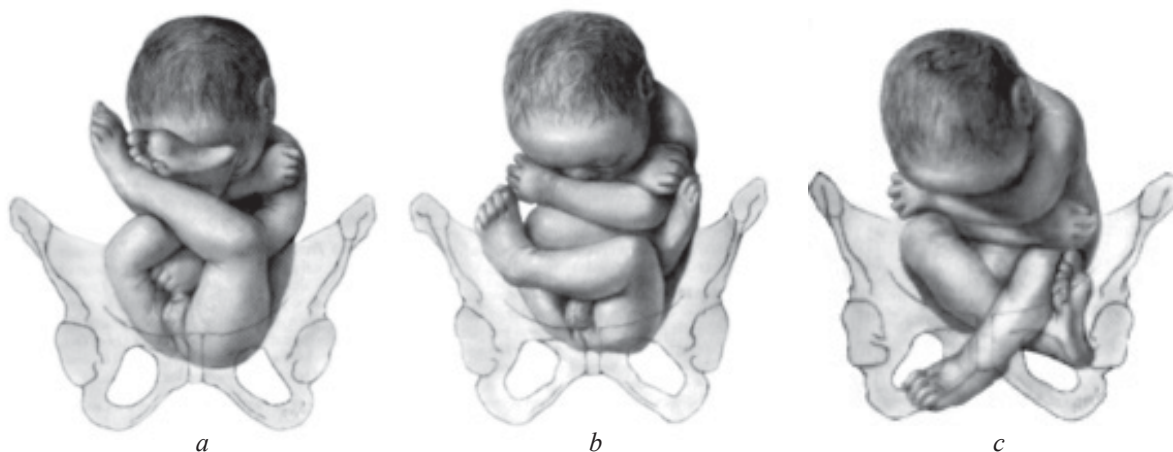


Fig. 56. Pelvic presentation:  
*a* — breech; *b* — complete; *c* — incomplete, or foot

*Attitude* of the fetus is a correlation between the extremities and head of the fetus to its body. Flexed attitude is the normal one: head is bent and pressed to the body, arms are bent in the elbow joints, crossed and pressed to the breast, legs are bent in the knees and hip joints, crossed and pressed to the abdomen.

*Presentation* of the fetus is a correspondence to the plane of the inlet to the pelvis of the part of the fetus which in labour first moves to the pelvis (presenting part of the fetus). If the head enters the pelvis, it is a *cephalic presentation*; if the pelvis of the fetus — *foot presentation*; if legs — *foot presentation*. Cephalic presentation is observed in 96% of the cases, pelvic — in 3.5% of the cases. If the head is bent to the chest (occiput is the presenting part) and engages the pelvis by the region of the minor fontanelle — it is a *vertex presentation* (Fig. 55, *a*). Depending on the different stage of the straightening of the head *presentation of bregma, brow and face* (0.3%) presentations form (Fig. 55, *b–d*).

If only buttocks engage the plane of the inlet to the pelvis, it is a truly pelvic (breech) presentation; if buttocks and legs — *full pelvic presentation*; if legs — *foot (incomplete) pelvic presentation* (Fig. 56, *a, b, c*).

With a truly pelvic presentation legs of the fetus are stretched along the body; the pelvic buttocks are put into in the plane of the pelvic inlet. In the case of complete pelvic presentation legs of the fetus are bent in knees and hip joints, in the plane of the pelvic inlet together with buttocks feet enter (one or both). During the foot presentation the legs are presenting parts. If the one leg presents, the *incomplete foot presentation* is formed, if both — the *complete foot presentation*. *Knee presentation*, when legs bent in the knee joints, is observed very rarely. In labour knee presentation transforms, as a rule, into the foot one.

Oblique and transverse lies of the fetus are observed very seldom (Fig. 57).

Most of the cephalic presentations are related to a piriform structure of the uterus. The head is larger than the buttocks, but the foot pole of the fetus (buttocks and legs) is more volumetric and mobile, that's why it occupies the widest part of the uterus. Pelvic presentation usually occurs as the result of anomaly of the head of the fetus (hydrocephalus), anomalies of development of the uterus, low attachment or placenta previa, hydramnios, preterm labour.

Methods of *external obstetrical examination according to Leopold* (Fig. 58) are used during the palpation of the abdomen for determining the fetus lie in the uterus.

*The first Leopold's method* determines the height of the uterine fundus standing and detects the part of the fetus, which locates in its fundus. The palms of both hands are placed on the uterus from the both sides to clasp its fundus, and fingers turned by the distal phalanges to each other. Palpatory the fetal head differs from the buttocks by the hardness and possibility to ballot.



Fig. 57. Transverse lie of the fetus

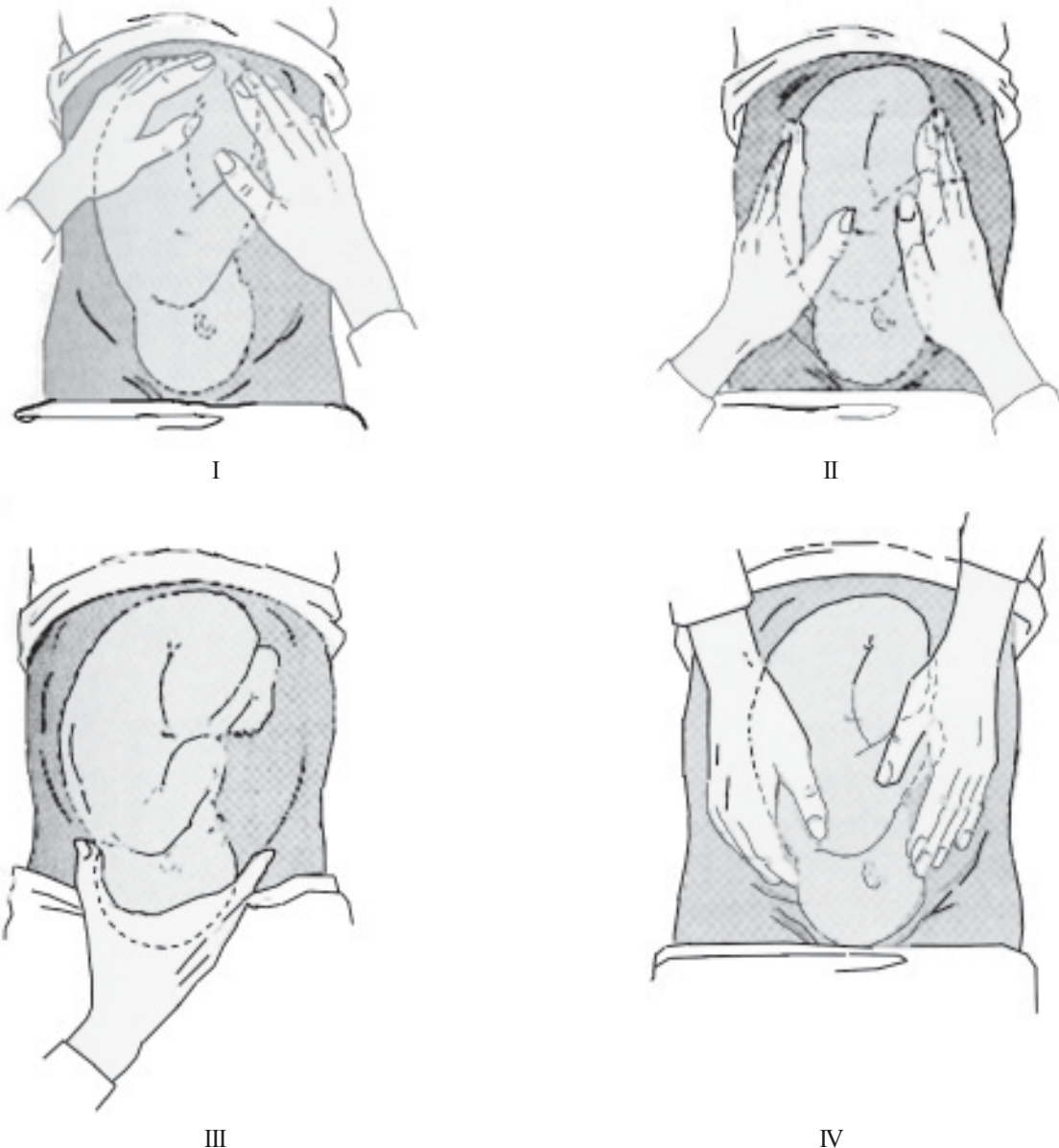


Fig. 58. Methods (I–IV) of the external obstetrical examination according to Leopold

*The second method* detects the lie, position and kind of the fetus according to the location of its back and small parts (usually on the opposite sides). Both hands move from the uterine fundus down till the umbilicus, and place them on the lateral surfaces of the uterus.

*The third method* detects the presenting part of the fetus and its relation to the plane of the pelvic inlet. The right hand clasps the presenting part above the pubic symphysis by such a way, that the thumb locates on one side, the others — on the opposite side of the lower segment of the uterus. For the detection of the mobility of the fetus, slight small pushes provoke its replacement from one side to another (balloting). If the head is presented in the pelvis and in the case of the breech presentation, the balloting is absent.

*The fourth method* detects the descending of the presenting part into the pelvis. If the most protuber-

ant part of the head is palpated, the occiput has not moved down on the level of the ischiac spines. The obstetrician should stand by his face to the legs of the pregnant woman and put his palms from the both sides of the lower segment of the uterus. Fingers of the both hands, turned to the pelvic inlet, penetrate carefully between the presenting part of the fetus and lateral walls of the pelvis. The head can be mobile, pressed to the pelvic inlet or fixated by the minor or major segment. This method determines the angle between the occiput and back of the fetus during straightening presentations.

It is possible to detect an extent of cervical opening by the height of the stand of contractile ring with the help of external palpatory methods.

The Henkel—Vasten's method is used in classical obstetrics for determining the ratio between the sizes of the maternal head and pelvis. Fingers are put on

the pubic symphysis and they glide along the same plane with the fetal head and pubic symphysis or lower down. It means that there is a correspondence between the sizes of the fetal head and mother's pelvis. This method can be done by the other way: the palm of the right hand is put on the pubic symphysis, and the left one — on the head of the fetus. If the plane of the hands in one level, or the hand on the head is lower the hand on the pubic symphysis, there is a correspondence between the head of the fetus and maternal pelvis parameters.

*The head of the mature fetus.* On the head there are: sutures — frontal, saggital, lambdoidal and coronal; fontanels — anterior, posterior and two lateral: sphenoidal (anterolateral) and mastoid (posterolateral). The frontal suture locates between the two frontal bones, the saggital one — between the frontal and parietal bones; lambdoidal — between parietal and vertex bones (Fig. 59, a, b).

*Anterior (major) fontanel* is between the frontal and parietal bones. It is connective tissue plate of a rhomboid form. *Posterior (minor) fontanel* is a triangle-shaped and locates between the parietal and occipital bone.

There are following sizes on the head of the mature fetus:

1) *Direct diameter* (diameter frontooccipitalis) is a distance between the glabella and external vertex tuber, 12 cm; circumference, corresponding to the straight size is 34–35 cm.

2) *Major oblique diameter* (diameter mentooccipitalis) is a distance between the chin and the most far point of the occiput; 13.5 cm. Circumference of the head is 39–41 cm.

3) *Minor oblique diameter* (diameter suboccipito-bregmaticus) is a distance from the subvertex fossa to the anterior fontanel; is equal 9.5 cm; corresponding circumference is 32 cm.

4) *Major transverse diameter* (diameter biparietalis) is a distance between the most distant points of the parietal tubers — 9.5 cm.

5) *Minor transverse diameter* (diameter bitemporalis) is a distance between the most distant points of the coronal suture — 8 cm.

6) *Vertical diameter* (diameter sublinguobregmaticus) is a distance from the middle of the anterior fontanel till the hypoglossal bone, 9.5 cm; the circumference of the head, corresponding to this size is equal 32–33 cm.

7) *Middle oblique diameter* (diameter obliqua) is a distance from the subvertex fossa to the border of the hair part of the forehead, 10 cm; circumference of the head, corresponding to this size is 33 cm.

Transverse diameter of the shoulder gilder (diameter biacromialis) is a distance between the supraacromial processes of the right and left scapula, is equal 12 cm; circumference of the shoulder gilder is 35–36 cm.

**Segments of the head of the fetus.** Before and during labour for the determining of the position of

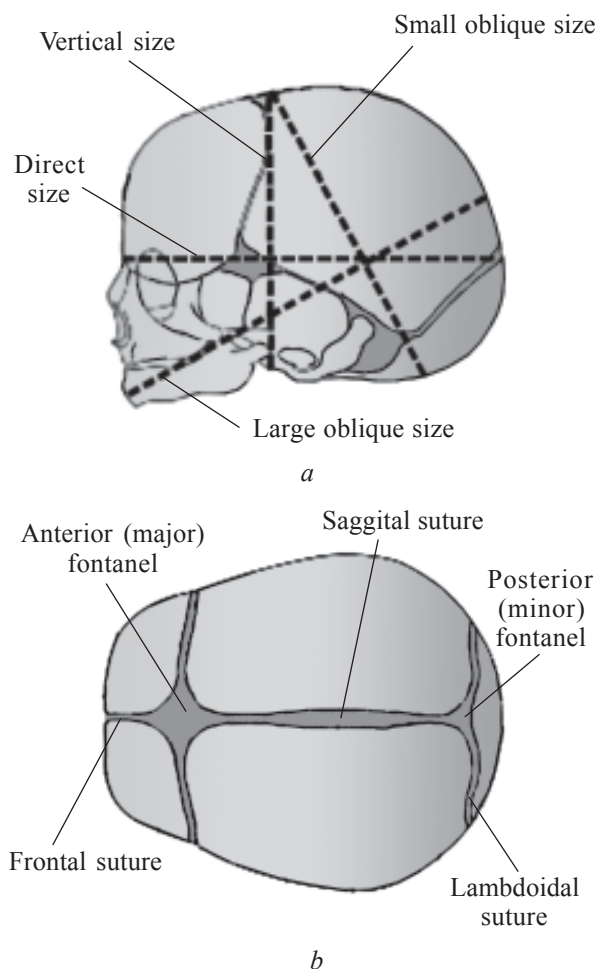


Fig. 59. Main sizes (a), sutures and fontanels of the head (b) of the newborn

the presenting part (the head) in relation to the plane of the pelvis, the concept “segment of the head” is used. *Major segment* of head of the fetus is a circumference of the largest plane of the head by which it passes through the plane of the pelvis during the engagement in the determined moment (according to I. F. Jordania). *Minor segment* is the least circumference of the head which passes through the plane of the pelvic inlet during such entering. Circumference which lays in the plane of the minor oblique diameter is a major segment during the vertex presentation; during the cephalicoanterior — in the plane of the direct diameter; during the brow — in the plane of the large oblique diameter; during the facial — in the plane of the vertical diameter of the head.

**Evaluation of the extent of the head fitting into the pelvic inlet during labour by palpation** is performed with the fourth Leopold's method. If the fingers of the hands can be placed under the head of the fetus and their end touch one another, it locates in the pelvic inlet, if they don't — the head is pressed to its inlet. If the vertex part of the head overhangs the pelvic inlet by 2 cm, and facial part is palpated — the head is put to the pelvis by the minor segment. If the occipital part of the head can not be palpated in the



pelvic inlet, and the facial one protrudes by 2–3 cm above the pelvic inlet, the head is put into the major segment. If the chin is palpated or it is not detected, the head is in the pelvic cavity.

**Internal obstetrical (vaginal) examination** is a necessary part of the obstetrical examination during pregnancy and labour. The examination is executed in the gynaecological chair or bed (a polster is put under the pelvis of the pregnant woman in the latter case) with using sterile gloves. The legs of the patient should be flexed in hip and knee joints and parted. The doctor is on the right. By the thumb and index fingers of the left hand he should part the pudendal lips and open the inlet to the vagina. Then with a cotton ball with disinfecting solution he should wipe the external urethral opening and the vestibule of the vagina. Then the middle finger of the right hand is put into the vagina, pressing the posterior wall of the vagina, then the index finger over it, then both fingers are moved into the vagina. The left hand is taken out. At the I trimester of pregnancy the size, shape and consistence of the uterus are evaluated during the vaginal examination. In the 2nd half of pregnancy and before labour this examination is performed and is written in labour history in the following order:

1. *Examination of the external genitalia.* Before placing the fingers into the vagina attention is paid to the peculiarities of development of the external genitalia, presence of the pathological processes on the vulva (condylomas, ulcers or signs of inflammation), character of the vaginal discharge, condition of the perineum (height, presence of the cicatrices).

2. During the *vaginal examination* they determine:

a) peculiarities of the inlet to the vagina (woman has given birth or has not), width of the vagina (wide, narrow), presence of the septums in it, perineal muscles condition (pelvic floor);

b) cervical condition (form and length: preserved, short, flattened); its consistence: dense, soft; location in relation to the axis of labour canal: centrated, positioned to the front, to the back; opening of the uterine fauces: passage of the cervical canal — for one, two and more fingers; the uterine os' edge condition: thick, thin, extends, does not extend; if the loops of the umbilical cord, tissue of the placenta and small parts of the fetus are detected in the limits of the uterine os;

c) condition of the lower segment of the uterus (thinned, painful);

d) condition of the fetal vesicle (if the finger passes in the cervical canal of the uterus): intact, absent, cut; its condition in labour pains: does it function during labour pains, if it is strained when they are absent; excessively strained, flat, does not function — in the case of oligoamnios;

e) condition of the presenting part (head, buttocks, legs), place of its location in relation to the planes of the pelvis; fontanels, sutures, their location as for the sac-

rum or pubic symphysis. During the transverse or oblique location of the fetus during the vaginal examination a presenting part is not detected, the shoulder of the fetus is palpated above the plane of the pelvic inlet;

f) condition of the pelvic walls, the presence of the bony prominences (exostoses), deformations, character of the internal surface of the pubic symphysis, height of the sacral cavity. Lowering the elbow, doctor tries to reach the promontorium by the middle finger: diagonal conjugate is measured — a distance between the inferior edge of the symphysis and the most outpouching points of the promontorium;

g) nature of the vaginal discharge — amount, colour, smell (a few amount of white mucous discharge in the norm).

After the examination (before the hand is removed) the vagina is washed by the antiseptic solution (furacillin 1:5000, chlorhexidine 0.05% solution).

*Position of the fetal head in the pelvic planes during the vaginal examination* is detected by the level in relation to the interspinal line (linea interspinosa; Fig. 60, a–f)

The head *is above the pelvic inlet*: while careful pressing upwards by the finger the head pushes out and then returns to the same position.

The head *is pressed to the pelvic inlet*: the inferior pole of the head locates by 1.5–2 cm above the interspinal line, sacral cavity is free.

The head *by its minor segment is in the pelvic inlet*: the inferior pole of the head is determined on the level of the interspinal line; sacral cavity is free.

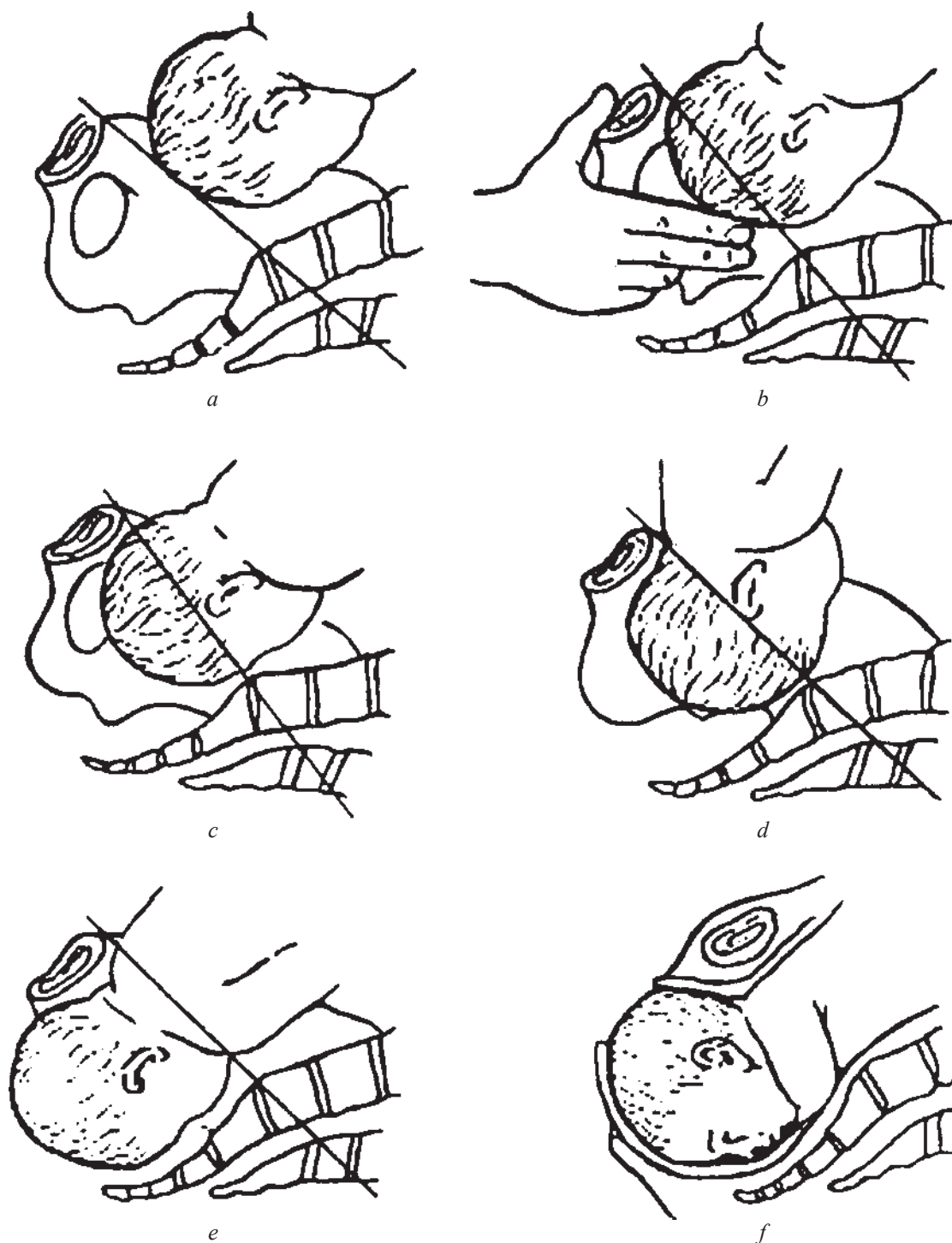
The head *by its major segment is in the pelvic inlet*: inferior pole of the fetal head by 1.5–2 cm under the interspinal line, the head occupies the half of the sacral cavity.

The head *is in the pelvic cavity*: the inferior pole of the fetal head by 2–3 cm above the interspinal line, ischial spines are not detected, the head fully occupies the sacral cavity.

The head *is on the pelvic floor*: the fetal head occupies the whole sacral cavity as well as the region of the coccyx, only soft tissues palpated; internal surfaces of the osseous landmarks are not examined.

**Abdominal auscultation.** Auscultation of the fetus's heart tones is performed in the 2nd half of pregnancy by a special obstetrical stethoscope, a wide part of which placed on the woman's abdomen. Heart tones of the fetus can be muffled because of great thickness of the anterior abdominal wall and hydramnios. The place of the best auscultation of the heart tones depends on the location, presentation, kind and position of the fetus. Often palpitation is auscultated from the back, and in the facial presentation — from the chest of the fetus. During the first position heartbeats are auscultated on the left, with the second one — on the right; with the cephalic presentation — lower the umbilicus, with the pelvic — higher the umbilicus. In labour because of the moving of the presenting part of the fetus and gradual turn of the





*Fig. 60.* Position of the fetal head in the pelvic plane:  
*a* — above the inlet; *b* — pressed to the inlet; *c* — by the minor segment in the inlet;  
*d* — by the major segment in the inlet; *e* — in the pelvic cavity; *f* — in the pelvic outlet

back to the front, the place of the best auscultation changes. If the head is on the pelvic floor or in the pelvic cavity — palpitation is better heard in the region of mons pubis. If there are twins, two foci of the palpitation are heard.

During the auscultation of the abdomen of a pregnant and parturient woman in 10–15% of cases the murmur of the umbilical cord, which has the fetal heart rate, is heard. The “uterine murmur” can be

heard in 90% of the cases; it appears in enlarged uterine vessels (usually at the place of placental location) in the 2nd half of pregnancy and in labour, its rate coincides with the mother’s pulse.

As the result of the rapid pulse of the parturient woman or bradycardia of the fetus a necessity to differentiate palpitation of the fetus from pulsations of the abdominal part of aorta of the mother may arise. If the pregnant woman holds breath after deep inha-

lation, the pulse slows and heart rate of the fetus does not change.

The heart rate of the mature fetus in the norm is 120–160 beats per a minute. Movements of the fetus increase the heart rate — spontaneous accelerations. The heart rate of the fetus is usually counted during 30–60 s. During labour pains palpitation can slow (decelerations of heart rate because of the short disturbance of the utero-placental blood circulation) with further continuing in the pauses between labour pains. If the heart rate does not continue during the whole pause between labour pains, it is an evidence of as-

phyxia (hypoxia) of the fetus. Cardiotocography (see chapter 11) is a modern objective method of estimation of the condition of the fetus during pregnancy and in labour. Electro- and phonocardiography are not widely spread.

#### RECOMMENDED READING

3 (99–104); 5 (15–36); 7 (353–359); 22; 26 (22–38); 56; 61 (37–67).

## Chapter 11

# METHODS OF ANTE- AND INTRANATAL EXAMINATION OF THE FETUS CONDITION

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Improving of the methods of functional examination of the condition of the fetus during pregnancy and in labour to greater degree contributed to the successes of the modern perinatology.

The main aims of perinatal examination are the preventing of the fetal death and perinatal lethality, preventing the iatrogenic preterm labour.

Methods of examination of the condition of the fetus and their interpretation depend on the factors of risk of pregnancy and gestational age of the fetus. Mistake in determining the term of pregnancy by the Naegele's formula can be 25%, during the US at the I trimester — 4–5 days, US up to the 20th week of pregnancy — 10 days.

Indications to the antenatal examination of the condition of the fetus at the III trimester are the following: suspicion at IUGR of the fetus, maternal diabetes mellitus, preeclampsy, stillborn in anamnesis for undetected reasons, overterm pregnancy, Rh-immunization, chronic extragenital pathology of the mother, decrease in movements of the fetus, which a pregnant woman feels.

**Determination of the fetus movements** by a pregnant woman is a subjective method, which does not have an independent significance. However, it can give necessary information about the condition of the fetus and necessity of using more informative methods for its examination.

The decrease in the movements to 10 and less than for 12 h is considered to be pathological. Weakening of the fetal movements can feel 5–10% of the pregnant women. If the proper means for objective examination are not taken, the fetus dies in 10–30% of the cases. During the further objective examination of the condition of the fetus as the result of the decrease in its movements (cardiotocography, biophysical profile, dopplerometry) the disturbance of its condition is diagnosed in 40–70% of the cases. The count of the movements of the fetus can be the screening method of the detection of its normal condition, but for the detection of pathological condition of the fetus it is necessary to use complex of objective methods.

**Ultrasound diagnosis.** Method of *ultrasound scan (US, echography, sonography)* is one of the most informative and safe methods of examination. The method is based on the ability of ultrasound to reflect from the surface of two separated mediums with different wave resistance. Ultrasound sensitive elements transform the electromagnetic energy in the oscillation of the still medium, as well as receive an echosignal, reflected from the surface of the organs, wall of the vessel or border between tissues and structural organs with different acoustic impedance.

Frequency of ultrasound waves, which emit by a probe, is 1,000 oscillation per 1 second. A probe is a source and a receiver of the ultrasound waves at the same time: every thousand fraction of a second it receives the reflected signals and generates the oscillations (impulse regimen). Ultrasound appliance, which works in real time (B-scanning) and provided by grey scale, is the most spread thanks to the high quality of obtained information. B-scanning is performed with the line, sector and convex probes. They can give the 2-dimension picture with a high permitting ability.

Modern ultrasound appliances can have special sets for the dopplerometric examination of blood circulation in the heart and vessels of the fetus with receiving of the colour two- and three-dimension picture.

Both transabdominal and transvaginal US, which depends on the term of pregnancy and purpose of examination, are used in obstetrics.

Three screening ultrasound examinations are recommended to perform during pregnancy:

1) at the I trimester (during the first visit to the women's consultation clinics) for the detection of location of the fetal ovum and its anomalies, multiple pregnancy, peculiarities of the anatomical structure of the uterus;

2) during the period of 16–24 weeks of pregnancy for the determining of the rates of development of the fetus, its correspondence to the term of pregnancy, detection of the possible developmental anomalies of the fetus for the in-time using of the methods of prenatal diagnosis and correction or abortion;

3) within the term of 32–36 weeks of pregnancy for the determining of the rates of development of the fetus, correspondence to the term of pregnancy, location, presentation of the fetus, location and structure of the placenta.

Normal course of pregnancy *at the I trimester* is confirmed with US while imaging the fetal ovum and embryo. US is performed with a filled (but not overfilled) urinary bladder of the pregnant woman (forming of the acoustic window). If the urinary bladder is overfilled, compression and flattening of the fetal ovum are possible.

Hypoechogenous ovoid mass with hyperechogenous contours because of the rejecting (decidual) membrane and trophoblast 3–5 mm in diameter is detected in uterus. Saggital and transverse diameters and average diameter of the fetal ovum are measured. Mistake in counting pregnancy term can be 4–5 days.

The rate of a weekly growth of the fetal ovum at the I trimester is 0.7 cm. In 5 weeks fetal ovum occupies 25% of the uterine volume, in 6 weeks — 35%, its diameter is 18 mm. The embryo (5 mm in length) and its heart activity identify in this period. Absence of imaging the heartbeat in such an embryo can be the sign of a missed abortion. If the internal diameter of the fetal ovum is 18 mm, the coccygo-parietal diameter of the embryo is 8.5 mm, and the head is 1/2 of its length. An embryo grows 1 mm a day.

In 8 weeks of pregnancy the fetal ovum occupies 35% of the uterine volume, embryo and its heart activity are clearly identified. The chorion looks like a hyperechogenous thickening of the fetal ovum. The yolk sac, a cystic mass, which attaches to the embryo is not determined after 11 weeks.

At the term of 10 weeks of pregnancy the fetal ovum occupies the whole cavity of the uterus. The head, body and extremities of the fetus can be identified. The placenta is detected by its falciform shape, echogenity and imaging of the place of attachment of the umbilical cord. The amnion joins with the chorion on the 12th week.

The coccygo-parietal size of the embryo (diameter of the long axis) is the most correct fetometric criterion (mistake is  $\pm 3$ –4 days) at the period from 8–12 week of pregnancy. 3 measurings are performed and their average number is counted.

US *at the II and the III trimesters* is represented by ultrasound biometry of the fetus (fetometry), placentography, quantitative and qualitative estimation of the amniotic fluid, identification and measuring of the fetal structures.

**Ultrasound fetometry.** *Biparietal diameter (BPD) and frontooccipital (FOD) diameters* of the fetal head, on the base of which it is possible to determine the circumference of the fetal head (CH) are detected in the profile of the *fetal head* in the place of the best imaging of the middle structures of the

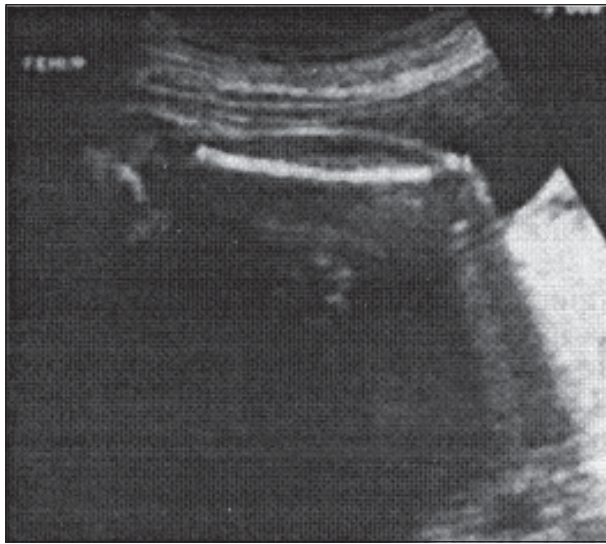
brain (M-echo) after the 12th week of pregnancy. Biparietal diameter is determined on the level of thalamus (triangular form) and transparent septum (rectangular form). At the II trimester biparietal size is the most informative criterion for the determining of gestation of the fetus (mistake is  $\pm 2$  mm). After the 26th week of pregnancy as the result of variability of the diameters of the fetal head biparietal size is not a correct criterion for the detection of gestation of the fetus.

*Average diameter of the abdomen (DA) and circumference of the abdomen (CA)* are detected in the transverse profile of the *abdomen*, on the level of the inlet of the umbilical vein in the liver (perpendicularly to the vertebral column of the fetus). The correlation of the circumference (CH) of the head with circumference of the abdomen at different terms of pregnancy is counted for observing the process of the abdomen growth. The ratio CN/CA is maximal (1.29) at the 12th week of pregnancy, then decreases till 1 nearly the 36th week and becomes less than 1 after the 37th week. The decrease in these meanings can occur as the result of micro- and anencephaly, enlargement of the fetus' abdomen (ascites, hydronephrosis, ileus, diabetes mellitus); the increase is the sign of asymmetric form of IUGR of the fetus, chromosomal anomalies (triploidy), intercranial cyst or tumor, diaphragmal hernia (abdomen, liver and intestine locate in the thoracic cavity). Serial changes of the circumference of the abdomen are performed when IUGR of the fetus is suspected, diabetes mellitus of mother, erythroblastosis of fetus, formations in the abdominal cavity of the fetus (cysts, ileus).

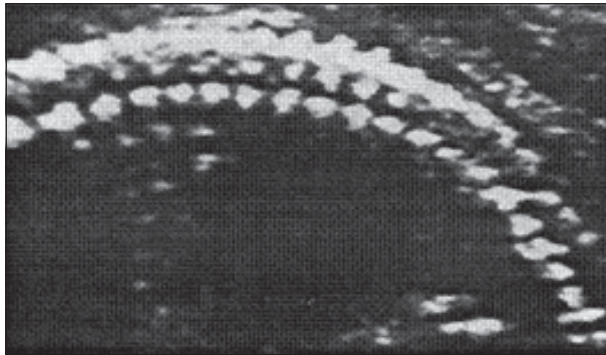
*Stomach* imaging is of C-form structure, filled with fluid, located caudally in relation to the heart of the fetus. Sometimes *intestinal loops* are observed in a healthy fetus. Meconium can be in the intestine with a full-term pregnancy, which can intensify its echogenity. The *liver* fills the superior part of the abdominal cavity and contains multiple vascular structures. The *umbilical vein* in transverse cut of the abdomen is rectangular and does not visualize completely. Interhepatic part of the umbilical vein should be equal with 1/3 of the abdomen. The *kidneys* in the transverse cut locate lower the liver after the 15th week of pregnancy (during the transvaginal examination — after the 12th week) and are two round formings of the average echogenity, which locate from the both sides of the vertebral column. The *urinary bladder* is a cavell mass filled with the fluid, located in the pelvic cavity. Imaging of the urinary bladder is important for the detection of the kidneys' function. If the shadow of the urinary bladder can not be detected, the repeated examination should be performed in 30–40 min.

*Extremities of the fetus.* The quantity of the extremities, their movements are detected, length of the hip bone is measured (Fig. 61, a).





a



b

Fig. 61. Echogram of the fetus:  
a — hip bone; b — vertebral column

The length of the hip bone and humerus of the fetus, as a rule, is the same till the 22nd week of pregnancy. The term of pregnancy (mistake is  $\pm 14$  days) is detected by the length of the hip bone at the III trimester.

**Umbilical cord.** At the II–III trimesters of pregnancy in its transverse profile 2 arteries and 1 vein are seen. Diameter of the vein is considerably larger than the diameter of the arteries.

**Vertebral column** of the fetus during the longitudinal scanning is detected as two parallel lines (lateroposterior laminae) with inconsiderable enlargement in the cervical and moderate narrowing in the sacral part (Fig. 61, b). Corpuses of the vertebrae are identified after the 14th week of pregnancy. As the result of meningocele the parallelism of the lines disturbs or the hernial forming of round shape, which outpouches through the dorsal surface of the vertebral column, is visualized. During the transverse scanning round isolated vertebrae without flattening of the lateroposterior parts are detected. The vertebral column images better when using the sector probe.

**Chest of the fetus.** The position of the heart and heart rate of the fetus are detected. In the period of

16–24 weeks of pregnancy a short-term decrease in the heart rate of the fetus up to 60–80 beats per min is observed. Lungs of the fetus are filled with liquor and do not function, that's why their echogenicity is compared with the one of the liver and spleen. There are 3 degrees of the echographic maturity of the fetus: I — echogenicity of the lungs is less than the echogenicity of the liver; II — echogenicity of the lungs and liver is the same; III — echogenicity of the lungs is greater than the liver's one (mature lungs). Respiratory movements of the fetus are the short-term extension and narrowing of the chest and diaphragmal movements. Hiccup-like movements differ from the respiratory ones by lower frequency, greater strength and irregularity.

**Amniotic fluid.** Subjective determining of the amount of amniotic fluid is performed by a specialist with a visual observing during careful longitudinal and transverse scanning. *Index of amniotic fluid (IAF)* is used for the objective estimation. It is estimated by way of dividing the uterus into the quadrants with two perpendicular lines: transverse — on the level of umbilicus of the pregnant woman, longitudinal — on the white line of the abdomen (Fig. 62) and total of the values, which were received by measuring of largest vertical column in each quadrant.

The amount of the amniotic fluid gradually increases; the index of the amniotic fluid becomes maximal in 24–26 weeks of pregnancy (the mistaken diagnosis of hydramnios can be made), and then gradually decreases. In 36 weeks of pregnancy the amount

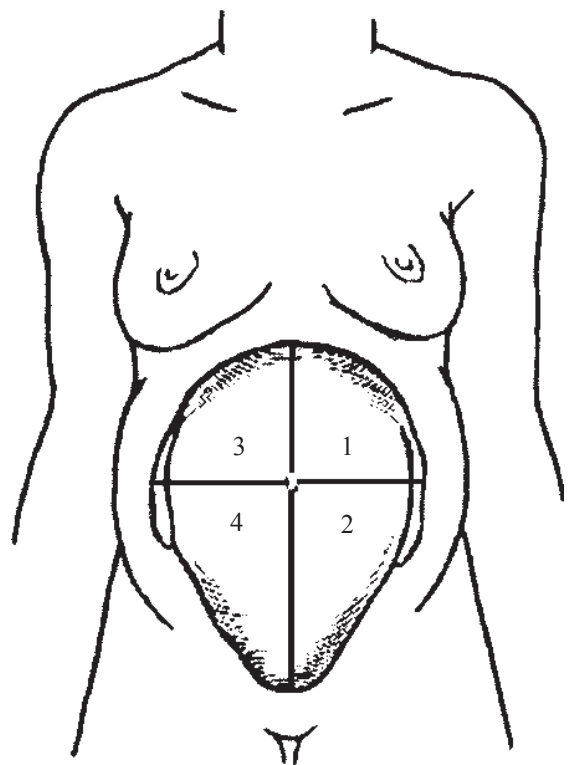


Fig. 62. Quadrants of the uterus (1–4) for the determining of the index of amniotic fluid

of the amniotic fluid is nearly 1 l. *Hydramnios* is the increase in the amount of the amniotic fluid more than 2 l, *olygoamnios* — a volume less than 1 l.

With *olygoamnios* the vertical diameter from the anterior uterine wall to the posterior one is less than 2 cm, and with *hydramnios* — more than 8 cm. If the amount of the fluid is normal, the vertical diameter of the column of amniotic fluid is 2–8 cm. *Olygoamnios* can accompany by the following pathological conditions of the fetus: IUGR, developmental defects of the urogenital tract, over-term pregnancy, rupture of the fetal membranes. *Hydramnios* can accompany the developmental defects of the nervous system (anencephalus, hydrocephalus, encephalocoele), the digestive tract (gastroschizis, omphalocele, esophago-tracheal fistulas, atresy of the duodenum), respiratory tract (hypoplasia of the lungs, chilo thorax).

**US of the placenta** (placentometry) reveals its location, thickness and degree of maturity. Location of the placenta is determined from the 9th week of pregnancy, the distance between the placental margin and internal fauces is measured (more than 5 cm in the norm). If the placenta locates on the anterior wall of the uterus, it is more possible for it to “lift” during pregnancy, if on the posterior wall — it’ll never migrate in the case of presentation. The final evaluations concerning the level of the position of the lower margin should be made at the end of pregnancy.

During US of the placenta its 3 parts are examined: chorial plate, parenchyma, separating (decidual) membrane. Thickness of the placenta is no more than 4 cm. If its thickness is more than 4 cm, such conditions as diabetes mellitus in the mother, syphilis, erythroblastosis or unimmune edema of the fetus, chromosomal anomalies should be excluded.

There are 4 stages of the *placental maturity* according to US data:

1) stage 0 — placental structure is homogenous, chorial plate is even; basal layer is not identified; such condition is typical for the II trimester of pregnancy.

2) stage I (determined from the 26th week of pregnancy) — individual hyperechogenous zones appear in the placental tissue, chorial plate becomes fibrous, basal layer is identified;

3) stage II (begins with the 32nd week) — waviness of the chorial plate increases. However, its excavations do not reach the basal layer; numerous small hyperechogenous inclusions appear, in the parenchyma — evenly located echogenous zones;

4) stage III (typical for a full-term pregnancy) — waviness of the chorial plate is promoted, excavations of which reach the basal layer, as the result of which placenta on the sonogram has a lobular structure; hypoechogenous space is visualized in the middle of each lobe. Signs of the III stage of the placental maturity are the evidences of the preterm maturation of the placenta, which is the one of the signs of placental insufficiency.

**Biophysical profile of the fetus (BPF)** is a complex estimation of the condition of the fetus with cardiotocography and four biophysical indices, estimated by ultrasound scan:

1) respiratory movements (not less than 1 movement lasts 30 s during 1 min);

2) movements of the fetal body (not less than 3 during 30 min);

3) tonus of the fetus (1 episode of the movements of the extremities from flexion to extension with the return to the primary — flexed position);

4) amount of the amniotic fluid (column of amniotic fluid free from the parts of the fetus and umbilical cord, height not less than 2 cm in two interperpendicular projections in the greater part of the uterine cavity is imaging in the norm).

Sometimes the fifth index is used — maturity of the placenta. Each index is estimated by two-pointed system (norm — 2 points, pathology — 0 points). If *olygoamnios* is absent, the mark in 8–10 points is an evidence of the normal condition of the fetus, 6–7 points — biophysical profile of the fetus is suspicious (chronic hypoxia of the fetus is possible and test should be done within nearest 24 h), less than 6 points — the test witnesses about the hypoxia of the fetus, an immediate repeating of the non-stress test (NST) or biophysical profile of the fetus is required. If the results do not improve, the elective delivery is necessary. If *olygoamnios* is present (if it is not connected with preterm rupture of the fetal membranes), any points of biophysical profile of the fetus is an immediate indication to delivery.

Progressive suppression of all biophysical functions of the fetus appears as the result of hypoxia. During **acute hypoxia** the indices of the fetus activity disturb in such consequence:

1) respiratory movements stop at first;

2) non-stress test of cardiotocogram becomes irreactive;

3) movements of the fetus stop, i. e. its motor activity disappears.

4) tonus of the fetus disappears the last.

The volume of the amniotic fluid decreases because of the **chronic hypoxia** of the fetus in some weeks or months.

The advantage of biophysical profile of the fetus (BPF) as compared to NST is the low frequency of the false negative results, as well as a possibility of its using at the beginning of the III trimester of pregnancy.

**Dopplerometric detection of the blood flow.** Doppler’s effect is based on the change of the wave’s length of the back-scattered radiation depending on the speed of the object’s moving according to the source of the wave radiation. Appliances, which work in the regimen of pulsating or constant Doppler’s wave, are used for the detection of the blood flow in the vessels of the pelvic cavity of a pregnant woman (external iliac, uterine arteries) and fetus (carotid, medi-

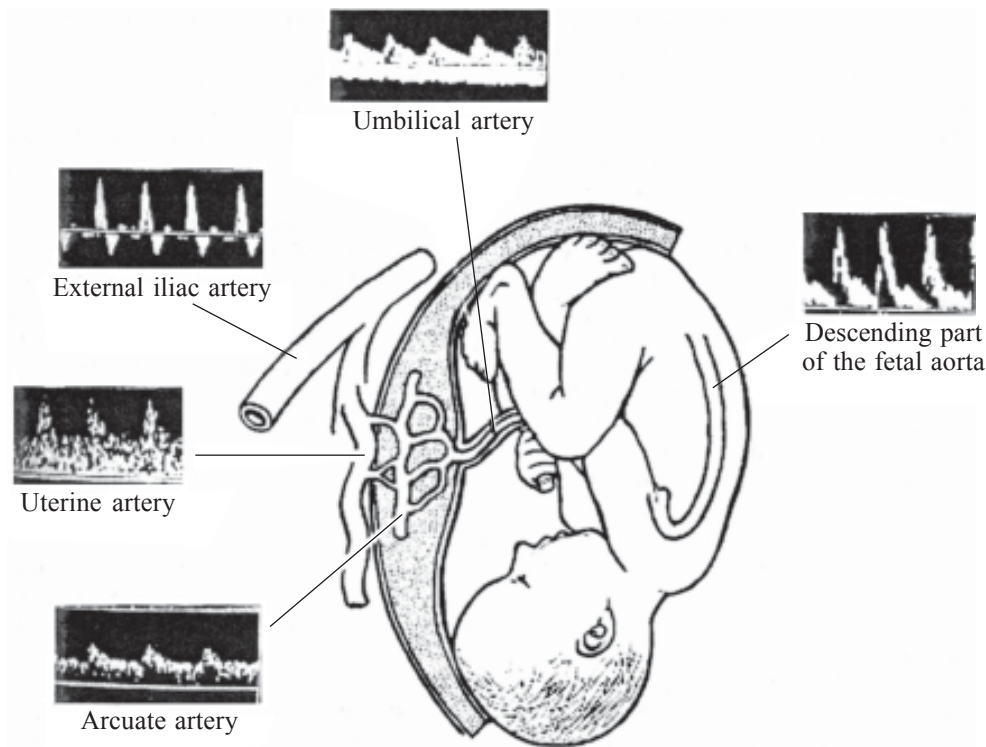


Fig. 63. Dopplerograms during a physiological pregnancy

um meningeal, umbilical arteries, descending part of the aorta; Fig. 63).

*Physiological fundamentals of dopplerometry.* Forming of the main structure of placenta completes till the 4th month of pregnancy. Lacunas of completely developed placenta contain 150 ml of blood of a pregnant woman, which is renewed 3–4 times a minute. The general square of the chorion's villi is 14 m<sup>2</sup>, which provides the proper level of exchange between the pregnant woman and the fetus. Speed of the uterine flow increases from 50 ml/min at the beginning of pregnancy up to 500–700 ml/min before labour.

During a physiological pregnancy the speed of diastolic blood flow gradually elevates. If pregnancy is complicated, walls of the arcuate arteries become less than elastic as the result of atheromatous changes, blood flow is impeded, blood supply of the intervillous lacuna disturbs. Pathological changes in placenta (insufficient quantity of the vessels) and IUGR of the fetus are observed in the cases, when diastolic blood flow does not increase while progressing pregnancy.

There are qualitative and quantitative methods of estimation of dopplerograms of the blood flow. The quantitative method has the most important significance for the clinical practice — determining the correlation between the blood velocity in the different phases of the cardiac cycle. *Maximal systolic blood velocity* is determined by the pump function of the heart of the fetus and volume of the arterial vessels. *The final diastolic blood velocity* reflects the resist-

ance of the peripheral vascular stream. *Systolic-diastolic correlation* is the ratio of the maximal systolic blood velocity to the final diastolic blood velocity. *Pulsating index* is a ratio of the difference between the maximal systolic and final diastolic blood velocity to the average blood velocity. *Index of resistance* is a ratio of the difference between the maximal systolic and final diastolic to the maximal systolic blood velocity. Each vessel has its own curve of the blood flow (Fig. 64).

Absence of the blood flow during the diastole, reverse blood flow (zero or negative meanings of the diastolic blood flow or appearing of excavation on the curvature at the end of the systole) — are the indicators for the urgent obstetrical intervention to

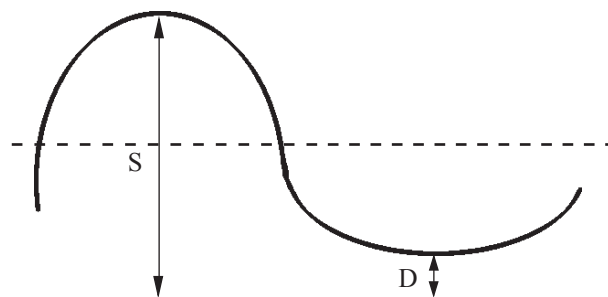


Fig. 64. Schematic picture of systolic (S) and diastolic (D) waves of dopplerogram;

S/D — systolo-diastolic correlation; index of resistance —  $IR = (S - D)/S$ ;

pulsating index —  $PI = (S - D)/\text{average blood velocity}$



rescue the fetus. As the result of the increased vascular resistance, which appears in the placenta, such a promoted reverse pressure during the diastole occurs in the blood flow of the umbilical cord, that blood stream of the fetus to the placenta stops and can perform the other way (from placenta to the fetus).

Under condition of arterial hypertension of the pregnant woman absence of the diastolic blood flow in the uterine artery can be the result of the vascular spasm.

Pathological curvatures of velocities in the umbilical artery are accompanied in the majority cases by hypoxia of the fetus in labour or complications in neonatal period; in 60–80% of the cases during IUGR of the fetus as the result of the placental insufficiency or mother's arterial hypertension.

Dopplerometry gives a possibility to diagnose the arrhythmia of the fetus, discordant development of the twins (syndrome of the reverse arterial perfusion in twins with vascular anastomoses of the placenta).

If the results of dopplerometry are normal, examinations are performed every month.

One of the last achievements is creation systems, which combine 2-dimension echoimpulse information and colour information in relation to blood velocity in examined organs (*colour dopplerometry*). Blood streams, turned to the different ways in relation to the probe, are coloured differently: to the element — red colour, from the element — blue colour; green colour means the turbulent stream of the blood. This method is necessary for prenatal diagnosis of devel-

opmental defects of the heart, detection of the peculiarities of the structure of the arteries of the fetus (identification of the renal arteries, arterial — Villisium's circle — in the brain during the severe forms of IUGR, accompanied by the centralization of the blood circulation); diagnosis of the vascular disturbances and detachment of the placenta; reverse arterial perfusion in discordant twins; the umbilical cord winding around the body parts.

The determining of the content of  $\alpha$ -fetoprotein in the blood serum of the mother is performed in the period of 15–18 weeks of pregnancy.

This test is performed for the prenatal diagnosis of developmental defects of the fetus (neural tube, gastrointestinal system, etc.), Dawn's disease, especially in women over 35 years old.

Determining of the levels of the *fetoplacental complex hormones* in the blood serum of the mother (chorionic gonadotrophin, placental lactogen, estriol, PH) and their metabolites in the urine can be the evidence of the placental insufficiency (HCG, PL, PH, E<sub>3</sub>) and worsening of the condition of the fetus (E<sub>3</sub>), if the decrease in these levels more than 50% occurs during the serial examinations. Prognostic estimation of these tests increases in the case of their using along with the other methods of estimation of the condition of the fetus.

Examination of the *acid-base condition of the blood of the skin of the fetal head* in labour determines the condition of acidosis, is an evidence of hypoxia. If pH of the blood is 7.25, the condition of

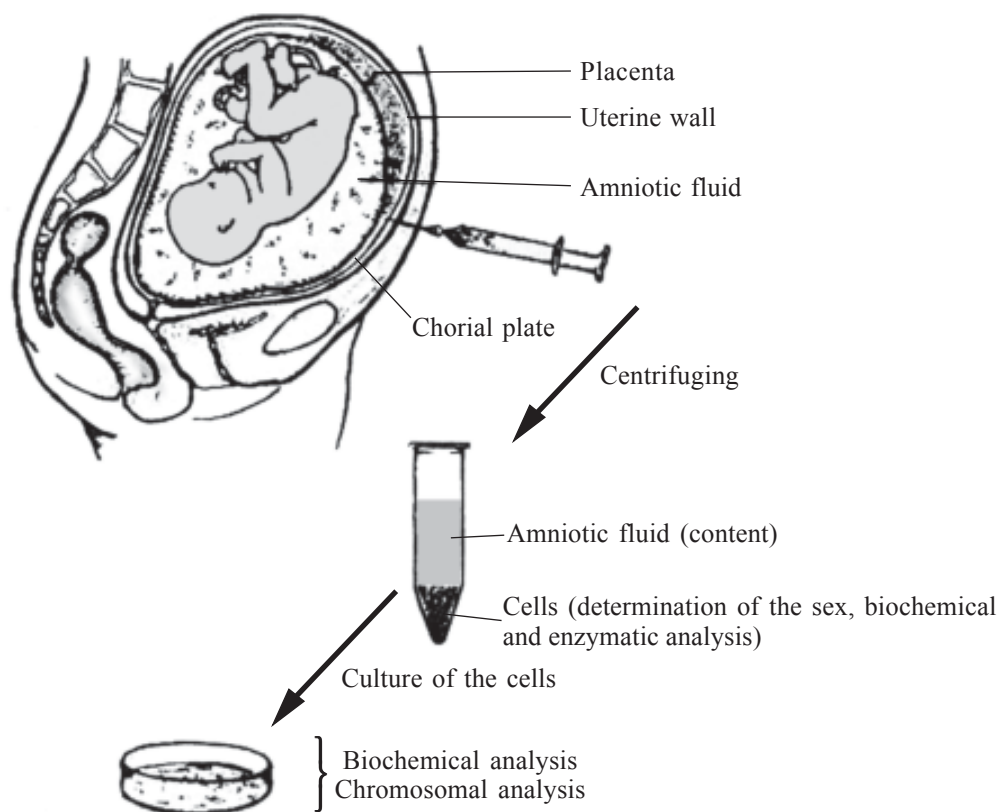


Fig. 65. Transabdominal amniocentesis



the fetus is normal;  $\text{pH} > 7.25$  — subcompensated acidosis is diagnosed (preacidosis);  $\text{pH} < 7.2$  — decompensated acidosis.

**Invasive methods.** *Amnioscopy* is an examination of the inferior pole of the fetal vesicle by optic appliance — amnioscope, which is placed in the cervical canal till the level of internal fauces. Amnioscopy can be done at the end of pregnancy if the cervical canal of the uterus is opened properly. The decrease in the amount of amniotic fluid and presence of the meconium in it are the signs of hypoxia. Rupture of the fetal membranes, bleeding and beginning of labour activity can be the complications of the procedure.

*Amniocentesis* is a puncture of the amniotic cavity for aspiration of the amniotic fluid (see Fig. 45; Fig. 65).

Transabdominal method of amniocentesis under the ultrasound control is the most spread method (see Fig. 45, b)

Puncture is done in the place of the largest excavation of the amniotic fluid, free from the fetal parts, umbilical cord and placenta. 10–20 ml of the amniotic fluid are aspirated for the diagnosis of the genetic diseases, enzymopathias (during the 14th–16th week); determination of the bilirubin's concentration (with haemolytic disease); detection of the level of phospholipids, lecithin and sphingomyelin (especially with the maternal diabetes mellitus), correlation of which is an evidence of the maturity of the fetal lungs (if the correlation lecithin/sphingomyelin  $> 2$ , the surfactant system of the fetus is mature; if  $< 1.5$  — there is a significant risk of the appearing of the respiratory distress-syndrome in the newborn).

Complications of amniocentesis; preterm rupture of the fetal membranes, miscarriage, preterm labour, bleeding, infection, injury of the mother's organs (intestine, urinary bladder), fetus and placenta.

*Fetoscopy* is a visual examination of the fetus with endoscopic appliance for sampling the skin, the liver, determination of the disturbance of the fetus development, cystic and tumor-like masses for prenatal diagnosis.

*Cordocentesis* is a puncture of the umbilical cord vessels for taking in the fetal blood, as well as injection of drugs in connection with Rh-immunization and hypoxia of the fetus. Transabdominal punctional cordocentesis, performed under ultrasound control, is the main method of the blood taking. Procedure is performed at the II–III trimesters of pregnancy. Bleeding is the main complication.

*Aspiration of the urine* as the result of obstruction of the urinary ducts of fetus — the puncture of the urinary bladder or renal pelvises for taking the urine for determination of the functional condition of the kidneys, as well as for solving the question about the possibility of the antenatal surgical correction.

*Biopsy of the chorion and blastocyst* are the methods of the early prenatal diagnosis of the hereditary diseases.

**Cardiotocography of the fetus.** Electric monitoring of the fetus heart rate, or *cardiotocography*, was introduced in obstetrical practice in 60-s of the XX century. The method was created as screening test for early diagnosis of hypoxia of the fetus for the in-time obstetrical intervention and prophylaxis of the hypoxia-induced neurologic injuries and death of the fetus. Last decades physiological foundations of the change of heart rhythm have been intensively studied, ways of interpretation of the parameters of cardiotocography (CTG) have been improved and recommendations for the observing of the pregnant women with anomalous heart rate of the fetus have been elaborated. Despite of a number of investigations devoted to his problem the agreement in the determining the main positions as for the fetal monitoring is not attained. Especially this concerns the conditions, as the result of which the fetus is in great danger, which requires an immediate delivery. It is necessary to remember that features of the heart rate of the fetus depend on its gestational age, biological rhythms, condition of the mother and influence of drugs.

The sense of the cardiotocography is in registration and estimation of the heart rate of the fetus and their deviations within a certain period of time and under different conditions (labour pains, movements of the fetus, influence of the drugs, etc.).

The appliance for the registration of CTG — cardiotocograph — has 2 canals of registration: for monitoring of the heart rate of the fetus and contractile activity of the uterus. Cardiotocograph measures the period of time between two consequent heart cycles of the fetus and automatically transforms this number to the heart rate of the fetus, which is registered on the strip of the cardiotocograph.

During *the external monitoring* (external CTG) for registration of the heart rate of the fetus ultrasound probe is used, which is fixed to the anterior abdominal wall of a pregnant woman. When performing *the internal monitoring* (internal CTG) unipolar spiral electrode is injected into the skin of the head or of the buttocks of the fetus, and the second one is fixed on the mother's hip. A contractile ability of the uterus (labour pains) when using the external method is registered by tensometric probe, located on the anterior abdominal wall, and when performing of the internal method — by using of special plastic catheter, which is put in the amniotic cavity above the presenting part of the fetus for measuring true intrauterine pressure. The possibility of receiving correct quantitative characteristics of labour pains and cardiac activity of the fetus without the restrictions of the pregnant woman movements is an advantage of the internal monitoring. Disadvantages of the method: technical complexity, risk of infection, possibility of the using only after the rupture of the amniotic membranes and dilation of the cervix not less than 1 cm.

Record of the heart activity of the fetus and contractile function of the uterus is performed during 20–60 min on the tape, which moves with the speed 1–3 cm/min. A pregnant woman should be in a half-sitted position or on the left side (for the prophylaxis of the syndrome of v. cava inferior). Each 10 min of monitoring ABP of the mother, who during the record of CTG observes the movements of the fetus, is measured.

The complete characteristics of heart rate monitoring (cardiotocogram) should contain quantitative and qualitative characteristics:

- *basal heart rate* (basal rhythm);
- *variability of the basal rhythm* (is formed from the immediate frequency, estimated by the computer systems and oscillations — slower oscillations, which are characterized by amplitude and frequency);
- *changeability of the basal rhythm* (presence of the episodic — spontaneous, related to the motor or respiratory activity of the fetus, and periodic ones, related to labour pains, accelerations and decelerations);
- *temporal changes of the heart rate.*

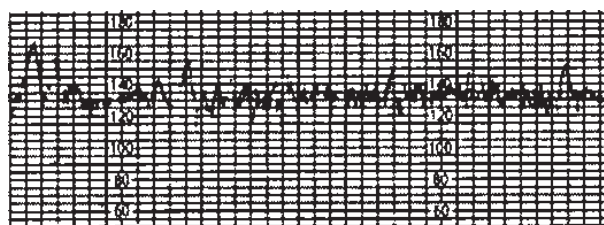
*Basal heart rate* (basal rhythm) is an average heart rate of the fetus (with oscillation 5 per 1 min) during a 10-minute interval, except the periodic and episodic changes (accelerations, decelerations), as well as periods of the significant variability of the rhythm (>25 per 1 min). Basal heart rate is counted in any 10-minute interval during not less than 2 min; in the other case the heart rate is undetected.

*Immediate frequency* or short-term oscillations of the heart rate “from beat to beat” — is the heart rate, which corresponds to the time interval between the two consequent beats of the heart; it is estimated with the computer systems.

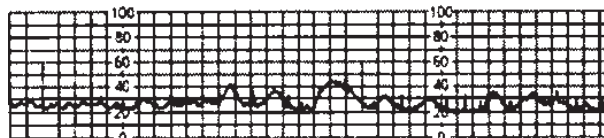
*Oscillations* (slow fluctuations) are characterized by the amplitude and frequency. *Amplitude* (width of the record) is counted as a difference between the maximal and minimal number of the heart rate during 1 min and expressed in beats (per a minute). *Frequency* is an amount of the crossings of the line, which is drawn through the middle of oscillations, during a minute.

Variability of the basal heart rate of the fetus is fluctuations of the basal heart rate. Such fluctuations are irregular by their amplitude and frequency and are visually detected as changes of the amplitude “from beat to beat”. They count the cardiac rhythm variability (amplitude and frequency) every minute during a certain interval of time and determine its average meaning. There are 4 types of the heart rate variability depending on the amplitude of oscillations:

- 1) *absence of variability* — changes of amplitude are not detected;
- 2) *minimal variability* — oscillations of the heart rate with the change of amplitude is less than 5 per minute;
- 3) *moderate variability* — amplitude of the heart rate is 6–25 per a minute (Fig. 66, a);



a



b

Fig. 66. Types of fetus heart rate variability: a — moderate; b — sinusoid rhythm

4) *considerable variability* — oscillations of the heart rate is over 25 per a minute.

The sinusoid rhythm is determined separately — the repeating of wave-like oscillations of the straight form with equal amplitude (Fig. 66, b).

Changeability of the basal heart rate is connected with acceleration and deceleration. *Acceleration* is a short elevation of the heart rate of the fetus in relation to the basal frequency with amplitude  $\geq 15$  beats per minute in the time interval 15 s — 2 min (from the beginning to the coming back of the basal frequency). Till the 32nd week of pregnancy elevation of the heart rate  $\geq 10$  per minute during  $\geq 10$  s is considered to be the acceleration. The prognosed acceleration is the one which lasts  $\geq 2$  and  $< 10$  min. The acceleration which lasts more than 10 min is considered to be the change of the heart rate.

*Deceleration* is a slowing of the heart rate in relation to the basal heart rate, related to the uterine contractions. There are such types of deceleration: early, late and variable. Early deceleration of the basal heart rate begins progressively (from the beginning to its lowest rate  $> 30$  s) and reflects the form of the uterine contractions: starts simultaneously with labour pain, the lowest level of the heart rate corresponds with the maximum of the uterine contraction; deceleration finishes with the uterine contraction. Early decelerations (Fig. 67, a) as a rule connected with the increase in the intracranial pressure in response to the compression of the fetal head and irritation of n. vagus. Sometimes early decelerations can be evidence of the umbilical cord.

*Late deceleration of the basal heart rate* also starts progressively. However, is late to the beginning of the uterine contraction. Minimal values of the heart rate (in 30 s) are observed after the peak activity of the uterus. The heart rate restores with a delay — after a labour pain stops (Fig. 67, b).

Late deceleration in the majority of cases related to hypoxia and acidosis of the fetus as the result of insufficiency of the utero-placental blood circulation.

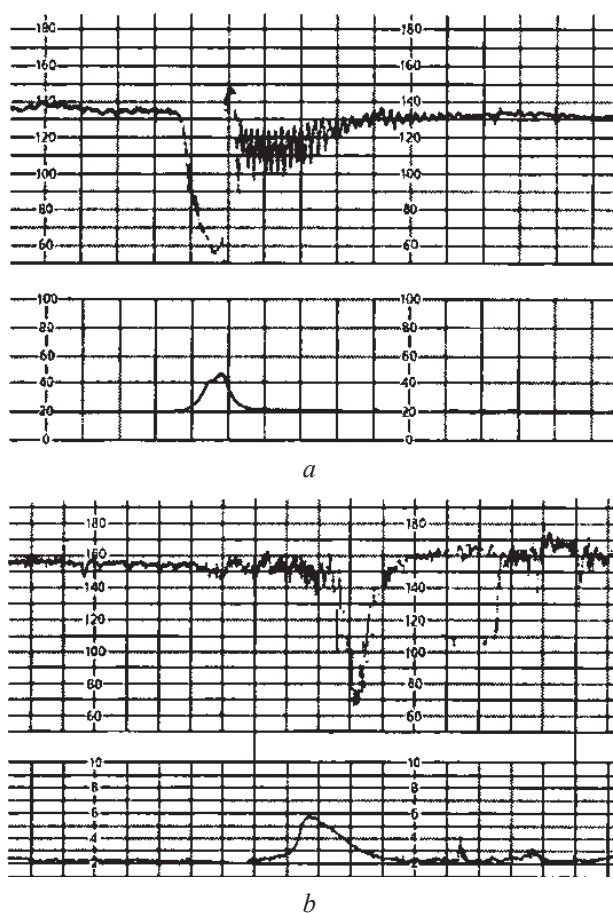


Fig. 67. Decelerations:  
*a* — early; *b* — late (superior curvature is heart rate of the fetus, inferior — labour pains of the parturient woman)

Tachycardia may develop as the result of disturbance of the condition of the fetus between the late decelerations.

Variable deceleration is characterized by a sudden decrease in the heart rate of the fetus in relation to the uterine contraction, which appears at any time,

as well as by duration from the beginning of deceleration till the minimal heart rate  $< 30$  s.

This type of deceleration is related to compression of the umbilical cord. The decrease in the heart rate lower than the basal rate occurs more than by 15 in 1 min during  $\geq 15$  s and  $< 2$  min from the beginning till the return to the basal heart rate. Form, duration, time of the beginning and finishing of the variable deceleration can not repeat in one and the same pregnant woman. In the case of the variable deceleration a pregnant woman should change her position.

*Prolonged decelerations* characterized by the decrease in the basal heart rate  $> 15$  per minute, last  $> 2$  min, but  $< 10$  min from the beginning up to return to the basal level. Prolonged decelerations which last more than 10 min are considered to be the changes of basal frequency.

All types of decelerations characterized by the depth of decrease in the heart rate according to the basal level in beats per a minute (except transitional electron artifacts). Their length is counted in seconds and minutes from the beginning till the end of deceleration. Decelerations are considered to be persistent if they accompany more than 50% of uterine contractions during any 20-minute segment.

*Clinical interpretation of cardiocotogram.* Oscillations of the basal heart rate is physiological within the limits of 110–160 per minute; decrease in the basal heart rate  $< 110$  per 1 minute is bradycardia,  $< 100$  per minute — expressed bradycardia; elevation of the basal heart rate  $> 160$  per 1 minute — tachycardia;  $> 180$  per 1 minute — expressed tachycardia. Injection of reserpin, raunatin,  $\beta$ -adrenoblockers to the pregnant woman and presence in pregnant woman of bradycardia can cause bradycardia of the fetus; tachycardia can be caused by injection of  $\beta$ -adrenomimetics, atrophin and fever (Table 8).

Tachycardia of the fetus which is not accompanied by decelerations can be related both with tachycardia of pregnancy and be the symptom of fetal hy-

Table 8. Prognostic meaning of the basal heart rate of the fetus

Heart rate of the fetus	Condition
Tachycardia ( $>160$ per 1 minute during $>10$ min)	Fever of the pregnant woman (infection) Infection of the fetus Thyreotoxicosis of the pregnant woman Anemia of the pregnant woman Tachyarrhythmia of the fetus Injection to the pregnant woman of anticholinergic preparations (atrophin) or $\beta_2$ -sympathomimetics Immaturity of the fetus Hypoxia of the fetus
Normal rhythm 120 (110) — 160 per 1 minute	Normal function of the fetoplacental complex
Bradycardia $< 110$ per minute during $> 10$ min	Severe hypoxia of the fetus Injection to the pregnant woman of $\beta_2$ -adrenoblockers Congenital block of the heart of the fetus



poxia. Tachycardia during II stage of labour is sometimes accompanied by acidosis of the fetus. Moderate bradycardia without decelerations is not always the evidence of fetus hypoxia and can appear during the posterior kind of vertex presentation in connection with reaction of n. vagus on persisting compression of the fetal head.

Variability is estimated as physiological one during the amplitude of oscillations 5–25 per 1 minute and their frequency 3–6 per one minute. Physiological base of variability is in influence of sympathetic and parasympathetic innervation on the heart of a mature fetus. Decrease in variability and especially its absence (“dumb rhythm”) are always the evidences of hypoxia, which aggravates the prognosis of the fetus. It was detected that under the condition of preserving of variability of the heart rate acidosis of the fetus is absent. Periods of “sleep” in fetus, and using by the pregnant woman of pain-relief and sedative drugs, magnesium sulphate and atrophin sulphate can cause the decrease in variability of the basal heart rate of the fetus.

Periods of significant variability of heart rate with amplitude less than 25 per 1 minute (saltator rhythm) are connected with compression of the umbilical cord and disturbance of the umbilical blood circulation. Sinusoid rhythm of CTG can be the indicator of perilous condition of the fetus (severe anaemia, edema) or the result of using of strong analgesics, which requires the additional examinations of the condition of the fetus with the help of other methods (pH of blood, biophysical profile and other).

Sporadic (spontaneous) accelerations as response to the fetus movements are the base for examination of the condition of fetus by *non-stress test* (NST). Screening NST is performed during 20 min. External monitoring and tocodynamometry are used simultaneously. The fetus is more active in 1–2 h after the pregnant woman’s feeding, and because of this it is an ideal time for performing NST. It is considered that accelerations of the heart rate >10 in 1 min independently from their number and length are the indicators of the normal condition of fetus. Presence of 2 accelerations during 20 min is considered to be a favorable prognostic sign and is evidence about the absence of the fetal hypoxia (*reactive non-stress test*). The record of NST should be technically qualitative (without artifacts). As the result of unsatisfactory record of the heart rate during 20 min, it is prolonged by 20 min more. If the record of CTG during 40 min is unsatisfactory, it is performed at another time the same day. If the accelerations are absent during 40 min, UST is negative (irreactive).

In this case the record is performed during another 40 min. The absence of accelerations during 80–90 min is a severe sign. During irreactive non-stress test its repeating is required in 24 h or the performing of the contractile stress (oxytocin test). *Test with acoustic stimulation* (stimulation of the fetus with

an artificial pharynx) is recommended to perform for the decrease in false positive results of non-stress test (absence of decelerations and accelerations during the fetal sleep). Palpation the fetal head, sounds, injecting of the concentrated solution of the glucose contribute to the appearing of accelerations. Prolonged accelerations can be a response to the movements of the fetus as the result of elevation of the tonus of sympathetic nervous system. The presence of accelerations (reactive non-stress test), as a rule, is an indicator of the normal condition of the fetus within the 1st week, if the mother’s condition does not aggravate.

**Contractile stress test (CST)** is based on the simultaneous registration during the external monitoring of the heart rate of the fetus with using of ultrasound and tocographic mechanic probes for determination of the uterine activity. The procedure is executed during 15–20 min. ABP of the pregnant woman is measured each 10 min. If during 10 min 3 uterine contractions by 40–60 s occur, a real estimation of CST can be performed. When a spontaneous uterine activity is absent, *oxytocin test* is performed: intravenous infusion of oxytocin with speed of 0.5 mU/min; the speed of infusion of oxytocin is increased each 15–20 min, and keeps on until reaching the frequency of the uterine contractions of 3 per 10 min when they last for 40–60 s.

*Test with mammary stimulation* is a modification of the oxytocin test (for the reducing of the risk of hyperstimulation of the uterus): uterine contractions as a response to the tactile stimulation of the nipples of the mammary glands in connection with reflector excretion of oxytocin by neurohypophysis.

It is necessary to remember about contraindications using of the stress tests (threat of preterm labour, placenta previa, hydramnios, rupture of the fetal membranes, preterm labour in anamnesis, cicatrix on the uterus).

*Positive CST* is characterized by persisting late decelerations of the heart rate in response to the uterine contractions. If not less than 3 labour pains per 10 min not less than 40 s each do not cause late decelerations, CST is *negative*. During CST performing the possibility of uterine hyperstimulation should be taken into consideration: if the uterine contractions appear in 2 min and last more than 90 s, or constant hypertonus of the uterus is present, the late decelerations will not be the indicators of the disturbance of the utero-placental blood circulation.

The spontaneous variable decelerations which appearing during the non-stress test or contractile stress test are connected with olygoamnois and possible compression of the umbilical cord. Prolonged and severe decelerations (heart rate < 90 per minute or by 40 per minute is less than the basal heart rate) independently on their type (early, late, variable), are accompanied by the high risk of the intranatal hypoxia of the fetus and unfavourable neurological conse-



quences in the newborn. Negative non-stress test as well as the positive contractile stress test is an evidence of severe disturbances of the fetus condition.

They consider that the reflector process is in the base of early decelerations, that's why they are not connected with the gas metabolism of the fetus. Late decelerations are the sign of the disturbance of the uteroplacental blood circulation and fetal hypoxia. The unfavourable prognostic signs of variable decelerations are the following: slow restoration of the basal heart rate; absence of the oscillations of the heart rate during the period of bradycardia; absence of acceleration of the heart rate of the fetus before the decelerations; long period of compensatory tachycardia after bradycardia; the restoring of the heart rate of the fetus till the level lower the initial; repeating of the episodes of prolong bradycardia.

For standardization of the parameters of the cardiotocogram different scales of estimation of the condition of the fetus were presented, on example Fischer and co-authors' score, etc.

Each indicator is estimated from 0 to 2 points by Fischer's score. 8–10 points correspond to the normal condition of the fetus; 5–7 points — to compensated hypoxia; less than 5 points — to decompensated one.

Modern appliances for monitoring the heart rate of the fetus perform the computer estimation of cardiotocograms. However, this do not exclude a necessity of visual investigation of the heart rhythm.

#### *Interpretation of the intranatal cardiotocogram.*

Standardized modern recommendations for intranatal estimation of the heart rate of the fetus contain the necessary determination of the following indices and their combinations:

- appearing of decelerations and bradycardia;
- determination of the decelerations type;
- quantitative characteristics of the depth and duration of decelerations and bradycardia;
- quantitative estimation of accelerations;
- quantitative estimation of variability.

In the majority of cases the absence of the pathological changes of the heart rate (normal basal frequency, the presence of accelerations, absence of decelerations) is accompanied by favorable perinatal consequences. The indicators of severe hypoxia, risk of neurologic and other complications and possible

death of the fetus are the persistent late or variable decelerations, promoted bradycardia during the absence of variability of the heart rate. However, there are literature data on the cardiac arrest and death of the fetus without any changes of its heart rate. That's why for improvement of prognostic estimation of the results of cardiotocography the following supplementary examinations are recommended to perform:

- determination of the gases in the blood and metabolic acidosis;

- other accessory investigations (tests with stimulation, pulse oxymetry, index of cardiac function, dopplerometry of the blood flow; metabolism of the fetus; magnetic-resonance spectroscopy, positron emission tomographic scanning);

- estimation of the newborn by Apgar's score;

- neurologic examination, presence of paroxysms, disturbances of the muscular tonus;

- detection of the anomalies (of the heart, vessels, lungs, kidneys, coagulation system, liver), etc.

Examination of blood pH of the fetus is not a screening method of the estimation of its condition. However, it is used in doubtful results of cardiotocogram. Value of pH < 7.25 is an evidence of preacidosis; < 7.2 — of acidosis and severe hypoxia of the fetus.

During top meanings of pH it is recommended to repeat tests each 20–30 min. Acidemia of the fetus is not always the evidence of its hypoxia when the maternal acidosis.

Labour are the stress test for the fetus: with each labour pain the providing by oxygenated mother's blood through the placenta to the fetus is reduced, which in 5–10% of the cases is accompanied by its hypoxia. Causes of the intranatal hypoxia of the fetus are divided into three groups (Table 10):

- 1) related to insufficiency of the utero-placental blood circulation;

- 2) caused by the compression of the umbilical cord;

- 3) induced by the condition of the fetus.

There are no strict criteria concerning a necessity and interpretation of the intranatal cardiotocogram, the majority of the investigators recommend to perform constant monitoring of the heart rate of the fetus during labour in such cases:

Table 9. Main characteristics of cardiotocogram by Fischer's score

Main parameters of the heart rate	Points		
	0	1	2
Basal rate, per 1 min	Less than 100 More than 180	100–120 160–180	120–160
Amplitude of the heart rate	< 5 < 3	5–10 3–6	10–30 > 6
Accelerations	Absent	Periodic	Spontaneous
Decelerations	Late, unfavourable, variable	Variable	Absent

Table 10. **Main causes of intranatal hypoxia of the fetus**

Insufficiency of the utero-placental blood circulation	Compression of the umbilical cord	Disturbance of the condition of the fetus
Overterm pregnancy	Umbilical cord twisting around the fetus	Immaturity Overmaturity
Growth restriction of the fetus	Long or short umbilical cord	Congenital developmental defects
Hyperstimulation of the uterus	Prolapse of the umbilical cord	Growth restriction of the fetus
Separation of the placenta	Nodes of the umbilical cord	Chorioamnionitis, sepsis
Placenta previa	Oligoamnios	
Accreted placenta	Anomal location of the umbilical cord vessels	
Rh-immunization		
Edema of the placenta		
Diabetes mellitus		
Edema of the fetus		

— disturbance of the heart rate of the fetus, detected by auscultation;

— dyeing of the amniotic fluid by meconium;

— stimulation of labour by oxytocin;

— labour through the natural maternal passages after the previous labour by caesarean section;

— complications in the pregnant woman which are accompanied by disturbance of the utero-placental blood circulation, arterial hypertension, diabetes mellitus, bleedings, preterm or overterm pregnancy, growth restriction of the fetus, haemolytic disease, anomalies of presentation, stillborns in amnion).

**Iatrogenic causes of the fetal hypoxia.** In the position of the pregnant woman on her back arterial hypotension, which is accompanied by the decrease in the utero-placental blood circulation, appears in 10% of cases. The position of the pregnant woman on the side contributes to the deviation of the uterus from the main vessels, which prevents arterial hypotension and improves oxygenation of the fetus. As the result of the oxytocin injection hyperstimulation of the uterus and its incomplete relaxation after labour pain is possible, which is accompanied by deterioration of the blood supply of the fetus and its hypoxia. While performing peridural anesthesia for preventing arterial hypotension and disturbance of utero-placental blood circulation as the result of the block of sympathetic nervous system a pregnant woman is recommended to perform infusive therapy in the lateral position.

**Intrauterine reanimation.** Intranatal hypoxia (distress of the fetus) in some cases requires an urgent delivery (caesarean section, obstetrical forceps). As usual, the doctor has enough time to perform intrauterine reanimation. The main means of correction of intranatal hypoxia of the fetus are following:

— *improving of the uterine and utero-placental blood circulation* (position of the pregnant woman on the side, frequent change of the position, knee-elbow position, Trendelenburg's position; intravenous

injection of isotonic solution of sodium chloride or Ringer—Lock solution; stop of the oxytocin injection; tocolysis by spasmolytic or  $\beta$ -adrenomimetic medicines);

— *improving of oxygenation of the fetus* (oxygenotherapy);

— *amnioinfusion* (injection of the warm isotonic solution of sodium chloride in amniotic cavity for the decrease in the compression of the umbilical cord).

**Diagnosis of the intrauterine death of the fetus.** Discrepancy between the uterine sizes and the term of pregnancy during the dynamic doctor's observing is a sign of ceased pregnancy on early terms. US reveals: "empty" fetal ovum (anembryony) and its degenerative changes (deformation, discrepancy between the diameter of the fetal ovum and the term of pregnancy); absence of the signs of viability of the embryo (palpitations, movements); discrepancy between the sizes and the term of pregnancy.

In the 2nd half of pregnancy, especially before labour, the pregnant woman can feel weakening, and then disappearing of the fetus movements. Growth of the uterus stops, palpitation of the fetus is not auscultated, mammary glands begin to produce milk except of colostrum; the pregnant woman complains of weakness. Absence of the heart activity is confirmed by cardiotocography and ultrasound.

Ultrasound diagnosis of intrauterine death of the fetus is based on the following data: absence of heart activity, enlargement of the cardiac chambers, signs of autolysis of the internal organs, deformation of skull bones, changes of brain structures, oligoamnios.

Long-lasting dead fetus in the uterus can cause accumulation of the tissue thromboplastin, which can cause the development of obstetrical thrombohemorrhagic syndrome and coagulopathic bleeding in labour.

#### RECOMMENDED READING

7; 8; 9; 22; 29 (28–45); 43 (8–48); 47; 49; 54; 55; 56; 61.

### CAUSES OF LABOUR ACTIVITY BEGINNING

Labour is a complex physiological process, which consists in expulsion of a viable fetus and elements of its membranes from the uterine cavity. There are 3 phases of the labour process: 1) preparing of the uterus to labour (“maturation” of the cervix, increasing of the frequency and intensity of the uterine contractions and its stimulation); 2) labour — coordinated spontaneous effective uterine contractions, which lead to the progressive smoothing and dilation of the cervix, moving and birth of the fetus and its membranes; 3) after-birth contractions and involution of the uterus.

Mechanism of initiation of labour is not completely determined. Neurohumoral and hormonal systems of a pregnant woman, the fetoplacental complex, biophysical and morphological mechanisms play an important role in the development of labour activity.

At the end of pregnancy and at the beginning of labour the processes of inhibition in the cortex of the brain and increase in the stimulation of subcortical structures (hypothalamo-hypophysial system, limbic complex) and spinal cord predominate in a woman. The base of *labour dominant*, which is characterized by intensification of reactions on interoceptive stimuli on the cervix and weakening or absence of reactions on exteroceptive stimuli, which is a necessary condition for the uncomplicated course of labour, forms in a pregnant woman.

The uterus has sympathetic, or adrenergic (corpus), and parasympathetic, or cholinergic (cervix) innervation.  $\alpha$ - And  $\beta$ -adrenoreceptors predominate in the corpus uteri, m-cholinoreceptors and d-serotoninoreceptors — in the inferior segment, chemo-, mechano- and baroreceptors — in the cervix. Activation of  $\alpha$ -adrenoreceptors is performed by oestrogens, catecholamines, prostaglandins, oxytocin, serotonin, histamin, kinins and other biologically active substances of tonomotor effect, the level of which increases in the blood serum of the mother before labour.  $\beta$ -Adrenoreceptors perform the opposite effect on the

myometrium (decrease in the tonus, stimulation and contractile activity of the uterus) and are effected by the influence of progesterone.

During last 2 weeks before labour the level of oestrogens elevates and level of progesterone reduces in the mother’s blood (delay of the progesterone block of myometrium). The reduce of the progesterone production leads to activation of the spontaneous uterine activity.

*Oestrogens* cause the increase in the noradrenaline level in the blood, which forms from the dopamin by neurohormones — endorphins. Endorphins (opium-like substances) released by the nervous cells of the brain and increase the tolerance to the pain (endogenous anesthesia) in labour. The increase in the muscular and connective tissues of myometrium, increase in the glycogen’s synthesis, macroergs (ATP), sensitization of the uterus to the substances of tonomotor effect occur under the influence of oestrogens. Changing the permeability of the cellular membrane for the kalium, natrium and calcium ions, they change the content of electrolytes in the myometrium. Under the influence of oestrogens the concentration of the kalium ions in cells increases, membrane potential of the immobility changes and the sensitivity of the myometrium’s cells to the stimulus elevates. Through the system of nucleonic acids oestrogens activate synthesis of contractile protein of the myometrium — actomyosin, catecholamines, activate the cholinergic system, suppress the activity of oxytocinase and monoaminoxidase, which destroy oxytocin, serotonin and catecholamines.

Alternate stimulation of adreno- and cholinoreceptors on the membranes of the myometrium causes the contraction of the longitudinally located fibers of the corpus uteri and active relaxation of the circulatory fibers of the inferior uterine segment, which provides moderate smoothing and dilation of the cervix, contributing to the moving of the fetus by the labour canal.

The elevation of the *hydrocortisone* level in the blood of the mother and fetus before labour contribute to the increase in the oestrogen content.

*Progesterone* elevates the membrane potential, blocks the transport of natrium ions, and stabilizes

the cellular membrane. The mechanism of the myometrium relaxation by progesterone is caused by its hyperpolarized effect on the cellular membranes, which leads to the inhibition of the penetration of the impulses of stimulation from one muscular cell to another one.

The decrease in the progesterone level in the blood can prevent the uterine contractions. Using of pharmacologic inhibitors of progesterone (mifepristone, RU-486) leads to the miscarriage or increase in the endometrium sensitivity to uterotonics. However, the prescription of progesterone for prophylaxis or stop of the preterm labour is not effective.

*Oxytocin* is a nonapeptide, which is synthesized by supraoptic (n. supraopticus) and paraventricular (n. paraventriculares) nuclei of hypothalamus, and then transported by axons to the posterior lobe of hypophysis. It was discovered in 1909 and from 1911 is used in practical obstetrics for stimulation of labour activity. The elevation of the oestrogens concentration contributes to the increase in the quantity of oxytocin receptors in the myometrium.

Oxytocin stimulates  $\alpha$ -adrenoreceptors of the corpus uteri and suppresses  $\beta$ -adrenoreceptors, activity of cholinesterase, increases the excitability of the cellular membrane, contribute to the accumulation of acetylcholine, which is a synergist of oxytocin.

Catecholamines are the mediators of the nervous system, elevate the contractile ability of the uterus, stimulating  $\alpha$ - and inhibiting  $\beta$ -adrenoreceptors of the myometrium.

*Melatonin*, which is produced by pineal body (epiphysis) by the acetylating of serotonin, is an antagonist of the latter and suppresses the motor function of the uterus. Intensive synthesis of melatonin at night and less — during the day is a characteristic feature of the cyclic changes of its secretion. Release of melatonin the day before labour sharply decreases, which stimulates activation of serotonin and oxytocin.

Hypophysial-adrenal system of the fetus also participates in the development of labour activity. Synthesis of corticotrophin by the anterior lobe of hypophysis of the fetus, which stimulates synthesis of dihydroepiandrosterone (DHEA) by adrenal glands, elevates before labour. DHEA in the liver of the fetus hydroxylates, penetrates through the umbilical cord in the placenta and there transforms into estriol. Oestrogens are synthesized also in adrenal glands and liver of the fetus. The increase in secretion of hydrocortisone by the adrenal glands of the fetus contributes to its transforming in the liver in the forerunners of oestrogens, which transform into oestrogens in the placenta.

Vasopressin, which is produced in the hypothalamus and accumulated by the hypophysis of the fetus, influences like the mother's oxytocin.

Modern hypotheses consider the *prostaglandins* to be the predominating factors, which contribute to the increase in the contractile activity of the uterus

and beginning of labour. It is considered that synthesis of prostaglandins is activated by steroid hormones, in particular oestrogens. The forerunners of the synthesis of prostaglandins are the phospholipids of amnion and chorion and free fatty acids (on example, arachidonic), which produced by the myometrium and separating (decidual) membrane of the uterus. Prostaglandins initiate labour activity, causing depolarization of membranes of the myometrium cells and release of the bound calcium. Prostaglandins also stimulate the secretion of oxytocin by the posterior lobe of hypophysis and contribute to inactivation of progesterone.

Prostaglandin  $E_2$  ( $PGE_2$ ) is synthesized predominantly by amnion, prostaglandin  $F_2\alpha$  ( $PGF_2\alpha$ ) — by a vascular layer of the myometrium and separating (decidual) membrane. Receptors to prostaglandin  $E_2$  are contained in the cervix, and to prostaglandin  $F_2\alpha$  — in the corpus uteri, which explains the different mechanisms of their biological effect;  $PGE_2$  contributes to the “maturation” of the cervix and is used for the antenatal preparation of “immature” cervix;  $PGF_2\alpha$  causes the contractions of the fundus and corpus uteri and it is used for labour stimulation if the “mature” cervix or for stimulation of labour activity.

The elevation of intracellular concentrations of *calcium ions* in the cells of smooth muscles is a final stage of initiation of the uterine contractions. Relaxation of the myometrium takes place as the result of ATP-dependent translocation of calcium in depot of sarcoplasmic reticulum.

*Bradykinin* is a vasoactive kinin, which contributes to the change of the permeability of membranes of the myometrium, stimulates  $\alpha$ -adrenoreceptors and blocks  $\alpha$ -adrenoreceptors, expands capillaries and arterioles, decrease ABP and increases the local blood velocity.

At the end of pregnancy the content of contractile protein *actomyosine*, which lyses ATP with release of energy, necessary for the supply of the contractile function of the uterus, increases. Oxygen-dependent enzymes of penthosophosphate catabolism of carbohydrates in erythrocytes and thermostable acid phosphatase in the blood serum play a considerable role in this process.

*Vitamins of group B and ascorbic acid* participate in the metabolism of carbohydrates, redox reactions, contribute to the accumulation of glycogen in myometrium, potentiate oestrogens acetylcholine and oxytocin effect.

All mentioned above neurohumoral and endocrine changes, which occur in an organism of a pregnant woman before labour, form labour dominant, which provides the beginning and physiological course of labour.

Any cells of the myometrium are able to generate stimulation in the case of the reduction of membranous potential. But the driver of the rhythm — a pacemaker — is a group of the cells, located in the region



of the uterine fundus closer to its right horn, in which stimulation appears in the first place and then spreads to the whole uterus.

## DEFINITION OF A PREGNANT WOMAN'S ORGANISM READINESS TO LABOUR

During last 1.5–2 weeks of pregnancy preparatory antenatal changes, mostly expressed in the genitalia, take place in a woman's organism. That's why the readiness of the organism to labour is determined by the structural changes of the cervix (indicators of its "maturity"). Among the accessory methods cytological examination of the vaginal smears, oxytocin non-stress and mammary test should be mentioned.

The corpus and cervix, two parts of one organ, undergo different changes during pregnancy and in labour, their coordination and synchronization provide favorable consequences for mother and fetus. The myometrium of the corpus uteri stretches during pregnancy, while the cervix stays closed. In labour the cervix becomes softer, smoothes, opens, and the fundus of the uterus actively constricts and contributes to the moving of the fetus through the labour passages. The corpus uteri has 3 main structural components: muscular membrane, collagenous and connective tissue. Main substance of collagenous connective tissue contains glycosaminoglycans. The volume of the smooth muscles in the cervix is 6–25%, and they do not play a considerable role in the process of "maturation" of the cervix. "Maturity" of the cervix increases as the result of the reduction of collagen and protein concentrations in it. During pregnancy muscular tissue substitutes by the connective one in the cervix. Young collagen fibers with high hydrophilicity and elasticity form. The increase in concentration of glycosaminoglycans starts from the vaginal part of the cervix and spreads to the internal fauces, which "maturates" the last.

Complex estimation of the "maturity" of the cervix is performed by the vaginal examination of a pregnant woman. It contains the following indicators: consistence of the cervix, length of the vaginal part of the canal of the cervix, degree of passage of the canal, thickness of the cervical walls, condition of the lower segment of the uterus, location of the cervix as for the pelvic axis. There are 4 degrees of the "maturity" of the uterus (by G. G. Hetchinashvili): "immature", "maturing", "incompletely mature" and mature.

In the USA and Western Europe for the estimation of the cervix point Bishop's score is used. If the mark is 0–2 points — the cervix is immature, 3–4 points — "incompletely mature" and 5–8 points — "mature".

Intensification of the cervical "maturation" occurs when injecting oestrogens (in many countries oestrogens are not used because of their low effectiveness and side effects) and prostaglandins (prostenon, cerviprost) as an intracervical (0.5 mg) or intravaginal (5 mg) gel.

*Oxytocin test (Smith's test)* is based on the determination of the minimal dose of oxytocin, able to cause contractions of the myometrium after intravenous injection. 1 U (0.2 ml) of oxytocine is added to 100 ml of isotonic solution of natrium chloride or 5% solution of glucose. It means that 1 ml of solution contains 0.01 U of oxytocine. A pregnant woman (in the position on her back or on the side) 5 ml of this solution is injected (1 ml during 1 min) in the ulnar vein and observe till the appearing of the first uterine contraction (with palpation or tocography). The test is positive (labour occurs within nearest 24–48 h), if the first uterine contraction takes place during 3 min after the injection of oxytocin.

*Mammary test (Lysovska's test)* is based on oxytocine release by the posterior lobe of hypophysis as the result of irritation of the receptors of the nipple and areola of the mammary gland. In a pregnant woman, who lies on the bed, at first during 10–15 min phonocardiogram is registered, and then mechanic irritation of the nipples till the appearing of the adequate contractions preformed (3 contractions during 10 min). Hyperstimulation of the uterus is characterized by prolonged (more than 90 s) or frequent (more than 5 during 5 min) labour pains, which can be accompanied by late decelerations. Disadvantages of the stress tests (oxytocin and mammary): invasiveness, possibility of hyperstimulation of the uterus, arterial hypotension of a pregnant woman, hypoxia of the fetus.

*Non-stress test* is the safest one for the mother and the fetus. During the readiness of an organism to labour spontaneous uterine contractions, accompanied by the reaction of cardiac activity of the fetus (accelerations or decelerations), registered on cardiogram.

*Colpocytologic examination* gives a possibility to estimate the endocrine changes in a woman's organism before labour. There are 4 types of vaginal smears (by Zidovsky):

I — "late term of pregnancy", or navicular type of smears, is typical for the 2nd half of pregnancy. Navicular and interstitial cells predominate (3:1), which form accumulations. Leukocytes and mucus are absent. Eosinophilic granulocytes — 1%, karyopycnotic index — 3%. Labour are expected in 10 days.

II — "shortly before labour". The quantity of navicular cells reduces, and of interstitial — increases (1:1); superficial cells appear. Eosinophilic granulocytes — 2%, pycnotic — 6%. Labour can begin in 4–8 days.

III — "term of labour". Cells of interstitial (60–80%) and superficial layer (25–40%) predominate. Navicular cells are only 3–10% of all cells. Eosi-

nophilic index elevates till 8%, karyopycnotic — till 15–20%. Leukocytes and mucus appear. Labour can start in 1–5 days.

IV — “true term of labour”. Isolated superficial cells (40–80%) predominate in smears. Background of the smear is dark (“dirty”) because of the increase in the content of leukocytes and mucus. Eosinophilic index is 20%, karyopycnotic — 40%. Labour occur in 3 days.

### PRECURSORY LABOUR SIGNS

The preparatory period, which lasts 2 last weeks of pregnancy (forming of labour dominant), foreruns labour. Correlation of oestrogens and progesterone changes as the result of elevation of the level of oestrogens, predominantly estriol, which perform the forming of the receptors to prostaglandins, oxytocin, serotonin, kinins and other biologically active substances, which increase the stimulation of the uterus.

Such changes are considered to be the forerunners of labour:

- lowering of the uterine fundus, as the result of which the compression of diaphragm stops, the respiration improves; the center of the pregnant woman’s weight moves to the front, shoulders and head move backwards (“proud walk of a pregnant woman”);

- decrease in the body weight of a pregnant woman;

- protrusion of the umbilicus;

- vaginal discharge of thick viscous mucus (mucus plug of the cervical canal of the uterus);

- appearing of the periodic dull or convulsion-like pain in the lower abdomen and pelvis. This pain can accompany the process of cervical “maturation” — moving of the muscular fibers of the internal fauces to its inferior segment.

The preparatory period transforms into the antenatal one — preliminary (not always), and antenatal — in labour. In 70% of the women with physiological course of pregnancy the antenatal period is not detected.

Table 11. **Differential-diagnostic signs of the antenatal period and true labour**

Signs	Antenatal period	Labour
Uterine contractions	With irregular gaps	With regular gaps
Periods between the contractions	Long-lasting	Gradually decrease
Intensity of contractions	Does not change	Gradually increase
Feeling of discomfort	In the lower part of the abdomen and in the groin	In the lower part of the abdomen and in the sacrum
Cervix	Does not open	Opens
Effect of the sedatives	Makes the uterine contractions weaker	Does not stop labour

Physiological antenatal period lasts nearly 6 h and is characterized by spasmodic pain aggravation which is irregular by intensity, frequency and duration usually in the lower abdomen and in the groin (Braxton—Hyx contractions). A pregnant woman feels no fatigue, sleep is not disturbed. Irregular uterine contractions gradually intensify and transform into regular labour activity (labour pains). In the period between labour pains tonus of the uterus is not increased, palpitation of the fetus is firm and rhythmic, cervix is mature, discharge — “mucus plug” with blood; the oxytocin test is positive. Sometimes it is hard to differentiate the beginning of true labour from pathological Braxton—Hyx contractions. Smoothing and dilation of cervix is the best test, which helps to differ antenatal uterine contractions (“false labour”) from the true labour (Table 11).

### RECOMMENDED READING

3 (99–104); 5 (15–36); 7 (353–359); 9; 22; 26 (50–63); 29 (28–45); 47; 49; 56; 58; 61.

### STAGES OF LABOUR

There are 3 stages of labour: I — *stage of dilation of the cervix*, II — *stage of expulsion of the fetus*, III — *postnatal stage*

**The first stage (stage of dilation of the cervix)** is a gap between the beginning of regular labour activity (1–2 pains during 10 min), which accompanied by the smoothing and enlargement of the cervix till the complete dilation of the uterine fauces (by 10 cm). In 10% of the cases labour begin from the rupture of the fetal membranes, which contributes to the decrease in the volume of the uterus, thickening of its walls and increase in the contractile activity.

The clinical objective signs of the beginning of labour activity, i. e. I stage of labour, are: appearing of the *labour pains* — frequent, spontaneous, intensive and long-lasting uterine contractions, which repeat in a definite stretch of time (pauses, at the II stage of labour reflector and volitional prelum contractions — *labours* — add to the uterine contractions).

From the beginning of labour till their completion a pregnant woman is called a parturient woman, and after she has given birth — a puerpera.

**Contractile activity of the uterus.** Cervical dilation occurs as the result of contraction, retraction of the muscular fibers of the corpus and fundus uteri (longitudinal fibers), as well as thanks to the distraction of the muscles of cervix and partly of the lower segment of the uterus (circular muscular fibers). The uterine walls become thicker, and walls of the lower segment and cervix become thinner. The uterine contractions begin from its fundus (right horn — a driver of the rhythm), then spread downwards — to the lower uterine segment. Normal uterine contraction in labour occurs as a *triple descending gradient*: fundus uteri — corpus — the lower uterine segment.

Interconnection (reciprocity) of the contractile activity of the fundus, corpus, lower segment and cervix of the uterus and coordination of the contractions (down — triple descending gradient, dominant of the

fundus, interconnection; across — between right and left parts of the uterus) is a characteristic feature for the normal labour activity. Each contraction of the longitudinal muscles of the fundus and corpus uteri (*active segment*) is accompanied by the stretching (distraction) of the lower uterine segment and cervix (*passive segment*), which causes dilation of the uterine fauces (Fig. 68).

Due to coordinated contractions the synchronism of the beginning of the phase of the maximal uterine contraction in its different parts initiates. The length of the contraction wave spread to the whole uterus is 15 s.

*Labour pains* (maternal urge to push) are characterized by frequency (their number during 10 min), duration, strength, or intensity (amplitude of contractions), and feeling of labour pain.

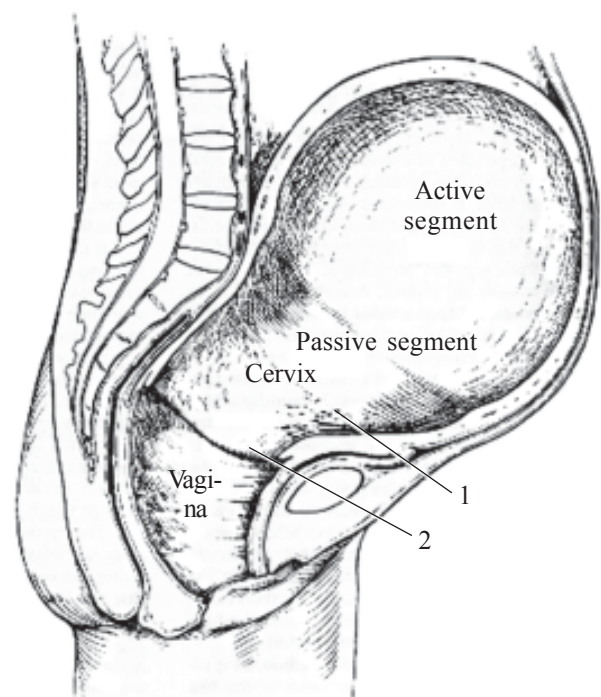


Fig. 68. Labour canal at the end of I stage of labour:  
 1 — internal uterine os; 2 — external uterine os



Feeling of labour pain depends on a threshold of the woman's pain sensitivity and intensity of labour pains (feeling of labour pains, as a rule, appears if the strength of the pains is more than 25–30 mmHg). Pain during labour pains is a consequence of cellular hypoxia, accumulation of unoxdated products in the myometrium, acidosis, uterine contractions, appendages, enlargement of the cervix and lower parts of the labour canal, pressure on the uterus, urinary bladder, ureters, urethra and intestine. Labour pain intensifies because a woman feels fear, stress and anxiety.

The length of labour pains is 15–20 s (by palpation), of pauses — 10–15 min at the beginning of labour. It should be mentioned that length of labour pains, which is determined by palpation, almost two times less than the objective (instrumental) examination. The regularity of labour pains, accompanied by the structural changes of the cervix (smoothing, dilation), gives an opportunity to differ the beginning of the I stage of labour from preliminary (prenatal) stage.

During the I stage of labour the length of labour pains increases from 60 to 100–120 s (length of the prelum muscles contractions at the II stage — 90–100 s), and gaps of time between them reduce to 60 s (between the prelum muscles contractions 35–40 s). Maximal length of labour pain at the end of the I stage is 60–70 s, and of pauses — 1–2 min.

Intensity and frequency of labour pains depend on the basal tonus of the myometrium — tension of the uterine muscles in pauses between labour pains. This tonus of rest is 10 mmHg. As the result of elevation of the tonus of the myometrium frequency of labour pains increases, and their amplitude — decreases. While progressing of labour, intensity of labour pains increases; during the I stage of dilation pressure in the uterus varies from 30 to 50 mmHg. At the II stage of labour intensity of labour pains decreases, but in connection with adding of the prelum muscles contractions the intensity of labour activity increases to 90–100 mm Hg. At the III stage of labour intrauterine pressure is 70–80 mmHg, and tonus of the myometrium is 250–300 mmHg, which contributed to the detachment of the placenta and stop of the postnatal bleeding.

During each labour pain intrauterine pressure elevates, which transmits to the fetal vesicle, as the result of which it obtains the form of the uterine cavity. The amniotic fluid streams to the inferior pole of the fetal vesicle, where the largest part of the fetus is located (the head or the pelvis). Stimulating nervous endings in the region of internal fauces, fetal vesicle (inferior pole of the fetal membranes, which contains the part of the amniotic fluid) contributes to intensification of labour pains (Fig. 69).

Contraction of the muscular fibers of the uterus due to its ovoid form are turned not vertically, but by tangent line to circular muscles of the lower segment of the uterus and cervical canal. That's why cervical dilation occurs both when absence of the fetal vesicle

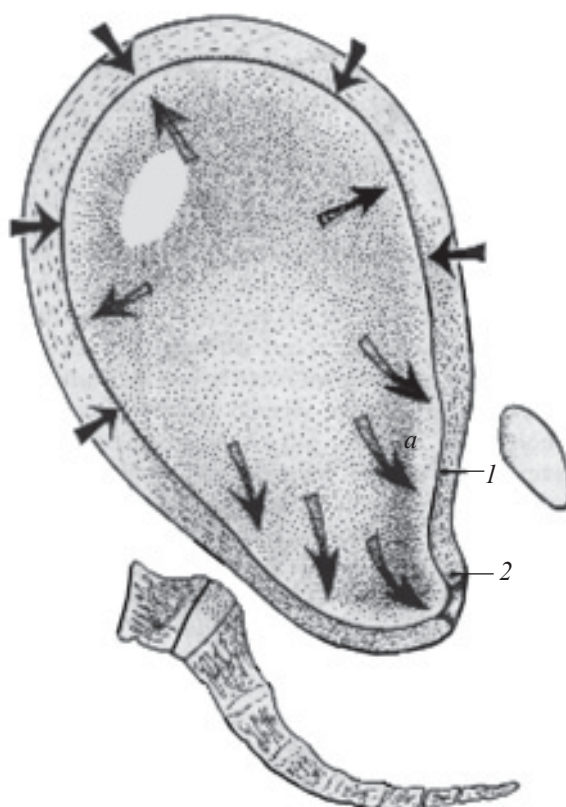


Fig. 69. Hydrostatic pressure of the fetal vesicle:  
1 — internal os; 2 — external uterine os  
(uterine orifice)

(beforehand discharge of amniotic fluid) and presenting part (during the transverse lie of fetus).

During labour pains as the result of contraction uterine muscular fibers cross and gradually move up. This causes thickening of the superior part of the corpus uteri and thinning its lower segment. The border between the superior (thickened) part of the uterus (corpus, fundus) and the lower segment is called a contractile ring. It can be detected in the stage of pains while palpating the uterus after the bursting of the amniotic fluid.

The lower segment of the uterus twists around the presenting part of the fetus by a thick ring — the *internal girdle of contact*. Between the lower segment of the uterus and osseous ring in the case of fixed fetal head in the pelvic cavity (by minor or major segment) *external belt of contact* forms. Girdles of contact of the amniotic fluid divide into two parts: major, which is above this girdle, — *posterior fluid*, and minor, located under it, — *anterior fluid*, which burst during the dilation of the fetal vesicle.

In nulliparous women cervical dilation begins with the internal os. After its complete dilation the cervix smoothes, canal disappears, the external os of the uterus begins to open. As the result of complete dilation of the uterine os (by 10–11 cm) the uterine cavity, cervical canal and vagina are the single whole labour canal. In multiparous women smoothing of



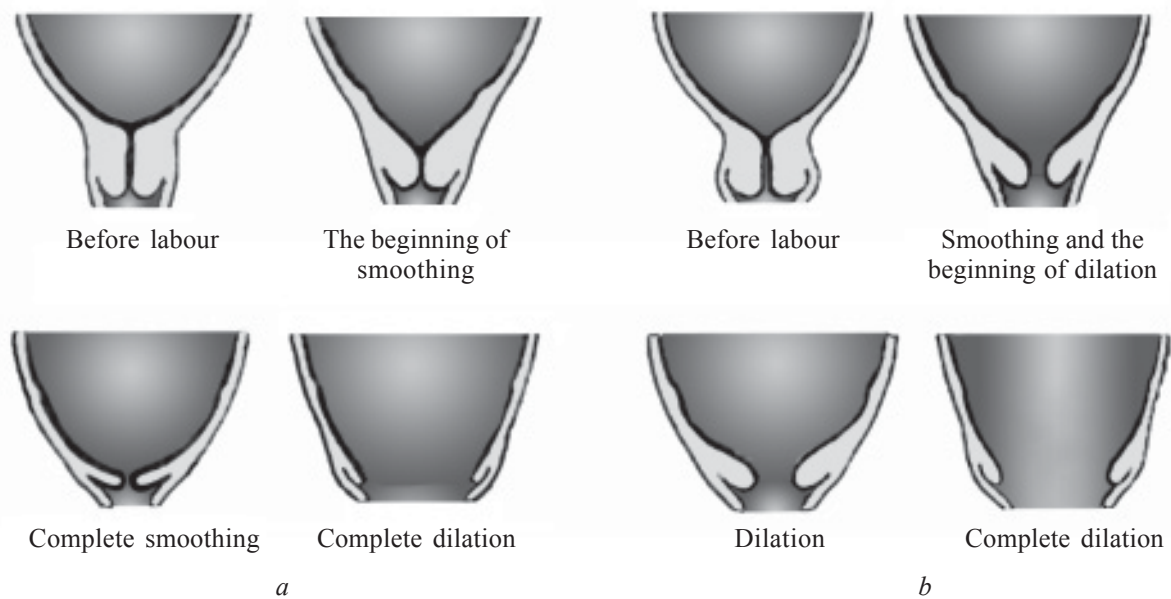


Fig. 70. Smoothing and cervical dilation in nulliparous (a) and multiparous (b) women.

the cervix, dilation of the internal and external os take place simultaneously.

An average length of I stage of labour in nulliparous women is 8–10 h, multiparous — 6–8 h. During the first 4–5 h structural changes of the cervix (smoothing, slow dilation, amalgamation with lower segment of the uterus) appear. If these preparatory changes in the cervix are insufficient, long and complicated course of labour should be expected.

When the fetal vesicle is intact, hydrostatic intrauterine pressure spreads evenly all over the presenting part of the uterus. Elevation of the intrauterine pressure, morphological changes and overstrain of the fetal membranes, as well as absence of the support for the fetal vesicle contribute to the rupture of the fetal vesicle (cervix is dilated, Fig. 70, a, b).

Obstetricians of our country consider the *timely discharge of the amniotic fluid* the rupture of the fetal vesicle during the complete or quite complete dilation of the uterine os. However there is a point of view, that the fetal vesicle performs its function till the opening of the uterine os by 5–6 cm. As a rule, 100–200 ml of transparent amniotic fluid discharge.

If the fetal vesicle ruptures during the incomplete opening of the uterine os (*early discharge of the amniotic fluid*), the presenting part of the placenta performs the role of stimulus of receptors of the internal os. *Early discharge of the amniotic fluid* is the rupture of the fetal vesicle till the beginning of labour activity, till the I stage of labour.

After the rupture of the fetal vesicle as the result of the difference between intrauterine pressure (higher) and atmospheric (lower) the outflow of the venous blood from the presenting part complicates, which can lead to a labour tumour development. *The labour tumour* is an edema of the tissues of the fetal head as the result of complication of the venous blood

outflow from the region of its presenting part, located lower the pole of attachment.

Because of the excessive density of the fetal membranes the fetal vesicle may not rupture even with the complete cervical dilation (*late rupture of the fetal vesicle*). In this case it is ruptured artificially by the bullet forceps (*amniotomy*). During the preterm, accelerated labour in multiparous women the vesicle sometimes does not rupture and the fetus is delivered in it (“in the shirt”). Such a pathological condition is dangerous for the newborn (threat of the fetal asphyxia, labour injury, preterm detachment of placenta as the result of rapid labour), and doctor should rupture the membranes immediately.

*High rupture of the fetal vesicle* is such its condition, when the amniotic fluids discharge during the vaginal examination if there are disturbances of its intactness.

After the complete discharge of the amniotic fluid labour pains become weaker, but in some minutes they intensify again. The volume of the uterine cavity decreases, intensity of labour pains increases. Complete opening of the uterine os is an evidence of the finishing of I stage of labour.

According to E. A. Friedmann, at the I stage of labour a latent and an active phase are determined by a clinical course (Fig. 71).

The *latent phase* begins from setting of the regular labour pains, intensity and frequency of which increase and finishes by the cervical dilation by 3–4 cm.

The average length of the latent phase in nulliparous women — 6.5 h; multiparous — 5 h; speed of the cervical dilation — 0.35 cm/h.

During the *active phase* of labour (after the cervical dilation by 3–4 cm) intensity and painfulness of labour pains increase, speed of cervical dilation increases to 1.2–3 cm/h in nulliparous women and 1.5–

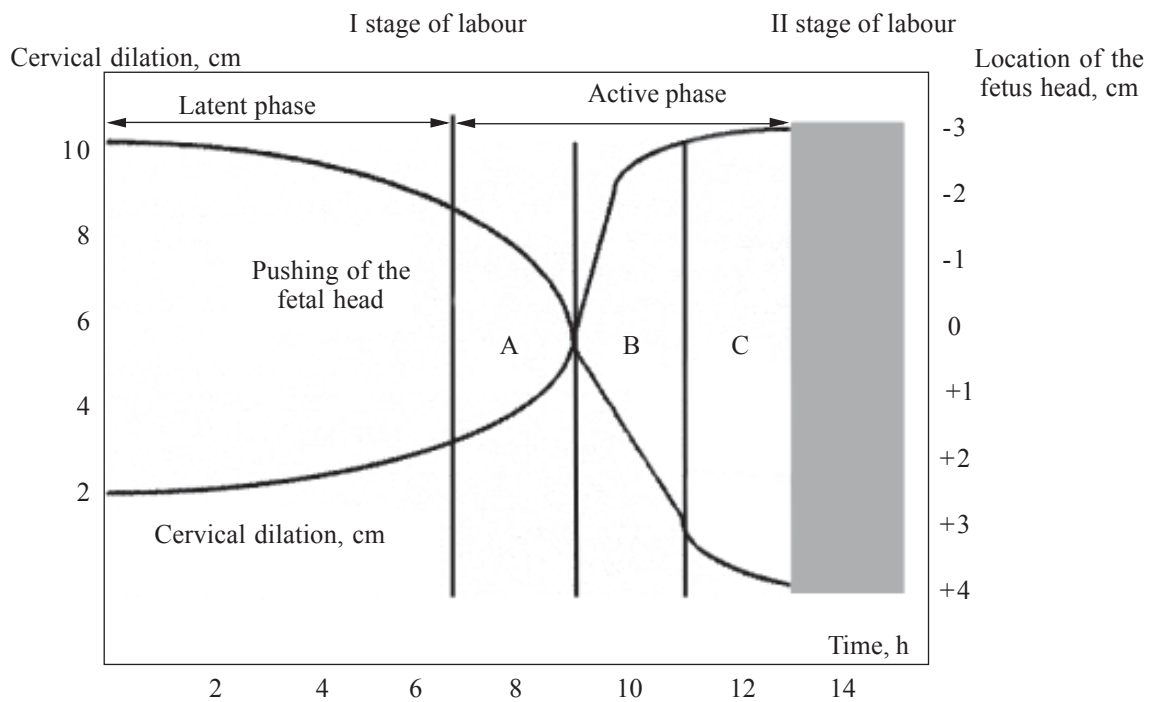


Fig. 71. Phases of cervical dilation and moving of the fetal head in a nulliparous woman (by Friedmann): A — phase of acceleration; B — maximal rise; C — slowing

6 cm/h — in multiparous ones. Speed of cervical dilation depends on the contractile activity of the myometrium, peculiarities of the structure of cervix, using of sedative and anesthetic drugs.

In the active phase of I stage of labour the phases of acceleration, maximal rise and slowing are distinguished. The phase of slowing begins with the dilation of the uterine os by 8 cm and lasts to its complete dilation. Speed of cervical dilation decreases to 1–1.5 cm/h, length of the phase of slowing in nulliparous women is 1–2 h, in multiparous ones — 0.5–1 h.

The speed of moving of the fetal head increases as the result of extension of the dilation of cervix and is usually 1 cm/h in nulliparous women and 2 cm/h — in multiparous, and after the complete cervical dilation — 4 cm/h at the I stage of labour. During the physiological course of labour till the moment of complete cervical dilation inferior pole of the fetal head locates, as a rule, in the narrow part of the pelvic cavity.

According to the data of foreign literature, the position of the fetal head is determined by its correlation to the interspinal line (level of the ischiac spines) — position “0” (Fig. 72).

In the stage of smoothing of the cervix a biparietal diameter of the head moves lower the plane of the pelvic inlet, which is diagnosed while palpation of the presenting part under the ischiatic spines. This fact confirms the adequacy of the sizes of mother’s pelvis to the sizes of the fetal head or absence of the barriers for its further moving. Clinical importance of the long-term standing of the fetal head in position “0” is in possible incorespondence between the sizes of the fetal head and mother’s pelvis. The position

“–3” corresponds the position of the fetal head above the pelvic inlet; the “–2” — fetal head is pressed to the the pelvic inlet; “–1” — fetal head by its minor segment is in the pelvic inlet; “0” — is in the pelvic inlet, insertion part — small fontanel — reaches the interspinal line. Location “+1” means that the fetal head locates by the major segment in the wide part of the pelvic cavity; “+2” — in the narrow part of the pelvic cavity; “+3” — on the pelvic floor; “+4” — inserts and disengages.

**The second stage — the stage of expulsion of the fetus**, during which the fetus is born. There are 2

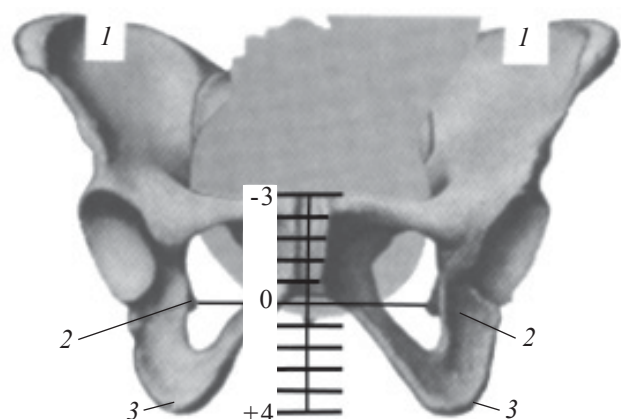


Fig. 72. Location of the fetal head correlating to the level of the interspinal line: 1 — iliac bone; 2 — ischiadic spine; 3 — ischial tuberosity (–3)–(+4) — location of the fetal head

phases in this stage: 1) the fetal head passes through the wide and narrow part of the pelvic cavity; 2) the fetal head moves down on the pelvic floor.

In the first phase of the II stage mechanic pressure on the fetus head increases, as the result of which this phase is the most dangerous (asphyxia of the fetus, injuries of the mother and fetus can appear). Elevation of the heart rate of the fetus during labour pains is caused by short-time decrease in the utero-placental blood circulation. The heart rate of the fetus can decrease while passing the head through the narrow part of the pelvic cavity and vulvar ring till 110–100 in 1 min, which is related to elevation of the tonus of n. vagus, caused by the compression by the fetal head.

At the end of the II stage of labour stimulation by the presenting part of the fetus of the receptors of vagina and muscles of the pelvic floor causes *prelum muscles contractions* — contraction of the muscles of the anterior abdominal wall, diaphragm and pelvic floor. A woman in labour can by herself regulate the strength of the prelum muscles contractions. Intrauterine pressure elevates up to 120–140 mmHg, frequency of labour pains (with prelum muscles contractions) increases, pauses between them become shorter. Physical tension and pain, related to intensification of the pressure of the fetal head on sacral plexus, rectum, muscles of the pelvic floor, require from a woman in labour a considerable expenditure of energy.

When the fetus passing through the labour canal its presenting part performs not only translational, but rotational motions. A presenting part of the fetus stretches the pudendal slit, perineum protrudes. In the moment of the highest strain of prelum muscles contractions insertion point of the fetal head — small fontanel is seen from the pudendal slit; between labour pains the head hides in the pudendal slit, and during the next prelum muscles contractions it appears again (*insertion of the head*).

*Insertion of the fetal head* begins after finishing its internal turn. During each prelum muscles contractions the greater part of the head inserts, and in some time it does not disappear in the pudendal slit in the pause between the prelum muscles contractions.

*Disengagement of the fetal head* corresponds to the fifth moment of labour's biomechanism — extension of the head. Occipital part of the head disengages for the first time, then — parietal tubers do. Tension of the perineum in the moment of disengagement of the parietal tubers is maximal.

After disengagement of the occiput and parietal tubers forehead and face of the fetus disengage, i. e. the whole head is delivered; during the anterior kind it is turned by its face to the back. During the next strain the internal rotation of the trunk, which corresponds with the external rotation of the head by the face, turned to the mother's hip (in the first position — to the right, in the second — to the left), occurs.

Anterior shoulder of the fetus comes under the pubic symphysis, which permits to disengage the posterior shoulder: the whole shoulder girdle is delivered. Then the trunk and legs of the fetus are easily delivered, posterior amniotic fluid discharges, which contains the admixture of the vernix caseosa, blood and meconium.

The length of the II stage of labour in nulliparous women is 30–60 min, multiparous — up to 40 min. A parturient woman is very tired after the birth of the fetus; as the result of the hard muscular work and loss of the warm chill can appear.

**The third stage of labour — postnatal** — begins from the moment of birth of the fetus and ends with the birth of afterbirth (placenta with fetal membranes). The reduce of the uterine volume (during 2–3 labour pains in 5–7 min with amplitude till 60 mmHg) and elevation of intrauterine pressure after the birth of the fetus contribute to the afterbirth detachment and discharging. Elevation of intramyometrial pressure, several times exceeding the blood pressure in the uterine artery, and simultaneous uterine contraction (compression of the channels of the spiral arteries by circular muscles of the myometrium) contributes to postnatal haemostasis and prevent pathological bleeding from the placental place.

The fundus uteri after the birth of the fetus locates on the level of the umbilicus. During the postnatal labour pains the uterus flattens, its fundus raises lower the umbilicus. Detachment of the placenta takes place in a spongy layer of the functional layer of the endometrium. If placenta began to detach from the center (by Schultze), then retroplacental hematoma discharges with afterbirth, which comes out by the fetal surface. If the detachment of placenta has begun on periphery (by Duncan), a part of retroplacental blood begins to discharge till the birth of the afterbirth, and a part — together with it, and the afterbirth is delivered by the maternal surface. Lowering of the afterbirth in the vagina is accompanied by appearing in parturient woman a wish to make an effort.

Physiological blood loss in the postnatal stage is 250 ml and should not exceed 0.5% of the woman's weight.

During the postnatal and early postnatal labour pains blood from placental zone of the myometrium partly pushes in the direction of main vessels, contributing to the receiving of the thromboplastic substances to the blood circulation, as the result of which hypercoagulation develops and possibility of thromboses increases in the early postnatal stage.

The length of the III stage of labour is 5–30 min. The **postnatal stage** starts when the afterbirth delivers, from this moment the woman is called a puerpera.

The general time period of labour in nulliparous women is 10–16 h, multiparous ones — 8–12 h.



## BIOMECHANISM OF LABOUR

**Biomechanism of labour** is a complex of movements of the fetus during its passing through the maternal passages. In 96% of the cases fetal head is its lowest (presenting) part. It turns by its least diameter in the direction of the largest diameter of each pelvic planes. So, in the plane of the superior foramen (inlet) of the pelvis transverse diameter is the largest, in wide and narrow parts of the pelvic cavity oblique conjugates are the largest, in the plane of the inferior foramen (outlet) — direct diameter. For passing through labour passages, head or buttocks of the fetus should make some movements (rotations), which are caused by the uterine contractions and form of labour canal. Vernix caseosa on the skin of the fetus, adequate amount of amniotic fluid, muscular-tendonal apparatuses of the pelvis and uterus are the supplying factors of labour's biomechanism.

During the vertex presentation the head in 90% of the cases inserts the plane of the pelvic inlet by such a way, that a saggital suture stands in the transverse or oblique diameter on the equal distance from promontorium and pubic symphysis — *synclitic, or axial insertion*. Even during the physiological labour timely deviation from the axial insertion — anterior and posterior asynclitism — are possible.

During *anterior asynclitism* (by Naegele) a saggital suture is closer to promontorium and parietal bone inserts the first; promontorium prevents the insertion of the posterior parietal bone. As the result of the further translational motion of the head saggital suture transfers in the middle location, and anterior asynclitism disappears.

During *posterior asynclitism* (by Litzmann) the posterior parietal bone inserts the first, saggital suture is closer to the pubic symphysis. This kind of asynclitism is less than favorable, but during the normal labour activity it removes.

Change of the form (*configuration*) of the head while its passing through labour canal depends on the abilities of the fetal head and labour canal, as well as from labour biomechanism. The most expressed configuration of the head will be with the presence of the soft bones in it and wide sutures and narrowing of the woman's pelvis. During the anterior kind of vertex presentation the fetal head has a dolichocephalic configuration.

In an overmature fetus (dense bones, narrow sutures) an ability of the head to change its form is insignificant, which can cause a complicated labour course.

*Labour tumour* can appear only in a viable fetus, and it is the more promoted, the more time has passed after the discharge of the amniotic fluid. During the vertex presentation labour tumour locates in the region of posterior fontanel; during the first position — on the right parietal bone, during the second one —

on the left. The labour tumour disappears independently in some days after labour.

**Anterior kind of the vertex presentation** (95% of all labour). **Biomechanism of labour** consists of 7 main moments (Fig. 73).

*Moment I — insertion of the fetus in the plane of the superior foramen (inlet) of the pelvis* (insertio capitis). Dilation of the coniform lower segment of the uterus several weeks before labour, elevation of the tonus of uterus and muscles of abdominal press, tonus and gravity of the fetus, sufficient sizes of the plane of superior foramen (inlet) in the pelvic cavity, normal amount of amniotic fluid, location of the placenta promote the I moment.

In nulliparous women the fetal head before the beginning of labour is already fixed above the inlet in the pelvic cavity, if sizes of the fetal head and pelvis of the woman correspond each other, in multiparous women fixation (insertion of the head) occurs during labour.

An ovoid form of the head contributes to its insertion in transverse or one of the oblique diameters of the plane of inlet of lesser pelvis.

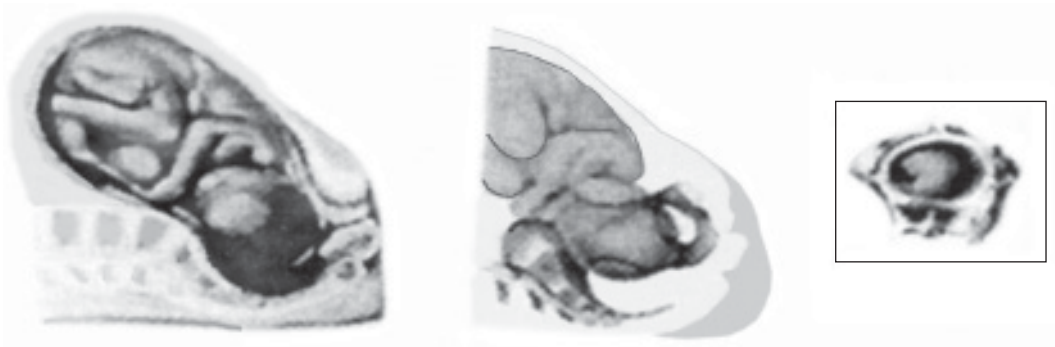
*Moment II — flexion of the head* (flexio capitis) — appears by the principle of a lever, which has two unequal arms. Atlantovertebral symphysis locates closer to the occiput, that's why a short arm of the lever turned to the occiput of the fetus, and a long one — to its elbow, which makes the difference in the moment of forces, which acts on the arms of the lever. A short arm (occiput) lowers down, and a long one rises up. The chin of the fetus is pressed to the chest, posterior fontanel slower down the nameless line and becomes the insertion point, which approaches to the pelvic axis. The head at first inserts by the direct diameter, which is 12 cm (saggital suture) and its circumference is 34 cm, in the transverse diameter of the inlet of the pelvic cavity. As the result of intensification of flexion and descent of the occiput enters the pelvic cavity by the plane, which corresponds to the small oblique diameter — 9.5 cm and has 32 cm in circumference.

The occiput moving down to the pelvis, passes through the less than barriers, than parietal bones do, which locate near the pubic symphysis and promontorium. The moment comes, when the force needed for lowering of the occiput is equal to the force needed to overcome the friction of the head near the promontorium. From this moment a selective lowering in lesser pelvis of the occiput stops (flexion of the head) and other forces begin to act, which contributes to the moving of the whole head.

*Moment III — sacral rotation* (rotatio sacralis) — is the most complex and long-lasting stage of labour biomechanism. The head is fixed on the pubic symphysis and promontorium. Sacral rotation is oscillation movements of the head with deviation of the saggital suture to the promontorium and pubic symphysis. It consists of three stages: 1) lowering of the



I-III



Fixation, flexion, sacral rotation of the fetal head

IV

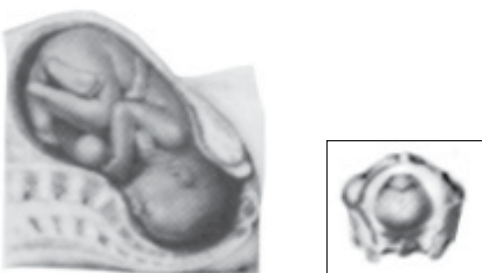


Internal turn of the head



External turn of the head

V



Beginning of the extension of the head



Internal turn of the shoulders



Complete extension of the head



Birth of the trunk

Fig. 73. Biomechanism of labour during the location of the fetus — anterior kind, vertex presentation: I-VII — moments of labour

anterior and delay of the posterior parietal bones; 2) sliding of the posterior parietal bone from promontorium; 3) moving of the both parietal bones over the frontal and occipital bones, lowering of the whole head in the narrow part of the pelvic cavity (sagittal suture in this moment is in the middle between promontorium and pubic symphysis).

*Moment IV — internal rotation of the head (rotatio capitis interna) — takes place in the pelvic cavity; it starts while the head is moving from the wide part of the pelvis to the narrow one and finishes on the pelvic floor. To the ending of the sacral rotation the*

head moved by its major segment to the plane of the pelvic inlet, and its inferior pole locates in the interspinal plane.

Rotation of the head is caused by its form (protuberant parietal tubers) and narrowing of labour canal with predominance of direct diameters over the transverse ones in the planes of narrow part and outlet of the pelvis.

Narrowing of the posterolateral part of the pelvis by parietal muscles, contractions of the muscles, elevating the anus, — levators, as well as piriform and internal obturator muscles contribute to the rotation

of the largest part of the head — the occiput — around the longitudinal axis to the front (during the anterior kind — by  $45^\circ$ , during the posterior kind — rotation by  $135^\circ$  is possible). The sagittal suture moves from the transverse to the oblique, and then — to the direct diameter of the pelvic outlet. During the rotation of the head sagittal suture coincides with the oblique diameter of the narrow part of the pelvic cavity: during I position — with the right, during II — with the left. As the result of finished rotation the sagittal suture stands in the direct diameter of the pelvic outlet, and subvertex fossa — under the pubic symphysis.

*Moment V — extension of the head* (deflexio capitis) occurs in the cavity of the pelvic outlet (on the pelvic floor). The head turns around the transverse axis, the subvertex fossa becomes the point of fixation, which moves under the inferior margin of the pubic symphysis. Extension of the head by  $120\text{--}130^\circ$  is caused by expulsion forces, which act through the vertebral column of the fetus, and lateral force of the muscular pressure of the pelvic floor. Forehead, face, chin of the fetus disengages, and the head is delivered through the vulvar ring by the most favorable minor oblique diameter, which is 9.5 and is 32 cm in circumference.

*Moment VI — internal rotation of the trunk and external rotation of the head* (rotatio trunci interna et capitis externa). After the extension of the head under the influence of the uterine contractions, muscles of the pelvic walls and pelvic floor shoulders of the fetus screwing move by their transverse diameter (distantia interacromialis) from the wide to the narrow part and pelvic outlet, trying to occupy their maximal size. The shoulders transfer from the transverse diameter of inlet in the oblique diameter of the pelvic cavity (during I position — in the right, during II — to the left) and insert in the direct diameter in the plane of the pelvic outlet. Internal rotation of the shoulders transmits to the delivered head, which during I position turned by the face to the right, and during II — to the left hip of the mother.

*Moment VII — delivery of the corpus and whole body of the fetus* (expulsio trunci and corporis totalis). After the external rotation of the head the anterior shoulder (during I position — right, during II one — left) moves under the pubic symphysis, the posterior one locates in the sacral cavity. On the border of the upper and the middle third of the humerus a point of fixation forms. The fetal trunk performs the lateral flexion in the thoracolumbar segment; posterior shoulder and posterior hand deliver at first. Then from the pubic symphysis anterior shoulder releases, and the whole trunk of the fetus delivers easily.

The movements of the fetus — translational, rotational and flexional — can be estimated by the standing of the sagittal suture, as well as by the location of the anterior and posterior fontanels, which are detected while internal obstetrical examination.

In classical obstetrics biomechanism of labour during the anterior kind of the vertex presentation is divided into 4 main moments: I — flexion, II — internal rotation, III — extension, IV — internal rotation of the trunk and external rotation of the head.

**Posterior kind, vertex presentation.** The posterior kind, vertex presentation is a variant of the physiological biomechanism of labour. Forming of the posterior kind can be related to the peculiarities of the structure of fetal head (small sizes, prematurity); pelvis of the mother, muscles of the pelvic floor. During the posterior kind (usually at the II position) the occiput of the fetus, moving through labour canal, makes a great arch ( $135^\circ$ ), as the result of which posterior kind in labour transforms to anterior one. In this case sagittal suture from the oblique diameter transfers into the transverse, then in the opposite oblique and, finally, in the direct diameter. In 1% of the cases the head turns only by  $45^\circ$ , as the result of which the fetus delivers in the posterior kind. Biomechanism of labour in the posterior kind of vertex presentation consists of the following moments:

*Moment I — insertion of the head in the plane of the pelvic inlet* — occurs the same as during the anterior kind (by sagittal suture in one of oblique diameters of the plane of the pelvic inlet); posterior fontanel is turned to the back.

*Moment II — flexion of the head* — occurs by the rule of a lever, i. e. the same as during the anterior kind; the posterior fontanel is an entering point.

*Moment III — sacral rotation* — is the same as in anterior kind. Anterior parietal bone overcomes the resistance of the pubic symphysis, sliding from its posterior surface and moving on the posterior parietal bone. Then the posterior parietal bone slides from the promontorium and moves under the anterior one. Both bones move on the frontal and occipital bones, and the whole head lowers down into the wide part of the pelvic cavity.

*Moment IV — internal rotation of the head*, which can occur by  $45^\circ$  or  $135^\circ$ . During the posterior kind, when the pelvic muscles perform the greater work than during anterior kind, head rotates by  $135^\circ$ , the posterior fontanel places above the pubic symphysis, and labour ends in the anterior kind. If the sagittal suture turns by  $45^\circ$  (this can be the result of weak labour activity), inserting by the direct diameter of the plane of the pelvic outlet, the occiput is turned to the back and labour end in the posterior kind.

*Moment V — additional flexion and further extension of the head.* On this stage the head performs two movements. After the end of the internal rotation head, lowered on the pelvic floor, moves under the inferior margin of the pubic symphysis by the anterior margin of the anterior fontanel (border of the hair part of the forehead). The first point of fixation, around which the fetus makes the additional flexion, forms. Thanks to this, occiput lowers down till the moment, when subvertex fossa moves to the

apex of the coccyx, as the result of which second point of fixation forms, around which the extension of the head is performed. The head disengages by the circumference of 33 cm, corresponding to the average oblique diameter in 10 cm. The labour tumour locates in the region of the anterior fontanel, the form of the head is dolichocephalic.

Moments VI and VII are the same as in the anterior kind of vertex presentation.

In classical obstetrics biomechanism of labour in the posterior kind of vertex presentation is divided into 5 main movements of the head: I — flexion, II — internal rotation (during this the posterior fontanel is turned to the back), III — maximal flexion, IV — extension, V — external rotation (internal rotation of shoulders).

Impeded moving of the head in the posterior kind of vertex presentation leads to the prolonged course of labour, development of secondary weakness of labour activity, which can accompany by asphyxia of the fetus, more frequent injury of the soft tissues of maternal passages. The posterior kind of vertex presentation in majority of cases appears in multiparous women, which can be related to decrease in the tonus of muscles of the pelvic floor.

#### RECOMMENDED READING

3 (99–104); 5 (15–36); 7; 9; 22; 26 (50–63); 29 (28–45); 47; 56; 58 (179–202); 61.

At present labour are considered by the principle of prophylaxis and decrease in the maternal and perinatal morbidity and mortality rate. Complex of means, necessary for solving this task, includes: work of the women's consultation clinics on the revealing the pregnant women of the high risk of obstetrical and perinatal pathology; abortion in early terms in connection with severe somatic pathology of the mother; congenital developmental defects and diseases of the fetus which are impossible to correct; intensive management of pregnancy with planned hospitalization; differentiated approach to establishing of an optimal term, method and place of labour.

Plan of conducting pregnancy and labour is made during the period of antenatal observing taking into account all factors of risk. Labour of the high risk should be performed in specialized clinical hospitals (perinatal centers), where there are day-and-night anaesthesiological-resuscitation service works, bank of blood and its preparations, necessary medical appliance, modern appliance for the detection of condition of the fetus, as well as conditions for resuscitation and care after the newborn.

Development of the world science, achievements in obstetrics and perinatology, introduction of new modern methods of estimation of the condition of the fetus, contractile ability of the uterus and their correction contributed to revision of some points in classical obstetrics concerning the labour management tactics.

## STAGE OF CERVICAL DILATION

Healthy parturient women, as a rule, get to the maternity hospital at the beginning of I stage — cervical dilation and have a change card of the women's consultation clinics, where peculiarities of the course of pregnancy and antenatal factors of risk are briefly described.

In the reception of the maternal hospital a pregnant woman is examined (os, mucous membranes, skin), weighed, her pelvis is measured, the body temperature, pulse rate and ABP are evaluated, objective examination of the systems of organs is performed, palpitation of the fetus is auscultated, its condition, presentation, position and kind by external palpation are detected. A midwife of the reception writes a passport and anamnestic data in labour record of a pregnant woman. A pregnant woman is hospitalized in observational department or isolator, if there is infectious disease or antenatal death of the fetus. Sanitary-and-hygienic cleansing of a parturient woman includes: shower, cutting of nails on hands and feet; if it is necessary — enema. Shaving of the pubic hair in the perineum region is unnecessary in modern obstetrics (risk of microinjuring and further infection of the skin).

Blood group and Rh-factor of a pregnant woman are detected; urine analysis on protein is performed; blood and urine are taken for clinical analysis; the vein blood is taken to determine the time of blood coagulation as well as smears from the vagina and ureter are taken. With no data on the Wassermann's reaction the blood is sampled. Somatic, external and internal obstetrical examinations are performed.

Condition of the fetus, its sizes and character of labour activity are evaluated. During the internal obstetrical examination external genitalia are examined, height of the perineum and presence of cicatrices, ulcers on it are detected, condition of the vagina (wide, narrow; septi) and cervix (length, consistence, dilation of the uterine orifice, condition of its margins — thick, thin, rigid) is estimated. The presence and function of the fetal vesicle during labour pains, character of the presenting part of fetus, its location accordingly to the pelvic planes (ballotement over the inlet, pressed to the inlet, by minor or major segment is in the plane of the inlet, in the pelvic cavity, in the plane of the pelvic outlet). The location of the sutures and fontanels in relation to the osseous landmarks of the pelvis are detected, entering point is determined. The osseous pelvis is estimated, the possible deformations, exostoses



and condition of the sacral cavity are detected, external pelvic sizes and diagonal conjugate, if it is possible to reach the promontorium, are measured, condition of the pelvic floor muscles is characterized.

Results of examination are put in labour record, factors of risk are counted, clinical obstetrical diagnosis is made. The diagnosis includes: term of pregnancy; parity (numbers of pregnancies and labour); term of labour (preterm (premature), term, delayed); stage of labour; condition, presentation, position, kind of the fetus; complications of pregnancy and labour; extragenital diseases; condition of the fetus. The conclusion, which contains the plan of labour management and treatment-and-prophylactic recommendations, is written in labour record after making the diagnosis. In the course of labour the plan of labour management can change depending on the obstetrical situation, which is written in labour record.

Beginning with the I stage of labour a parturient woman is kept under constant observation. General condition of woman, paying attention on its complains (degree of pain feeling, tiredness, head ache, disturbance of vision, dizziness), is kept under observance; frequency and length of labour pains and pauses between them, function of the urinary bladder and intestine are detected. Overfilling of the urinary bladder, as the result of its anatomical closeness to uterus and their general innervation, leads to dysfunction of the lower segment of the uterus and development of weakness in labour activity. That's why it is recommended to empty urinary bladder every 2–3 h. In case of retention of urine during 3–4 h catheterization of the urinary bladder is carried out.

In some obstetrical clinics graphic monitoring of the dynamics of cervical dilation and moving of the fetal head is represented as a partogramm (Friedmann curvature). As a rule, it is registered during the physiological labour.

The pulse is counted (the elevation of the pulse rate to 90–100 per minute is physiological), the body temperature is taken, ABP in pauses between labour pains each 1–2 h is measured. External obstetrical examination is done several times, attention is paid to the form of the uterus before and during labour pains, dynamics of dilation of the uterine orifice, height of the contractile ring over the superior margin of pubic symphysis and condition of the round uterine ligaments are kept under observance. During a labour pain the contractile ring outpouches over the pubic symphysis on the same number of transverse fingers as uterine orifice is opened (Schatz—Unterberger—Zanchenko sign).

**Methods of registration of uterine contractile function.** Basal tonus of myometrium, intensity of labour pains, their length, frequency, rhythm, interval between them and the presence of prelum muscles contractions at the II stage of labour are the indicators of the contractile function of the uterus during labour.

Contractile function of the uterus during labour is estimated by palpation and objective registration of uterine contractions by external and internal tocography (hysterography).

Length, intensity and frequency of labour pains are estimated by *palpation* in upper parts of the uterus. Palpation is performed by both hands simultaneously to control the reciprocity of contraction of left and right part of the uterus.

External tocography (hysterography) is the most wide-spread among the methods of estimation of the contractile activity of the uterus in practical obstetrics.

*External tocography* is performed with probes of registration of mechanic activity (pneumatic, hydraulic, mechano- and photoelectrical appliance) or with electric probes (indirect electrohysterography from the abdominal wall, reohysterography). Safety, aseptics and absence of contraindications are the advantages of external methods. However, thickness of subcutaneous layer, tension of the muscles of the anterior abdominal wall and correct application of probes can influence the results of examination.

*Internal tocography* (transcervical or transabdominal) is performed with probes of registration of the pressure (radiotelemetry, cylinerometry) and electric probes. Internal tocography can estimate the real intraabdominal pressure. Possibility of infection and examination only after the rupture of the fetal bladder are the disadvantages of this method.

Activity of the uterus is determined in units of Montevideo (UM) by multiplying the strength of uterine contractions (mmHg) by the number of labour pains, occurred in 10 min. Activity of the uterus during labour increases from 100–150 to 200–250 UM. Intrauterine pressure at the I stage of labour is 6–8 mmHg, at the II stage — 20–25 mmHg, at the III stage — the uterine tonus decreases to 6–8 mmHg.

The length of a labour pain at the I stage of normal labour is 60–90 s, at the end of I stage — 100–120 s, at the II stage — 90 s. The length of labour pains during palpation is almost two times less than during the detection with instrumental methods. A gap of time between labour pains gradually reduces and during active labour activity (3–5 labour pains within 10 min) is nearly 60 s at the I stage and 35–40 — at the II stage of labour.

The strength of labour pains increases at the I stage of labour from 30 to 50 mmHg, at the II stage it decreases, but as the result of beginning of prelum muscles contractions reaches 90–100 mmHg.

Tonus of the uterus before the detachment of placenta does not exceed the one at the I stage of labour, and after its detachment increases almost two times.

At the III stage of labour the frequency decreases, but strength of contractions increases. Depending on the contractile function of the uterus, at the III

stage of labour three phases are determined: 1) from the fetal delivery till the appearing of the signs of placental detachment; 2) from the beginning of placental detachment to its complete separation from the uterine wall; 3) from the complete separation of placenta till delivery of the afterbirth.

Tonus of the uterus before the placental detachment is the same as at the I stage of labour, and after the separation of the afterbirth it increases almost two times. Intensity of labour pains at the III stage of labour exceeds that one at the I and II stages. As the result of decrease in the uterine tonus postpartum haemorrhage considerably increases.

It is necessary to look after the character of discharge from the maternal passages (their absence, discharge of the amniotic fluid, its amount, colour, admixture of meconium, bloody discharge). Appearing of bloody discharge can be the evidence of detachment or presentation of placenta, rupture of cervix and other injuries of maternal passages. The most valuable information is received during the performing internal obstetrical (vaginal) examination, which is performed 2 times during the physiological course of pregnancy: after a parturient woman enters the hospital and after the discharge of the amniotic fluid. It should be mentioned, that increase in frequency of vaginal examinations not only disturbs the patient but also presents the risk of ascending infection (chorioamnionitis), especially after the rupture of fetal membranes.

During pregnancy of low risk and physiological course of labour a parturient woman is recommended to keep an active regimen, which contributes to the reduce of the labour act duration: getting up from the bed, walking, doing respiratory exercises for relaxation, rest in a pause between labour pains. If the fetal head is put up or the amniotic fluid discharges, it is recommended to lie on the side, which corresponds to the position of the fetus. Semi-sitting position of the woman (axes of the fetus and uterus coincide) contributes to the correct insertion of the fetal head. Long-lasting position of the parturient woman on the back can aggravate blood supply of the fetus and cause the vena cava inferior syndrome.

The important condition of favorable ending of labour is an emotional support of the woman by both medical staff and a member of her family, who, by her wish, is present during labour (husband, mother, or anyone else). Besides, the maneuvers directed at relaxation, pain relief during labour pains, massage can be performed by the member of the parturient woman's family (Fig. 74).

Such an approach reduces a woman's feeling of anxiety, her uncertainty as for the successful ending of labour, makes the process shorter and reduces the incidence of complications.

In any stage of labour it is recommended to be in active condition (walk), except this, parturient woman can choose by herself comfortable position.

Each 20–30 minute auscultation and count of the heart rate of the fetus are performed; in pregnant women of the group of high risk of perinatal pathology monitoring of the fetal heart rate and contractile function of the uterus are performed. Intravenous introductions and constant monitoring of the heart rate of fetus during pregnancy of low risk, as a rule, are not recommended, if there are no disturbances of the fetus heart beats during auscultation.

Even during the physiological labour heart activity of fetus changes: during the cephalic presentation and labour pains accelerations of the heart rate up to 180 per a minute or early deceleration till 90 per a minute can appear; during the pelvic presentation — up to 80 per minute. Stable decrease in the heart rate of fetus up to  $\leq 110$  per a minute or increase till  $\geq 160$  per minute is an evidence of its hypoxia.

Bradycardia (during cephalic presentation — 90 per a minute, pelvic — 80 per a minute) or tachycardia (accordingly up to 180 and 190 per a minute) are *the expressed signs of the fetal hypoxia* in labour. Acute decelerations — till 50 per a minute or W-form — up to 40 per a minute, if labour pain is absent, appear as an answer at prelum muscles contractions.

For improving the utero-placental blood circulation during hypoxia of the fetus in labour the following means are used: spasmolytics and vasodilator drugs (euphylline,  $\beta$ -sympathomimetics); for regulation of the vascular blood flow — theonicol, complamine; disaggregants — trental, curantil; low-molecular dextranes — rheopolyglukin, rheogluman; stabilizers of capillary permeability, metabolites — vitamins of B group and ascorbic acid, cocarboxylase, methionine, folic acid; antihypoxants — cytochrome C, sodium succinate, glucose as an energetic material, essential for stabilization of the function of placental membrane; oxygenation of the parturient woman by air-oxygen mixture. It should be remembered, that no drug completely eradicates fetal hypoxia, but just partially improves the conditions of its viability. That's why in promoted hypoxia of the fetus and presence of conditions for operational delivery exist, labour finishes by operational way depending on obstetrical situation.

Beginning of labour is an appearing of 2 labour pains during 10 min. Labour is not an even process. Within the first 4–5 h complex structural changes in cervix occur: it becomes shorter, smoothes, merges with lower segment of the uterus. The general length of the I stage of labour during the management of labour act is 10–12 h in nulliparous women and 6–8 h in multiparous women. Length of labour has a positive correlation with fetal weight, term of pregnancy, woman's weight before pregnancy and before labour and negative correlation with mother's height. Increase in the fetal weight by each 100 g prolongs labour by 3 min; increase in the mother's height by 10 cm reduces labour by 36 min; each week of the pregnant woman prolongs labour by

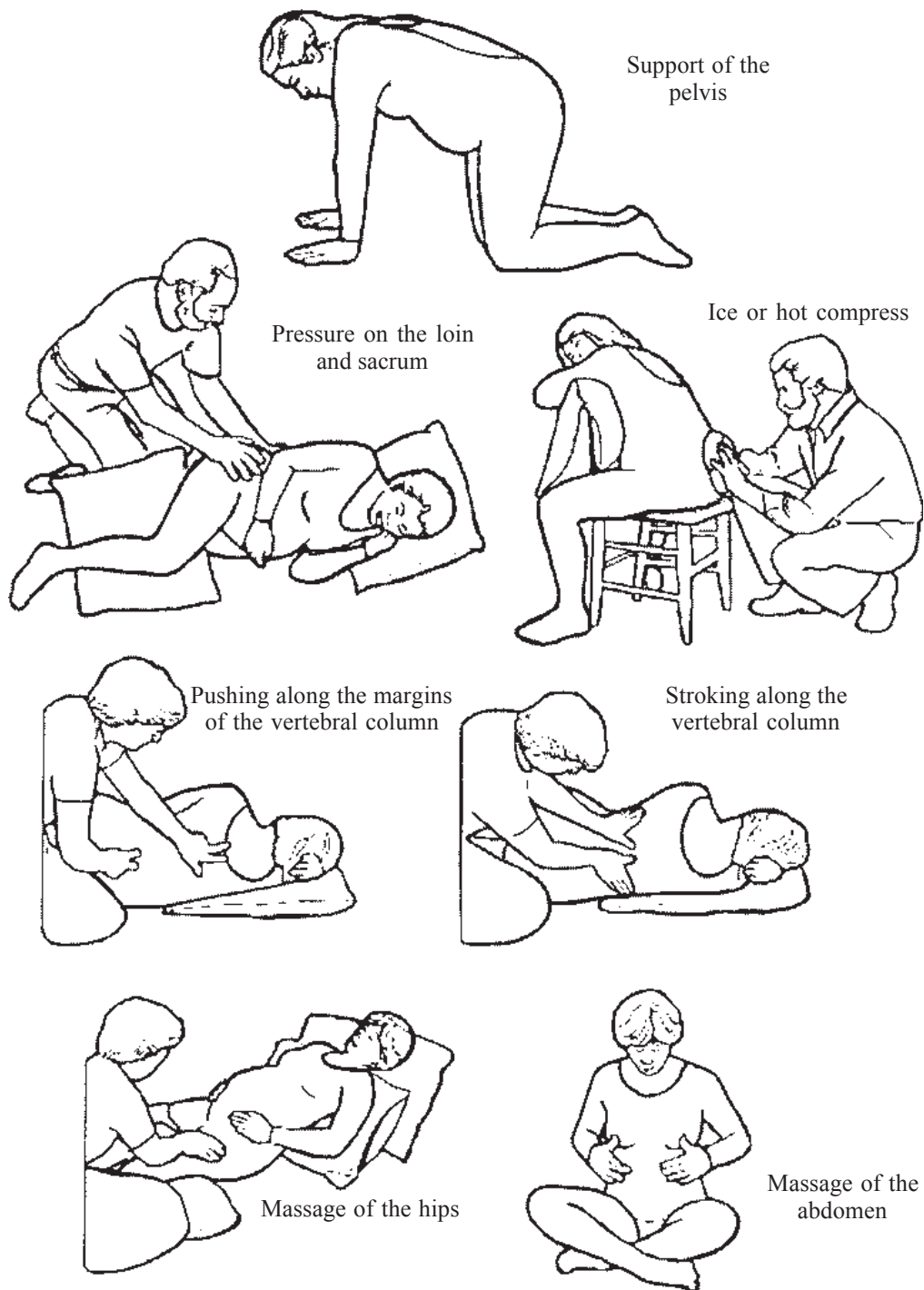


Fig. 74. Methods for reducing the pain and massage at the I stage of labour

1 min; each 1 kg of the pregnant woman's weight slows labour by 2 min, and each 1 kg of her weight before pregnancy — by 1 min.

In conditions of normal labour and completely coordinated labour activity the processes of cervical dilation and moving of the presenting part of the fetus occur synchronically. At the I stage of labour speed of the head's passing is 1 cm/h for nulliparous women, 2 cm/h — for multiparous; after complete cervical dilation (at the II stage of labour) — up to 4 cm/h. Permissible standing of the fetal head in the plane of the pelvic inlet is 6 h, in the plane of the outlet — 2 h.

Long-lasting compression of the soft tissues (especially of the urethra) leads to ischemia with further necrosis, which can cause development of urogenital fistula on the 7th–8th day after delivery.

The latent phase of labour (from the beginning of regular labour pains till the complete smoothing and cervical dilation by 4 cm) usually lasts for 5 h; speed of the cervical dilation is 0.35 cm/h. labour pains in this stage is not very painful, that's why till the dilation of cervix by 3–4 cm it is not recommended to use analgesics (using analgesics can lead to the prolongation of the latent phase, tiredness of the parturi-

ent woman, development of the secondary weakness of labour activity).

The active phase of labour lasts for 3–4 h during the speed of cervical dilation by 1.5–2 cm/h in nulliparous women, and by 2–2.5 cm/h in multiparous women, the number of labour pains is 3–5 during 10 min. During this phase feeling of pain intensifies. That's why it is recommended to use spasmolytics and analgesics for supporting of reciprocity of contractions of the fundus and corpus uteri and active relaxation of the lower segment and cervix (no-spa — 4 ml, baralgin — 5 ml).

The intime dosed sleep-rest (2–3 h long) for restoring the myometrium's resources is one of the most rational way of labour management and prophylaxis of secondary labour weakness in case of good condition of the fetus. Viadril (500 mg), sodium oxybutirate (20 ml 20% solution), nitrogen dioxide (N<sub>2</sub>O — 80%, O<sub>2</sub> — 20%) have a good spasmolytic effect. Analgesia is provided with using aprofhen (1–2 ml of 1–2% solution) with seduxen or dyphenhydramine hydrochloride or droperidol (1–2 ml of 0.25% solution) with solution of phentaniol (1–2 ml of 0.005% solution).

While managing the I stage of physiological labour it is recommended to perform substantiated and in-time prophylaxis of fetal hypoxia. For prophylaxis of hypoxia 20–40 ml of 40% solution of glu-

cose; 5 ml of 5% solution of ascorbic acid; 10 ml of 2.4% solution of euphiline intravenously, oxygenotherapy. It should be remembered that amniotomy is not a routine procedure: it can make labour shorter by 1–2 h, but there are no evidences that rapid labour are accompanied by better consequences for mother and fetus. Artificial rupture of fetal membranes is performed only if the fetal head is fixed, for preventing of prolapse of the umbilical cord; the amniotic fluid is discharged under control of the fingers. Aseptic conditions are intensified after amniotomy.

In the phase of slowing (from cervical dilation by 8 cm till its full opening), which lasts from 40 min to 2 h, spasmolytics are injected again.

Feeding during labour is prohibited, because in the case of inhalation anesthesia necessity of using complications (aspiration) can appear. Liquid can be drunk in small amounts (juices, milk as antacid mean).

Increase in the rate of operational interventions during labour at uncomplicated pregnancy without significant decrease in perinatal morbidity and mortality, as well as increase in the cost of medical help made the WHO to change policy of management of physiological labour. This policy is turned on reduce of unnecessary interventions during labour management, which can lead to using of accessory technologies — a so called cascade effect (Fig. 75).

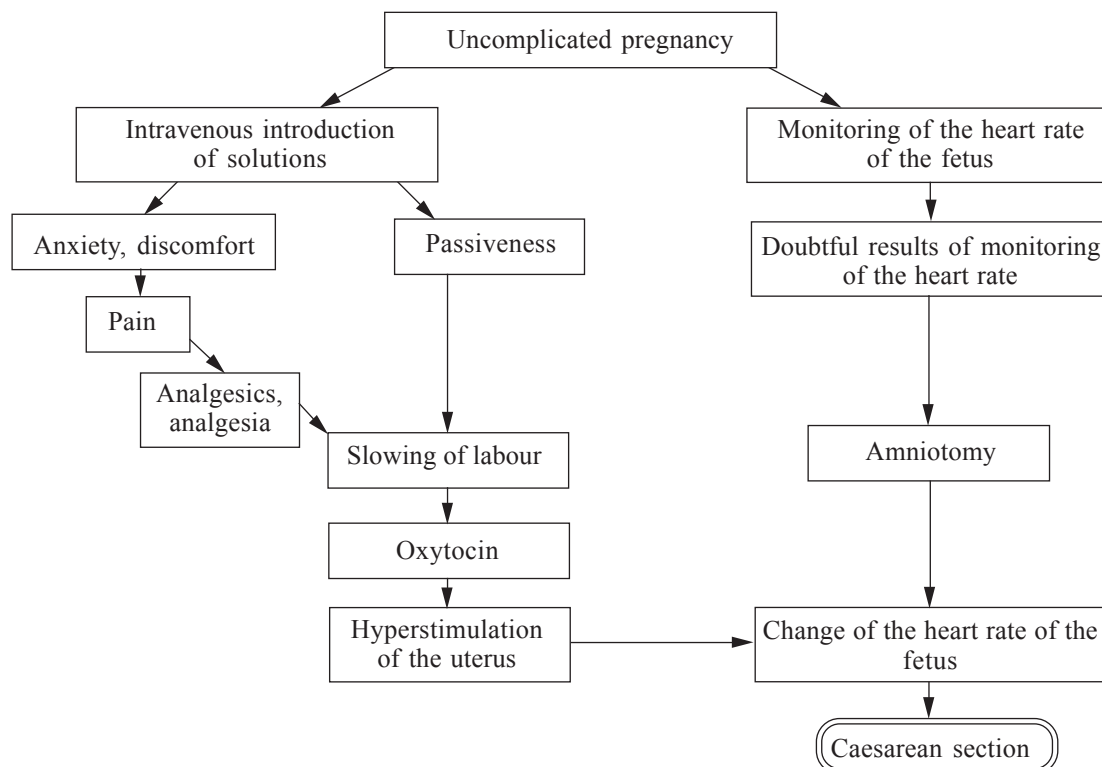


Fig. 75. Cascade effect as the result of unnecessary interventions during uncomplicated pregnancy



## STAGE OF FETUS EXPULSION

The second stage, the stage of expulsion of the fetus, begins with complete dilation of uterine orifice (by 10 cm). If till this time the fetal vesicle is intact, amniotomy is performed. At this period the contractile activity of the uterus is characterized by intensive contractions, to which prelum muscles contractions add after the presenting part of fetus reaching the pelvic bottom (plane of the pelvic outlet).

At the II stage of labour internal rotation, extension of the head, internal rotation of the trunk and external rotation of the head take place.

All the systems of an organism of a parturient woman (cardio-vascular, respiratory, nervous, muscular) at the II stage undergo maximal tension. The signs of decompensation of blood circulation can appear in parturient women with cardio-vascular pathology, hypertension during II stage of labour.

At the II stage of labour, when the head passes the wide and narrow parts of the pelvic cavity and places on the pelvic floor, not only mechanic expulsion takes place, but also the organism prepares to the extrauterine life, which requires a great responsibility of the doctor. That's why premature prelum muscles contractions (till placing of the fetus head on the pelvic floor) during the squeeze of the anterior lip of cervix is dangerous in this stage. It should be mentioned, that appearing of prelum muscles contractions in the location of high standing head can be the sign of clinical discrepancy between the sizes of fetal head and mother's pelvis. If prelum muscles contractions begin during full cervical dilation, and the head is in the plane of the pelvic inlet, there is a real threat of the uterine rupture.

Length of the II stage of physiological labour in nulliparous women is 30–60 min, in multiparous ones — 15–20 min. In the case of more prolonged prelum muscles contractions disturbance of utero-placental blood circulation, which can negatively influence the condition of the cervical part of the vertebral column of the fetus. There is one more point of view: the duration of the II stage of labour is not connected with low points according to the Apgar's score or necessity of performing a special help to newborns. However, it increases the risk of obstetrical bleedings and postnatal infection. The majority of obstetricians of this country consider that the II stage of labour should not be longer than 2 h for nulliparous and 1 h for multiparous women. According to the data of some foreign researchers, length of the II stage of labour up to 3 h is not dangerous for the fetus. But long standing of the fetus head in one of the pelvic cavities because of aggravation of blood supply can lead to disturbances of adjoining organs of the mother (urinary bladder, urethra, rectum) with fistulas development in the postnatal stage.

Artificial intensification of prelum muscles contractions is dangerous in connection with disturbance of labour biomechanism (the head delivers, but internal rotation of shoulders and external rotation of the head do not occur, distotion of shoulders appear, which can lead to labour injury).

During the II stage of labour observing of the parturient woman should be more intent (general condition, colour of the skin and mucous membranes, presence of pain, disturbances of vision). The body temperature, pulse are under control, ABP is measured between labour pains. It is necessary to control labour activity. The third and the fourth methods of external obstetrical examination determine the head position in relation to the pelvic planes. The Piskaček—Henter's method is used to control the progressive move of the fetal head: doctor covers the fingers by an aseptic napkin, touches the external margin of the right pudendal lip of the parturient woman. If the head of fetus locates in the pelvic cavity or on the pelvic floor, while pressing on this region it is possible to reach the inferior pole.

Cardiac tones of the fetus at the II stage of labour are auscultated each 5–15 min and after each prelum muscles contractions in connection with the risk of acute hypoxia (cord entanglement, premature detachment of placenta as the result of long-lasting prelum muscles contractions and short intervals between them). Records in labour history are made every 5–15 min.

The vaginal discharge of the parturient woman (meconium during hypoxia of the fetus, blood as the result of injury of the maternal passages or detachment of placenta; purulent discharge during the inflammatory process) and condition of the external genitalia (edema after the compression of soft tissues of maternal passages) should be thoroughly controlled.

**Labour maneuver.** Labour are managed in a neonatologist's presence. A parturient woman usually lies on her back with legs bent in her knees and hip joints on a special functional bed, which has lifted up the part for the head. During the prelum muscles contractions at the beginning of each labour pain a parturient woman should make a deep breath, hold breathing and press chin to the chest and brace (external Valsalva's method), regulating the strength of prelum muscles contractions; she should plant her feet against special stand, take the holder by her arms.

Position of the parturient woman on her spine during the II stage of labour is not necessary. In some countries parturient women give birth on the side squatting or sitting on a special chair. It is supposed that a sitting position contributes to the decrease in the incidence of cranio-cerebral injuries of the fetus. Before the beginning of head disengagement a polster can be put under the sacrum of a parturient woman to straight up the vertebral column, which contributes to intensification of evacuating forces and de-

crease in the pressure on the perineum. After the head disengagement manual obstetrical care is performed, which is based on preventing premature extension of the head and disturbance of the cerebral blood flow of the fetus related to this as well as protection of the perineum from the rupture (Fig. 76 *a-d*).

During the anterior kind of vertex presentation the head should disengage through the vulvar ring by its minor oblique diameter (9.5 cm, circumference 32 cm). During delivery of the head the tension of the perineal tissues is reduced by taking of the tissue of vulvar ring and transfer from top to bottom. Manipulations are done carefully, without excessive pressure on the fetal head. Manual obstetrical help consists of 5 moments: 1) preventing of the premature extension of the head; 2) release of the head from the vulvar ring during the absence of prelum muscles contractions; 3) reduce the strain of the tissues of perineum; 4) regulation of prelum muscles contractions; 5) release of the shoulder girdle and delivery of the fetal trunk.

A doctor or a midwife, who takes labour, is on the right side from the parturient woman. External genitalia of the parturient woman are disinfected. Sterile medical shoes are worn on the feet, sterile linen is put under the pelvis. The right hand of the obstetrician locates on the perineum of the parturient woman, and the left one — on the head of the fetus. The obstetrician, touching the fetal forehead during the prelum muscles contractions prevents the rapid move of the fetal head and its premature extension. After the end of prelum muscles contractions the head is carefully released from the pudendal slit by the thumb and second finger of the right hand. When the occiput is delivered and the subvertex fossa is under the pubic symphysis (point of fixation), the parturient woman is prohibited to push. In connection with this she is recommended from this moment and till delivery of the whole head to breathe rhythmically, putting her hands on the chest. Rhythmic deep breathing helps to overcome the prelum muscles contractions. The obstetrician accurately releases the parietal tubers of

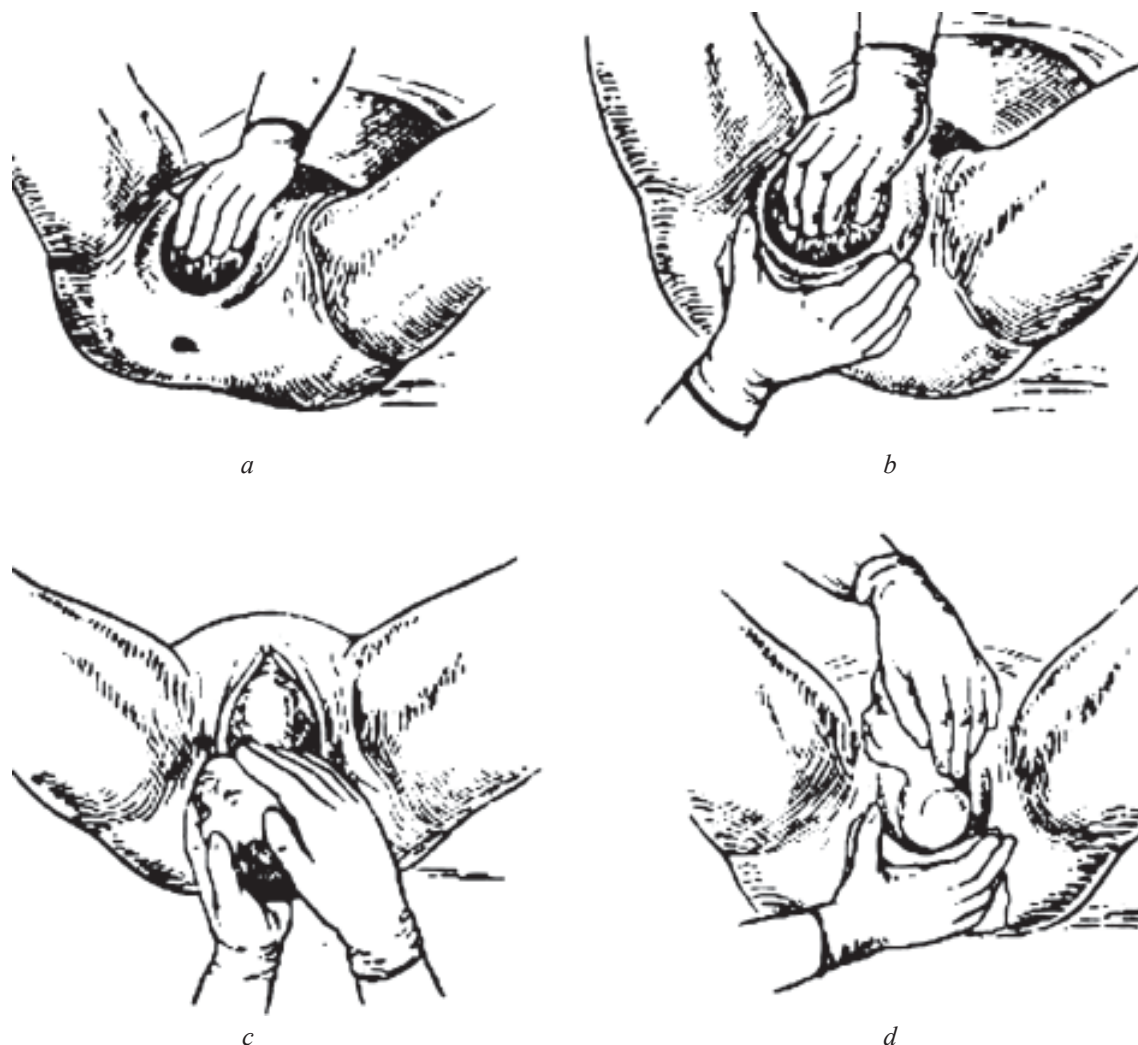


Fig. 76. Manual obstetrical care during vertex presentation:  
*a* — prevention of premature extension of the head; *b* — reduce of perineal tissue tension;  
*c* — release of the anterior shoulder; *d* — release of the posterior shoulder

the head, like “taking off” the tissue of the vulvar ring. With his left hand he contributes to the progressive extension of the head, and with the right one — “takes off” the perineum. While releasing parietal tubers and occiput of the fetus carefulness is required, because the strain of the perineum reaches the greatest extent at this moment.

After delivery of the head in the case of umbilical cord’s twisting around the fetal neck, its loop is carefully taken off or sected by scissors between two clamps.

Episio-, or perineotomy (Fig. 77), is performed for prophylaxis of injury of the maternal passages and acceleration of labour (treat of the perineum’s rupture, hypoxia of the fetus, large fetus, breech presentation).

Routine performing of episiotomy is not recommended. Episiotomy is performed in cases, when the head begins to strain the perineum, as well as before applying obstetrical forceps, or before the disengagement of buttocks during the breech presentation.

During episiotomy the skin, subcutaneous tissues, mucous membrane of the vagina, fascia and superficial muscles of perineum are sected. Episiotomy (medial, mediolateral, lateral) enlarges the outlet from the vagina, reduces the muscles tension and relieves delivery. Pain, bleeding, continuing rupture are the complications of episiotomy, but they are always less than during the rupture of the perineum of III–IV degree. Advantages and disadvantages of medial and mediolateral episiotomy are represented in table 12.

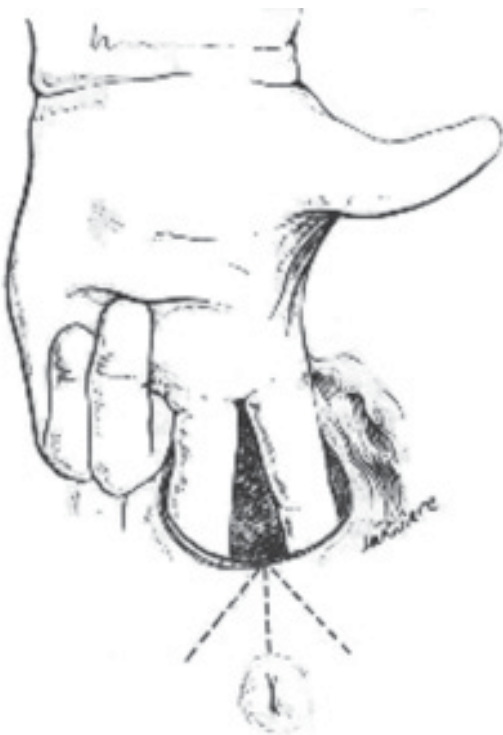


Fig. 77. Medial or mediolateral episiotomy. The fetal head is protected by the fingers simultaneously

Table 12. Advantages and disadvantages of medial and mediolateral episiotomy

Consequences	Episiotomy	
	Medial (perineotomy)	Mediolateral (episiotomy)
Recovery	Mild	Complicated
Complicated healing of the wound	Sometimes	Often
Painfulness	Minimal	1/3 of cases
Dispareunia	Rare	Often
Anatomical restructuring	Good	In 10% of cases
Blood loss	Minimal	Considerable
Spread of rupture to the external sphincter of the anus	Sometimes	Almost never

During delivery the fetal head is turned to the left or to the right hip of the mother depending on the position of the fetus, which is related to external rotation of the shoulders during the prelum muscles contractions. Shoulders insert by the direct diameter of the plane of the pelvic outlet. Performing careful traction of the head downwards, the obstetrician helps delivery of the anterior shoulder. Then the traction of the head upwards, “taking off” the tissue of perineum from the posterior shoulder, is performed. After delivery of the shoulder the girdle trunk of the fetus is taken by both hands, and lifting up is evacuated from the maternal passages. Attention: *do not hurry!*

**Newborn.** To prevent the aspiration mucus is drained from the nasal part of the pharynx of the newborn immediately after the external rotation of the head, when its chest is compressed by the maternal passages and he can not make the first inhalation. After the first inhalation skin of the newborn becomes rose, he begins to move by his extremities, loudly screams. Condition of the newborn is estimated by Virginia Apgar’s score on the 1st and 5th min of his life (Table 13).

By the Apgar’s score the majority of newborns on the 1st minute of life has 7–8 points (acrocyanosis is detected as the result of transitional blood circulation and decrease in the muscular tonus); 4–6 points — asphyxia of slight degree; 0–3 — severe asphyxia. The mark 10 points on the 1st minute of life is detected only in 15% of the newborns. On the 5th minute of life estimation by the Apgar’s score in the norm rises up to 8–10 points.

**Primary toilet of the newborn.** For prophylaxis of ophthalmoblenorrhoea the eyes are processed by 30% alcoholic solution of sulfacil sodium. By aseptic tampon the eyelids are processed from the external



Table 13. Estimation of the newborn by Apgar's score (on 1st and 5th min of life)

Parameters	Estimation, points		
	0	1	2
Heartbeats	Undetected	Till 100 per minute	More than 100 per minute
Breathing, scream	Undetected	Bradypnoe, arrhythmic, weak	Normal, loud
Skin colour	General paleness and cyanosis	Acrocyanosis	Pink
Muscular tonus	Weak (extremities are flabby, hang down)	Slight degree (extremities are bent)	Active movements
Reflector stimulation (reaction on evacuation of mucus, stimulation of the feet)	Undetected	Grimace	Cough, sucking movements, splits out the catheter

margin of the eye to the internal one; the inferior eyelid is accurately retracted and a few drops of 30% alcoholic solution of sulfacil sodium are put in the lid slit.

After the stop of pulsation of the umbilical cord two clamps are applied on it (10 cm from the umbilical ring), processed by 5% alcoholic solution of iodine and incised by aseptic scissors.

During the physiological labour it is recommended to put a newborn to the breast of the mother (within first 2 h), better till the section of the umbilical cord, which contributes to its better adaptation and reduce of the length of postnatal stage of labour. Rapid omphalotomy is necessary in premature labour, asphyxia and isoimmunization. If after delivery a child lies at the level of the inlet of vagina and lower and fetoplacental circulation does not stop during omphalotomy, 100 ml of blood are transfused to the newborn from placenta. Such excessive blood amount can be both useful (anemia of the fetus) and harmful (discordant twins) for the child.

As for the putting of the newborn on the mother's abdomen, there are many opinions. Some authors consider, that this method has some disadvantages: 1) contamination of aseptic field; 2) danger for the newborn; 3) blood outflow to the placenta.

The remain of the umbilical cord is wiped by a gauze tampon, wetted in 96% ethylic alcohol, and the umbilical cord is wringed dry, compressing by the second finger and thumbs. On 0.5–0.8 cm from the margin of the umbilical ring an aseptic metallic clamp or a special clamp is applied. If the maternal blood is Rh-negative, sterile silk or gauze ligature (possibility of performing substitutive blood transfusion) is applied on umbilical remain 5 cm in length. The umbilical cord is cut by 1.5 cm from the ligature by aseptic scissors, processed by 5% alcoholic solution of iodine; the umbilical stump is applied with a gauze bandage.

Primary processing of the skin of the newborn is based on remove of vernix caseosa, remains of blood,

meconium and mucus by a sterile cotton wool tampon, impregnated by liquid vaseline or oil.

After the primary toilet of the newborn its height (from pate to hill), weight, circumference of the head (direct diameter) and shoulders are measured. Bracelets are put on, where the sex, mother's surname and name, number of labour history, weight and height, date and time of delivery are written. The newborn is covered with warm wrapping clothes and blanket and put on the warm wrapping table.

## AFTERBIRTH STAGE

The postnatal, third, stage of labour begins after delivery of fetus and finishes by delivery of the afterbirth (placenta and fetal membranes). This period is divided into three phases: I — from delivery of the fetus till the appearing of the signs of placental separation; II — from the appearing of the signs of placental separation till its total separation; III — delivery of the afterbirth.

The postnatal period of labour is the shortest (5–30 min). However, very important because of the possibility of appearing of postnatal bleeding.

The afterbirth period is conducted in an actively expecting manner. General condition of puerpera, colour of the skin and mucous membranes, pulse, ABP are kept under observance, attention is paid on her complaints (dizziness, head ache). To prevent the disturbance of contractile ability of the uterus and bleeding, the urinary bladder of puerpera is emptied and the uterus independently performs detachment and elimination of the afterbirth, according to the principle of classical obstetrics — “hands off the uterus”, right after delivery of the child. A special bedpan is placed under the pelvis of the woman to control the blood loss.

The postnatal period is accompanied by physiological blood loss, which is 250–300 ml, or 0.5% of



the woman's weight. The course of the postnatal period depends on the location of the placenta, course of the I and II stages of labour. In norm villi of the chorion locate on the level of spongy layer of the functional layer of the endometrium. As the result of anatomo-functional insufficiency of the layer villi locate in the basal endometrium, attaching to the myometrium. Rarely villi of the chorion penetrate in the myometrium (in the region of cicatrices).

If the condition of the parturient woman is satisfactory and there are no symptoms of bleeding, signs of placental detachment, connected with the form of the uterus and location of the umbilical cord, are kept under visual and manual observance. In the case of the threat of bleeding from the disengagement of the head of fetus mobilization of the vein and dropped introduction of oxytocin in 5% solution of glucose are performed, which at any stage can be supplied by introduction of methylergometrin, etc.

*Schreder's sign* is a change of the form and height of standing of the uterine fundus. Right after birth the uterus acquires the round form and locates near the middle line of the abdomen, and its fundus — on the level of umbilicus. After the detachment of the placenta the uterus becomes longer, deviates to the right, its fundus raises higher the umbilicus in connection with passage of the afterbirth through the inferior uterine segment and vagina.

*Kustner—Chukalov's sign*. If the placenta has detached, the umbilical cord is not drawn in the vagina during the press by the rib of the palm above the pubic symphysis.

*Alfred's sign* — ligature (or clamp) is placed on the umbilical cord near the pudendal slit, after the placenta detachment deeps by 8–10 cm.

*Appearing of the eminence above the pubic symphysis*. When a detached placenta deeps in the thin-walled lower segment of the uterus, its anterior wall among with abdominal one rise and form an eminence above the pubic symphysis.

*Mikulitch—Radetskiy's sign*. As the result of placenta immersing in the vagina an urge to push appears (not always) in a parturient woman.

*Dovzhenko's sign*. If during the deep breath of the parturient woman umbilical cord does not draw into the vagina, the placenta has detached.

*Klein's sign*. If as the result of exerting of a parturient woman or slight pressing on the fundus of her uterus the umbilical cord becomes longer and does not draw into the vagina, the placenta has detached.

*Strassman's sign*. If knocking on the fundus uteri transfers through the filled umbilical vein, the placenta has not detached.

*Gogenbichler's sign*. If the umbilical cord can turn around its axis as the result of overfilling by the blood of the umbilical vein, the placenta has detached.

To be convinced in placental detachment, the presence of 2–3 signs is enough (Schreder's, Alfred's, Kustner—Chukalov's). If the placenta has detached,

a parturient woman is recommended to exert herself. Intraabdominal pressure, as a rule, is enough for afterbirth discharge (Fig. 78, a).

The placenta can discharge by fetal (by Schultz) or maternal (by Duncan) surface. If the placenta does not discharge independently, the expulsion of the afterbirth is performed (today it is used rarely).

*Abuladze's method*. After evacuation of the urinary bladder of the parturient woman both hands capture her anterior abdominal wall in longitudinal fold, and the woman is offered to exert herself. Thanks to the elevated abdominal pressure detached placenta delivers (Fig. 78, b).

*Henter's method*. After evacuation of the urinary bladder, the uterine fundus transfers to the middle line. The doctor stands near the woman's side, with his face to the feet. The back of the hands, clenched in fists, are put on the fundus uteri in the region of its angles and progressively push down and inside. A parturient woman should not exert herself meanwhile.

*Crede—Lasarevitch method* is the most injurious and is not used in modern obstetrics. Its technics is as follows: after the evacuation of the urinary bladder careful massage of the uterus is done till the appearing of its contractions. The uterine fundus is taken by such a way, that thumb is on the anterior wall of the uterus, palm — on the fundus, and four fingers — on the posterior wall. Thanks to the compression of the uterus in anteroposterior direction during the pressure on its fundus down and to the front by pelvic axis the afterbirth is expelled.

Before performing the mentioned above methods it is necessary to inject spasmolytics for prophylaxis of spastic contraction of the uterine orifice and squeezing of the afterbirth in it.

In the case of delay of fetal membranes in the uterine cavity the delivered placenta is turned by the hands clockwise. As the result of this fetal membranes are twisted in a spiral, which contributes to their detachment from the uterine walls. A parturient woman is recommended to lift up the pelvis, supporting on the feet: under the weight of the placenta the fetal membranes separate.

Active management of the postnatal period is used when bleeding occurred and the blood loss is 250–300 ml while the signs of placental detachment are absent. Active means (manual separation and expulsion of the afterbirth) are used during inconsiderable external blood loss and in connection with the aggravation of the woman's condition.

Attempts to intensify the process of expulsion of the afterbirth by the massage of the uterus, pulling the umbilical cord are excluded, because they break the physiological process of placental detachment from the uterine wall, change the rhythm of its contractions and intensify the bleeding.

Maternal surface of the delivered afterbirth is thoroughly examined, put on the plane surface to make sure the membranes and the placenta are intact. Mar-

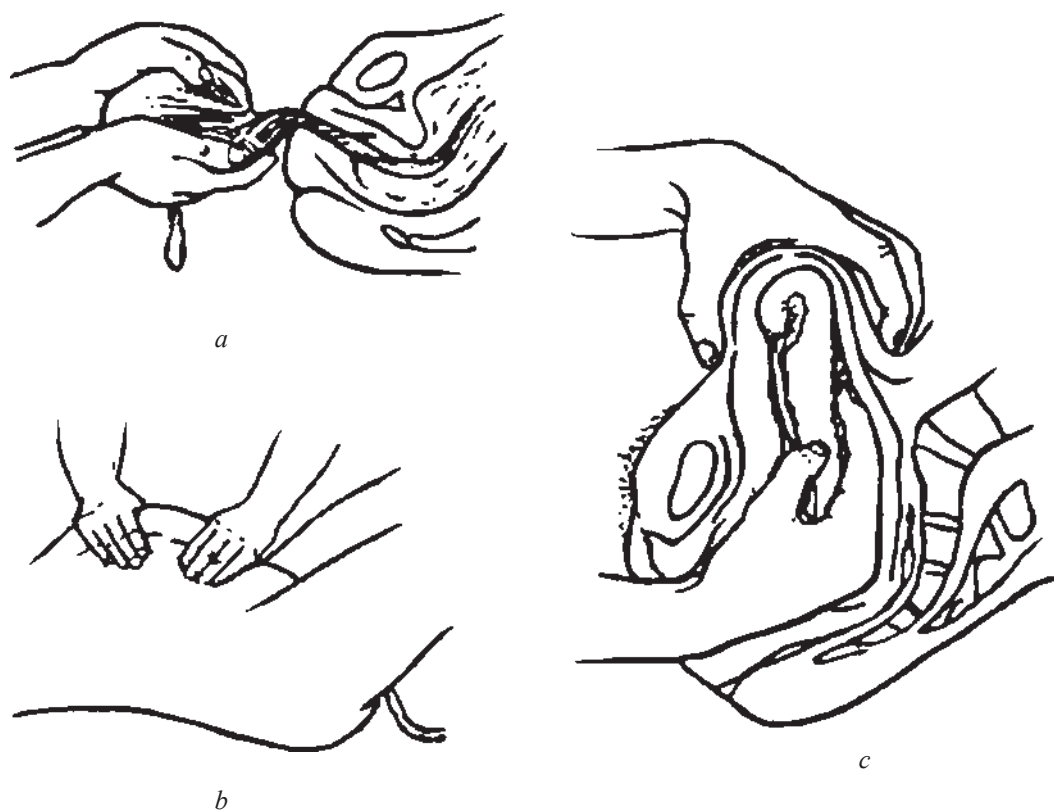


Fig. 78. Management of II stage of labour:  
 a — delivery and reception of the afterbirth; b — discharge of the placenta by Abuladze's method; c — operation of the manual detachment of the placenta

gins of the placenta should be smooth and even. The presence of broken vessels is an evidence of the delay of supplying lobe of the placenta in the uterine cavity. Examining the fetal surface of the afterbirth, margins of the membranes are straightened, trying to reconstruct their intactness; attention is paid on the broken vessels. During the detection of the broken parts of the afterbirth in the uterus (possibility of the severe bleeding, pyo-septic complications) manual examination of the uterine cavity with remove of the tissues of the placenta and membranes is performed.

During the placenta examination the attention is paid to dystrophic and inflammatory changes, the presence of blood coagulants (retroplacental hematoma). The afterbirth is weighed, blood is collected in measuring glass and the blood loss is detected (ml). The fetoplacental coefficient is counted. All data are put in labour history.

Waiting for the spontaneous detachment of the placenta is possible during 30 min. If during this time signs of its detachment are absent, manual detachment and elimination of the placenta are recommended (Fig. 78, c).

*Manual detachment of the placenta and elimination of the fetal (the afterbirth) membranes* are performed after applying a parturient woman narcosis with preliminary disinfection of her external genitalia and the obstetrician's hands. The urinary bladder is evacuated with catheter. The doctor penetrates the uterine cavity by one hand, the other hand is placed

outside, in the region of the fundus. The hand, which is in the uterine cavity, is slid along the umbilical cord to its base, the margin of the placenta is found and with "sawing" movements the placenta is detached from the uterine wall by the control of another hand. The operating hand should be turned by its palm's surface to the placenta, and side surface — to the uterine wall. The doctor captures a detached placenta by his hand and eliminates from the uterus, pulling the umbilical cord. Taking out the hand should be done after complete examination of the uterine cavity and the afterbirth. In the postnatal period women are prescribed antibacterial drugs in the case of manual detachment of the placenta and elimination of the afterbirth.

After delivery of the afterbirth the external genitalia, perineum and internal surface of the hips of the woman are disinfected. Then with the specula cervix and vaginal walls are examined; stitches are put on all ruptures of external and internal genitalia. The woman is kept under observing (general condition, pulse rate, ABP, location of the uterus, discharge from the vagina) during 2 h in the puerperal block (early postnatal period).

*Prophylaxis of hypotonic bleeding* is based in the prescription of tonomotor drugs, which contribute to the uterine contractions and stop the bleeding (in the moment of disengagement of the fetal head 1 ml of methylegometrin for 20 ml of 40% solution of glucose are injected intravenously or after section

of the umbilical cord — 10 U of oxytocin intramuscularly or 20 U in 1,000 ml of isotonic solution of sodium chloride intravenously). Prophylactic introduction of tonomotor drugs, which intensify the uterine contractions, are recommended in such cases: burdened obstetrical anamnesis, overstrain of the uterus (multiple pregnancy, hydramnion, large fetal weight), spasmolytics and analgesics using during labour, anomalies of labour activity, presence of anaemia, etc.

## EARLY POSTNATAL STAGE

During the first 2 h after labour a puerpera is observed in the room of the puerperal block. In connection with the threat of massive uterine bleedings her general condition, pulse, AP, tonus of the uterus, amount of the bloody discharges from the vagina are kept under observance. If the condition is satisfactory, bleeding is absent, the puerpera is transferred to the postnatal department in 2 h.

## LABOUR INDUCTION

Induction of labour — is a stimulation of the uterine contraction till the spontaneous beginning of labour (by medical indications). Induction of labour is recommended, if the consequences for mother and fetus will be better than the continuing of pregnancy. Induction of labour is performed with or without amniotomy.

Modern *indications* to induction of labour are the following:

- 1) severe forms of preeclampsy (pregnancy-induced arterial hypertension);
- 2) premature rupture of the fetal membranes;
- 3) chorioamnionitis;
- 4) threat for the life of the fetus (severe growth restriction, isoimmunization);
- 5) severe extragenital pathology of a pregnant woman (diabetes mellitus, renal diseases, chronic pulmonary disease);
- 6) death of the fetus;
- 7) previous accelerated labour in woman, in connection with what she can not be quickly hospitalized;
- 8) overterm pregnancy;
- 9) partial detachment of the placenta with insignificant bleeding.

*Contraindications* to induction of labour are the same as for delivery through the natural maternal passages:

- 1) placenta previa;
- 2) presentation of vessels of the umbilical cord (vasa previa);
- 3) transverse and oblique position of the fetus;
- 4) prolapse of the umbilical cord;

5) previous classic caesarean section or inferiority of the cicatrix on the uterus after it in the lower uterine segment;

6) active genital herpes.

Some obstetrical conditions require an especial attention, but they are not the absolutely contraindications to induction of labour:

- 1) multiparous women;
- 2) multiple pregnancy;
- 3) hydramnion;
- 4) diseases of the heart of the pregnant woman;
- 5) severe arterial hypertension of the pregnant woman;

6) anomalies of the heart rate of the fetus, which don't require an immediate delivery;

7) breech presentation of the fetus;

8) location of the presenting part in the pelvic inlet.

Induction of labour should be performed only after complete examination of a pregnant woman, estimation of the condition of the fetus, explanation to her indications and methods of stimulation, as well as after her agreement for this intervention. A pregnant woman should be informed about the possibility of performing the caesarean section or repeated induction of labour.

*Both maturity and satisfactory condition of the fetus and readiness of the maternal passages ("maturity of the cervix") are the most important condition of performing labour induction.* Gestational age of the fetus is confirmed with the clinical data (first day of the last menstruation, feeling of the fetal movements, objective data), level of HCG in the early terms of pregnancy, results of US at the I and II trimester of pregnancy, ultrasound fetometry. If there is a necessity of determining the maturity of the fetus lungs, it is expedient to perform amniocentesis.

For estimation the readiness of the organism of the pregnant woman to labour the degree of *the maturity of the cervix* is estimated by the Tchetchinashvili's method or by the Bishop's score.

If the cervix is mature (9 and more points by Bishop's score), the labour induction failure is minimal. During insufficient maturity of the cervix local prostaglandins are used ( $E_1$ ,  $E_2$ ,  $F_2\alpha$ ) as intracervical gel (on example, prepidil-gel, containing 0.5 mg of dinoprostone). If the maturation of the cervix has not take place during 12 h, the gel is re-injected (maximal dose of dinoprostone — 1 mg).

In Ukraine the preparing maternal passages is performed with using of oestrogen-calcium content (folliculin 20,000–40,000 U or synestrol 2 ml intramuscularly; 10 ml of 10% solution of calcium chloride, 20 ml of 40% solution of glucose, 5 ml of 5% solution of ascorbic acid, 100 mg of cocarboxylase intravenously).

If labour induction is decided to be performed, a pregnant woman is transferred to the puerperal department in the morning, her pulse, ABP, temperature of the body are over control; infusion of crystal-

loids is begun. Monitoring of the heart rate of the fetus and contractile activity of the uterus (cardiotocography) is performed. Prostaglandins (1–5 mg in the posterior vault of the vagina or 0.5 mg in the cervical canal) are prescribed the night before induction for preparation of the cervix. Bowel opening (enema) is not necessary.

Methods of the induction of labour are divided into surgical (amniotomy) and medicamentous (introduction of oxytocin or prostaglandins).

*Amniotomy* is a safe, easy and reliable method of labour induction if the cervix is mature. The decrease in the uterine volume stimulates its contractions. During a full-term pregnancy labour usually finish in 6 h.

For induction of labour 1–5 mg of *prostaglandin* (prepidil-gel, contenting 1 mg of dinoprostone) is injected intravaginally. If during 6 h labour has not started yet, 1–2 ml of dinoprostone (maximal or general dose — 3 mg) is injected.

Parenteral introduction of *oxytocin* is one of the most effective medicamentous methods of labour induction. Oxytocin is prescribed in concentration of 10 U by 1 l of isotonic solution of sodium chloride or 5% solution of glucose, but the dose is determined in every case individually. Infusion is performed with the speed of 0.01 ml/min and increases by arithmetic progression each 15 min, but no more than 0.15 U/min. The dose over 0.4 U/min can cause the injury of the kidneys. During the infusion of oxytocin it is recommended to perform cardiomonitoring of the fetus.

After reaching a necessary intensity of uterine contractions (40–60 mmHg) or their length during 40–60 s with intervals of 1–4 min the increase in oxytocin dose is stopped. If the uterine contractions become weaker, infusion of oxytocin is continued. In-

fusion is slowed or stopped during the intensity of uterine contractions more than 60 mmHg, length over 60 s, intervals between labour pains less than 2 min or as the result of appearing of signs of fetal hypoxia.

*Complications* of labour induction for mother and fetus are represented below.

As the result of first unsuccessful attempt of performing induction during 6 h and intact fetal membranes the procedure is repeated in 6–18 h. This time is enough for restoring the energetic resources of myometrium and rest of the puerpera. Intracervical preparation of the maternal passages with prostaglandins is continued; 6-hour induction is performed. After a repeated failure the woman has a rest for 6–18 h. If the third attempt is necessary the induction of labour is begun from amniotomy.

## ACTIVE LABOUR MANAGEMENT (PROGRAMMING LABOUR)

The increase in caesarean section incidence during last 20 years in the world with the absence of adequate decrease in perinatal mortality contributed to a necessity to revise the standard approaches of labour management. Some obstetricians-gynaecologists consider that the decrease in the incidence of operational management of labour can be achieved by the labour active management. According to recommendations of the National Maternal Hospital in Dublin (1984), *main principles* of active management are as follows:

- 1) strict criteria in choice of pregnant women for programming labour;
- 2) early amniotomy;
- 3) hourly vaginal examination;
- 4) prescribing of oxytocin when the speed of cervical dilation is less than 1 cm/h;
- 5) a high (in relation to a standard one) dose of oxytocin in pregnant women who need in labour stimulation;
- 6) expecting policy should be no more than 12 h at the I stage of labour and 2 h at the II stage.

However, as on the opinion of other specialists, such an approach does not guarantee the fetus safety and requires further studying.

*Advantages* of programming labour (E. T. Mihailenko, M. Ya. Tchernega, 1988; V. V. Abramchenko, 1996) are following:

- 1) readiness of the pregnant woman, her adequate psychological condition;
- 2) labour at day time, when all the trained stuff of the labour block is present;
- 3) active observing from the beginning of labour activity;
- 4) decrease in the labour course.

### Complications of the induction of labour for mother and fetus

Mother	Fetus
Emotional crisis (fear, anxiety)	Risk of immaturity of the fetus as the result of incorrect determining of gestation
Ineffective induction and necessity of further attempts	
Weakness of labour activity, prolonged labour	Prolapse of the umbilical cord
Accelerated labour (threat of the uterus' rupture)	Infection
Obstetrical bleeding (premature detachment of placenta, hypotonia of uterus)	Asphyxia or injury of the fetus during the accelerated labour
Intrauterine infection	
Hypofibrinogenemia, other coagulopathias	
Embolism by the amniotic fluid	



*Disadvantages* of programming labour management are following:

- 1) forced position of the parturient woman during labour induction and infusion of solutions;
- 2) more frequent anomalies of the fetal head insertion;
- 3) disturbances of the contractile activity of the uterus;
- 4) uterine hypotonia after labour.

*Complications* of programming labour occur rarely and in majority are caused by insufficient estimation of the situation before labour induction (immaturity of the fetus, unprepared cervix and other).

Conditions, necessary for performing of programming labour, especially in nulliparous women, are following:

- 1) cephalic presentation of the fetus;
- 2) full-term pregnancy;

- 3) weight of the fetus not less than 3,000 g;
- 4) insertion of the fetal head in the plane of the pelvic inlet;
- 5) a mature cervix;
- 6) prepared uterus for the manifestation of regular uterine contractions (by data of cardiotocography).

Strict selection of the pregnant woman for performing the programming labour improves the results of labour for mother and fetus.

#### RECOMMENDED READING

- 2; 3 (99–104); 5 (15–36); 7 (353–359); 9; 22; 26 (50–63); 32 (7–31); 47; 56; 58; 61.

Labour pain is connected with uterine tractions, its ligaments, appendages, strain of the cervix uteri and lower parts of the labour canal, pressure on the uterus, urinary bladder, ureters, urethra and intestine; stimulation of periost of the internal surface of sacrum, compression and strain of the blood vessels by numerous mechano- and baroreceptors as the result of uterine contractions; hypoxia and accumulation of unoxylated metabolites in the myometrium (*absolute components*), and also with feeling of fear, stress and anxiety (*conditioned-reflectory or psychogenic component*), experienced by parturient women.

Disturbance of interregulation between subcortical neurodynamic processes and functional condition of the cortex of the cerebrum, as well as individual features of the parturient woman, her emotional condition, attitude to the future maternity influence the mechanism of appearing of labour pain too. So, nearly 25% of nulliparous women and 10% of multiparous women can experience intensive pain, and vice versa correspondingly — nearly 10% and 25% — insignificant.

In the case of anomalies of labour activity pains can be the evidence of disproportion between maternal pelvis and fetal head. The pain is caused by excessive, titanic, long, arrhythmic uterine contractions, intrauterine infection. The pain can disturb contractile activity of the uterus, function of the urinary bladder, can be the cause of reflector muscular spasm, breaking the digestion (nausea, vomiting).

Under the influence of pain the function of cardio-vascular system (tachycardia, increase in cardiac output, elevation of ABP, central venous pressure, peripheral vascular resistance, possible disturbance of the cardiac rhythm) disturbs, which is especially dangerous for pregnant women suffering from heart disease, hypertension and late gestosis. Changes in the respiratory system, which occur in connection with pain manifest themselves in tachypnea, decrease in respiratory volume, increase in the minute volume of respiration, which can cause hypercapnia and disturbance of the utero-placental blood circulation.

All these peculiarities cause a necessity of individual approach to pain relief during labour. Individual labour pain relief of full value is a manifestation of human treatment of the woman.

Pain during I stage of labour is usually the consequence of uterine contractions and dilation of its cervix. The reflector arch passes through the sympathetic nervous fibers, which spring from the spinal cord in zones  $T_X-T_{XII}$  and  $L_I$ . During descending the head pain occurs as the result of strain of lower parts of the labour canal and perineum along somatic nervous fibers, passing at levels  $S_{II}-S_{IV}$ .

Maneuvers which are used to make the labour pain easier, are known from early ages. But N. I. Pirogov for the first time used the narcosis with ether in obstetrics in 1847 (during the application of obstetrical forceps). Chloroform, nitrogen dioxide, chlorhydrate, narcotic analgesics, barbiturates, solution of novocain, magnesium sulfate with omnoponium, hypnosis were used for anaesthesia of the labour and obstetrical operations.

Defense reaction on pain (decrease in pain impulsion) is a destroy of a part of nervous fibers of the uterus, which occurs at the beginning of labour depending on their amount at the beginning of pregnancy (partial physiological deneravation of the uterus). Non-medicamental and medicamental methods of labour anaesthesia are used in obstetrics.

### NON-MEDICAMENTAL METHODS OF LABOUR ANAESTHESIA

Physiopsychoprophylactic preparation of pregnant women, autogenous and heterogeneous training, hypnotherapy, acupuncture, abdominal decompression, electroanalgesia are the non-medicamental methods of labour anaesthesia.

*Psychoprophylactic preparation* of pregnant women to labour was elaborated by Ukrainian scientists I. Z. Velvovskiy, K. I. Platonov, V. A. Ploticher and is widely spread (physiopsychoprophylactic meth-

od with using of the physical exercises) all over the world. Its aim is to prevent the psychogenic component of the pain, which is based on the prejudice of the pregnant woman as for her inevitability and obligation, which causes fear. In connection with this 4 weeks before the labour 3–6 special classes in small groups are performed with pregnant women in the women's consultation clinics, during which they get acquainted with peculiarities of the course of pregnancy, labour, process of development of fetus, are taught by correct behavior during the labour pains and prelum muscles contractions, as well as maneuvers, which decrease pain (change of the body position, respiratory and exercises for relaxation, methods of self-massage). Till the 20th week, within 23–30 weeks (together with psychoprophylaxis) classes with pregnant women on physical training in small groups under the supervision of exercise therapy instructor (complex of physical exercises, directed at the preparation of nervous, cardio-vascular, respiratory and osseous-muscular system), are performed.

**First class** (interview) is carried out individually during the first visit of a pregnant woman to a women's consultation clinic. During the first meeting a doctor should set a contact with a pregnant woman, listen to her complains, gather the anamnesis. He pays attention to the age, education, profession, conditions of the work, home environment of the pregnant woman, asks about her attitude to pregnancy and labour, reveals harmful features, determines emotional-psychical condition. It is necessary to analyze not only the previous pregnancies, labour and course of the present pregnancy, but also the gynaecological diseases. During the interview the doctor tries to consolidate positive emotions as for the favorable finishing of the pregnancy and labour. If the complicated labour are expected, the doctor accurately prepare pregnant woman about a possible operational intervention.

**Second class**, as the further ones, — is a group one. It is dedicated to the elimination of fear in pregnant women as for the labour and pain, connected with it. The doctor tells about the role of CNS in development of pain and it is not obligatory during delivery. A pregnant woman is explained that insignificant and bearable pain feelings during the labour can be removed by the method of physiopsychoprophylactic preparation.

**On the third class** doctor, using proper pictures, schemes, models, introduces the pregnant women with anatomotopographic peculiarities of female genitalia, osseous pelvis, menstrual function, fertilization and development of embryo and fetus with its location in the uterus, role of the placenta, amniotic fluid. Pregnant women get to know about the changes, which occur in maternal passages during pregnancy and in labour (uterine growth, strain of ligaments and vessels, softening of the cervix, its dilation, adaptation of the fetal head to pelvic sizes, fetus moving through

maternal passages), doctor accents their attention on physiology of these processes and preparation of the female organism. Pregnant women also get the information about the independent decrease in the feeling of weight and pressure in the lower abdomen, performing the special methods. The doctor accents, that labour is a heavy physical load, requires the great needs of energy, which should be spent carefully, be able to rest between the labour pains to preserve force for the period of the fetus expulsion.

**The fourth class** is dedicated to physiology of the first period of labour, mechanism of dilation of the cervix. The signs of labour beginning (frequency and length of the labour pains — 3–4 times an hour, discharge of the mucous from the vagina and amniotic fluid, even if the labour pains are absent) and necessity of hospitalization under these conditions are discussed. Pregnant women are let know beforehand about a necessity of performing manipulations in the puerperal hospital (examinations, vaginal examinations, catheterization of the urinary bladder, take in blood and urine analysis). A pregnant woman is told about correct positions in the first period of labour, which reduce pain feelings and do not aggravate blood circulation of the fetus (walking, position on the side, in the arm chair, semi-sitting and other). A correct and quiet behavior of a pregnant woman in labour contributes to physiological course of the latter and makes the labour course shorter. Pregnant women are explained how to count the labour pains and how to rest in pauses between them. They are recommended to evacuate the urinary bladder each 2 hours, and taught the special methods to reduce the pain.

**First method** — correct regular breathing during the labour pains with physiological frequency (up to 30 per min).

**Second method** — combination of inspiration and expiration during the labour pains with sliding along the lower abdomen from the middle line of suprapubic eminence outside and upwards to the inguinal lines (inspiration) and to the starting position without touching the abdomen by the hands (expiration), as well as stroking of the Michaelis' rhomboid region. Principle of the method is based on the knowledge of skin pain zones Zakharyin—Head, corresponding to them in the uterus.

**Third method** is used during the frequent intensive labour pains (pushing by the thumb the points of anaesthesia — cutaneous surface of the region of anterosuperior spines of the iliac bones and placing the fists under the external angles of Michaelis' rhomboid).

At the class pregnant women are taught these methods on practice.

**The fifth class** acquaint pregnant women with peculiarities of the labour course at the II–III stages. Attention is paid to the change of the nature of pain feelings (sence of bursting, pressure on the anus, re-

gion of the perineum). It is recommended to change the position of the body for reduce of the pain and contributing to the fetus movement. They are taught to keep breathing three times during the prelum muscles contractions (by 10–15 s) after the deep inspiration. Information about the course of the third period, length and character of postnatal labour pains is given.

**On the sixth class**, the last one, pregnant women are told about the course of the postnatal period, expediency of staying mother and newborn is one ward if there are no complication, about the rules of breast feeding, care about the mammary glands, about the necessity of the diet, in time evacuation of the urinary bladder and intestine, repeat the main moments of the previous classes, convince the pregnant women of a successful childbirth.

After delivery the effectiveness of physiopsychoprophylactic training is estimated: “complete effectiveness”, “partial effectiveness” and “ineffectiveness”.

The method of physiopsychoprophylactic training developed and is used all over the world with some peculiarities (labour care in the family). In modern time the performing of labour together with her people (a husband, a mother, members of her family) in a family puerperal wards is a humane treat of woman and effective psychological support. Special preparational classes are visited by a pregnant woman together with her husband, who wants to help his child to deliver. The husband or anyone else, to whom a pregnant woman entrusts the care during labour, under the guidance of a doctor and midwife, performs the massage, helps the parturient woman to find the comfort position during the labour pains, psychologically supports her. In some developed countries (Netherlands, USA and others) the majority of uncomplicated labour during pregnancy of low risk are managed at home in usual conditions and environment. The first in Ukraine family puerperal wards were opened in Odessa, Kiev, Donetsk with the support of the Agency of International Development.

**Method of autogenous and heterogeneous training** (9–10 classes by 25–30 min in length) contributes to the reduce of emotional stress of a parturient woman, directs her nervous potential on the effective performing somatic functions during the labour, rises the pain threshold, reduces the length and intensity of pain, decreases the motor excitability related with pain.

**Hypnosuggestive therapy** used for muscular relaxation and psychical rest of the pregnant woman.

**Acupuncture** (introduction of 2–3 needles by 30 min — 12–18 h) can also be used for labour anaesthesia.

For electroanalgesia the impulse current of 1 mA, frequency 130 Hz and more is used. Electrodes are applied on the forehead and occiput of the pregnant woman, duration of the session is 1–2.5 h. In 40–60 min pain reaction reduces. For intensification of the

effect before the electroanalgesia session a parturient woman is injected pipolphen (diphenhydramine hydrochloride) or promedol.

## MEDICAMENTAL METHODS OF LABOUR ANAESTHESIA

There are no absolutely safe and effective medicinal methods of analgesia in obstetrics. Permeability of the placenta is the main factor, which restricts using of analgesic preparations in obstetrics. Respiratory centers of the fetus are very sensitive to the sedative preparations and preparations for narcosis. These substances rapidly transport to the fetus through the placenta and can cause respiratory depression (asphyxia) in a newborn. As the result of immaturity of the fetal liver the effect of narcotic analgesics considerably intensifies, which leads not only to depression of the breathing, but also to suppression of reflector activity and arterial hypotension. Besides, the using general or local anaesthesia can be very dangerous for the mother.

Medicines for analgesia of labour should correspond with following requirements:

- 1) tranquilizing and analgesic effect;
- 2) absence of suppressive effect on labour activity, preventing and liquidation of spasms of the cervix and lower uterine segment;
- 3) absence of negative effect on the pregnant woman and fetus;
- 4) preserving of consciousness of the pregnant woman;
- 5) accessibility.

Anaesthesia of labour with medicines is recommended under following conditions:

- 1) restless behavior of the pregnant woman, intensive pain;
- 2) active phase of the I period of labour (cervical dilation is no less than by 3–4 cm) during the absence of contraindications (hypoxia, transverse lie of the fetus, presentation of the placenta, defective cicatrix on the uterus).

Analgesia, absence of normal pain perception is not absolutely necessary during physiological labour through the natural maternal passages, however, it can help a parturient woman to avoid excessive suffering. During the complicated labour analgesia is necessary for the safety of a pregnant woman and can be used during 12 h and more. In the modern obstetrical anaesthesiology combined methods of analgesia with some substances, which have similar effect, are used. Psychotropic drugs from the group of major and minor tranquilizers (ataractics) in combination with analgesics and spasmolytics are the most spread.

Tranquilizers normalize functional condition of the cortex of the cerebrum, weaken a parturient wom-



an's reaction on external stimuli, and decrease anxiety and agitation. During the labour normal course a parturient woman is prescribed 300 mg of trioxazine or 200 mg meprobamate, and in cases of intense stimulation dose of tranquilizers is twice increased.

Narcotics (promedol, dyphenhydramine hydrochloride), which elevate the pain threshold by 50% and more, are the most effective analgesics. The analgesic effect of the major part of narcotics occurs not early than in 90 min and lasts for 1–2 h. Nausea, vomiting, intestinal paresis, decrease in frequency, strength and duration of uterine contractions are the side effects, if these analgesics are used during the latent phase of labour. Immaturity of the fetus, intrauterine growth restriction, injury and asphyxia intensify the negative effect of analgesia on the newborn.

If the cervix is opened not less than by 3–4 cm and an active labour activity is present, 20 mg of promedol, 50 mg of pipolphen are injected intramuscularly, as well as no-spa or gangleron. For intensification of analgesia drugs are injected in half doses in 3–4 h. Promedol is not injected, if there is less than 2 h before the delivery of the childbirth (suppression of the respiratory center of the fetus).

Promedol is combined with minor tranquilizer diazepam (seduxen, valium) — 10 mg intravenously. If the sedative effect is insufficient, 10 mg of diazepam is injected in 30 min. In 1 h after its introduction 20 mg of promedol are injected. If it is necessary, in 2–3 h introduction of promedol is repeated.

The most popular combinations of analgesics are the following: 1) promedol (20–40 mg), dyphenhydramine hydrochloride (20 mg), no-spa (40 mg); 2) promedol (20–40 mg), diazepam (10 mg), isoverin (50 mg); 3) dipidolor (15 mg), diazepam (10 mg), galidor (50 mg).

**Neuroleptanalgesia** is performed with using of neuroleptic droperidol and strong analgesic of short effect phentaniil. Droperidol provides sedative effect, potentiates the effect of narcotic analgesics and analgetic drugs, normalizes hemodynamics, which is very important for a pregnant woman with hypertensive syndrome and preeclampsy. Phentaniil in comparison with promedol suppresses contractile activity of the uterus to a lesser extent. Suppression of the respiration of mother and fetus, bradycardia and bronchospastic effect are the side effects of phentaniil. When the cervix is dilated by 3–4 cm and pain reaction is promoted, a mixture is injected intramuscularly: 2–4 ml of droperidol and 2–4 ml of phentaniil. The repeated introduction of droperidol is possible not earlier than in 2–3 h. Introduction of phentaniil can be repeated in 30–60 min, if there was no positive effects, but no later than 1 h before the finishing of labour (suppression of the respiratory center of the fetus).

For anaesthesia of labour sodium hydroxybutyrate (GHOA-sodium) and viadril are used, which can be

injected in combination with derivatives of phenothiazine (pipolphen) and narcotic analgesics (promedol). GHOA-sodium is used as basic method for a medicamental sleep-rest of a tired parturient woman. It is injected intravenously (10–20 ml of 20% solution (2–4 g of substance), diluted in 10–20 ml 40% solution of glucose) or per os (4–6 g of dry substance, diluted in 50–100 ml of boiled water). GHOA-sodium has nootropic effect, penetrates through gematoencephalic barrier, performs sedative, myorelaxational and anti-hypoxic effect. The duration of effect of preparation is 2–5 h, however, it is weak (mild). This preparation is contraindicated during the severe gestoses of the pregnant woman with hypertensive syndrome and hypokaliemia.

**Anaesthesia** is a partial or complete loss of sensitivity with loss of consciousness or without it as the result of using drugs.

**General anaesthesia**, or narcosis, very often leads to suppression of CNS of mother and newborn.

General incubational anaesthesia is performed, as a rule, during caesarean section, severe hypertension of the pregnant woman, obstetrical bleeding. It is performed in such a way:

- 1) introduction in narcosis — intravenously barbiturate, which has a short effect, or ketamin;
- 2) introduction of preparations of succinilcholine for muscular relaxation before the intubation;
- 3) intubation;
- 4) anaesthesia by nitrogen dioxide with oxygen (1:1), which is an ideal for anaesthesia and safe for mother and fetus. Wide using of this method limits the potential risk of complications, related with intubations and aspiration.

**Drugs for inhalation narcosis** in low concentrations do not have negative effect on the fetus. In modern obstetrics **nitrogen dioxide ( $N_2O$ )**, which has spasmolytic effect, accelerates cervical dilation, reduces I stage of labour and is not harmful for mother and fetus, is used more often. It is used in mixture with oxygen (1:1, 2:1, 3:1) with special narcosis appliance for autoanalgesia (a parturient woman by herself uses the apparatus depending on intensity of the pain). Intervals are done between inhalations (duration of each is 30–40 min). Nitrogen dioxide is a mild narcotic. For intensification of analgesic effect premedication with narcotic analgesics or neurotrots from the group of derivatives of phenotiazin, as well as diazepam, promedol, droperidol, especially in the presence of extragenital pathology in a parturient woman, is performed.

**Trichlorethylen (trylen)** has more promoted effect of general anaesthesia, in comparison with nitrogen dioxide. Trichlorethylen (0.4–0.5 %) for autoanalgesia is used in mixture with nitrogen dioxide (40%) and oxygen (60%), especially in women with hypertensive complications, cardiac defects, when an adequate anaesthesia is necessary during the whole I stage of labour. Inhalations of trichlorethylen are stopped

30–40 min before the beginning of the II stage of labour to prevent narcotic depression of the fetus.

*Phtorotan* is one of the active, operated, but toxic drugs for the narcosis. That's why it is used in urgent need in anaesthesia in pregnant women who has promoted arterial hypertension to stop labour activity (discoordination of labour activity; treat of the uterine rupture). During active labour activity phtorotan can be used during 2–3 h, better in mixture with nitrogen dioxide and oxygen. *Side effect*: the decrease in labour activity, depressive effect on the fetus, threat of hypotonic postnatal bleeding.

*Pentran (metoxyflurane)* is the most powerful and dangerous remedy for inhalation narcosis. Using of pentran, as well as phtorotan, should be substantiated by special indications (overstimulated labour activity, psychomotor excitability, severe arterial hypertension, threat of the uterine rupture). Side effect is the same as the phtorotan's. Inhalation of pentran is done with oxygen or air. It should be mentioned, that some drugs of inhalation narcosis can negatively influence hemocoagulation.

**Nerve block.** Local infiltrational and regional anaesthesia is used as a method of anaesthesia during the delivery.

**Local infiltrational anaesthesia** is a harmless method, but requires much time and is performed only before epiziotomy and putting stitches on the ruptured perineum. 0.25–0.5% solution novocaini, 0.5–1% solution trimecaini, 0.25–0.5% solution lidocaini are used for local anaesthesia.

**Local anaesthesia.** *Paracervical anaesthesia* is not used in modern obstetrics because of frequent development of bradycardia and acidosis of the fetus.

*Pudendal anaesthesia* is performed at the II stage of labour. The principle of this method is in blocking pudendal (genital) nerves for anaesthesia of external genitalia and perineum. Block can be performed both through the perineum and lateral walls of the vagina. During the first method a needle of 10 cm in length is injected in points located in the middle between the ischial tuberosity and margin of the sphincter of the anus. Convinced in the absence of the blood in the syringe, 10–30 ml of 0.25–0.5% solution lidocaini is injected from each side. During the second method the vaginal wall is pricked on the level of ischiadic spine and end of the needle is injected behind it. Anaesthesia is effective if the contractions of external sphincter of the anus are absent after touching it. Because of low efficacy and pain during the procedure this method is used very seldom in modern obstetrics. Pudendal anaesthesia in Ukraine is used during preterm labour.

**Peridural anaesthesia** is one of the modern methods of labour anaesthesia (Fig. 79).

During peridural anaesthesia a block of nervous fibers at the level of segments  $T_{XI}$ – $T_{XI}$ ;  $L_I$  and  $S_{II}$ – $IV$  is performed. 2% solution of lidocain, 2.5% solution of trimecain and other anaesthetics (6–10 ml depend-

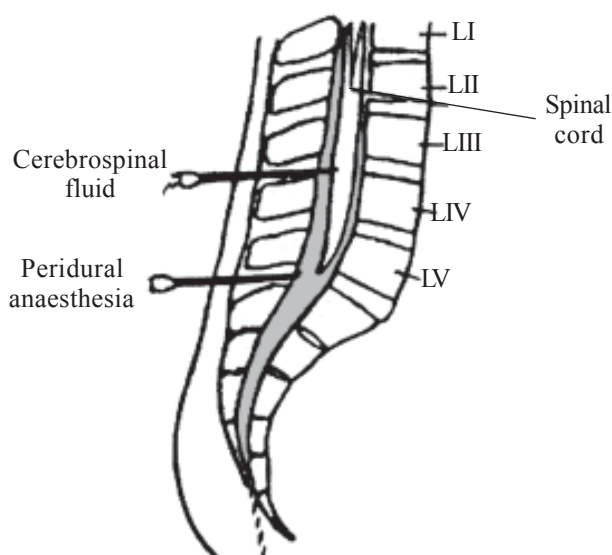


Fig. 79. Peridural anaesthesia

ing on the weight of the woman) are used for anaesthesia; interval between introductions at the beginning of active phase of labour is 1–1.5 h, at the end of the I stage — 30–40 min.

Efficacy of peridural anaesthesia is 95%, but special skills and experience of the doctor are required for its performing. It can be used for anaesthesia of both physiological labour (during active labour activity and after dilation of the cervix by 5–6 cm in nulliparous women and by 3–4 in multiparous ones) and obstetrical (late gestosis, distortion of the cervix, discoordination of labour activity) and extragenital pathology. Besides this peridural anaesthesia is performed during caesarean section (Fig. 80).

Possibility of preserving consciousness in women and absence of the effect on contractile activity of the uterus are the advantages of this method. Peridural anaesthesia does not cause asphyxia of the fetus and hypotonic bleedings. Such complications, as arterial hypotension and bradycardia appear rarely. As the result of relaxation of the pelvic floor correct rotation of the fetal head can disturb, which causes the increase in the incidence of cases of the posterior kind, and sometimes — a necessity in obstetrical forceps application.

*Spinal anaesthesia* is also used for labour anaesthesia. Absence of the influence on incidence of fetal hypoxia, postnatal bleedings, simple techniques of performing, adequate relaxation of the inferior part of the labour canal and pelvic floor are the advantages of spinal anaesthesia. Head ache (5% of cases), arterial hypotension, high rate of operational delivery during the absence of prelum muscles contractions, disturbance of breathing because of the rapid introduction of drugs for narcosis are its disadvantages.

*Indications* for use of medicamental methods of anaesthesia and possible *complications* are represented below.

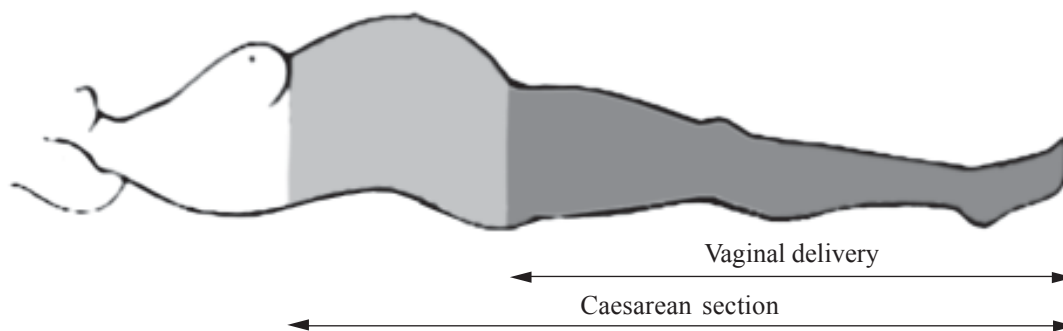


Fig. 80. Peridural anaesthesia during vaginal delivery and caesarean section

#### Indications for general and local anaesthesia

<i>Local anaesthesia</i>	<i>General anaesthesia</i>
Previous feeding	Necessity of immediate delivery
Respiratory infections	Acute hypoxia of the fetus
Bronchial asthma	Acute obstetrical bleeding
Possible disturbances of breathing	Hysterics of the parturient woman, ineffective relaxation of the uterus
	Coagulopathy, neuropathy
	Bacteriemia, viremia

#### Complications of local and general anaesthesia

<i>Local anaesthesia</i>	<i>General anaesthesia</i>
Arterial hypotension, decrease in the placental blood circulation	Aspiration of the stomach's content (Mendelson's syndrome)
Injury intravascular or high spinal block	Complicated intubation (as the result of obesity)
Postspinal headache	Obstruction of the respiratory tract
Spinal caudal neuropathy	Long-lasting apnea
	Pain, edema of the larynx

*Aspiration of the acid content of the stomach* as the result of general anaesthesia with further development of pneumonia of the parturient woman and the fetus (Mendelson's syndrome) is the main cause of death during anaesthesia in obstetrics. Severe pneumonia develops, if the stomach's content has pH < 2.5. Aspiration of the acid fluid causes tachyp-

nea, bronchospasm, atelectases, cyanosis, arterial hypotension, dry and moist rale; aspiration of the solid parts — development of atelectases and bronchopneumonia. Exudation in the interstitial tissue of the lungs and alveoli causes the decrease in alveoli's strain, shunting of the blood circulation and hypoximia.

*Treatment* is in immediate evacuation of aspirated content from the mouth, pharynx and trachea of the parturient woman, if necessary — performing bronchoscopy; drain of tracheobronchial tree with 2–4% solution of sodium hydrocarbonate. Each 8 h during a day corticosteroids in large doses are injected intravenously. For supporting pO<sub>2</sub> of arterial blood endotracheal intubation with periodic positive pressure on level of 60 mmHg is performed. If the aspiration pneumonia has developed (caused by anaerobic flora), antibacterial therapy with obligatory including of clindamycin or metronidasol is prescribed.

*Prophylaxis* of the Mendelson's syndrome: avoiding feeding before the general anaesthesia as long as possible; neutralization of the acid content of the stomach before the beginning of anaesthesia with antacids (on example, sodium citrate); pressing on thyroid cartilage and compression of esophagus during intubation of trachea and in the beginning of introduction of drugs for narcosis.

#### RECOMMENDED READING

3 (99–104); 5 (15–36); 7 (353–359); 22; 47; 58 (179–202); 57 (76–96); 61.

### PHYSIOLOGICAL CHANGES IN A PUERPERA'S ORGANISM

Postnatal period (puerperal — from Lat. *puer* — a newborn) begins with the delivery of the afterbirth and lasts nearly 6 weeks. During this period the reproductive system of the woman undergoes the process of *involution*, i.e. returns to the condition which was before pregnancy, except the mammary glands. The changes in neuroendocrine, cardio-vascular, respiratory and urinary systems and in the blood system, caused by pregnancy, gradually disappear. The mammary glands begin to develop actively during pregnancy and reach their functional development after the labour, in the lactation. Hypothalamo-hypophysial-ovarian cycle and ovulation restore, as a rule, in women who do not feed by the breast during this 6-week period.

**Reproductive system.** The withdrawal of the effect of the placental hormones, especially of oestrogens and progesterone, is the cause of genitalia involution. The most promoted reversed changes at the postnatal period occur in the **uterus** (Table 14).

After the afterbirth delivers, the uterus reduces considerably as the result of strong contraction. The uterine corpus is spherical at that moment, its consistence is dense. Anterior and posterior wall closely attach each other. The largest thickness of the uterine wall is detected in its fundus (4–5 cm). Right after the labour uterine contraction becomes less in zones of its isthmus and cervix, thickness of the wall on these parts is 0.5 cm. The cervix is blue-red, looks like a thin-wall sack, usually with lateral ruptures, the uterine orifice right after the delivery inserts the hand of obstetrician (10 cm), however, its diameter in some hours reduces to 2–4 cm. The uterine corpus attaches to the anterior abdominal wall and preserves con-

Table 14. **Involucional changes of genitalia in the postnatal period**

Time after delivery	Location of the uterine fundus	Diameter of the placental platform, cm	Lochia	Uterus mass, g	Condition of the cervix
Right after the delivery	In the middle between the umbilicus and pubic symphysis	12.5	Lochia rubra (1–4 days)	900	Soft, smooth, 5 fingers are inserted
The first day	On the level or a little bit lower the umbilicus		Lochia rubra	450	Inserts 1–2 fingers
The first week	7.5 cm above the pubic symphysis	7.5	Lochia serosa (5–9 days)	200	Inserts 2 fingers
The second week	Uterus is not palpated above the pubic symphysis	5	Lochia alba (10–15 days)	100–200	Inserts 1 finger
The sixth week	— “ —	2.5	Usual	60–100	Uterine orifice is fissural



siderable mobility because of the strain and decrease in the tonus of its ligamental apparatus.

The reduce of the uterine weight (from 1,000 g up to 60–100 g), its sizes (from 15×12×8 cm till 8×6×4 cm) on the 6th week after the labour, which is related with both decrease in the sizes of muscular cells (as the result of cytoplasm reduction and content of contractile protein) and with reduction of their general amount, predomination of catabolism in the myometrium. Muscular cells, wall of the vessels, nervous structures and connective tissue undergo the disintegration and degeneration.

Right after the afterbirth delivery the uterus locates in the middle between the umbilicus and pubic symphysis (Fig. 81), then moves up and during next 2 weeks locates a little bit lower the umbilicus.

Height of the uterine standing above the pubic symphysis reduces after the labour by 1–2 cm per day. On the 5th day after the labour uterine fundus locates by 7.5 cm above the pubic symphysis, and on the 10th–14th day the uterine fundus is not palpable through the abdominal wall. In 4 weeks the uterus acquires usual sizes. Stimulation of nipples of mammary glands during the breast-feeding contributes to reflector discharge by neurohypophysis of endogenous oxytocin, which intensifies the uterine contraction.

After expulsion of the afterbirth (in the spongy layer of separating membrane) the whole internal surface of the uterus is a wound the surface with the expressed destructive changes in the region of the placental platform. Postpartum uterine contractions contribute to the compression of the vessels of this region, thrombi development in them and hemostasis.

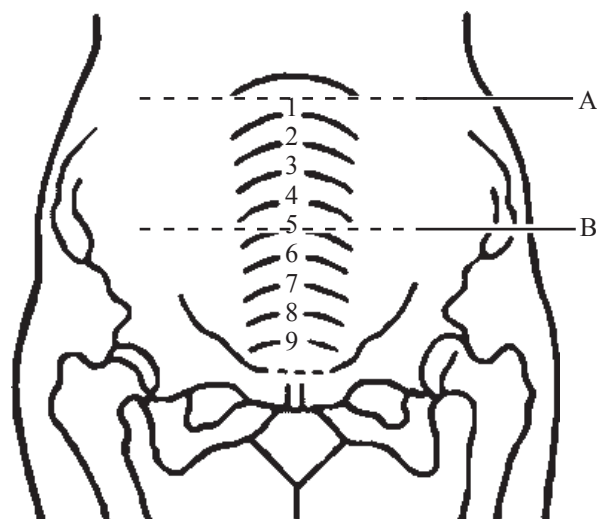


Fig. 81. Dynamics of involution of the uterus in the postnatal period (figures indicate the days of postnatal period):

A — height of the uterine fundus standing after the afterbirth delivery; B — in 6–12 h after the delivery

During 2–3 days after the delivery decidual (separating) membrane of the endometrium stays in the uterus. Its superficial layer necrotises and discharges with exudation, admixture of blood as postnatal discharge — lochia (from Lat. *loch* — labour). Basal layer of the decidual membrane, which contains uterine glands, preserves, and, as during the menstruation, is the base for regeneration of the new endometrium.

*Lochia* are dark-red (*loch*ia rubra) at the first 2–4 days and contain remains of the decidual membrane, erythrocytes, leukocytes, sometimes — remains of meconium, vernix caseosa and languo. Lochia should not contain large blood clots; if they are present, the supplying examination (remains of the placental tissue, undiagnosed injuries of the labour canal, other complications) should be performed. As the result of spasm of cervix, obturation of the isthmus by blood clot or detritis lochia can accumulate in the uterine cavity — *lochiometra*.

During the physiological course of the postnatal period during the first 3–4 days the uterine cavity remains sterile thanks to activation of processes of phagocytosis and proteolysis, neutralization of bacteria and their toxins.

During 5–10 days the discharge from the maternal passages are rose in the norm (*loch*ia serosa) and contain the remains of necrotized decidual membrane, erythrocytes, leukocytes, mucus of the cervix, multiple microorganisms. If the bloody lochia are present after the 7th day of the postnatal period, it should make sure that it is caused not by subinvolution of the uterus, remains of the placenta, late postnatal bleeding, development of ascending postnatal infection (endometritis).

Gradually lochia become yellow- or cream (*loch*ia alba), contain predominantly leukocytes, decidual cells, cells of epithelium, fat, cervical mucus, crystals of cholesterol and bacteria.

Like menstrual discharge, lochia have weak specific odour, neutral or alkaline reaction. Appearing of unpleasant odour, “muddy” lochia is evidence of the development of infection.

Their general volume is 240–300 ml, their amount every day decreases. In the morning there are more discharge, which is related to their accumulation in the uterus and vagina during the night sleep. Amount of lochia can increase as the result of intensive breast-feeding.

Stop of the discharging of lochia (as a rule on the 3rd week of the postnatal period) is an evidence of the closing of the cervical canal, which considerably reduces the risk of ascending infection.

Regeneration of the endometrium occurs during 3 weeks, except the region of the placental platform. Complete regeneration of epithelium in the region of the placental platform lasts for 6 weeks. As the result of disturbance of regeneration in the place of attachment of the placenta late postnatal bleedings can appear.

The period of involution of the uterus depends on the individual peculiarities of a puerpera's organism, character of operational intervention during the delivery, endocrine status, duration of the delivery and breast-feeding. If the puerpera has a large fetus, hydramnion, anomalies of the labour activity, myoma of the uterus or restricted mobility, involution of the uterus slows down. In nulliparous women involution occurs more rapidly than in multiparous ones.

**Cervical** involution is a longer process, which starts with the isthmic region. In 3 days the isthmus uteri is opened only by 1.5–2 cm, which is related to the contraction of circular muscular fibers. Forming of the cervical canal of the uterus ends approximately by the 10th day. The isthmus uteri completely closes till this time. The uterine orifice closes at the end of the 3rd week and acquires the fissural form as the result of lateral ruptures (a typical sign for women who gave birth through the maternal passages).

**Vagina** after the delivery is wide, its walls are blue-red, swelled, ruptures and cracks are on their surface. Gradually, during 3 weeks, thanks to elasticity walls of the vagina constrict, their sizes reduce, but they rarely become the same as before pregnancy. Near the hymen papillae (carunculae hymenalis) form; the pudendal slit closes, but not completely.

In women who feed with breast as the result of suppression of the ovarian function the vaginal membrane will reflect hypooestrogenous condition (pale-rose colour, non-promoted folds), which can cause dyspareunia (pain during sexual contact). Tonus and contractile activity of muscles which surrounds the inlet to the vagina can be increased with special physical exercises.

On the 6th–7th day of the postnatal period edema of the **external genitalia** disappears, ruptures of the cervix, vagina and perineum as well as wounds after episiotomy heal, tonus of muscles and fasciae of the pelvic floor restores.

**Fallopian tubes** with the uterus move in the pelvic cavity gradually and on the 10th day locate horizontally as usual. Tonus of ligamental apparatus of the uterus restores at the end of the 3rd week after delivery.

Complex changes occur in the **hypothalamo-hypophysial-ovarian** system. In ovaries involution of the corpus luteum of pregnancy finishes and process of the follicles maturation begins. The withdrawal of the chorionic gonadotrophin effect, acute decrease in level of oestrogens and progesterone of fetoplacental origin contribute to the increase in secretion of hypophysial gonadotrophins and restoring of ovogenesis in the ovaries. Time of appearing of the first menstruation and ovulation after the delivery varies. As the result of suppression of lactation in mothers feeding with breast no longer than 1 month, first menstruation appears as a rule in 6–10 weeks after delivery; in 50% of cases first menstrual cycle is anovulatory. In 6 weeks after the labour menstruations re-

store in 40% of women who do not feed with breast, in 24 weeks — in 90% of women.

In breast-feeding women menstruations and ovulations restore as a rule later and depend on the duration of lactation and peculiarities of woman's nutrition. High rate of prolactin causes suppression of gonadotrophic function of hypophysis and physiological *lactational amenorrhea*. If the lactation preserves, menstruation as usual restores in 30–36 weeks, ovulation — in 17–28 weeks.

**Abdominal wall and pelvic floor.** As the result of long-lasting stretching by the uterus and rupture of elastic fibers of the skin the anterior abdominal wall remains soft and flabby after labour; tonus, as a rule, restores in some weeks or months, but as the result of muscular atonia can be weak. Special physical exercises contribute to the restoration of the muscular tonus. Sometimes diastasis recti appears. Red striae on the skin of the abdomen, which form during pregnancy as the result of strain and rupture of elastic fibres, become grey and stay forever.

Tonus of the muscles of the pelvic floor gradually restores, but injury, appeared during the vaginal delivery, can cause the weakening of the muscles and genital prolapse.

**Mammary glands.** During pregnancy the mammary gland enlarge under the influence of oestrogens (development of ductular system), progesterone (development of alveolar system) and chorionic somatomammotrophin (the placental lectogen). Production of colostrum begins with the 3rd month of pregnancy. High concentrations of oestrogens during pregnancy suppress the elevation of prolactin level, which prevents milk production. Stop of the effect of these hormones after delivery contributes to appearing of prolactin and secretion of milk. It is interesting that level of prolactin necessary for providing lactation is lower than during pregnancy. Optimal levels of insulin, thyroid and adrenal hormones play a secondary role in lactation. Though sucking of the mammary gland by the baby is not necessary for initiation of lactation, it stimulates periodical secretion of prolactin and oxytocin.

Within first 2–3 days after delivery the mammary glands are soft and discharge thick glue yellow fluid — colostrum. It contains antibodies — immunoglobulins A, M, G and D, titer of which increases within first days after delivery and decreases on the 4th day; T- and B-lymphocytes, lyzocim interferon contribute to the protection of the newborn from infection and forming of local immunity. In the colostrum concentration of lactophenine — the protein, necessary for formation of hematopoiesis in the newborn, — is larger than in the mature milk. On the 3rd–4th day the transitional milk forms, on the 2nd–3rd week after delivery — the mature milk, which has a constant content of components.

Energetic value of colostrum during first days of postnatal period is 628 kJ/100 ml (150 kcal/100 ml),

of the mature milk — 293 kJ/100 ml (70 kcal/100 ml). The main components of the milk are proteins (albumins, globulins, casein), lactose, water and fats rich in vitamins, enzymes, polyunsaturated lipid acids. Presence of enzyme lipase in the female milk contributes to the partial lyses of the milk fats in the mouth and stomach of the baby, which is very important at insufficient maturity of the liver and pancreas of the newborn. The mature milk is isotonic according to the blood plasma and contains 87–88% of water, 1.1–1.5% of proteins (colostrum contains 7.38% of proteins), 3.5–4.5% of lipids, 6.5–7.5% of carbohydrates (lactose), 0.2–0.3% of salt, as well as vitamins, enzymes and antibodies.

**Metabolism** increases during first weeks after the postnatal period and normalizes on the 3rd–4th week after delivery. Volume and capacity of the lungs of a puerpera restores to their normal condition during 6 weeks.

**Cardio-vascular system.** In connection with liquidation of the uteroplacental circle of blood circulation, loss of fluid during labour hemodynamic changes occur right after delivery. The volume of blood plasma decreases approximately by 1,000 mg, which leads to redistribution of extracellular fluid in the blood stream. During 1 h after delivery tachycardia can take place in a puerpera. Later, during 6–8 days after labour, bradycardia can be observed. ABP, as a rule, is stable. Its considerable reduce can be the evidence of postnatal bleeding. Stroke volume of blood and venous pressure elevate (this can cause decompensation in women suffering from cardiac diseases) and normalize during 2–4 weeks. The volume of blood restores during the 1st week. Loss of fluid and increased diuresis contribute to the decrease in the woman's weight by 4–5 kg within first days after labour.

**Blood system.** During first 2 weeks after labour leukocytosis (15,000–20,000 in 1 ml and more) can appear during fair lymphopenia and absolute eosinopenia. Hemoglobin level and hematocritic number during first 2 days after labour vary considerably, their interpretation is complicated as the result of change of the volume of circulating blood. It is supposed that reduce of hematocritic number by 2% in comparison with the one before labour is an evidence of blood loss (approximately 500 ml). The decrease in the volume of blood plasma causes the increase in viscosity of the blood and its coagulation capacities, especially in women with traumatic labour, infection complications (increase in the outflow of tissual thromboplasin and other procoagulational factors).

**Urinary system.** Function of the kidneys is not disturbed in a healthy puerpera. Diuresis can slightly elevate. During first 12–24 h after labour it can be difficult to empty the urinary bladder as the result of microinjury during labour, edema of the ureter and cervix of the bladder, decrease in its tonus, relaxation of the muscles of anterior abdominal wall and also of

pain of the perineum's injury. If it is necessary, catheterization of the urinary bladder is done. The urinary bladder after labour has an increased volume and is less sensitive to the intravesicular pressure, which causes its frequent overstrain and incomplete evacuation. These disturbances can intensify as the result of using peridural anaesthesia during labour. Excessive urine and bacteriuria may cause infection of the urinary tract.

**Digestive system.** A puerpera often feels thirsty, which is related with the loss of fluid during labour. During first days after labour atonia of the intestine, caused by the reduce of nutrition, decrease in the tonus of the anterior abdominal wall, edema of perineum, especially after episiotomy, can appear.

## CLINICAL COURSE AND MANAGEMENT OF POSTNATAL PERIOD

During first 2 hours after labour (*early postnatal period*) a puerpera is kept in the puerperal ward under the constant observance of medical stuff to control the general condition, pulse, ABP, tonus of the uterus, amount of discharge from the vagina (possibility of the massive postnatal bleeding as the result of disturbance of homeostasis in the vessels of the placental platform, hypotonia of uterus, injury of maternal passages). If the general condition of the newborn is normal, early breast-feeding should be begun (*immediately after delivery, in the puerperal ward*), which contributes to active uterine contraction, lactation and better adaptation of the baby. When a puerpera is transferred to the postnatal department a newborn's epicrisis, where the general condition of the puerpera, colour of her skin, mucous membranes, body temperature, pulse, ABP, height of the uterine standing, character and amount of discharge from the maternal passages are reflected, is written in labour history.

A puerpera after labour feels a necessity to sleep (fatigue as the result of physical and emotional stress). In 2–4 h she can drink and eat.

A puerpera is considered to be healthy if the postnatal period proceeds normally. Keeping the rules of aseptics and antiseptics and personal hygiene is the base of care for puerpera. The principle of cyclicity of filling the wards should be strictly kept in the postnatal department.

The doctor and ward midwife every day should estimate the general condition of the puerpera (sleep, appetite, mood), measure the pulse, take the temperature (at 6 and 17 o'clock); examine the mammary glands, degree of their swelling, detect if there are no nipple cracks; determine the height of uterine fundus standing, its consistence, painfulness; examine the



external genitalia; detect the character and amount of the discharge, function of the urinary bladder and intestine. All data are put in labour history.

During the first 24 h after the labour a non-permanent elevation of the temperature up to 38°C is possible. The *enlargement of the mammary glands* on the 3rd–4th day after labour can be accompanied by the elevation of the body temperature (*milky fever*), which lasts no longer than 1 day.

Magnesium sulfate (60–100 ml of 25% solution), diuretics (hypothiazid — 50 mg, furosemid — 40 mg) in the first half of the day with potassium preparations: potassium chloride — 1 g 3 times a day, parlodol (2.5 mg), water-soluble camphor — 2 ml intramuscularly are prescribed during 2–3 days for liquidation of pathological swelling of the mammary glands (*lactostasis*). For the decrease in spasm of mammary ducts and improvement of milk outflow no-spa (2 ml of 2% solution) is used intramuscularly with further intramuscularly injection (10–15 min before feeding) of 5 U of oxytocin. In the case of considerable swelling of the mammary glands physical methods of treatment are effective: ultrasound, short-wave ultraviolet radiation. It should be mentioned, that swelling of the mammary glands is related to late breast-feeding of the newborn, large intervals between the feeding (night interval). Swelling of the breast occurs rarely in the mothers, which begin to feed the newborn as earlier as possible after the delivery and without any restrictions.

Any *elevation of the body temperature* in the postnatal period requires the thorough examination to exclude the postnatal infection of the urinary tract. A prolonged subfebrile temperature (up to 37.5°C) is a pathological condition and requires to make the diagnosis of complication. The elevation of the temperature till 38°C and higher during three taking with intervals of 1 h, as well as subfebrile temperature during more than 1 day require the transfer of the puerpera to the observational department.

*Active regimen of puerpera* (early getting up — in 2 h after the transfer to the ward) and postnatal gymnastics contribute to normalization of function of the intestine and urinary bladder, rapid restoration of the tonus of muscles of anterior abdominal wall and pelvic floor, prophylaxis of thromboembolic complications and physiological course of the postnatal period.

From the first day after delivery (and caesarean section) physical exercises are begun: respiratory gymnastics, active position in the bed, then — exercises for joints, pelvic floor, muscles of the abdominal wall and back. The duration of the gymnastics is 15–20 min. Massive blood loss during delivery, elevation of the body temperature more than 37.5°C, severe forms of hestosis of the pregnant woman, ruptures of perineum, decompensated forms of cardio-vascular diseases, postnatal pyo-septic complications (endometritis, thrombophlebitis) are the contraindications to the physical exercises. A shower and sitting bath a

puerpera can take every day depending on her condition: water during a sitting bath should not penetrate the vagina.

*Presence of the baby together with the mother* favours the uncomplicated course of the postnatal period, lactation and improving of adaptation of the newborn. During this period a puerpera acquires the skills for both care of the newborn (under the guidance of neonatologist and medical nurse of the children's department) and keeping the rules of hygiene. Staying together positively influences the psychoemotional condition of the mother and forming the feeling of motherhood.

*Regimen of feeding* on the baby's demand without necessary 3–4-hour and night intervals, frequent sucking the mother's breast effect her reflexogenic zones, causing the impulses, which get to the hypophysis and intensify the production of prolactin. Prolactin contributes to the production of milk and its getting to the milk ducts. Oxytocin release by the hypophysis as the result of stimulation of the nipple and peripapillary circle reflectory causes the contraction of myoepithelial cells of alveoli and milk ducts and intensifies the lactation. Even evacuation of the mammary gland, which decreases the swelling without reduce of the secretion of the milk, occurs as the result of its frequent sucking by the newborn. Appearance and voice of the baby, positive emotions stimulate milk production; stress, pain and fear suppress this process. Early and frequent breast-feeding contributes to the even elevation of lactation, decrease in the incidence of nipple cracks, pyo-septic complication in mother and newborn.

*Discomfort*, which a puerpera feels, can be referred to her fatigue as the result of hard muscular work during labour, ruptures of maternal passages, episiotomy and spinal analgesia (spinal head ache). Unsteroid anti-inflammatory drugs (analgin, paracetamol — per os, intramuscularly or as rectal suppositories) are prescribed if necessary. In multiparous women, pain during the uterine contraction can be intense during the first 3 days after delivery.

Intime evacuation of the urinary bladder and intestine contribute to the *physiological involution of the uterus*. In slowed involution of the uterus (subinvolution) tonomotor drugs are prescribed: methylergometrin — 1 ml of 0.02% solution 2 times a day intramuscularly, oxytocin — 1 ml intramuscularly, before the feeding of the baby. With delay of the discharge from the genital tract, lochiometra the drugs which constrict uterus are prescribed after the discharge of lochia from the uterus (massage of the uterus; no-spa — 2 ml intramuscularly; papaverin hydrochloride — 2–4 ml 30–40 min before the feeding; oxytocin — 1 ml 15 min before feeding).

If *diuresis of the puerpera is complicated*, it is stimulated reflectorily (stream of tap-water is introduced, region of urethra is washed with the warm water, warm bed-pan is put under the pelvis of the puerpera, warm heater is put on the lower abdomen).



If this does not help, proserine — 1 ml of 0.05% solution is introduced intramuscularly or catheterization of the urinary bladder is performed.

Rectal suppositories, magnesium sulfate are prescribed during *constipations*; as the result of delay of bowel emptying a cleansing enema is done during 3 days.

*Toilet of the external genitalia* is done 3–4 times a day, as well as after each act of urination and defecation. Processing of the external genitalia is performed with disinfection solutions (potassium permanganate — 1:4,000, furacillin — 1:5,000). Cleanliness and dryness of the perineum should be kept after each defecation of the puerpera. Early application of ice to the wound (on 20–30 min with intervals 15–20 during the first day) is effective for liquidation of edema and pain in the wound's region (after episiotomy).

*Wound after episiotomy* is washed with water and soap, processed with 3% solution of hydrogen peroxide, then 5% solution of potassium permanganate (2–3 times a day), 1% alcoholic solution of brilliant green. It is expediently to use detergents as spray, which protect wound from stimulation by the lochia. Non-medicamental methods of prophylaxis of wound infection are used: HF-inductoterm, decimeter waves, laser radiation of the perineum (red and infrared lasers), diameter of laser ray — 0.3 cm, power — 200 mV/cm<sup>2</sup>, the procedure is performed 10 min every day during 5–7 days. If stitches are put on the perineum, the puerpera should avoid movements, related to parting legs, they should not sit down during 10–14 days.

*Sutures* on the perineum are taken off on the 4th–5th day after delivery. Cleansing enema is done before it (if there was no self-evacuation of the intestine). Analgetics and dietary fiber restriction for delay of the bowel emptying for 5 days are prescribed during the rupture of III degree.

**Care for the mammary glands.** Formely the medical stuff recommended the puerperas to wash mammary glands with water and soap two times before every feeding. It is known now that frequent washing of the nipples with soap can injure the skin and cause nipple cracks. Frequent wash of the nipples remove the natural smegma from the skin surface of nipples and peripapillary circles, as the result of which the skin gets dry and cracks develop. It is considered that washing of the mammary glands before each feeding, especially if the mother feeds the baby by his demand, is not necessary. It is enough to wash the nipples only 1 time a day during a usual everyday toilet.

Milk production occurs reflectorily as the result of sucking of mother's breast by the baby. The more baby sucks the more milk is produced. Hypophysis releases more prolactin at night, that's why *night feeding especially contributes milk production*. The mammary glands produce the same amount of milk as the baby requires. If the mother wants to augment the amount of milk, she *should feed the baby longer and more frequent*. Doctors advise the mothers to feed their babies by the breast only for a short time (by 2–3 min at first days and by 5–10 min — in future), because they supposed that long-lasting sucking of the breast could cause injury and inflammation of nipples. Today it is known that duration of sucking does not play any role. The main causes of the nipple cracks appearing are the following:

- 1) late breast-feeding of the newborn;
- 2) incorrect techniques of the breast feeding and expression of breast milk;
- 3) inadequate care for the nipples.

Mother should feed the baby in her comfort position (Fig. 82, a, b).



a



b

Fig. 82. Correct position during breast-feeding:  
a — while sitting; b — while lying

During feeding the head of the baby should be on one line with his trunk, and the abdomen — opposite the mother's. The newborn with his body should be turned to the mother's breast by such a way that he should not turn around and bend his head during sucking. The mother lifts up the mammary gland (not just a nipple) and gives it to the baby. The nipple or peripapillar circle should not be captured with fingers and tried to put in the baby's mouth. The mother can touch the lips of the baby by her nipple to stimulate the catching reflex; it is better to touch the upper lip. It should be waited until the baby opens widely its mouth, and then quickly put it to the breast. The lower lip of the baby should be under the nipple, the chin — attach to the breast, and the tongue will be just under the milk sinus. In such a position the nipple is situated a little bit above the center of the baby's mouth and can stimulate its palate.

The following signs are the evidence of correct position of the child:

- 1) the child by his trunk is turned to the mother;
- 2) the face of the child is near the breast of the mother and touches it with the chin;
- 3) the mouth of the baby is widely opened, the lower lip is turned outside;
- 4) the greater part of the peripapillar circle locates under the upper lip than under the lower lip;
- 5) one can see how the baby makes deep sucking movements;
- 6) the baby is relaxed, at the end of feeding he is satisfied;
- 7) the mother does not feel pain in the nipples;
- 8) one can hear how the baby swallows the milk.

Within first 4 min the newborn sucks 60–90% of the milk; in future milk is obtained slower, and if he continues to suck, he gets much less milk. Babies suck the breast not only to satisfy hunger, but also to feel comfort and closeness to the mother.

If the weight of the newborn is large, it can be feeded by the both mammary glands. Small children, as a rule, are satisfied while sucking one mammary gland. The baby should be given an opportunity to suck completely one mammary gland to get enough amount of "late" milk. During the next feeding the baby is given the second breast; the remains of the milk are drooped by the hand or with a breast-pump.

It is recommended to make solar and air bathes for the mammary glands in the intervals between the baby's feeding *for prophylaxis of nipple cracks*. Besides, correct techniques of breast-feeding should be kept (if the techniques of the breast-feeding is changed pain disappears immediately and nipple crack heels). After each feeding the nipple should be processed by the drop of "late" milk. 5–10% liniment of syntomy-cine, sea-buckthorn oil, 1% solution of brilliant green, 3% solution of boric acid, solution of microcide, galascorbine and chlorophilpt are used for treatment. Some obstetricians consider that frequent processing of the nipples with water and soap, disinfecting solu-

tions and application of unguent can delay the process of cracks healing. Ultrasound therapy improves the trophicity of the tissues: ultrasound in a dose of 0.2–0.4 W/cm<sup>2</sup> on 3 min 3–5 times a day; 3–4 sessions are performed.

*For intensification of lactation* it is necessary to increase the volume of taken water and to feed the baby frequently. Besides, it is recommended to make a massage of the mammary glands, ultrasound therapy (2–5 min on each gland), ultraviolet radiation (0.25–1 biodose for 3 min, 5–6 sessions); oxytocin — 0.5–1 ml intramuscularly 2 times a day 5–10 min before the beginning of the feeding; vegetable species on the base of fruits of anise, fennel, radix of dandelion, herbs of nettle, apilacus, honey and nuts — as eating products.

*Contraindications to breast-feeding* are the following:

— from the mother's side — mastitis, breast carcinoma, active tuberculosis, use of anithyroid drugs, antimetabolites and other toxic substances, infection of human immunodeficiency virus — HIV (HIV-infection can be transmitted with mother's milk to the newborn);

— from the newborn's side — severe disturbance of cerebral circulation, intracranial hemorrhages, syndrome of respiratory disorders, hemolytic disease, severe prematurity, severe diseases of the newborn.

*Suppression of lactation*, if it is necessary (stillborn, severe extragenital pathology, purulent mastitis in anamnesis, promoted cicatrical changes of the mammary glands), should be begun from the first days of the postnatal period (till the swelling of the mammary glands). For suppression of lactation the prolactin secretion inhibitor — parlodel (bromcriptin) — 2.5 mg 1–2 times a day during 14 days till the end of lactation; tight bandage of the mammary glands for 72 h; drugs of camphor (sulfocamphocain — 2 ml intramuscularly, bromcamphor — 1–2 pills 3 times a day during 14 days) are prescribed.

Postnatal depression of different extent can appear in a puerpera in some days after delivery. It can be caused by:

— emotional disappointment during pregnancy and delivery;

— fatigue as the result of reduce of the sleep;  
— feeling of discomfort in early postnatal period;  
— uncertainty as for her own possibilities in care for newborn;

— bewilderment in connection with her own appearance and decrease in attractiveness.

If these problems exist or intensify, consultation of a psychiatrist is required.

*Diet* of a puerpera, who feeds by the breast, should contain products with large amount of proteins, fruits and vegetables, every day disposal of 2 l of fluid (general energetic value of the ration is 10,886 — 17–723 kJ; 2,600–2,800 kcal/day). For prophylaxis of anemia, mother, who feeds by the breast, should

intake with food up to 60 mg of iron, that's why her ration should contain products rich in iron (ham, liver, greens). Large amount of carbohydrates (sugar, confectionary) contributes to the deposition of fat and suppresses lactation. Food should be eaten in 20–30 min before the baby's feeding. Spicy meals, conserved products, alcohol, fat meat, pea are not recommended.

**Immunization.** 1 dose (300 mg) of anti-rhesus anti-D-immunoglobulin is introduced to the unimmunized Rh-negative women who gave birth to the Rh-positive children in 72 h after delivery for prophylaxis of rhesus-immunization.

A puerpera **is discharged** home during the uncomplicated course of the postnatal period on the 5th–6th day. In developed countries in the world with

insurance medicine puerperas come back home on the 2nd day after labour.

*Sexual activity* can be restored on the 3rd–4th week, depending on the health condition and if the wounds after episiotomy heal (possibility of dispareunia).

In 3–4 weeks after delivery a puerpera should be standardly examined and consulted as for the problems of family planning and contraception.

#### RECOMMENDED READING

3 (170–178); 5 (177–186); 7 (273–281); 21 (373–383); 22; 46 (57–156); 47; 53 (709–728); 56; 58 (179–202); 61.

A fetus from the moment of its birth is called a newborn. The neonatal period (first 28 days of the baby's life) is a very important transitional period from intrauterine development to extrauterine life of the baby, its primary adaptation to the conditions of environment. Labour is a physiological stress for the fetus, which is accompanied by significant changes of function of its organs and systems. Right after the delivery in a baby pulmonary respiration appears, blood circulation rebuilds, external secretion of the digestive glands begins to function, thermoregulation improves, main metabolism and enzymatic processes change. Mechanism of the newborn's adaptation depends on maturity, body weight and other factors. In mature children adaptation is more perfect in comparison with immature and overmature newborns.

**Mature newborn.** A newborn is considered to be *mature* if the period of its intrauterine development is 37 complete weeks, weight — not less than 2,500 g, height — not less than 45 cm. Average weight of the mature newborn is  $3,500 \pm 500$  g (girls by 5–10% less), height —  $50 \text{ cm} \pm 2 \text{ cm}$ . Its head is  $1/4$  of the body length, its circumference — 34–36 cm, circumference of the chest — 32–34 cm. A mature newborn screams loudly, his movements are active, promoted muscular tonus and sucking reflex. The skin is rose, elastic, covered with *languo* (predominantly on the shoulder girdle), well-developed subcutaneous layer. The ears and cartilages of the nose are elastic, the nails are dense and protrude over the margin of the the nail matrix. The umbilicus locates in the middle between the pubic symphysis and xypoid process. In boys the testes are sunk in the scrotum, in girls the small pudendal lips are covered with large ones.

**Thermoregulation** in newborns is not perfect: after delivery rectal temperature is  $37.7\text{--}38.2^\circ\text{C}$  and during 4–6 h normalizes:  $36.5\text{--}37.5^\circ\text{C}$ .

**Skin** of the newborn is covered with white-coloured *vernix caseosa*, which protects his organism from the loss of heat and possesses bactericidal and nutritional properties. Large amount of blood vessels penetrate through it, which reflects on the quick loss of heat. The sebaceous glands function well, but the

sweat glands are not perfect. The skin of newborns is very sensitive, is easily subjected to maceration, and inflammatory processes spread on its all layers.

**Respiratory organs.** In newborns the respiration rate is 30–60 per 1 min. The respiratory tract is narrow, the mucous membrane of the nasal part of the pharynx and trachea are inclined to edema, the respiratory tube is very short. This causes the fact that mild inflammation of the nasal mucous membrane disturbs the act of sucking in a child, and inflammatory process rapidly spreads, which can cause pneumonia in a few hours.

**Cardio-vascular system.** After a childbirth, as the result of the end of the placental blood circulation, beginning of the function of the minor circulation and elevation of the pressure in the left atrium the oval foramen closes, arterial (Botallo's) and venous (Arantius') ducts evacuate. The heart rate in a newborn is 120–160 per 1 min, however, as a response to stimulus (chill, cry, feeding) tachycardia develops quickly. When screaming the baby's heart rate is 180 per 1 min, and during the sleep — up to 100 per min. Bradycardia can be the evidence of the pathological process in a newborn's organism (haemorrhage in the brain, elevation of intracranial pressure). During delivery systolic ABP of the baby is 60–80 mmHg, diastolic — 40–45 mmHg; in 10 days it elevates up to 100 and 50 mmHg.

**Digestive system** is incompletely mature. The oral cavity is small and adopted to sucking and swallowing. The tongue is short and wide; the salivary glands produce a few saliva, which is poor in enzymes. While sucking as the result of movements of the tongue, jaws and lips a closed cavity with negative pressure forms in the newborn. Length of esophagus is 10–12 cm, width is 0.8 cm, muscular layer is not enough developed, as the result of which the baby often regurgitates. Physiological capacity of the stomach in the first day after delivery is 7–10 cm<sup>3</sup>, on the 10th day — 90 cm<sup>3</sup>. Muscles of the stomach are not enough developed, as the result of which it's often overfilled with gases. The stomach of the newborn produces pepsin, chimosin (rennet) and is adopted in the first



weeks of life only for digestion of milk. Low activity of enzymes can cause dyspepsia.

During first 2 days after delivery excrements of baby are meconium, on the 3rd–5th day — transitional fecal masses, beginning from the 5th–7th day — usual (till 2 weeks — 5–6 times a day, then — 2–4 times a day).

**Hemopoiesis.** Red bone marrow is the main organ of hemopoiesis of the newborn. Hemoglobin's level in a baby is higher than in adults (180–240 g/l), and on 80% consists of fetal hemoglobin, which content is closer to oxygen. The erythrocytes amount in the umbilical blood is  $4.54 \cdot 10^{12}$  in 1 liter, colour index is higher 1. Hematocrit number is 45–65%. The amount of leukocytes increases till  $(25-30) \cdot 10^9$  in 1 l at a background of slight neutrophilia; after the 1st week of the baby's life the amount of lymphocytes twice decreases at a background of slight lymphocytosis. Hypoglycemia and hypoproteinemia are observed, which causes susceptibility of the newborns to infection.

**Muscular system** is not enough developed. Because of immaturity of CNS stimulation of the subcortical structures predominate, that's why extremities of the newborn are pressed to the trunk and bent.

**Osseous system.** The vertebral column of the newborn is quite completely a cartilaginous tissue, does not have flexures; chest looks like a cut cone, the ribs locate horizontally. The bones of the baby contain a few salts, because of which they are soft and elastic. Traumatic fractures, which appear during labour, occur subperiosteally ("green branch"). Major (anterior) and small (posterior) fontanels close in a year.

**Nervous system** is not enough developed, subcortical processes predominate. The gyri of the cerebrum are slightly expressed. Movements of the newborn are not coordinated. Reflexes, caused by the stimulation of the lips of newborn and providing sucking and swallowing: lip, search (Fig. 83, *b*), sucking reflexes are well developed; stimulation of the newborn's palm causes grasping reflex and reflex of opening the mouth (Fig. 83, *a*).

**Endocrine system.** The degree of development of the endocrine system of the newborn depends on the endocrine system of the mother. Secretor function of the endocrine glands of the newborn begins immediately after delivery. Hormones are secreted in small amount, which is compensated by the mother's hormones. Hypothalamo-hypophysial system is able to perform somatotrophic, thyretrophic and corticotrophic regulation, which is observed at the end of the intrauterine period.

**Metabolism.** Processes of assimilation predominate in newborns. An increased necessity in carbohydrates is observed; fats of the milk energetically absorb and easily deposit in different organs and adipose depot. An organism of the newborn is able to delay natrium and chlorine ions. Pollakiuria (fastened urination) is physiological.

**Urinary system** is formed in the period of delivery. The decrease in concentration capacity of the kidneys of the newborn is caused by reduced sensitivity of tubules of the kidney to vasopressine. Immediately after delivery the amount of urine is 25% of the volume of all disposed fluid, on the 3rd day — it doubles, on the 5th — increases 4 times. Capacity of the urinary bladder of the newborn is 50–80 ml. During the 1st week of baby's life proteinuria and uraturia are observed.

**External genitalia** have been already formed in the newborns. Physiological phimosis can appear in boys; morphological development of the testes is not finished. The ovary in girls contains 200,000 primary follicles. The uterus is cylindrical, length of the vagina is 25–35 mm. The hymen is with thick margins and small orifice.

**Immune system.** Transitory immunodeficient condition and increased susceptibility to infection (hypogammaglobulinemia, low level of immunoglobulins M in a few amount penetrating through the placenta, decrease in the function of T-lymphocytes) are characteristic features for the newborns' immune system.

**Transitory conditions of newborns** reflect the process of adaptation to the new conditions of existing, are timely and do not require special treatment.



*a*



*b*

Fig. 83. Reflexes of the newborn:  
*a* — grasping; *b* — searching

**Syndrome of the baby who has just been delivered** — a primary reaction of a newborn on multiple external stimuli, which manifest as immediate stop of movements and deep breath and scream appearing after that. During further 5–6 min pupils dilate in baby as the result of catecholamines release.

**Transitory hyperventilation** is characteristic for the first 2–3 days of life of the newborn after the first breath the transition of the baby to independent pulmonary respiration takes place. During this periodic respiratory movements with deep breath and disturbed expiration directed at compensation of acidosis, which is present during childbirth, are observed.

**Transitory blood circulation.** In the neonatal period considerable, but gradual restructuring of the blood circulation takes place: the placental circulation is liquidated, arterial (Botallo's) and venous (Arantius') ducts close, the circulation forms, the pulmonary circulation increases.

**Transitory weight loss** of the newborn occurs during the first 4 days of life and does not exceed 6–7% in the norm. It is caused by catabolic character of metabolism in connection with great expenditure of energy on supplying of temperature homeostasis, as well as on regulation of activity of vitally important functional systems under new conditions. Weight loss is related to considerable loss of fluid, excretion of meconium and urine, eructation of amniotic fluid. The baby absorbs a little colostrum. Restoring of the weight in a mature newborn occurs on the 7th–10th day.

**Labour tumour** forms on the presenting part of the fetus around the leading point as the result of edema of soft tissues and venous hyperemia, sometimes with punctual hemorrhages. The tumour does not extend over the lines of sutures and fontanels and disappears in 1–3 day.

**Transitory hyperbilirubinemia** develops in the newborn during first days of life. Physiological jaundice is caused by intensive decay of erythrocytes in connection with immaturity of the enzymatic systems of the liver and transfer to the new conditions of gaseous metabolism. Transitory jaundice occurs in 60–70% of the newborns and disappears in 5–10 days.

**Physiological erythema.** Within first 2 days after delivery hyperemia of the skin, which gradually disappears with further desquamation during 4–6 days, is observed. *The enlarged sweat glands* with transparent or caseous content can be observed on the hairy part of the head, on the skin of the neck fold, the shoulder girdle and chest. Small cysts (milia) of the sebaceous glands, which disappear in some months, are often observed on the newborn's face (forehead, nose).

**Toxic erythema** is characterized with rash on the skin as small polymorphic red maculae and small vesicles in the period of physiological weight loss (on the 4th–5th day), when a child does not receive enough fluid (feeding with colostrum). Similar to all transito-

ry conditions toxic erythema does not require a special treatment.

**Sexual crisis** can appear in children of both sexes. *Swelling of the mammary glands*, caused by the influence of the mother's milk hormones is its most frequent form. Swelling of the mammary glands is bilateral as a rule, it is mostly expressed on the 7th–14th day of life and lasts for 2–4 weeks. *Bloody discharge from the vagina* can be observed in 1–2% of the girls on the 3rd–4th day of life during 1–3 days as the result of sharp decrease in mother's oestrogens.

**Transitory fever** manifests on the 3rd–4th day of life in the period of maximal weight loss of the newborn as the result of dehydration and overheating of its organism. Anxiety of the child, dryness, sometimes hyperemia of the skin and mucous membranes are observed, convulsion-like twitching of extremities can appear. Treatment is based in abundant drinking of water.

**Uric acid infarc of the newborn** is an appearing of yellow-rose sediment of salts on external genitalia and clothes after the urination. It is related to intensification of uric acid forming in a newborn's organism as the result of increase in cellular elements decay and peculiarities of protein metabolism.

**Transitory peculiarities of hemopoiesis** related to high activity of erythropoiesis during first hours of a newborn's life, predominance of synthesis of erythrocytes with fetal hemoglobin (a response to erythrocytes intensified destroy).

**Care for the newborns** includes an adequate help during labour, control under forming of independent respiration in the child, help during his feeding, keeping the constant temperature, preventing the contact with causative agents of infection.

After delivery the baby is estimated by the Apgar's score on the 1st and 5th min of its life. Mucus is evacuated from the respiratory tract with catheter. According to the clinical, functional and biochemical indicators, the degree of maturity of the newborn according to its gestational age is detected.

For prophylaxis of ophthalmoblenorrhoea the eyelids of the child are processed by a sterile cotton wool tampon, then both eyelids are retracted and 1–2 drops of solution of argentum nitrate or 30% solution of sodium sulfacil are dropped in the lid slit. 1–2 drops of such solution are dropped in the girls' pudendal slit for prophylaxis of gonorrhoeal vulvovaginitis.

After delivery (on the puerperal bed) a bracelet, where the surname, name and patronymic of mother, number of labour history, child's sex, weight, height, date and time of birth are written, is put on the hand of the child. The mother is told about the sex of the baby. The newborn is attentively examined, estimated on presence and condition of the labour tumor, labour injuries, developmental defects are detected, weight, height, circumference of the head and chest are measured.

In the infantile department the newborn is also examined, attention is paid to the skin colour, charac-

ter of the scream, evacuation of urine and meconium, condition of the remain of umbilical cord. Data on the bracelet is checked with the labour history. Remains of the smegma are removed by a sterile cotton wool tampon with vaseline or any other oil. Natural skin folds in the axillary fossae and in the groin are thoroughly processed, they are smeared with 1% tannin unguent.

Everyday toilet of the newborn is carried out, as a rule, before the morning feeding. The newborn is weighed, the body temperature is taken in the axillary fossa. The data are put in the history of development of the newborn.

Washing the face with warm boiled water or wiping by a cotton wool tampon, moistened in warm 2–3% solution of boric acid is a morning toilet of the newborn. The auricles are wiped in the same manner. The eyes should be processed by sterile cotton wool tampons (individually for each eye), moistened with furacilin solution (1:5,000), in direction from the external to the internal angle of the eye. The nasal passage and external acoustic meatus are cleared by thin cotton wool tampons, moistened with sterile vaseline or other oil. The oral mucosa is examined (detection of oral moniliasis, aphthae, erosions) and is processed with 20% solution of sodium tetraborate in glycerin.

After the toilet of the face the whole skin of the child is examined. It is given a wash under the stream of warm water (36°C), during these movements by the hands is done in direction from the front to the back — from the pubic symphysis to the anus. After this procedure the skin of the child is accurately dried with a wrap, folds of skin and buttocks smeared with sterile oil.

Appearing of intertrigo on the skin of the newborn is an evidence of bad care. Wraps should be changed as they become dirty, but not before feeding. The baby should not lie in dirty and wet wraps.

Toilet is performed after the change of wraps. Pustules on the skin are taken off by cotton wool tampons, moistened in alcohol; place of the pustule is processed by 5% solution of potassium permanganate. In the case of considerable intertrigo and multiple pustules curative bathes with boiled water with solution of potassium permanganate (saturated rose colour) are applied.

On the 2nd day after delivery the umbilical remain is washed with 3% solution of hydrogen peroxide, then process with 5% alcoholic solution of iodine. After this with sterile scissors or scalpel remains of umbilical cord are removed, the wound is processed with 5% alcoholic solution of iodine, the tampon, moistened with ethylic alcohol, and sterile bandage are applied. In a day the bandage is removed and the wound is processed with 3% solution of hydrogen peroxide. In future the base of the umbilical wound is processed every day with 5% solution of potassium permanganate.

On the 3rd–5th day after delivery, if there are no contraindications, vaccination by antituberculosis vaccine (BCJ) is performed to the child: in the upper part of the left shoulder 0.1 ml of vaccine is introduced intramuscularly. In 2–3 weeks papule forms, which disappears in some months, at the site of the vaccine introduction.

**Newborn is discharged** from the maternity hospital if his health condition is satisfactory, a tendency to restoration of physiological weight loss and rejection of the umbilical remain are present and satisfactory condition of the umbilical wound.

#### RECOMMENDED READING

3 (179–182); 5 (17; 187–196); 21 (524–542); 46 (596–612); 53 (499–566); 58 (321–341).

### Chapter 18

## DISTURBANCES OF LABOUR ACTIVITY

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Regulation of labour activity is one of the fundamental problems of modern obstetrics. Disturbance of contractile activity of the uterus is closely related to such complications as anomalies of labour activity, obstetrical bleeding, prematurity and postterm pregnancy, postnatal pyo-septic diseases, labour traumatism, perinatal and maternal morbidity and mortality.

Works of E. A. Friedman (1961, 1963) were a great contribution, made in understanding of physiological and pathological process, inherent to labour activity. A. P. Nikolayev, M. S. Baksheyev, O. T. Mikhailenko, M. Ya. Chernega, L. V. Tymoshenko, G. K. Stepankivska, V. S. Artamonov in Ukraine, I. I. Yakovlev, S. M. Bekker, L. S. Persianinov, T. A. Starostina, Ye. A. Tchernukha, I. S. Sidorova, N. V. Onoprienko, Ye. K. Ailamazyan, V. Ye. Radzinskiy, V. V. Abramchenko in Russia and in Byelorussia — I. V. Duda, S. L. Voskresensky and others developed the problem of disturbances of contractile activity of the uterus.

Labour is a complex physiological process, clinical course of which is characterized by the increase in frequency, strength and duration of uterine contractions, progressive smoothing and dilation of the cervix and moving of the fetus through the labour canal. This is an instinctive-reflector process, set in hereditary apparatus of cellular structures and in other organs and systems of an organism.

**Disturbance of contractile function of the uterus** is observed in 15–20% of parturient women, mostly in nulliparous women (80–85%). Almost every third operation of caesarean section is caused by anomalies of labour activity.

The pathology, which causes disturbance in one of the components of contractile function of the uterus, belongs to anomalies of labour activity. These components are following: tonus of the myometrium, intensity of labour pains, rhythm, frequency and coordinance of uterine contractions, duration of interval between them.

**Etiology, pathogenesis.** Regulation of contractile function of the uterus includes three main mechanisms:

1) myogenic regulation, caused by peculiarities of morphofunctional structure and blood supply of the uterus;

2) neurogenic regulation, characterized by cooperation of peripheral and central nervous systems;

3) endocrine regulation, which is in cooperation of functions of endocrine system of the parturient woman and fetoplacental complex. Disturbance of any of the mentioned mechanisms causes the development of disturbances of labour activity.

*Factors of risk* of disturbances of contractile activity of the uterus:

a) before pregnancy: extragenital diseases, neuroendocrine pathology, diseases and developmental defects of genitalia, aggravated reproductive anamnesis (stillborn, abortions, bleeding in labour), biological and constitutional factors (age till 18 and over 30 years), short women — 152 cm and less, anatomically narrow pelvis; and also social-economical factors: unplanned pregnancy, professional harmfulness, home problems, harmful habit;

b) during pregnancy: gestosis, disturbance of the development of fetus and the placenta; disturbance of the uterine circulation; fetoplacental insufficiency; anomalies of location and presentation of the fetus; multiple pregnancy, hydramnios; large weight of the fetus; preterm rupture of the fetal membranes; overterm pregnancy;

c) during labour: pathological preliminary period; insufficient maturity of the cervix with the beginning of labour activity; irregular discharge of amniotic fluid, especially during the immature cervix; disturbance of the form and function of the fetal vesicle; clinically narrow pelvis; ungrounded or irregular applying of pain relief or stimulating drugs.

Prognosis on stages of labour activity anomalies, taking into account mentioned factors of risk, will contribute to their timely prophylaxis and correction.

Classification. The following classification of disturbances of labour activity (Ye. A. Tchernukha and co-authors, 1990) is usually used in Ukraine:

1) **prenatal period**;



2) **uterine inertia** (hypoactivity or inertia of the uterus): a) primary; b) secondary; 3) inertia of prelum muscles contractions;

3) **excessive labour activity** (hyperactivity of the uterus);

4) **discoordinated labour activity**: a) discoordination; b) hypertonus of lower segment of the uterus (reverse gradient); c) circular dystonia (contractile ring); d) spastic labour pains (tetany of the uterus).

The English-American school of obstetricians determine the disturbances of labour activity by general concept — “dystocia” (complicated labour). Dystocia can be caused by disturbance of three “P”:

1) “*the powers, or propulsion*” — by disturbance of uterine activity and expulsive forces (prelum muscles contractions);

2) “*the passenger*” — anomalies of location, presentation and development of the fetus; presence of the large fetus;

3) *the passage, or pelvis* — deviation from the normal structure and sizes of the pelvis.

This part deals with only disturbances of labour activity, caused by the break of uterine activity and expulsive forces.

American obstetricians classify the anomalies of labour activity depending on the phase of labour, during which they appeared (latent or active), and usually identify them with partogramm (Friedman curvature) — idealized graphical registration of labour course, developed for the better understanding of time interconnections between the cervical dilation and lowering of the presenting part of the fetus (Fig. 84).

So, at the I stage of labour there are the following phases: 1) prolonged latent; 2) prolonged active; 3) secondary stop of cervical dilation; 4) prolonged phase of deceleration, and during the II stage the following: 1) impossibility of lowering of presenting part of the fetus; 2) slowing of the lowering of presenting part; 3) stopping of lowering of presenting part of the

Cervical dilation, cm

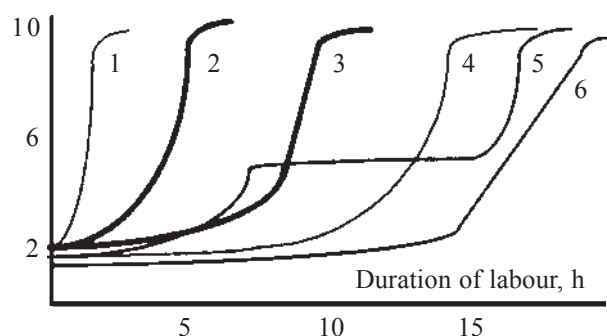


Fig. 84. Typical deviation from the normal labour course (according to Friedmann):

1 — accelerated labour; 2 — normal labour in multiparous woman; 3 — normal labour in nulliparous woman; 4 — prolonged active phase; 5 — secondary stop of cervical dilation; 6 — prolonged latent phase

fetus. Besides, excessively active labour activity (accelerated labour) is determined.

**Pathological prenatal period.** The incidence of pathological prenatal period, on different authors' data, is 2–20% (by Friedman data the prolonged latent phase is observed in 2–3% of nulliparous women and 0.5–4% in multiparous one).

*Clinical course, diagnosis.* Irregular in frequency, duration and strength spastic pain, which appears predominantly in the lower abdomen, which does not cause the structural changes of the cervix, is present in the pathological prenatal period unlike of physiological one; basal tonus of the myometrium is increased. The fetal vesicle is flat and does not perform its function. Pain lasts more than 6–10 h, makes the pregnant woman tired and disturbs her rhythm of sleep and staying awake.

During the external obstetrical examination the increased uterine tonus, especially in its lower segment, is detected. Presenting part of the fetus, as a rule, stays motionless above the pelvic inlet. Small parts of the fetus are hardly palpated as the result of elevation of the uterine tonus. External obstetrical examination reveals elevated tonus of muscles of the pelvic floor and spasm of circular vaginal muscles. The cervix is usually immature, there are no structural changes in it.

Treatment in pathological prenatal period depends on maturity of the cervix. If the cervix is mature and a pregnant woman does not feel fatigue, the labour is induced. If the cervix is immature, analgesics are used (promedol, baralgin), spasmolytics (no-spa, papaverin, aprofen), antihistamine preparations (pipolphen, dyphenhydramine hydrochloride), sedative drugs (seduxen — 10–20 mg),  $\beta$ -adrenomimetics (partus-sisten — 5 ml — 0.25 mg on 500 ml of 5% solution of glucose; bricanil and others). In order to intensify the cervical maturation, such drugs are introduced: oestrogens intramuscularly in the dose of 300 U/kg — folliculin (20,000–40,000 U) or synestrol 0.3 ml of 2% solution by 0.5 ml ether for narcosis intramuscularly 2 times a day with interval 12 h during 3–5 days (oestrogens are not used in the USA for intensification of maturation of cervix); sigestin — 200 mg by 500 ml of 5% solution of glucose during 2–2.5 h; prostaglandins (in the posterior vault of the vagina — prostin E<sub>2</sub>; in the cervical canal of the uterus — cervicoprost, prepidil-gel — 2.5 mg). Prophylaxis of intrauterine hypoxia of the fetus (curantil, oxygenotherapy) is performed simultaneously.

There are data in the literature (A. V. Zabocritsky, 1998) about the expediency of using in the pathological prenatal period of calcium ions antagonists — nifedipine (10 mg per os — 3 times with a 15 minute interval; the total dose is 30 mg), especially with symptoms of fetal hypoxia and cardio-vascular pathology; antagonist of bradykinine — parmidine (0.25 mg per os 3 times a day during 3–4 days or as rectal suppositories); of inhibitors of prosta-

glandins synthesis — indometacin (25 mg per os, then in rectal suppositories — 100 mg).

If the pathological prenatal period lasts more than 12–20 h, condition of the fetus is satisfactory and the parturient woman is tired, the medicamentous sleep-rest during 2–3 h is prescribed. In this purpose diazepam (seduxen) — 20 mg on 20 ml of isotonic solution of sodium chloride, pipolfen — 50 mg and promedol — 40 mg are introduced intravenously. Sodium hydroxybutyrate (10–20 ml of 20% solution) is introduced intravenously slowly for intensification of effect. A decision about induction of labour or caesarean section is discussed in case of absence of effect in women, which have aggravated obstetrical anamnesis, extragenital and obstetrical pathology.

**Uterine inertia** is the most frequent form of disturbances of contractile function of the uterus, which is present in 8–9 % of parturient women, predominantly in nulliparous.

Uterine contractions begin at the fundus and spread all over the uterus (triple descending gradient). Their intensity and duration are maximal in the uterine fundus. In the norm contractions reach their maximum in all parts of the uterus simultaneously; they occur with the rate not less than 3 in 10 min, last 45–74 s, their maximal intensity is 20–60 mmHg, basal tonus of the uterus does not exceed 10–15 mmHg. Contractions of the muscular fibers contribute to the cervical dilation. In 95% of the parturient women frequency of labour pains during the spontaneous labour is 3–5 during 10 min.

Activity of the uterus can be detected with palpation, external and internal tocography.

*Clinical course, diagnosis.* Lower limit of intensity of uterine contractions (intrauterine pressure), which is necessary for the cervical dilation, is 15 mmHg. The following signs are typical for the uterine inertia: reduce of intensity (less 30 mmHg), frequency (less than 2 during 10 min) and duration (less than 45 s) of uterine contractions; increase in intervals between labour pains; slowed smoothing, cervical dilation (less than 1.2 cm/h in nulliparous women and 1.5 cm/h in multiparous women); long-lasting (more than 2 h) location of the presenting part of the fetus in one plane of the pelvis; slowed passing of the fetus through the labour canal, even if the sizes of maternal pelvis and fetal head correspond each other. This causes prolonged labour (more than by 12–18 h), tiredness of the parturient woman and intrauterine suffering of the fetus. In 12 h of labour activity physical and psychological tiredness appears in a parturient woman, and in 16 h — energetic resources of the myometrium are exhausted, unoxidated substances of metabolism accumulate, the fetus tolerance to the labour stress decreases. Slowing of labour can cause hypoxia and intracranial injury of the fetus, injury of labour canal, forming of urogenital and rectovaginal fistulae, and increase in waterless interval — the development of

chorioamnionitis in delivery, appearing of postnatal bleedings and pyo-septic complications.

If the uterine inertia takes place from the beginning of labour, it is *primary uterine inertia*. *Secondary uterine inertia* manifests itself after a period of normal labour activity.

Uterine inertia (hypotonic uterine dysfunction) usually corresponds to the disturbances in active labour phase by Friedman (primary inertia — prolonged active phase; secondary — prolonged phase of deceleration). During uterine inertia the basal tonus of the myometrium is not elevated, uterine contractions have normal synchronic gradient. Treatment of the uterine inertia in parturient women who have not reached the active phase of delivery is one of the most typical mistakes, which can cause discoordination of labour activity.

Diagnosis of uterine inertia is made only after dynamic observation of a parturient woman during 2–3 h. It is necessary to make a differential diagnosis with pathological prenatal period (main criterion — structural cervical changes), cervical dystocia (rigidity), disordinated labour activity (elevated basal tonus of the myometrium), clinical incorrespondence between the sizes of mother's pelvis and fetal head (clinically narrow pelvis).

Primary uterine inertia usually appears in parturient women with a pathological prenatal period, as well as as the result of inadequate using of analgesics before the cervical dilation by 3–4 cm (in the latent phase of labour).

Inertia of prelum muscles contractions at the II stage can also be both primary and secondary and often occurs as the result of infantilism of nulliparous women, because of decreasing in the tonus of anterior abdominal wall, hernia of linea alba, as well as obesity in multiparous women.

*Treatment.* Before the treatment of the uterine inertia, one should be convinced, that woman is really in the active phase of labour (cervical dilation by 3–4 cm), exclude the possibility of pathological prenatal period, disproportion between mother's pelvis and fetal head.

Treatment during *primary inertia* should be done according to the labour dynamics and condition of the woman. The causes which can lead to the development of uterine inertia (olygoamnios or hydramnion) should be removed first of all; during the dilation of the uterine fauces by 3–4 cm amniotomy (incision of the fetal vesicle — amnion) is performed. If the pelvis of the woman is clinically normal, stimulation of labour with oxytocin, prostaglandins or their combination is begun. Stimulation is more effective if the amnion is ruptured. Intravenous introduction of uterotonics is the most effective. Preliminary intramuscular introduction of oestrogenic drugs — 40,000 U of folliculin or 10–20 mg of 2% solution of synestrol by 5 ml of ether for narcosis are used for sensitization of the uterus to oxytotic substances. 300 mg of

5% solution of ascorbic acid with 20 ml of 40% solution of glucose, thiamin bromide or cocarboxylase — 100 mg, pyridoxine hydrochloride — 2 ml are introduced for intensification of energetic supplying of the myometrium.

For intravenous injection 1 ml of oxytocin (5 U) is diluted in 500 ml of 0.9% solution of sodium chloride or 5% solution of glucose and introduced drop by drop, starting from 6–8 drops in 1 min and gradually increasing their number by 5 drops every 5–10 min till the effect (no more than 40 drops per 1 minute). If the oxytocin introduction in the given dose during 2 h does not intensify the uterine contractions, its further infusion is inexpedient. Depending on obstetrical situation prostaglandins can be applied or caesarean section can be done.

For intravenous injection 5 mg of prostaglandin  $F_2\alpha$  (ensaprost) or 1 mg of prostaglandin  $E_2$  (prostenone) is diluted in 500 ml of isotonic solution of sodium chloride or in 5% solution of glucose and introduced by 6–8 drops per 1 minute, increasing the dose if necessary till the reaching of therapeutic effect (25–30 drops per 1 minute).

Simultaneous intravenous injection of half doses of oxytocin (2.5 U) and prostaglandin (2.5 mg) potentiates the effect of these preparations (remedies).

Contraindications to the stimulation of labour:

- 1) anatomically and clinically narrow pelvis;
- 2) incorrect presentations and location of the fetus;
- 3) preterm separation of the placenta;
- 4) central presentation of the placenta;
- 5) cicatrix on the uterus after operations (caesarean section; enucleation of myomatous nodes, metroplastics and other);
- 6) overstrain of the uterus (expressed hydramnion, macrosomia of the fetus, multiple gestation);
- 7) stenosis of the vagina, scarry changes of the cervix, perineum;
- 8) cervical distocia;
- 9) intrauterine hypoxia of the fetus;
- 10) fatigue of a parturient woman;
- 11) allergic intolerance of uterotonics.

Besides of obstetrical contraindications to labour stimulation, preparations of prostaglandins should not be introduced to parturient women suffering from sever diseases of cardio-vascular and hemopoetic systems, kidneys, liver, during glaucoma and sesceptibility to bronchospasm. Nausea, vomiting, diarrhea, fever and postinjectional thrombophlebitis are the side effects of prostaglandins (not always).

If a parturient woman is introduced oxytocin or prostaglandins, anyone should stay with her.

Oxytocin can aggravate the uteroplacental circulation and can cause hypoxia of the fetus, that's why cardiomonitoring of the condition of the fetus and auscultation of the fetus' palpitation during not less than 1 min after a labour pain should be done. Pre-medication with spasmolytics, sedative and antihista-

mine drugs is performed before the stimulation. Spasmolytics (no-spa — 2 ml, aprofen — 1 ml of 1% solution, papaverin — 2 ml of 2% solution) should be introduced if labour activity is regular and cervix is dilated over than 3–4 cm. The repeated introduction of spasmolytics is possible in 3–4 h.

Oxygenotherapy, intravenous introduction of 2 ml of 1% solution of sigetin and 20 ml of 40% solution of glucose or 10 ml of 2.4% solution of aminophylline with glucose are introduced for prophylaxis of intrauterine hypoxia of the fetus.

Infusion of oxytocin is stopped if the uterine contractions last more than 60 s or long-lasting decelerations of the cardiac rhythm are present. Period of semi-decay of oxytocin in blood plasma is nearly 5 min, that's why it rapidly eliminates from the mother's blood and does not cause serious complications.

If a parturient woman is tired, it is necessary to perform a dosed therapeutic sleep-rest during 2–3 h by introduction of combination of sedative drugs, narcotic analgesics, desensitising drugs, neuroleptics (seduxen, droperidol, promedol, pipolphen, sodium oxybutyrate). For observing the dynamics of cervical dilation till the medicamental rest and after awakening of the parturient woman internal obstetrical examination is performed. If after the sleep normal labour activity does not restore, oxytocin and prostaglandins are introduced intravenously.

If there are contraindications to labour stimulation or effect is absent after the introduction of uterotonics, operational delivery is performed: caesarean section, application of obstetrical forceps (depending on obstetrical situation).

**Secondary uterine inertia** appears in 2% of cases, as a rule, at the end of cervical dilation or in the stage of expulsion of the fetus (inertia of prelum muscles contractions). Evaluating the causes of secondary inertia, disproportion between the sizes of the fetal head and mother's pelvis should be excluded first of all.

Secondary uterine inertia often arises as the result of breech presentation of the fetus, belated rupture of amnion, chorioamnionitis and endometritis in labour, but often can have iatrogenic origin (inexpedient prescribing of uterotonics, analgesic and spasmolytic drugs). Fatigue of a parturient woman and exhaustion of the myometrium energetic resources can also be the causes of secondary uterine inertia. Long-lasting location (more than 2 h) of the head of fetus in one plane of the pelvis can cause necrosis of tissues with further forming of fistulae. Signs of fetal hypoxia are often observed.

Policy of labour management during the secondary uterine inertia depends on the extent of dilation of the uterine orifice, location of the presenting part of fetus in the pelvic cavity, condition of the fetus and concomitant obstetrical and somatic pathology. A clinically narrow pelvis (disproportion between maternal pelvis and fetal head) should be excluded



first of all. Glucose, vitamins (thiamin, pyridoxin, ascorbic acid), sigetin, calcium's preparations and inhalation of oxygen are prescribed for energetic providing of an organism and prophylaxis of fetal hypoxia. If amnion is intact, amniotomy is performed. If the fetal head is pressed to the pelvic inlet, condition of the fetus is satisfactory, and the parturient woman is tired, a short medicamentous sleep-rest is prescribed. After the parturient woman wakes up, labour induction is performed. If the fetal head locates in the cavity or in the outlet of the pelvis, stimulating therapy is begun immediately. The fact that the higher fetal head stands the more active labour stimulation (intravenous introduction of oxytocin), should be taken into consideration. If the fetal head is in narrow part or in the pelvic outlet, only subcutaneous injections could be done.

**Inertia of prelum muscles contractions.** As the result of complete cervical dilation in a parturient woman, as a rule, a maternal urge to push appears during each uterine contraction. During a prelum muscles contraction she makes a deep breath, shut her mouth, keeps the breath and independently (with guidance of obstetrician) regulates the constrictions of abdominal muscles for elevation of intraabdominal pressure. Combined contractions of the uterus and abdominal muscles push the fetus to the pelvic outlet. The reason of inadequate prelum muscles contractions can be the epidural anaesthesia (decrease in the resistance of muscles of the pelvic floor and opportunities of a parturient woman to constrict muscles of abdominal wall independently).

During the prelum muscles contractions inertia uterotonics (oxytocin, prostaglandins) are prescribed. If the muscles of the abdominal press are unable to contract, the Verbov's bandage and its modifications are applied, using the sheet (is applied rarely). Perineo- and episiotomy is performed according to indications. If this stimulation is ineffective, operational delivery depending on the situation (caesarean section, application of obstetrical forceps, vacuum-extraction) is performed. Expulsion of the fetus by the Crysteller's method is traumatic and dangerous for the mother and fetus. If the fetus is dead, operations, which destroy the fetus, are performed.

1 ml of 0.02% solution of methylergometrin by 20 ml of 40% solution of glucose is introduced intravenously to prevent bleedings at the III and early postnatal stages.

**Excessive labour activity** (hyperreactivity of the uterus) is a rare pathology (0.7–0.8% of cases). It is characterized by excessive (more than 50 mmHg) and frequent (more than 5 during 10 min) labour pains among the increased basal tonus of the uterus (over 12 mmHg), which contributes to the *precipitated* (less than 4 h in nulliparous women and less than 2 h in multiparous women) and *accelerated* (accordingly 4–6 h and 2–4 h) labour. Disturbance of cortico-visceral regulation, increased production of uterotonics, in-

adequate introduction of oxytocin or prostaglandins, weak resistance of the soft tissues of labour canal and, very rarely, absence of the pain sensitivity can be the causes of excessive parturition. Such disturbance can occur in pregnant women with diseases of cardio-vascular system and sometimes is the result of preterm labour.

*Clinical course and diagnosis* of excessive parturition are not complex. Beginning of labour is accelerated, process of smoothing and cervical dilation is intensive. Very often such labour take place at home or during transportation of a pregnant woman to the maternity hospital. Disturbances of the uteroplacental circulation, preterm separation of the placenta, acute hypoxia and intracranial injury of the fetus (cephalohematoma, hemorrhages in the brain, Erb-Duchenne palsy) are possible. Precipitated labour with the powerful resistance of the soft tissues of labour canal can cause the catastrophic damages of the latter, up to the rupture of the uterus. Risk of hypotonic bleeding from the place of the placenta's implantation increases at the III and early postnatal stages. A parturient woman should be kept under constant observance, because the fetus can fall down on the floor and be seriously injured.

Treatment should be turned on the decrease in uterine activity. A parturient woman is laid on the side on the bed, opposite to position of the fetus. Infusion of oxytocin, if it was performed, is immediately stopped. For the reduce of the activity of labour pains inhalational narcosis (dinitrogenum oxide with oxygen, phlorotan, ether) is applied.  $\beta$ -Adrenomimetics (partusisten, alupent, brycanil, terbutalin) are introduced intravenously: 0.5 mg of the drug are diluted in 250 ml of isotonic solution of sodium chloride or 5% solution of glucose and introduced intravenously drop by drop, beginning with 5–8 drops in 1 min and gradually augmenting the dose till the normalization of parturition. Partusisten (1 ml — 25 mg) is diluted in 4 ml of isotonic solution of sodium chloride or 5% solution of glucose immediately before the injection; introduce intravenously streamly during 2–3 min. For diagnosis of signs of overdosage, the pulse, ABP level of the parturient woman and the heart rate of the fetus should be under control. After delivery the labour canal is thoroughly examined: ruptures are detected and sutured.

Prenatal hospitalization is recommended if there was precipitated labour in anamnesis. If the last precipitated labour finished unfavorably for the fetus, a decision of the elective caesarean section should be made.

**Discoordination of birth activity** (hypertonic dysfunction of the uterus) is observed in 1–3% of all labour. Coordination of contractions of different segments of the uterus — triple descending gradient is disturbed. Spasm of the myometrium of all uterine segments (tetany of the uterus), spreading of the wave of contraction in the opposite direction — from the



lower segment to the uterine corpus (reverse gradient), possible unrelaxation of the cervix during contraction of its corpus (dystocia of the cervix) can appear. Circular dystocia (contractile ring) is a contraction of the circular muscular fibres on the different levels of the uterus (except the cervix). Long-lasing, without pauses, uterine contraction at a background of high basal tonus of the myometrium appears as the result of tetany of the uterus.

Reasons for development of discoordination in birth activity are not investigated in details. Developmental defects, inflammatory diseases of the uterus, disturbance of innervatory, reciproctic connections between the corpus and cervix, scarry changes of the cervix after labour injuries, diathermocoagulation, biopsy and also flat amnion can be the factors of risk.

*Clinical course, diagnosis.* Discoordination of the parturition appears predominantly in the latent phase of labour (before the cervical dilation by 4 cm). Simultaneously the basal tonus of the myometrium elevates and gradient of pressure disturbs. Contractions of the uterine fundus are less intense than the contractions of its middle segment; complete asynchronism in generation of impulses in the both uterine horns or connection of these two mechanisms can occur. Uterine contractions are painful and ineffective, the cervix is often immature, without the dynamics of dilation. The lips of the uterine orifice are thick or thin, strained, edema, if the treatment was absent, and deep cervical ruptures are observed when untreated.

Untreated discoordination of parturition causes the reduction of uteroplacental blood circulation, development of intrauterine hypoxia and disturbances of the cerebral circulation of the fetus. Disturbance of the contractile activity of the uterus can cause the increased blood loss at the III and early postnatal stages.

The following symptoms are typical for the dis-coordinated parturition:

- 1) the uterus is of narrow ovoid form, the presence of a spastic ring in the uterine area;
- 2) the presenting part of the fetus is mobile or pressed to the pelvic inlet;
- 3) a flat amnion;
- 4) ill-timed moving of the amniotic fluid (protective reaction, turned on the reduce of myometrium tension);
- 5) Schickele's symptom (spasm of the uterine orifice during labour pains);
- 6) painful irregular weak labour pains;
- 7) intrauterine hypoxia of the fetus.

Treatment of parturient women with dis-coordinated parturition caused by a *flat amnion* begins with amniotomy after the introduction of spasmolytics and cholinolytics (atropin). *Prescribing of oxytocin* at a background of increased basal tonus of the myometrium is a *great mistake*. Sedative drugs (seduxen — 10 mg), narcotic analgesics (promedol — 20–40 mg), spasmolytics (no-spa — 2–4 ml, papaverin hydro-

chloride — 2–4 ml of 2% solution, baralgin — 5 ml),  $\beta$ -adrenomimetics (partusisten — 0.5 mg), antagonists of calcium ions (verapamil — 5 mg by 300 ml of 0.9% solution of sodium chloride intravenously 10–20 drops per 1 min) are prescribed. If it is necessary, a deep narcosis is performed (halothane, ether). Estrogenous preparations (folliculin — 20,000 U, sinestrol — 10–20 mg of 2% solution by 0.5 of ether for narcosis intramuscularly) are prescribed if the cervix is immature. If a parturient woman is tired, she is prescribed a medicamental sleep-rest for 2–3 h. After her awakening the normal parturition can develop. If the discoordination of labour activity can not be conservatively treated, in the case of appearing of the signs of intrauterine suffering of the fetus, as well as in burdened obstetrical anamnesis, the decision about the operational delivery by caesarean section should be done in time.

Periodic inhalation of 60% moistened oxygen is prescribed for a parturient woman for prophylaxis of intrauterine hypoxia of the fetus.

Treatment during the uterine tetany depends on the cause of its appearing. With overdosage of oxytocin, its introduction should be immediately stopped and  $\beta$ -adrenomimetic should be introduced intravenously. Magnesium sulfate (10 ml of 25% solution intravenously) or spasmolytics can be introduced or operational delivery (depending on obstetrical situation) should be done. Uterine tetany can be the symptom of threat or beginning of the uterine rupture and preterm separation of the placenta, which are dangerous for the woman's life.

If there is a clinically narrow pelvis, the caesarean section is prescribed. Depending on the obstetrical situation, application of obstetrical forceps and extraction of the fetus by the pelvic end are possible; if the fetus is dead, then operations, which destroy the fetus, are performed. After the operational delivery, manual separation of the placenta is performed; the uterine cavity is examined to rule out possible ruptures.

*Prophylaxis.* Women's consultation clinics (detection of the groups of risk, treatment of pregnant women suffering from extragenital and obstetrical pathology, performing psychoprophylactical and medicinal preparation to labour, prenatal hospitalization) play an important role in prophylaxis of anomalies of parturition. A grounded policy of delivery, adequate prenatal preparation and rational management of labour using the modern achievements of science and practice are the important means for prophylaxis of anomalies of contractile activity of the uterus in obstetrical clinics.

## RECOMMENDED READING

1; 3 (99–104); 4 (29–55); 5 (15–36); 7 (353–359); 9; 20; 12 (92–107); 22; 28; 29 (224–247); 32 (7–31); 47; 56; 58; 61.

## Chapter 19

# MULTIPLE PREGNANCY

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Development in the uterus of one fetus is physiological. Pregnancy is considered to be **multiple** if two or more fetuses develop simultaneously. Children delivered from the multiple pregnancy are called **twins**.

The incidence of multiple pregnancy is 0.4–1.6% of all labour and increases in the whole world. Twins are delivered in one case in 90 labour, triple — in 1:90<sup>2</sup>. four twins — in 1:90<sup>3</sup> and so on, conjoint (*Siamese*) twins — in 1 case on 10 mln of labour. Nearly 3/4 of twins have the same sex, predominantly they are boys (boys — 45%, girls — 30% of cases).

Multiple gestation is a condition of high risk in obstetrics and requires a special management to reach the optimal outcome for mother and fetus. Preterm labour is a frequent cause of perinatal mortality during multiple gestation. Congenital developmental defects are observed in 18% of cases.

**Etiology.** Multiple gestation can develop as the result of fertilization of 2 or more ovums, which matured simultaneously, as well as during the develop-

ment of 2 and more embryos from one ovum (*polyembryony*).

Factors of risk of multiple gestation are the following:

- 1) increase in age and number of labour in mother's anamnesis;
- 2) tall women and women with large weight;
- 3) inheritance (family predisposition on mother's side);
- 4) developmental defects of the uterus (saddle-like, double);
- 5) blood group 0(I) or A(II);
- 6) Negroid race;
- 7) using of combined oral contraceptives before pregnancy;
- 8) induction of ovulation and superovulation, fertilization *in vitro*.

Possibility of multiple gestation increases as the result of applying of assisted technologies. During the induction of ovulation with clomiphene-citrate the birth rate of twins is 6–8%, and with applying exogenous gonadotrophic drugs — 25–35%. If insemination occurs *in vitro* and some fertilized ovums are transmitted to the uterus, the incidence of multiple gestation is 35–40%.

Twins delivered from one ovum are called monoovular (monozygotic), from two ovums — biovular (dizygotic; Fig. 85, *a, b*).

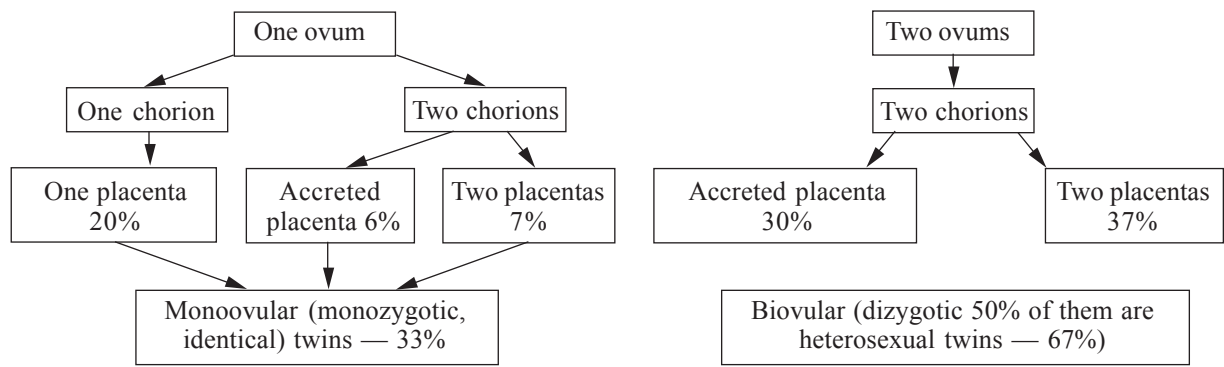
*Monoovular (monozygotic) twins* develop as the result of dividing of one fertilized ovum in the different after fertilization time (at the stage of cleavage) or during the fertilization of polynuclear ovums with several spermatozoons.

*Biovular (heteroovar, dizygotic) twins* develop as the result of fertilization of 2 and more different ovums, matured in 1 or several follicles of 1 or both ovaries by 2 (or more) different spermatozoones.

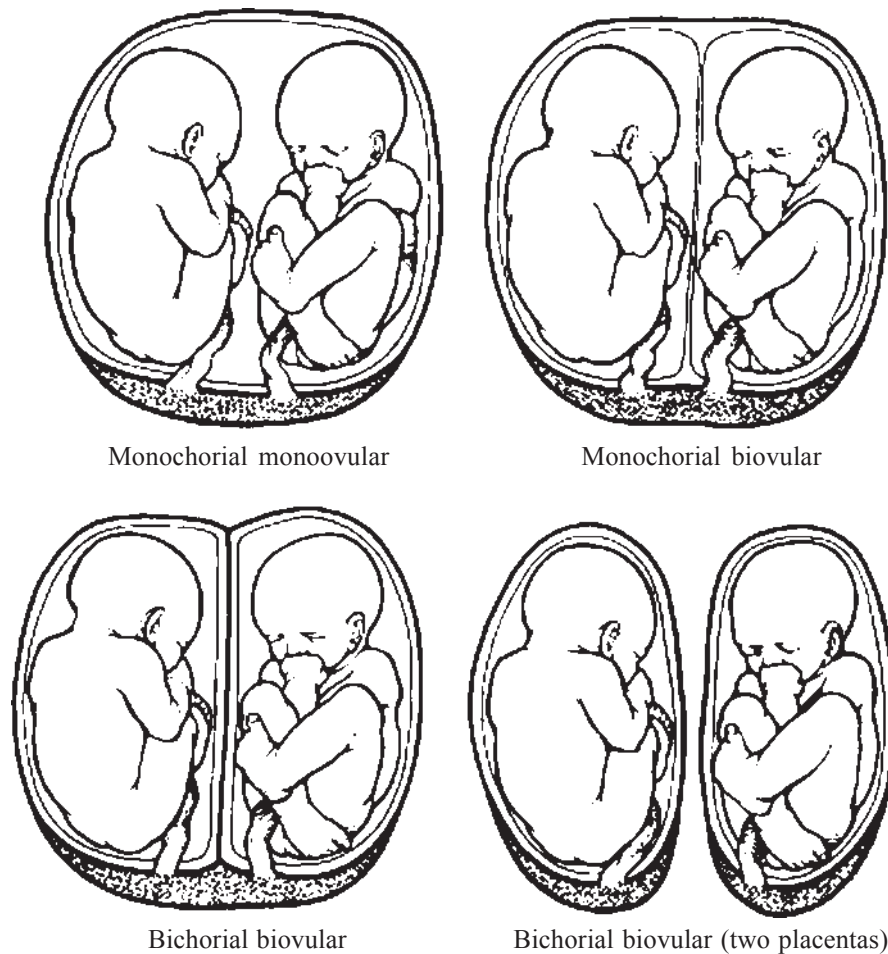
*Superfertilization* is fertilization of 2 (or more) ovums by spermatozoons of different males, but its existence in a human being is not detected. There is also a hypothesis that fertilization of the ovum which ovulation has already occurred during pregnancy is possible.

### Complications of multiple gestation

<i>Complications on mother's part</i>	<i>Complications on fetus' part</i>
Edema, proteinuria and hypertensive disturbances caused by pregnancy (late gestosis)	Preterm abortion Low weight
Anemia	Intrauterine growth restriction
Presentation of the placenta	Congenital developmental defects
Preterm detachment of the placenta	Amniotetal bleedings
Anomalies of parturition	Pathology of the umbilical cord
Hypotonic postnatal bleeding	Hydramnios
	Increased ante-, intra- and neonatal mortality



a



b

Fig. 85. Variants of development of twins and types of the placentation (a, b)

*Triple* can be monoovular, heteroovular, as well as with the presence of two monoovular fetuses and one individual fetus.

*Four* twins can be monoovular and heteroovular and can be both two twins or triple with one individual fetus.

**Biovular twins** (see Fig. 85, b). Fertilized ova develop independently one from another. After implantation in each preembryo its own chorion and amnion form, as the result of which each embryo has its own placenta and separated system of blood circulation. If implantation of the ova takes place at

a considerable distance between them, the margins of the placenta do not join and each embryo, except chorion and amnion, has its own capsular membrane (decidua capsularis). If the implantation of the oocytes has occurred at a short distance, the embryos have the common separating membrane and margins of their placentas join. Septum between two fetal sacs consists of 2 amnions (fluid membranes) and 2 chorions (villar membranes). Each placenta has its own vascular system, sometimes between the vessels of the placentas anastomoses form, which can be the cause of irregular blood supply and discordant



*Fig. 86.* Discordant development of the twins: unsymmetrical twins (one is underdeveloped).

development of the twins, as the result of which one of the fetuses is underdeveloped (Fig. 86).

Biovular twins can be both homo- and heterosexual with one or different blood groups.

**Monoovular twins** (Fig. 85, *b*) have a common placenta, capsular and main decidual membranes. Vessels of the twins connect by multiple anastomoses. The septum between the two fetal sacs consists basically of 2 amnions, i.e. each fetus (twin) has its own amnion (biamniotic twins). Sometimes they have common amnion (monoamniotic twins), in this case delivery of conjoined (Siamese) twins is possible.

Monoovular twins are usually monochorial, homosexual, have one blood group. They are genotypically identical (100% of common genes), their weight is always lower; they die antenatally more often than the biovular ones. Peculiarities of the ovum division after its fertilization, which manifest in the structure of the fetal membranes, are in the base of this problem.

If the division of an embryo occurs in 3 days after the fertilization, each embryo has its own amnion and chorion, i.e. membranes are biamniotic and bichorial. If the division proceeded between the 4th and the 8th days after the fertilization, the chorion, unlike amnion, begins to develop, as the result of which each embryo will have its own amnion, but a common chorion (biamniotic monochorial twins, fig. 85, *b*). Division between the 9th and 12th days occurs after the development of amnion and chorion, as the result of which monoamniotic and monochorial twins develop. Division after the 12th day of fertilization will be incomplete, which causes the development of conjoined twins (usually — with chest connection — thoracopagus; Fig. 87; rarely — with cranial — craniopagus, ischiopagus).

The incidence of congenital anomalies of development in monoovular twins three times higher than in biovular (accretion, absence of the heart — acardia and others). Transfusion syndrome of the twins



*Fig. 87.* Conjoined twins with chest connection (thoracopagus)

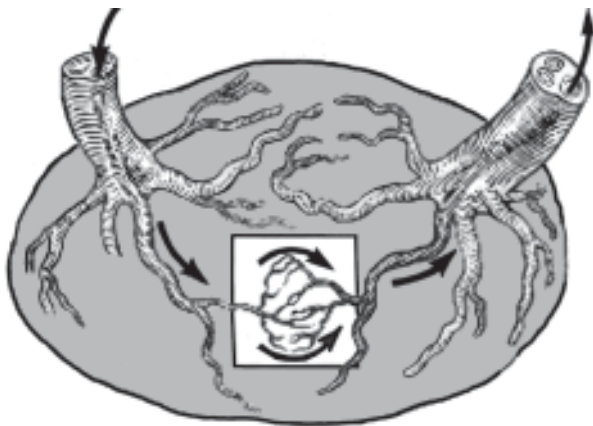
(the placental-vascular anastomosis, or shunt; fig. 88) is one of the serious complications in monozygotic twins.

It usually appears during the development of monochorial twins, development of different vascular anastomoses (shunts): possibly arterioarterial, arteriovenous and venovenous. Arteriovenous anastomosis (during the bichorial twins is observed rarely) is the most dangerous for the fetuses. In this case blood from one fetus to another is delivered from the arteries to the veins, sometimes with serious consequences (see fig. 86, 88). Anomal transfusion in a fetus-donor causes the intrauterine growth restriction, anemia, hypovolemia; hypervolemia, arterial hypertension, polycytemia and congenital cardiac insufficiency develop in a fetus-recipient. As the result of hypervolemia in a fetus-recipient diuresis increases and hydramnios develops, when in a fetus-donor oligoamnios develops. Hydramnios of one of the fetus can elevate the risk of preterm labour.





a



b

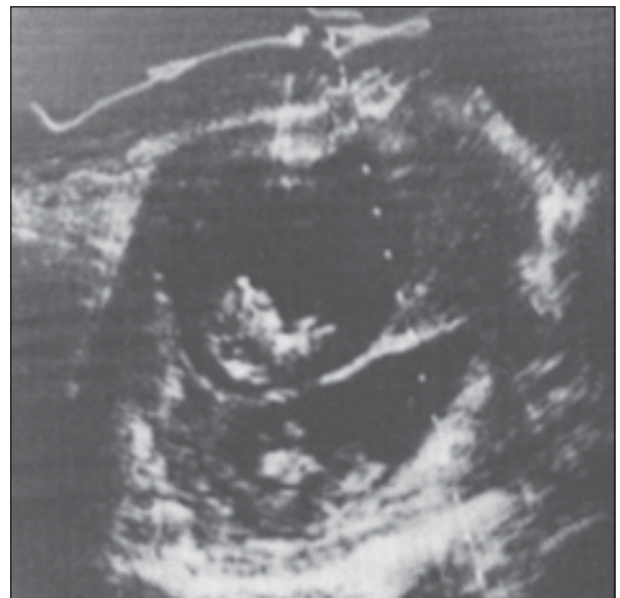
Fig. 88. Transfusion syndrome of the twins:  
*a* — a 23-week twins: a pale donor (weight 690 g, oligoamnios) — in the left; a recipient (weight 730 g, hydramnios) — in the right; *b* — arterio-venous placental anastomosis (shunt)

Bivascular umbilical cord, its membranous attachment (7%), tight twisting around the parts of the fetuses are the severe complications of monozygotic twins.

*Diagnosis.* In modern obstetrics the most correct and the earliest diagnosis of multiple gestation is based on ultrasound data. Thanks to applying transvaginal sensitive element diagnosis of twins is possi-



a



b

Fig. 89. Ultrasonogramm of twins:  
*a* — on the 7th week of pregnancy (two fetal sacs with fetuses); *b* — on the 11th week

ble on the 6th week of pregnancy; during a usual transabdominal examination — on the 10th week (Fig. 89).

In every second case from twins, which were detected during US at early terms of pregnancy, one fetus abortates or dies with further resorption, which is accompanied by the further development of single pregnancy and delivery by one fetus. Very rarely dead mummified fetus stays in the uterus (fetus papyraceus, fetus compressus).

*Clinical signs of multiple gestation:*

1) the enlargement of the uterus (more than 4 cm) which doesn't correspond to the gestational age of the fetus; differentiation is performed to exclude the

presence of large fetus, hydatidiform mole and hydramnios;

2) excessive weight gaining by a pregnant woman without edema, development of gestosis and excessive eating;

3) hydramnios, elevated uterine tonus;

4) mother's feeling of increased activity of the fetus;

5) early development of late gestosis and iron deficiency anemia;

6) palpating in the uterus of 3 and more large parts of the fetus and many small ones, small sizes of presenting part during the high standing of the uterus;

7) simultaneous auscultation of palpitations of 2 fetuses with difference of more than 8 beats/min, asynchronous with mothers' one, especially with "zones of silence" between them;

Change of laboratory data during multiple pregnancy can be the following:

1) anomaly elevation of the rate of mother's chorionic gonadotrophin and  $\alpha$ -fetoprotein;

2) decrease in the rate of mother's hemoglobin and hematocrit, hypervolemia;

3) increase in the frequency of disturbances of tolerance to glucose.

Ultrasound screening of the pregnant woman for early detection of multiple gestation for adequate antenatal management and prophylaxis of possible complications has in modern conditions a peculiar meaning.

**Clinical course and management of pregnancy.** Course of multiple pregnancy is accompanied with increased load on mother's organism, which leads to high incidence of complications. Fatigue, dyspnea, varix dilation of lower extremities and frequent urination can occur in pregnant women.

**Antenatal management** of multiple gestation is as follows:

1) prescribing an adequate diet (balanced diet with increased content of protein, multivitamins and microelements);

2) regular control over ABP, indicators of clinical urine analysis (incidence of late gestosis of the pregnant woman increases 4 times, the most severe forms are observed during dizygotic twins);

3) constant control over the rate of hemoglobin, hematocrit, performing early prophylaxis of anemia and preventing increased blood loss in labour (consuming of iron drugs);

4) restriction of physical activity, bed regimen after the 24th–26th weeks of pregnancy to reduce a number of preterm labour;

5) observing under the tonus and uterine contractions (pain in sacrum, intensification of vaginal discharge) for in-time diagnosis of threat of preterm labour; control over the condition of the cervix (smoothing, dilation), which is performed each 1–2 weeks;

6) performing tocolytic therapy with  $\beta$ -adrenomimetics during 2–4 weeks with intervals of 1–

2 weeks (partusisten, bricanil — overdosage of  $\beta$ -adrenomimetics during the multiple gestation intensifies the risk of pulmonary edema), spasmolytics (no-spa, buscopan); placing cervical suture;

7) planned hospitalization of the pregnant woman in 18–22 weeks and 31–34 weeks, which are the critical terms for preterm abortion during multiple gestation; urgent hospitalization is performed if the complications are present.

Antibacterial and dehydratational therapy is prescribed during hydramnios, however it is ineffective. Medical transabdominal amniocentesis is performed if necessary.

Beginning with the 30th–32nd weeks of pregnancy, everyday count of the fetus' movements is recommended. US is performed no later than 12–16 weeks and is repeated monthly. After the 30th–32nd week sonographic examination is performed more often, if the discordant development of twins is observed (difference between the fetuses' weights is more than 20%). At the end of pregnancy monitoring of cardiac activity of the fetuses (unstressed, stressed tests, biophysical profile, dopplerometric examination of blood circulation — dopplerosonography) is performed.

The duration of pregnancy reduces as the result of increase in the number of fetuses. Delivery with twins, if there are no complications, occurs on the 37th week of pregnancy; with one more fetus the duration of pregnancy reduces by 4 weeks. The maturity of the lungs of the fetuses during multiple gestation occurs earlier than during the single pregnancy; if it is necessary, the amniotic fluid is examined with amniocentesis.

Position of the twins in the uterus is usually longitudinal. In the majority of the cases cephalic presentation of both fetuses (more than 40% of cases) is observed; occipital presentation of 1 fetus — nearly 40% of cases; presentation of the 1st fetus, which differs from the occipital presentation of the 2nd fetus, is observed in 20% of cases (Fig. 90).

**Clinical course and management of labour.** Multiple gestation causes a complicated course of labour. The majority of labour occurs prematurely; weight of the fetuses in 50% of cases does not exceed 2,500 g. In 60% of cases labour are complicated by late discharge of the amniotic fluid. Prolapse of the umbilical cord and of small parts of the fetuses can occur as the result of hydramnios, irregular location and low weight of the fetuses. In 20–30% of cases anomalies of contractile activity of the uterus (primary and secondary uterine inertia) are present. In the period of expulsion of the fetus preterm separation of the placenta before or after delivery of 1 fetus, change of location (longitudinal on transverse) of the 2nd fetus in the uterus can occur, which requires obstetrical operations. During the breech presentation of the 1st fetus and cephalic presentation of the 2nd fetus labour can be complicated by simulta-

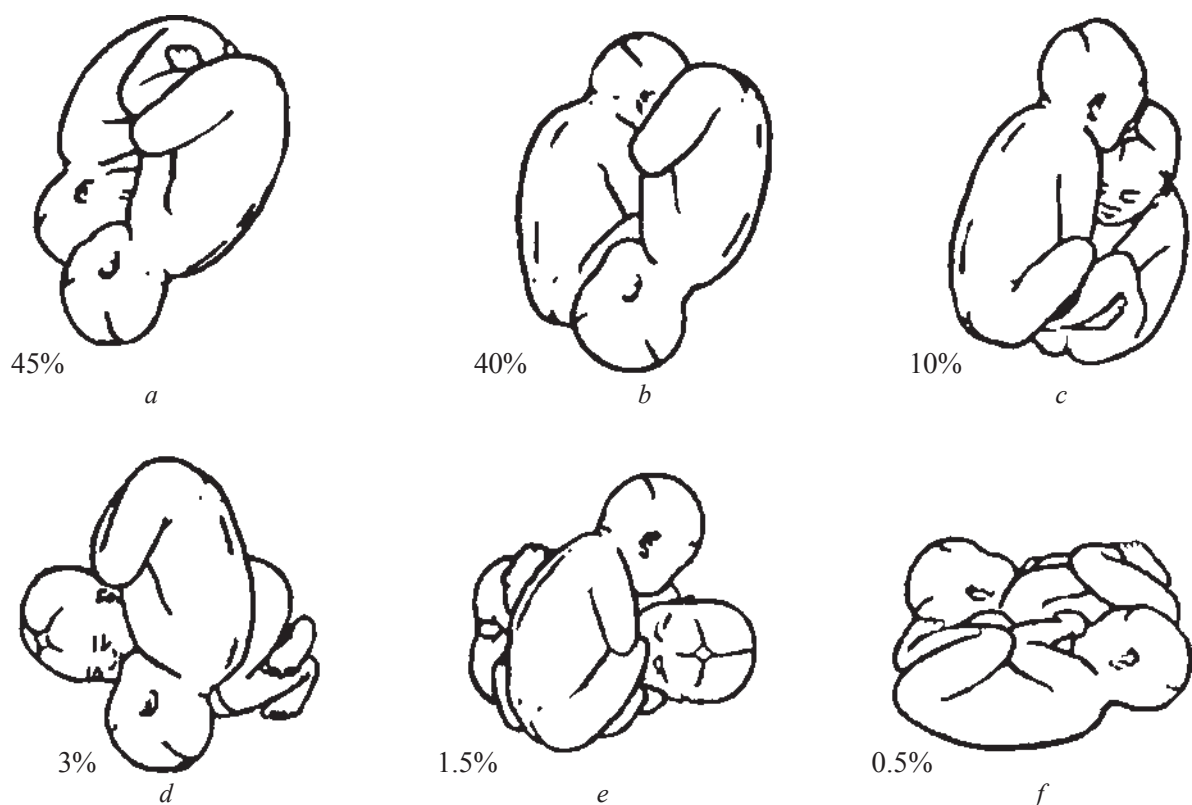


Fig. 90. Variants of presentations of twins (a-f)

neous lowering in pelvis of the heads of both twins, which can cause their coupling (collision of the twins) and a necessity in performing operations which destroy the fetus. Labour is often complicated by hypoxia of both fetuses, their delivery with asphyxia of different degree; perinatal mortality increases 4–5 times. Despite of maternal hypovolemia, during the multiple gestation postnatal blood loss augments 5 times, massive hypo- and atonic postnatal bleedings often appear. Risk of postnatal pyo-septic complications increases at the postnatal period because of the disturbance of contractile activity of the uterus, anemia, long lasting and operational delivery and increased blood loss.

The success of **delivery** to a greater extent depends on the type of presentation of the fetuses, their gestational age and skills of the doctor. Vaginal delivery is recommended during the occipital presentation of one fetus. Such labour should be performed in operational ward with the presence of anaesthesiologist and pediatrician-neonatologist (indications to abdominal delivery can arise).

Delivery should be very careful, turned on minimalization of labour injury, especially in premature twins. Immaturity of the fetus, labour injury and acute asphyxia as the result of excessively active manipulations in labour are the most frequent causes of perinatal mortality during multiple gestation.

**First stage of labour.** During premature pregnancy and cervical dilation less than 4 cm it is expedient to perform tocolytic therapy. During the preterm rup-

ture of fetal membranes and insignificant discharge of the amniotic fluid, expectant policy with dynamical observing of the parturient woman (change of the body temperature, clinical blood analysis, restriction in numbers of vaginal examinations, control over the vaginal discharge from the genital tract), as a rule, is chosen. Depending on indications, antibacterial therapy, prophylaxis of syndrome of respiratory disturbances of the fetuses (mucosalvan, dexamethasone), means, turned on improvement of uteroplacental blood circulation and oxygenation of the fetuses (introduction of solutions of glucose, ascorbic acid, vitamins, inhalations of the oxygen) are performed. If the uterine inertia is present, and fetuses are mature, stimulation of labour by combined introducing of oxytocin (2.5 U) and prostaglandins (2.5 mg) is performed. Early amniotomy for the reduction of uterine strain is done with hydramnios.

During labour monitoring of the heart activity of the fetuses is performed, a parturient woman is recommended not to lie on her back (to prevent arterial hypertension and the syndrome of vena cava inferior). The using of medicamental analgesia and anaesthesia should be restricted during labour for prophylaxis of uterine inertia.

**Second stage of labour** during the premature pregnancy is performed without perineal protection; episiotomy is performed to reduce the pressure on the fetal head. Umbilical cord of the first fetus is clipped from the fetal and maternal endings for prophylaxis of anemization of the second fetus. After delivery of

the 1st fetus internal obstetrical examination is performed: location and presentation of the 2nd fetus is detected. If the head or the buttocks of the 2nd fetus are fixed in the pelvis, by the hand the uterine fundus is pushed, carefully, over the control of the finger (to prevent the cord prolapse) amniotomy of the 2nd fetus and vaginal delivery (in 10–15 min after delivery of the 1st fetus) are performed. Prognosis for the 2nd fetus is better in the case of reduce of interval between the deliveries of both fetuses. If the head of the buttocks or the 2nd fetus are not fixed in the pelvis, by external manipulations (external version) and pushing on the uterine fundus it is tried to fix them. If the external version was not effective or the 2nd fetus is in the stage of severe hypoxia and can die during labour in breech presentation, caesarean section is performed. Internal version of the fetus on the leg (during the transverse location of the 2nd fetus) can be done only by a high-skilled obstetrician during the effective relaxation of the uterus (threat of severe injuries of the fetus and uterine rupture).

If contractile function of the uterus after delivery of the 1st fetus is not restored during 10 min, oxytocin is introduced intravenously. In the case of bleeding (separation of the placenta) or serious disturbances of the heart in the 2nd fetus only an urgent delivery depending on the obstetrical situation (caesarean section, application of obstetrical forceps, vacuum-extraction, extraction by the leg) can save it.

After delivery of the 2nd fetus for prophylaxis of hypotonic bleeding 1 ml of 0.02% solution of methylergometrin by 20 ml of 40% solution of glucose is introduced, careful massage of the uterus is done; introduction of oxytocin (5–10 U) is performed during 2 h. Drugs which elevate the uterine tonus — uterotonics are prescribed in the postnatal period, control over the tonus of the uterus and prophylaxis of infection complications are performed. In modern obstetrics indications (in labour's interests) to caesarean section extend.

*Delivery via caesarean section* is recommended to perform in case of the monoovular monoamniotic twins, the different from cephalic presentation of the 1st fetus, number of the fetuses more than 2, low weight of the fetuses, cord prolapse and in connection with general indications from mother's and fetus' sides (hypoxia of the fetus, uncorrected uterine inertia; absence of the effect during the stimulation of labour; unprepared maternal passages during a full-term pregnancy and intrauterine hypoxia of the fetus, presentation or the preterm separation of the placenta, severe forms of late gestosis, expressed extragenital pathology of the mother).

Zygosity of the newborns is detected according to the peculiarities of the placenta's structure. If the placenta is bichorial, twins can be both monoovular (monozygotic) and biovular (bizygotic). Blood groups, haplotypes by HLA system and blood serum proteins are examined for correct determination of zygosity in the case of bichorial homosexual twins. For *prophylaxis of multiple gestation* it is recommended the following:

- 1) using barrier methods of contraception during the first menstrual cycle after the ending oral contraceptives course;

- 2) using the clomiphene-citrate during the induction of ovulation;

- 3) treatment with gonadotrophic hormones should be performed by adequate doses under everyday ultrasound of the follicle growth.

Modern assisted reproductive technologies of extracorporal fertilization and transplantation of embryo permit eliminating "unnecessary" fetuses from the uterus under the ultrasound control.

#### RECOMMENDED READING

3 (285–290); 5 (197–207); 21 (371–372); 22; 42; 46; 56; 61.



## PREGNANCY AND LABOUR AT PELVIC PRESENTATION

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Longitudinal location of the fetus during its cephalic (occipital) presentation in labour is considered to be physiological by the modern obstetricians. Pelvic presentation of the fetus is a location of the caudal (pelvic) ending of the fetus in the plane of the pelvic inlet or above the pelvic inlet. During a full-term pregnancy the incidence of pelvic presentation is 3–4%, and during a preterm pregnancy it is considerably higher — 1 in 5 labours in the term of pregnancy till 30 weeks. According to US prospective data, the pelvic presentation is usual for the fetus at the end of the II trimester of pregnancy. But as the result of the larger sizes of the pelvic ending of fetus in comparison with its head, gradually the major part of the fetuses acquire the cephalic presentation at III trimester. A steady pelvic presentation forms till the 34th week of pregnancy. Possible “mistakes of polarity” of the fetus can be caused by the following factors:

- 1) restricted activity of the fetus because of the excessive extension of lower extremities, olygoamnios, multiple gestation, reduce of the tonus of the fetus, presence of short umbilical cord;
- 2) disturbance of fetouterine interconnections (placenta previa, localization of the placenta in the fundus or cornu uteri; anomalies of the development of uterus, tumours of uterus and pelvis, a narrow pelvis);
- 3) developmental defects of the fetus (anencephalus, hydrocephalus and others);
- 4) reduce of the uterus' tonus as the result of numerous labour and hydramnion;
- 5) tendency to repeated appearing of pelvic presentation during the further pregnancies.

Pelvic presentation is accompanied by 4–5 folds increase in perinatal morbidity and mortality rate, which is caused by prematurity, immaturity, low weight of the fetus, its intrauterine growth restriction, frequent anomalies of development, multiple gestation, cord prolapse, placenta previa, operational interventions during labour and labour traumatism of the fetus.

*Classification.* Pelvic presentation can be breech, foot (complete and incomplete) and mixed breech. In

multiparous women pelvic presentation is observed two times more often than in nulliparous women. Breech presentation usually occurs in nulliparous women, mixed and foot — in multiparous ones. During the *breech presentation* buttocks of the fetus are inserted in the plane of the pelvic inlet, legs are along the trunk (Fig. 91, *a*). During the *mixed breech presentation* legs of the fetus bent in the knee and hip joints, feet are inserted in the plane of the pelvic inlet together with buttocks (both or one; fig. 91, *c*). During the *complete foot presentation* both legs, straighten in hip and knee joints, are inserted in the plane of the pelvic inlet, and during *incomplete foot presentation* — one leg (the second one locates above and bent in the knee joint; fig. 91, *b*).

The knee presentation, when legs are bent in knee joints, turned to the pelvic lumen, is observed very rarely. As a rule, knee presentation transforms in the foot one during delivery. The breech presentation is the most frequent — 65% of pelvic presentation; a mixed breech presentation — 25%, foot — 10% of all cases. Position of the fetus during the pelvic presentation is detected the same as during the cephalic (according to the back of the fetus).

*Diagnosis.* Clinical methods of diagnosis of pelvic presentation are based on the data of external and internal obstetrical examinations. US helps to detect the peculiarities of presentation, weight of the fetus, degree of extension of the head and lower extremities (important factor for prognosis of vaginal delivery), and is the most exact diagnosis. Sometimes the location of lower extremities as for the maternal pelvis during US can be hardly detected. Modern medical facilities gives an opportunity to use *computer X-ray-pelviometry* in such cases.

During the *external obstetrical examination*, using the Leopold's maneuvers, a dense fetal head, which is able to ballotate, can be detected in the uterine fundus; a volumetric, irregular form part, which is softer than in the uterine fundus, and is not able to ballotate, is detected above the pelvic inlet. High standing of the uterine fundus can be observed. Palpitation of the fetus during pelvic presentation is better

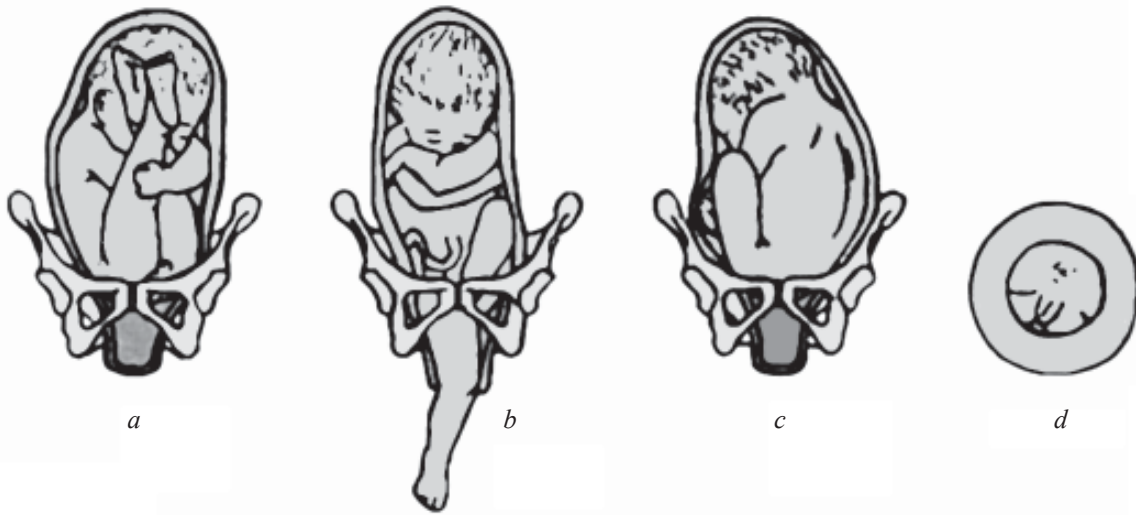


Fig. 91. Variants of pelvic presentation:  
 a — breech; b — incomplete foot; c — mixed breech;  
 d — during the vaginal examination the anus of the fetus is detected

auscultated higher the umbilicus or at its level, on the left or on the right from it.

During the *vaginal examination* small parts of the fetus (legs) or soft large part (buttocks) are detected. If the cervix is dilated enough, the anus, external genitalia, sacrum of the fetus, absence of the sutures, fontanels and hair can be detected. During the breech presentation only the buttocks are palpated. It is determined to which side the fetus' back is turned (as for the sacrum). The kind of presentation is detected by the buttocks. During the foot presentation the position of the fetus can be detected if the obstetrician can reach the popliteal fossa by his finger. Necessary data can be obtained by learning the location of fingers and heel of the foot of the fetus, and during knee presentation — knee calyces and popliteal flexures. For differentiation of the leg of fetus with a prolapsed hand attention is paid to the following signs: the foot has the heel bone, connects with crus at an angle, and, as a rule, pressed to the anterior surface of the crus, as the result of which a calcanean tuber protrudes. Above the calcanean tuber from both sides two large condyles are palpated. Fingers of the foot are short, attach to one another, their edges locate in a row by one line. The knee joint differs from the ulnar one by the presence of a ball-like mobile knee calycle. The arm is connected with the forearm by the straight line, toe is very mobile, is easily pressed to the palm and deviated to the side; fingers are different by their length and extended. The arm of the fetus takes the finger of the doctor.

**Pregnancy course and treatment** during the pelvic presentation do not differ from that of the cephalic one. Corrigent gymnastics is recommended to perform from the 35th week of pregnancy to change the location of the fetus, as well as perform the external prophylactical rotation of the fetus on the head (in the hospital).

*Technique of corrigent gymnastics* (by I. I. Grishchenko and A. Ye. Shuleshova, Cayo, Dikan) is based on performing of a complex of physical exercises to elevate the tonus of the muscles of the uterus and anterior abdominal wall, which is achieved when stimulating machano- and baroreceptors. Walking during 1 min with deep breathing is the initial exercise. The main complex of exercises is intended to strengthen the major muscles of the trunk (rotation of the trunk to the front and in the sides according the position of the fetus, rotation on the bed on the left and on the right side with rest in each position for 10 min, adjoining of the hips with bent knees to the abdomen). Exercises, turned to strengthening muscles of the pelvis and pelvic floor, compose the finishing complex. The exercises are repeated 3–4 times 3 times a day for 7–10 days.

Hippocrates offered to make an *external cephalic version* during its incorrect presentation. External prophylactical version on the head was introduced in Russia by B. A. Arkhangelsky in 1941 and performed by G. Korablyov in 1943. Today the majority of obstetricians consider the external cephalic version a grounded variant for management of pregnant women with a steady pelvic presentation of the fetus, which contributes to the decrease in the incidence of caesarean section and perinatal mortality. In modern obstetrics it was modified and some conditions of its performing were also changed.

*External prophylactical cephalic version* (Fig. 92) is more effective in multiparous women than in nulliparous ones, in connection with more pliant anterior abdominal wall in the first case.

Version is performed without anaesthesia to control the degree of pain sensitivity of a pregnant woman (risk of uterine injury). Rhesus-negative pregnant women are prescribed immunoprophylaxis by antirhesus anti-D-immunoglobulin.

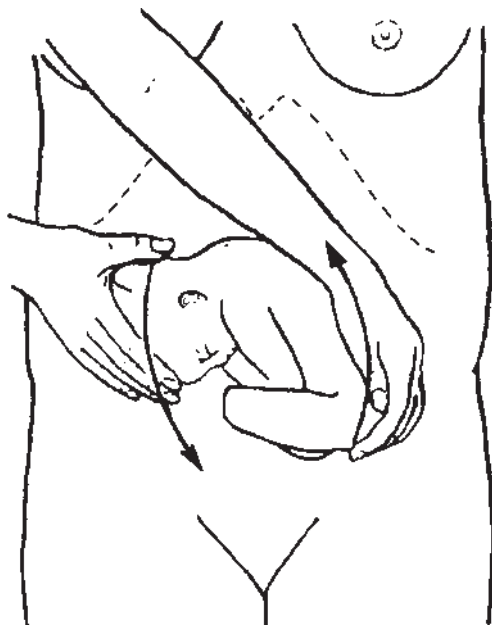


Fig. 92. External cephalic version

**Technique.** In order to perform the external cephalic version one should empty the intestine and urinary bladder of the pregnant woman; spasmolytics are introduced, tocolysis with  $\beta$ -adrenomimetics (partusisten, bricanil, terbutalin) for relaxation of the uterus is performed. The pregnant woman should lie on a firm surface, the doctor — stand or sit on the right. After buttocks have been palpated by one hand, and head — by another one, he carefully begins to move the buttocks from the back of the fetus up, and head — to the abdominal wall and down.

**Conditions** necessary to perform the external version: 1) single gestation; 2) mobility of the fetus — pelvic end is not fixed in the cavity of the pelvic inlet, proper amount of the amniotic fluid; 3) term of pregnancy no longer than 36 weeks, threat of preterm labour is absent (in the USA external version of the fetus on the head is performed only after the 37th week of pregnancy for prophylaxis of iatrogenic preterm labour); 4) reactive nonstress test before the version (if the pregnancy is full-term); 5) agreement of the pregnant woman. If the external version was unsuccessful (fetus returns to the previous pelvic presentation), it is performed one more time, after which the fetus is fixed with a bandage and torus. If the pelvic presentation preserves, a pregnant woman is hospitalized before labour. External version on the head will be more effective if there is no obesity in mother and in the case of the anterior position of the fetus. Monitoring of the fetal heart rate and, if it is possible, ultrasound control are carried out during the version.

**Contraindications** to external version of the fetus on the head are the following: 1) oligoamnios, restricted mobility, hypoxia of the fetus; 2) preterm rupture of the fetal membranes; 3) the placenta pre-

via; 4) bleeding at the III trimester of pregnancy; 5) late gestosis; 6) extragenital pathology in decompensation; 7) developmental uterine anomalies, operation on uterus, abdominal adhesions; 8) narrowing of the pelvis; 9) spontaneous abortions or preterm labour in anamnesis.

Preterm labour, preterm placental detachment and twisting around the fetal parts of the umbilical cord are the *complications* of external version.

External version is stopped if pain worries the pregnant woman, version is hardly performed, signs of vital activity of the fetus appear, which are detected with heart rate monitoring.

**Biomechanism of labour** during the pelvic presentation has the same laws as during the cephalic one, and consists of 7 moments (Fig. 93).

*The first moment* — insertion of buttocks in the cavity of the pelvic inlet (Fig. 93, a). Linea intertrochanterica, or interbuttockal, plays the role of sagittal suture during cephalic presentation and stands in the cavity of the pelvic inlet by one of oblique sizes (in the first position — on the left; in the second position — on the right); sacrum of the fetus is turned to the front (anterior kind) or to the back (posterior kind). Posterior kind in labour often transfers to the anterior, as well as during the cephalic presentation.

*The second moment* — lowering of the buttocks (see fig. 93, a). While developing of parturition, buttocks as the result of their compression lower into the pelvis. The anterior buttock lowers the first, which is the entering point; a labour tumour forms on it. This moment correspond to the flexion of the head during the vertex presentation of the fetus.

*The third moment* — sacral rotation of the buttocks (see fig. 93, a). Performing the oscillation movements, the buttocks pass the promontorium and lower into the wide part of the pelvic cavity.

*The fourth moment* — internal turn of the buttocks (Fig. 93, b, c). Both the buttocks and the head make the internal turn and lower on the pelvic floor. A buttock line is set in the direct size. In the first position the left buttock lies in the front, in the second — the right one does.

*The fifth moment* — delivery of the buttocks and trunk till the inferior angle of the scapula (anterior scapula; Fig. 93, c, d). The anterior buttock moves out from the pubic symphysis and disengages through the vulvar ring the first. It fixes by the wing of the ischiac bone near the lower edge of the pubic symphysis. Around the fulcrum powerful lateral flexion of the lumbar part of the vertebral column of the fetus takes place, as the result of which the posterior buttock delivers. The arch of the vertebral column straightens — and the anterior buttock delivers completely. Progressive move of the buttocks and trunk turned along the entering axis of the pelvis upwards — to the pubis. During the mixed breech presentation legs deliver simultaneously with the buttocks, during the pure breech presentation — a little bit later

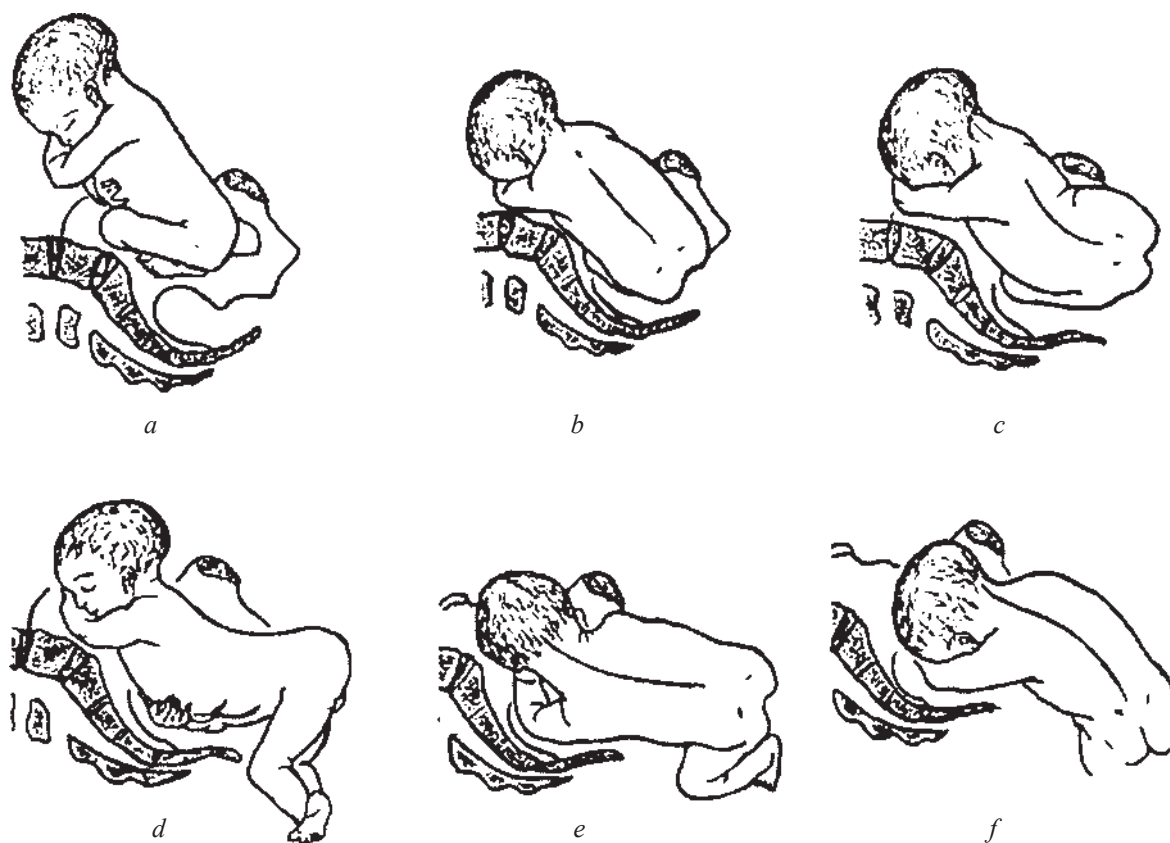


Fig. 93. Biomechanism of labour during pelvic (breech) fetal presentation: *a* — insertion, lowering and sacral version of the buttocks; *b* — internal version of the buttocks; *c* — delivery of the buttocks; *d* — delivery of the trunk till the umbilical ring; *e* — delivery of trunk till the inferior angle of the anterior scapula; *f* — delivery of the upper extremities (shoulder girdle)

when the trunk delivers till the umbilicus. The buttocks easily perform the external version and the trunk as the result of progressive move delivers till the umbilicus, the fetus' back is turned to the front. The buttocks which delivered in the direct diameter of the pelvic outlet together with the trunk move in the oblique diameter and then stand on the transverse diameter. External version is done thanks to lowering in the pelvis of the shoulder girdle by the same size, with which buttocks entered the pelvis. During 2–3 prelum muscles contractions the fetus delivers to the posterior angle of the anterior scapula, the trunk again transfers into the I position in the left oblique diameter of the pelvic outlet, and at the II position — in the right; the arm delivers together with the chest.

*The sixth moment* — delivery of the upper extremities (shoulder girdle, fig. 93, *d*). The shoulder girdle performs the same movements as during the vertex presentation in the pelvis. Biacromial size of shoulders during the progressive move to the front transfers from the oblique diameter of the inlet in the direct diameter on the pelvic outlet. If the normal location of the fetus preserves, the column of the brachial bone of anterior arm fixates near the lower margin of the pubic symphysis; the posterior arm is delivered the first, then the anterior arm moves out from the pubis. If the location of the fetus disturbs, the arm throws back, which requires a special obstetrical assistance.

*The seventh moment* — delivery of the head. The head enters in the pelvis simultaneously with delivery of the shoulders. Saggital suture is set in the oblique diameter of the pelvis, opposite to the biacromial size of the shoulders. Then the head performs all its movements, according with the laws of biomechanics, as during the occipital presentation. However, all movements occur rapidly, the head, if it is not straighten, moves by the small (9.5 cm) or middle oblique diameter (from the suboccipital fossa till the anterior margin of the anterior (major) fontanel — 10 cm). The head fixates with suboccipital fossa under the pubic symphysis, and around this point of fixation the chin, face and fetal forehead disengage above the perineum.

Classical obstetrics divides the biomechanism of labour into 6 moments: 1) internal rotation of the buttocks; 2) lateral flexion of the lumbal part of the vertebral column of the fetus; 3) internal rotation of the shoulders and external turn of the trunk; 4) lateral flexion of cervico-thoracic segment of the vertebral column; 5) internal rotation of the head; 6) flexion of the head.

Biomechanism of labour during the foot presentation does not differ much from the one during the breech presentation. Prolapse of the presenting part before the complete dilation of the uterine orifice and cord prolapse are the complications of labour, in connection with which indications to caesarean section extend in such cases in modern obstetrics.



**Clinical course of labour.** There are 3 variants of delivery through the natural maternal passages during the pelvic presentation: spontaneous vaginal delivery, partial extraction of the fetus and complete extraction of the fetus.

*Spontaneous vaginal delivery* occurs without complications, any tractions and manipulations except the support of the fetal trunk. Such mechanism is possible, if there is an active parturition and fetus of small sizes (especially in multiparous women). During a *partial extraction* fetus spontaneously delivers till the umbilicus, after which extraction is performed. If there is a *complete extraction*, then obstetrician extracts the whole trunk of the fetus.

*Complications.* Labour of pelvic presentation can be complicated with late discharge of amniotic fluid, uterine inertia, intrauterine hypoxia of the fetus. The second stage of labour is very dangerous for the fetus, especially after the birth till the umbilical ring. In this time the umbilical cord is compressed between the bones of the maternal pelvis and fetal head, and maximal time, which obstetrician has for successful end of labour, is **5 min**. If during 5 min the upper extremities, the girdle and the fetal head do not deliver, he dies of asphyxia. Besides cord compression, in this stage preterm separation of the placenta and acute hypoxia of the fetus can develop. Accelerated delivery of the fetal head, especially as the result of application of external methods (push on the maternal abdomen to augment the intraabdominal pressure), can cause labour injury of the fetus (rupture of the tentorium of cerebellum, intracranial hemorrhage).

A less volumetric than the head part moves through labour passage the first during pelvic (especially foot) presentation, which does not prepare labour canal. Delivery of the pelvic ending, especially during the immature pregnancy can occur when the uterine orifice has not dilated. After delivery of the shoulder girdle spasm of not completely dilated uterine orifice around the neck of the fetus can develop, which causes throwing of the head back. During the disturbance of labour biomechanism (uterine inertia, inconspicuity between the sizes of the maternal pelvis and fetus) throwing of arm back can occur, and posterior kind of presentation can take place.

**Labour management.** Labour management of pelvic presentation is one of the main obstetrical problems, which requires from the doctor knowledge, practical skills. Taking into consideration a high incidence of complicated delivery and perinatal morbidity and mortality, the plan of labour management of pelvic presentation should be made in prenatal department *ex consilium*. To minimize the perinatal morbidity and mortality rate, in modern obstetrics indications to caesarean section extend in the case of pelvic presentation, except those, when the gestational age is little and fetus is unviable. The incidence of the caesarean section during the pelvic presentation is 25–75% and more in different clinics.

**Indications to caesarean section:** 1) large fetus; 2) narrowing of the maternal pelvis; 3) straighten fetal head (by US data); 3) late gestosis; 4) anomalies of the parturition; 5) mixed breech and foot presentation; 6) complicated obstetrical anamnesis (labour injury, death of the fetus); 7) immature pregnancy (with a viable fetus and presence of conditions for intensive care); 8) pronounced intrauterine growth restriction; 9) twins with pelvic presentation of the first fetus.

*Management of vaginal labour* at pelvic presentation of the fetus is recommended to perform under following conditions: 1) breech presentation of the fetus; 2) normal sizes of the maternal pelvis; 3) fetal weight less than 3,600 g, which is confirmed with 2 and more US; 4) individual experience and skills of the doctor on management of labour of pelvic presentation of the fetus; 5) presence of anaesthesiologic and neonatologic reanimation department.

In some cases and during the presence of all mentioned above conditions the caesarean section provides best consequences for the fetus with pelvic presentation. On the other hand, even with a caesarean delivery the fetal injury is not always avoided (hardships during the extraction of the fetus, cord entanglement and others).

A skillful doctor should perform labour of the pelvic presentation. Monitoring of the fetal heart rate, pelviometry, ultrasound examination to detect the degree of straightening of the head are performed, location of lower extremities, correlations between the sizes of maternal and fetal pelvis and developmental anomalies of fetus and uterus are detected.

At the **I stage** of labour one should prevent the rupture of the fetal bladder, perform the prophylaxis of uterine inertia and intrauterine hypoxia of the fetus. Right after the discharge of amniotic fluid internal obstetrical examination to establish correctly the diagnosis and to prevent the cord prolapse is done. If the amniotic fluid bursted ill-timely and there is uterine inertia, a parturient woman is introduced adequate doses of oxytocin, prostaglandins or their combination. It should be remembered that only during active parturition a successful labour outcome is possible. Overdosage of the tonomotor drugs can cause acute hypoxia of the fetus, preterm separation of the placenta. That's why during prolonged uterine inertia (during 3 h) and intensification of the fetal hypoxia it is expedient to change the plan of labour management and begin caesarean delivery.

**II stage of labour** requires a particular attention. 1 ml of 0.001% solution of atropine sulfate or other spasmolytic drugs are introduced intravenously for prophylaxis of the cervical spasm in 30–40 min before delivery of the child. To reduce a possibility of labour injury and make the head delivery easier, episiotomy and pudendal anaesthesia are done. The heart rate of the fetus is auscultated after each prelum muscles contraction. A parturient woman inhales the ox-

xygen in intervals between the prelum muscles contractions. From the disengagement of the buttocks of the fetus a parturient woman is laid on the edge of the bed, a polster is put under the sacrum to reduce the angle of the pelvic slope. Some obstetricians recommend to press the hips to the abdomen during the prelum muscles contractions. Discharge of meconium by the fetus during the pelvic presentation occurs mechanically and is not the sign of hypoxia of the fetus.

In management of labour of the pelvic presentation of the fetus there are 4 stages: 1) delivery of the fetus till the umbilicus; 2) delivery of the fetus till the inferior angle of the scapulas; 3) delivery of the arm; 4) delivery of the head.

In Ukraine during labour management of pelvic presentation of the fetus a *manual assistance according to M. A. Tsovyanov* is applied. This method is based on preserving normal location of the fetus, which prevents the throwing of arms back and extension of the head. During the breech presentation the legs of the fetus locate a long the trunk and press the crossed arm to the chest; the feet reach the face, contributing to the flexion of chin and its pressing to the chest. In result of such location circumference of the fetus on the level of the shoulder girdle is 42 cm, which is more than circumference of the head (32–34 cm).

*Manual assistance according to Tsovyanov I* (during the breech presentation of the fetus) is based on the moment that after the disengagement of the buttocks, the obstetrician takes them with the hand by such a way that thumbs locate on the pressed to the abdomen legs of the fetus, and other 4 fingers — along the sacrum (Fig. 94, a).

The trunk of the fetus lifts up — along the axis of labour canal. Such location of obstetrician's hands prevents the preterm prolapse of the legs, dropping of the buttocks and contributes to the upward moving of the body — to the pubis. While the trunk delivers, obstetrician's hands slide along it, staying with the pudendal slit of the parturient woman (Fig. 94, b). It should be remembered that tractions are forbidden. The doctor should slide the hand along the trunk of the delivering fetus. After the disengagement of the girdle of the upper extremities, the hand can prolapse. It is important that legs should not be prolapsed earlier than delivery of the shoulder girdle. If the arms of the fetus do not deliver by themselves, the doctor without changing the position of his hands sets the shoulder girdle in the direct diameter of the pelvic outlet and deviates the trunk of the fetus to the back. During this the anterior arm moves out from the pubic arch. Then the trunk should be lifted up, make delivery of the posterior arm from the pubic arch easier. In the depth of the pudendal slit the chin and mouth of the fetus appear. The trunk is lifted up to deliver the fetal head. Careful, but powerful pressing on the pubic arch by the obstetrician (Naujok method) can assist delivery of the head. If delivery of the

head delays, it is released by Mauriceau—Leuvret manœuvre (Smellie—Mauriceau—Leuvret, Mauriceau—Leuvret—LaChapelle; fig. 95).

*Manual assistance by Tsovyanov II* of the foot presentation is based on the making a barrier for moving the fetus to intensify the parturition. As soon as the legs appear from the vagina, the doctor should cover the external genitalia with a sterile napkin and with his palm during each pain counteract the preterm prolapse of the legs out of the pudendal slit. Such counteraction is required till the complete dilation of the uterine orifice. Till this time the buttocks lower down on the pelvic floor, and fetus squats down forming a mixed breech presentation. Counteraction is stopped, when the legs of the fetus begin to move out from the palm of the obstetrician. This method can be applied during mixed breech presentation; actions are made untill the pelvic ending of the fetus lowers down on the pelvic floor. If during the Tsovyanov's assistance after delivery of the fetus till the umbilicus its further independent move stops, it is necessary to perform *classical obstetrical assistance*

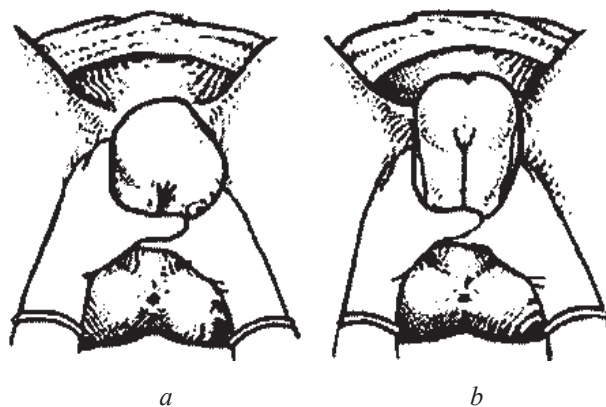


Fig. 94. Manual assistance according to Tsovyanov I (a, b)



Fig. 95. Releasing of the fetus' head according to Mauriceau—Leuvret

to release arms and head. Each arm is released by a proper arm of obstetrician — the right — by the right, the left — by the left. The posterior hand is released the first, which locates above the perineum (more space for manipulations). The trunk of the fetus with legs are lifted up — to the inguinal plica of the mother. By the second and middle fingers of the hand, corresponding to the posterior hand of the fetus, the obstetrician slides to the front on the back of the fetus along the scapula, presses on the crook of an arm, and by slides along the chest of the fetus, extracting its posterior arm. The anterior arm is transferred to the posterior, turning the trunk of the fetus by 180°; back of the fetus should pass under the pubic symphysis. The second arm is extracted the same as the first one.

In order to extract the head by the *Mauriceau—Leuvret method* (Fig. 95) the fetus is sit down on the obstetrician's forearm. By the second finger in the mouth of the fetus the doctor holds the head flexed. By the second and middle fingers of the free arm he takes the shoulder girdle of the fetus. Traction is carried out by a free arm firstly downwards — to forming of the point of fixation of the suboccipital fossa above the pubis, then — upwards. Movements should be careful to prevent the injuries of the cervical segment of the vertebral column of the fetus. Some obstetricians use the *Bracht's maneuver* for labour management. Delivery of the fetus till the umbilicus should be done spontaneously, till this time the obstetrician should not make special means not to brake the location of the fetus ("hands off the fetus"). After delivery of the fetus till the lower angle of the scapulas, its trunk it turned upwards, moved above the pubic symphysis, then — along the axis of labour canal and abdomen of the mother. Pubic symphysis plays a role of point of fixation, around which the occiput of the fetus rotates. This method can be applied if the fetal head is bent. The urinary bladder of the mother should be emptied. By both hands the obstetrician captures the posterior parts of the fetal osseous pelvis, liquidating the pressure on the kidneys and adrenal glands of the fetus. In order to prevent the excessive extension of the head one can use special obstetrical forceps Piper.

**Obstetrical operations.** In modern obstetrics the caesarean section of pelvic presentation is still widely applied, that's why such operations are rarely performed because of the high risk of mother and fetus injury. But in some cases they can be necessary.

During acute hypoxia of the fetus, immediate disturbance of the mother's condition or expressed uterine inertia, when conditions for performing Tsovyanov's assistance or classical manual assistance are absent, sometimes *extraction of the fetus by the pelvic ending* is performed, however, it is rather traumatic. During this obstetrical operation artificially replay all 4 stages of labour of the pelvic presentation (complete extraction of the fetus).

*Indications* to operation: 1) obstetrical pathology, which requires the immediate finishing of labour (pre-term separation of the placenta, eclampsy attack, embolism, pulmonary edema, cord prolapse, acute hypoxia of the fetus); 2) decompensation of extragenital diseases; 3) extraction of the fetus by pelvic ending, after the operation of the classical podalic version.

Conditions for the operation: 1) complete dilation of the uterine orifice; 2) opened fetal bladder; 3) adequate correlations between the sizes of the fetus and maternal pelvis. Operation is done under analgesia after a usual preoperational preparation.

Depending on the kind of presentation, there are 4 types of operation of extraction of the fetus by pelvic ending: *extraction of the fetus by the leg, by both legs, by inguinal flexion.*

*Extraction of the fetus by the leg* (Fig. 96) is performed in the case of incomplete foot presentation.

By the hand in the uterine cavity the obstetrician looks for and captures the leg of the fetus. The thumb should be along the crus of the fetus, the other fingers capture the crus from the front (Fig. 96, a) In order not to capture the fetal head by mistake, one should slide the hand along the trunk of the fetus till its buttock, then under it along the hip and crus and capture the foot. Simultaneously transabdominal pressure on the buttocks of the fetus is performed to move them downwards. Downward traction is performed, gradually extracting the whole lower extremity by such a way that popliteal fossa is turned to the front (anterior kind). After the appearing of anterior inguinal flexion and the wing of the ischial bone, point of fixation forms, and then the posterior buttock delivers. The anterior hip is captured by the both hands and lifted up. After he delivery of the posterior buttock, the posterior leg prolapses.

After delivery of the buttocks the obstetrician places the thumbs along the sacrum of the fetus, the other fingers capture its hips (Fig. 96, b). Traction should be done inwards, extracting the trunk till the umbilicus, and then — till the posterior angle of the scapulas (Fig. 96, c). The arms and head are released the same as during the classical manual assistance (Fig. 96, d-f).

*Extraction of the fetus by both legs* is done during the complete foot presentation. Each leg of the fetus is captured by the hand with the fetus' hand by such a way to locate the thumbs of gastrocnemius muscles of the fetus, and the other — on the crus. While extracting the fetus, both hands of the obstetrician slide along the fetal legs upwards by such a way to be near the vulvar ring of the parturient woman. Disengagement of the buttocks and further delivery of the fetus occur the same as during the incomplete foot presentation.

Extraction of the fetus during the breech presentation begins with the lowering of the leg; mixed breech presentation transfers into the incomplete foot presentation. The further techniques of extractions corresponds with the mentioned above.

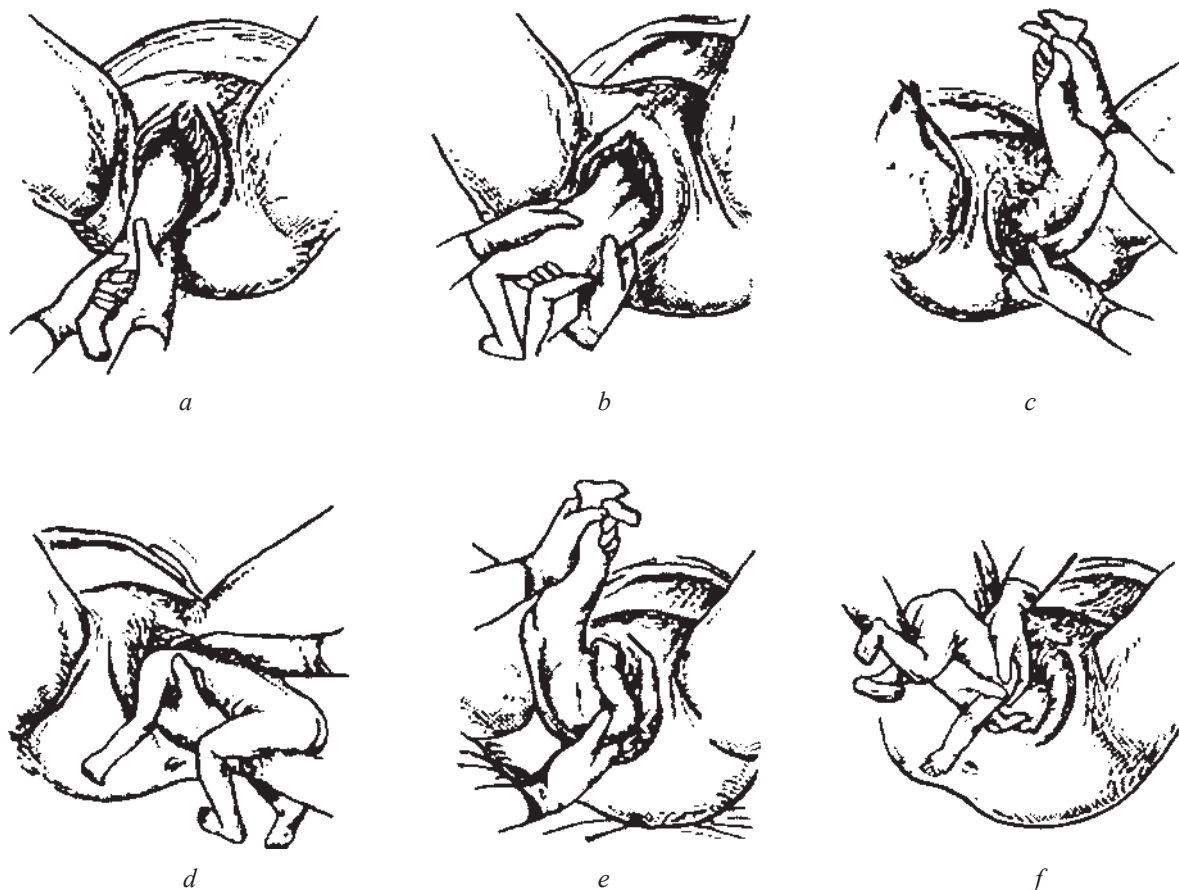


Fig. 96. Extraction of the fetus by the leg:  
*a* — capturing and extraction of the leg; *b* — capturing of the buttocks; *c* — releasing of the posterior hand; *d* — backward rotation of the anterior shoulder; *e* — release of the second (anterior) hand; *f* — extraction of the head

*Extraction of the fetus by the inguinal flexion* is performed during the breech presentation. Complete dilation of the uterine orifice and location of the fetal buttocks on the pelvic floor are the necessary conditions for extraction of the fetus by the inguinal flexion. This operation is very hard technically. The doctor places the second finger beneath the inguinal flexion of the fetus and performs the tractions downwards. By the other hand he captures his radiocarpal articulation to intensify tractions. The anterior buttock of the fetus should be moved under the inferior edge of the pubic symphysis before the point of fixation forms. Then by means of upward tractions the posterior buttock is released. After delivery of the buttocks the operation is done similar to that during the extraction of the fetus by the leg.

Operation of extraction of the fetus by the pelvic ending can be accompanied with traumatic injuries of the maternal passages (cervical rupture, perineum, sometimes injuries of the symphyses of pelvis). This operation is more traumatic for the fetus, in which injuries of the head (intracranial hemorrhage, hematoma, cephalohematoma, fracture of the cranial bones), trunk (injuries of the vertebral column, internal organs — liver, kidneys, adrenal glands and others) and fractures of upper and lower extremities can appear.

#### RECOMMENDED READING

3; 5; 21; 22; 27; 32 (7–31); 44; 46; 53; 56; 57; 61.



## Chapter 21

# TRANSVERSE AND OBLIQUE LIE OF THE FETUS

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The position, during which the longitudinal axis of the fetus corresponds to the longitudinal axis of the uterus, is correct. If the axis of the fetus forms an angle with the axis of the uterus, then position of the fetus is irregular. During the *transverse lie* of the fetus the longitudinal axis of the fetal trunk is perpendicular to the axis of the uterus (Fig. 97), during the *oblique lie* the longitudinal axis of the trunk of the fetus forms a sharp angle with the longitudinal axis of the uterus.

Located underneath the large part of the fetus during its transverse lie is higher, and during oblique — under the iliac bone. Position of the fetus during the transverse and oblique lie is determined by the place of the head: if it locates in the left — it is a first position (Fig. 97, *b, c*), if in the right — the second (Fig. 97, *a*). The kind of the fetus, as during longitudinal position, is detected by the fetal back: if it is turned to the anterior wall of the uterus — anterior kind (Fig. 97, *a-c*), if to the posterior — posterior kind (Fig. 97, *b*).

Disturbance of the polarity of the fetus — transverse or oblique lie — can be unstable (transitor) or

stable. Only operational delivery (caesarean section, obstetrical operations for change of the position of the fetus, operations, which destroy the fetus) is possible during the transverse or oblique lie of the fetus. The incidence of malpositions is 1:250 in multiparous women and 1:1,000 in nulliparous women. Perinatal mortality rate varies within 5–15% and is related predominantly with prematurity, cord prolapse and parturition anomalies. Like during the breech presentation, transverse and oblique lie usually takes place during a premature pregnancy (25% in 16 weeks of gestation, when a physiological increase in the volume of the amniotic fluid occurs and fetus comes back from the pelvic to the cephalic presentation).

Causes of malposition of the fetus are following: 1) reduce of the tonus of anterior abdominal wall and uterus, especially after a few labour; 2) hydramnios; 3) multiple gestation (often in the second fetus of twins); 4) developmental defects of the uterus (unicornis, bicornis, saddle-like, with septum); 5) placenta previa; 6) tumors of the uterus and appendages; 7) expressed scoliosis in the lumbar part of the vertebral column. Placenta previa occurs as the result of

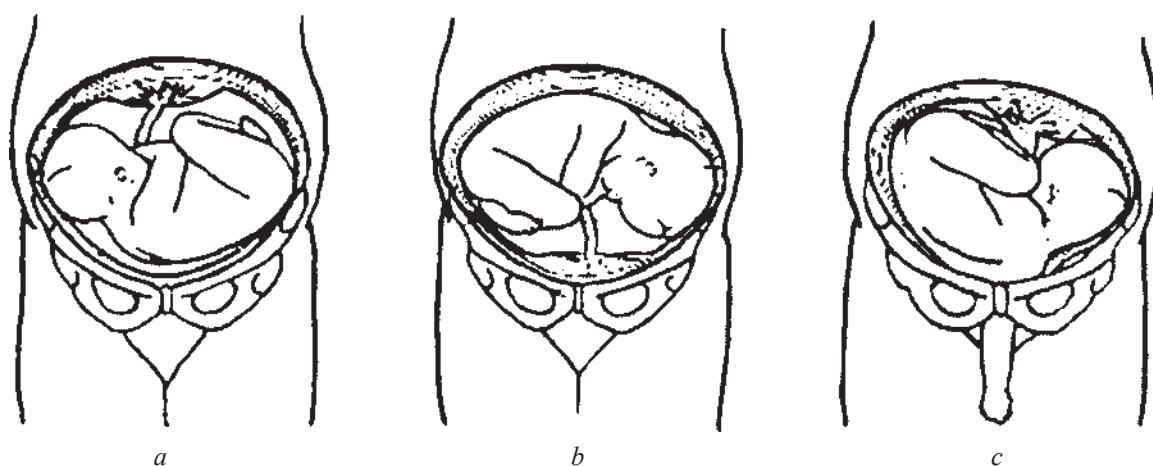


Fig. 97. Transverse lie of the fetus:

*a* — the placenta is in the uterine fundus (fetus is by its face upwards); *b* — central placenta previa (fetus is by its face downwards); *c* — neglected transverse lie with a protruded hand

anomalies of fetus' position almost in 12% of cases. If the transverse lie of the fetus preserves till labour, the incidence of the placenta previa increases up to 20–25%.

*Diagnosis* of transverse and oblique lie of the fetus is based on clinical (examination, palpation, auscultation) and functional (US) data, and if necessary — X-ray examination.

During the examination of the abdomen of the pregnant woman, its form (transversal-ovoid, oblique-ovoid) is detected, the uterus is straighten in transverse or oblique distance, its fundus is located lower, and presenting part above the pelvic inlet is not detected. Large parts of the fetus — head and buttock — are palpated not in the superior and inferior poles of the uterus, but in its lateral parts. Heartbeats of the fetus are heard at the umbilical level.

*Vaginal examination*, if the fetal bladder is intact, not always can help to make a diagnosis. Besides, performing internal obstetrical examination can be dangerous as the result of high risk of the placenta previa, rupture of the fetal vesicle and related to them complications — massive bleeding, acute hypoxia of the fetus, cord prolapse or hand.

If after the discharge of the amniotic fluid the oblique lie has not transformed into longitudinal, it transforms as a rule into the transverse and then delivery is finished with operational intervention. During the vaginal examination, if the cervix is dilated more than by 4 cm, side of the fetus (ribs, intercostal spaces), scapula, vaginal cavity can be palpated and prolapse of the hand can be detected. During the hand prolapse from the pudendal slit diagnosis of transverse lie of the fetus is obvious. The method of “invitation with hand” (imagining) is used to detect whether right or left arm is prolapsed. If it is possible, the right arm is prolapsed, if not — the left one. In the first position prolapse of the right arm indicates the anterior kind, of the left — the posterior one. During the second position — vice versa: prolapse of the right hand is an evidence of posterior kind, of the left — anterior kind.

Vital capacity of the fetus is determined by heart tones, movements of the small parts, cord pulsation, prolapsed arm, which is confirmed with US.

**Clinical course, management of pregnancy and labour.** Course of pregnancy during transverse and oblique lies of the fetus is common. Women begin the correcting gymnastics from the 32nd week of pregnancy. If the effect is absent, the pregnant woman is hospitalized to perform the external version of the fetus on the head, which is performed like with the pelvic presentation. If this attempt is unsuccessful, the pregnant woman is prepared to caesarean delivery. Spontaneous labour through the natural maternal passages with delivery of a viable fetus is impossible in such cases. Vaginal delivery is very difficult technically, dangerous for mother and accompanied with considerable traumatism of the fetus and stillbirth.

If the diagnosis of transverse or oblique lie was not established in time and till the beginning of the parturition caesarean section was not made, labour can get complicated by early discharge of the amniotic fluid (division of the fluid on anterior and posterior is absent), prolapse of hand or umbilical cord, forming of neglected transverse lie of the fetus (pressing of the shoulder in the pelvis, immobility of the fetus, edema and cyanosis of the arm, hypoxia or death of the fetus). Overstrain of the lower segment of the uterus (Fig. 98) as the result of neglected transverse lie of the fetus (*shoulder presentation*) can cause uterine rupture with lethal outcome for mother and fetus.

During the other variant of the pregnancy course among with preterm discharge of the amniotic fluid uterine inertia develops, ascending infection, death of the fetus and generalization of infection take place.

*Caesarean section*, which is performed till the beginning of parturition, i.e. planned, is the only reasonable method of delivery during the transverse and oblique lie of the fetus.

*Operation of external-internal version of the fetus on the leg* by Braxton—Hicks (Fig. 99) with further extraction of the fetus today is performed only in rare cases (if the fetus, or the second fetus of the twins is dead or unviable because of its severe immaturity).

During the neglected transverse lie with alive fetus *extraperitoneal caesarean section* is performed in some cases. If the arm is presenting, the parturient woman should be laid on the side, opposite to the presenting arm of the fetus, lifted her up by the pelvic ending. The parturient woman with neglected transverse lie of the fetus cannot be transported, care should be done in the hospital, where she was brought. It is necessary to remember that a prolapsed

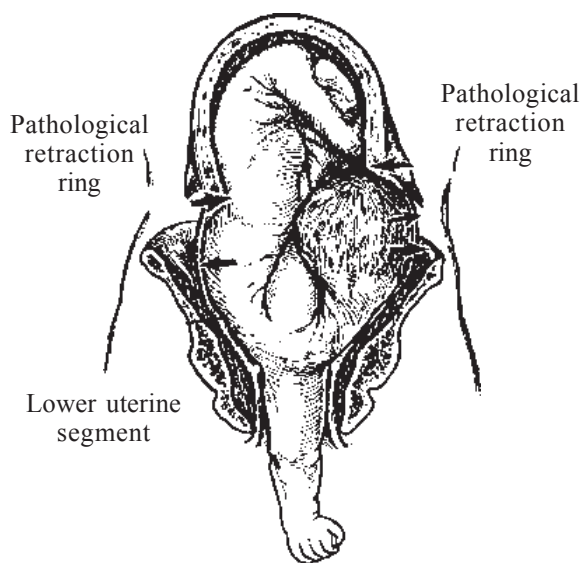
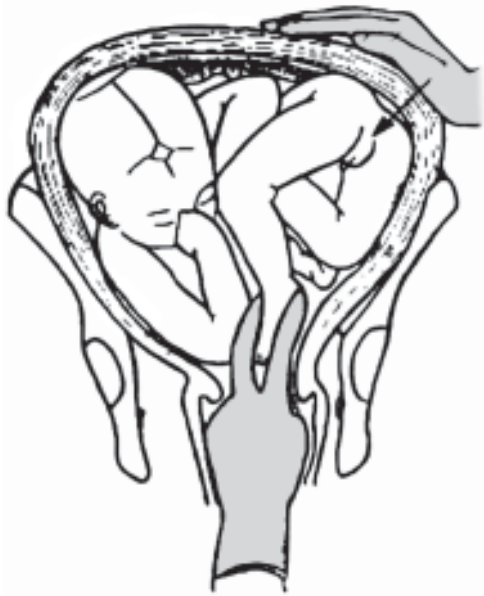


Fig. 98. Neglected transverse lie of the fetus, shoulder presentation; pathological retraction ring, threat of the uterine rupture



*Fig. 99.* External-internal version on the leg according to Braxton—Hicks

arm of the fetus should not be put on its place, and umbilical cord is turned into napkin, moistened with warm isotonic solution of sodium chloride. If during the hospitalization in the maternal hospital transverse lie and intrauterine death of the fetus is diagnosed, the operations which destroy the fetus are performed — embryotomy, decapitation. After the classical version on the leg and destructive operations manual separation of the placenta is performed and the uterine cavity is examined.

The reduce of perinatal and maternal pathology, related to transverse and oblique lies of the fetus, is achieved by improving of antenatal care, introducing ultrasound screening of the pregnant woman, planned hospitalization and in time performing caesarean section.

#### RECOMMENDED READING

3; 5; 22; 27; 46; 53; 56; 57; 61.

## Chapter 22

# LABOUR OF THE STRAIGHTENING PRESENTATION OF THE FETAL HEAD

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Flexed position of the head — vertex presentation is considered to be physiological. Depending on the head straightening one of three kinds of straighten cephalic presentation forms: **sincipital, brow or face presentation**. Their incidence is 0.5–1.0% of all labour, however they can be the cause of anomalous parturition, hypoxia of the fetus as the result of prolonged parturition, clinically narrow pelvis (especially during brow presentation), traumatism of mother and fetus.

Irrespective of the variants of head straightening (sincipital, brow or face presentation), as a rule the further passing by labour canal the **posterior kind** forms. It is explained by the fact that occiput of the fetus in this case is the most prominent point of the head; occipital part during the passing of the head is affected by resistance of the anterior pelvic wall; turn of the head backwards, to the free sacral cavity, occurs easier. During the straightening presentation of the head its insertion, passing and engagement occur by the largest size, as the result of which labour are often get complicated by anomalies of parturition, labour traumatism of mother and fetus. Today the indications to performing caesarean section of the straightening presentation of the head are much wider.

*Etiology.* The straightening presentation of the fetal head can occur during the following conditions:

- 1) narrowed maternal pelvis, especially of the pelvic inlet (flat, platypeloid pelvis);
- 2) large sizes of the fetus and its head, developmental defects (hydrocephalus, anencephalus);
- 3) reduce of the tonus of muscles of the anterior abdominal wall, uterus, pelvic floor (in multiparous women);
- 4) tumours of pelvis and fetus, which prevent flexion, normal insertion and passing of the head;
- 5) cord winding around the neck of the fetus;

**Sincipital presentation** — the most minimal head straightening in comparison with face and brow presentation. Determining of the sincipital presentation is possible during the vaginal examination. The anterior (major) fontanel is the lowest (entering) point of

the head in this case.

**Biomechanism of labour.** *The first moment* — insertion of the head by the sagittal suture in transverse, rarely oblique, diameter of the pelvic inlet during the sincipital presentation occurs not by the small oblique diameter (9.5 cm), like with the occipital presentation, but with the direct one — brow-vertex (12 cm).

*The second moment* — moderate straightening of the head, as the result of which the anterior (major) fontanel becomes an entering point.

*The third moment* — sacral rotation — takes place in the cavity of the pelvic inlet. The anterior parietal bone lowers the first, and then — posterior one. The frontal and occipital bones can be replaced under the parietal bones.

*The fourth moment* — internal rotation of the head occurs in the pelvic cavity by such a way that the anterior (major) fontanel turns to the pubic symphysis.

*The fifth moment* — flexion and straightening of the head occur in the cavity of the pelvic outlet. The bridge of the nose moves under the lower edge of the pubic symphysis, forming the first point of fixation. Around it the head bends, as the result of which the vertex and occiput of the fetus release. Then the second point of fixation forms — occipital tuber, around which straightening of the head takes place, as the result of which the forehead and face of the fetus deliver. The head is engaged by the direct diameter, which is 12 cm and by circumference — 34 cm. A labour tumour locates on the anterior (major) fontanel, the head has brachicephalic configuration, looks like a tower (for comparison: during the posterior kind of occipital presentation the labour tumour locates in the posterior (minor) foramen, the head engages in the position of flexion by the middle oblique size).

*The sixth and the seventh moment* of biomechanism of labour occur the same as during the occipital presentation.

Labour of sincipital presentation of the head is characterized by more prolonged course, especially at the II stage, is often accompanied with uterine in-



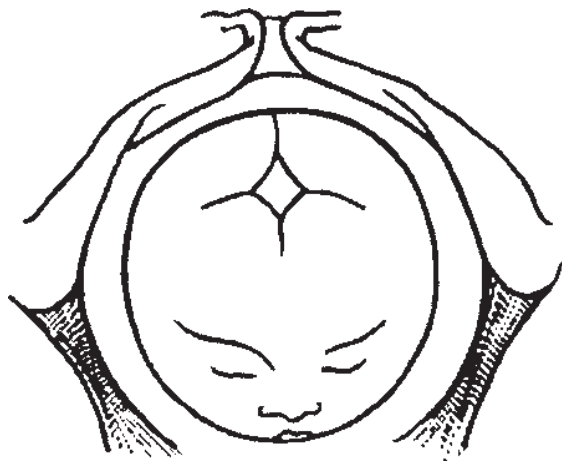


Fig. 100. Brow presentation of the fetus

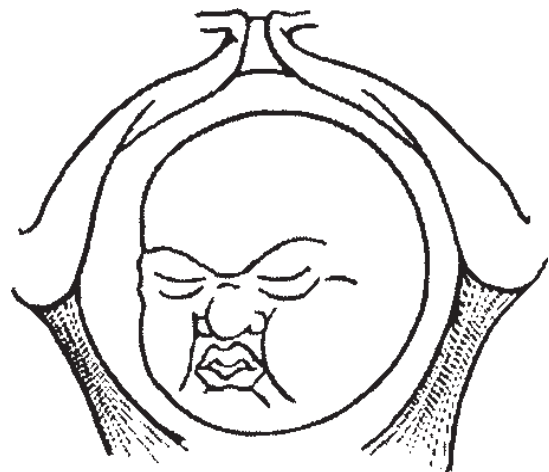


Fig. 101. Face presentation of the fetus

ertia, labour traumatism of mother (ruptures of the cervix, perineum) and fetus (hypoxia, labour injury). In connection with this in modern conditions indication to caesarean section during the straightening presentation of the fetus are still wider.

**Brow presentation** (Fig. 100) occurs in 1 case in 500 labour and is 5% of all cases of the straightening presentation.

Diagnosis is based on data of vaginal examination: by the entering axis of the pelvis the position of the forehead of the fetus is detected; in the transverse size of the inlet plane — frontal suture; from the one side — bridge of the nose and eye arches; from the other — anterior angle of anterior (major) fontanel. Brow presentation is a middle position between the flexion (vertex presentation) and straightening (face presentation). If the fetus is mature, the brow presentation is a temporary condition — while entering the head to the pelvis.

In the pelvic inlet the head fixates by large oblique diameter of 13.5 cm, and circumference of 38–40 cm. The frontal suture is in transverse size of the pelvic inlet.

**Biomechanism of labour.** On the *first stage* of biomechanism of labour there is a disproportion between the sizes of the fetus' head and the pelvic inlet. If the fetus is mature, the further passing of the head stops, signs of clinically narrow pelvis develop and labour are finished with caesarean section. If the fetus is immature, of small sizes, the *second moment* of labour biomechanism takes place — head straightening, as the result of which the center of the forehead, which is fixed on the lowest level of the entering axis of the pelvis, becomes the entering point (see fig. 100).

The *third moment* — sacral rotation of the head, which proceeds similar to vertex presentation.

The *fourth moment* — internal turn of the head by 90°, frontal suture transfers from the transverse diameter of the pelvic inlet to the oblique, and then — the direct one. Wings of the nose of fetus are turned to pubic symphysis.

The *fifth moment* — maxilla moves under the lower

edge of the pubic symphysis, forming the first point of fixation, flexion of the head and its delivery till the occipital tuber, which fixates on the apex of coccyx, forming the second point of fixation, around which the head begins to straighten, as the result of which the mandible and maxilla deliver, begin. The head delivers by the largest size — large oblique diameter (13.5 cm). The labour tumour locates on the forehead — from the eye arches till the angle of anterior (major) fontanel. Configuration of the head in the profile looks like a triangle with the apex near the forehead.

Labour of the brow presentation are possible only with immaturity, small fetus or a large maternal pelvis. Prolonged uterine inertia, asphyxia of the fetus, rupture of the uterus, ruptures of the perineum with avulsion of levator muscles, forming of bladder-vaginal fistulas as the result of long-lasting standing of the head in one plane of the pelvis can be the complications of labour. Mostly the head of a mature fetus, which inserts in the pelvis during the brow presentation, in the first moment of biomechanism of labour straightens to the face presentation to enter the pelvis by its smallest diameter. If such an additional flexion does not take place, the labour through the maternal passages are impossible because of absolute incompatibility between the head sizes, by which it passes through labour canal, and the size of the normal pelvis. In connection with this brow presentation with an alive mature fetus is the indication to caesarean section.

**Face presentation** of the fetus (Fig. 101) is characterized by maximal head straightening, i.e. when the occiput is pressed to the back, and chin is the entering point. The incidence of face presentation is near 1:700–1:800 of labour.

The diagnosis of face presentation in some cases is possible during the external obstetrical examination and is based on the following signs: occiput of the fetus protrudes from the side, over the frontal bones, and from the other side the chin is detected; between the occiput and back of the fetus an excavation is

detected; during palpation of the lateral walls of the uterus the back is not detected; from the opposite to the occiput side small parts of the fetus are palpated; back moves from the abdominal wall of the mother, as the result of which heartbeats of the fetus are better heard from the chest, where the small parts of the fetus are palpated: in the first position — under the umbilicus on the right; in the second — on the left. During the vaginal examination from one side the chin and mouth are palpated, from the other — radix of the nose and eye arches. Because of the forming of a labour tumour sometimes it is needed to differentiate the face and breech presentation. It should be mentioned that the anus of the fetus always locates on the line of ischiadic tubers, and in the mouth edges of the jaw can be palpated. Face presentation can be primary and secondary (forms as the result of additional straightening of the head from the brow presentation).

**Biomechanism of labour.** The *first moment* of the biomechanism of labour is the insertion of the head in the pelvic inlet by its vertical diameter (9.5 cm). Facial line locates in the transverse or oblique diameter of the plane of the pelvic inlet, and the chin and anterior (major) fontanel locate at the same level.

The *second moment* — instead of flexion the fetal head maximally straightens. The chin goes down lower the anterior (major) fontanel. In this position the face of the fetus lowers into the pelvic cavity.

The *third moment* — sacral rotation of the head, which occurs without restrictions.

The *fourth moment* — the head makes an internal rotation. The facial line transforms into the direct diameter of the plane of the pelvic outlet, and the chin moves under the pubic symphysis (posterior kind of face presentation). During the disturbance of internal turn the chin of the fetus can rotate to the sacrum, i.e. the back of the fetus turned to the front (anterior kind). Labour of the anterior kind of face presentation are impossible (stop) because of forming a clinically narrow pelvis, if the rotation of the chin to the pubic symphysis did not occur. The girdle of upper extremities and the head are on the same level and cannot simultaneously pass the pelvic inlet (Fig. 102).

During the posterior kind of face presentation the *fifth moment* of labour biomechanism begins: the face lowers till the moment of disengaging of the chin, during this the angle between the mandible and neck of the fetus moves under the lower margin of the pubic symphysis. Point of fixation — the hyoid bone, forms, around which the head flexes. Consequently



Fig. 102. Anterior kind of face presentation: labour is impossible

forehead, vertex and occiput are born. The *sixth and the seventh moments* of labour biomechanism are the same as during the occipital presentation (internal rotation of the trunk, external rotation of the head, delivery of upper extremities and the fetus).

Disengagement of the head occurs by the circumference, according to the vertical size (diameter 9.5 cm, circumference — 33 cm). The labour tumour is in the region of mouth and chin, configuration of the fetal head is dolichocephalic.

Labour of the face presentation can be complicated by ill-timed discharge of the amniotic fluid, cord prolapse, uterine inertia, intrauterine hypoxia and labour injury of the fetus (compression of the vascular-nervous fascicles of the neck), as well as by maternal labour traumatism (ruptures of the perineum and cervix).

Management of labour of the small fetus, absence of hypoxia and normal sizes of the maternal pelvis can be conservative, under the constant monitoring of the fetal heart rate. Taking into consideration, that during the full-term pregnancy the face and other kinds of straightening presentations are mostly caused by some narrowing of the pelvis, caesarean section is performed in majority of cases.

#### RECOMMENDED READING

3; 5; 22; 27; 46; 53; 56; 57; 61.

The study about a contracted pelvis was one of the leading problem in the classical obstetrics. It was developed by Deventer, Laevre, Smellie, N. M. Ambodik-Maximovitch, Baudeloque, Litzmann, Naegele, Michaelis, Vasten, Henter, A. Ya. Krasovsky, I. P. Lasarevitch, M. M. Fenomenov, V. S. Gruzdev, G. A. Solovyov, M. S. Malinovsky, B. A. Arkhangel'sky, R. I. Kalganova and other famous obstetricians.

Today a promoted narrowing of the pelvis (III–IV) are almost absent. With the development of perinatology the indications to caesarean section during the contracted pelvis and anomalies of parturition, related to any obstruction of labour canal has been extended. However, today the main fundamentals of the theory of a contracted pelvis do not lose its actuality.

There are concepts of anatomically and clinically contracted pelvis in obstetrics.

**Anatomically contracted** is considered the pelvis, in which one of its sizes (diameters) is reduced by 1.5–2 cm. The contracted pelvis is also the one during the passing of which a mature fetus (especially the head) meets the mechanic barrier and difficulties. Anatomically contracted pelvis can be functionally full-blooded with minor narrowing and small fetus. If the sizes of the fetus do not correspond with the sizes of a contracted pelvis, such a pelvis is considered both anatomically and *clinically (functionally)* narrow. The incidence of the anatomically contracted pelvis is 1–7%.

**Clinically contracted pelvis** is the one of normal form and sizes, which becomes functionally narrow in labour (during the large fetus, straightening presentation of the head), which meet with mechanic difficulties or are impossible. The incidence of clinically contracted pelvis is 0.5–1.7% of all labour.

**Etiology.** The causes of the anatomically contracted pelvis are the woman's infantilism, insufficient nutrition, excessive physical load in the childhood, rachitis, tuberculosis, poliomyelitis, injuries and tumours of the pelvis. Disturbance of the hormonal balance in the period of puberty influences the devel-

opment of the contracted pelvis: oestrogens contribute to the pelvic growth in a transverse diameter and ossification, androgens — to the enlargement of the skeleton and pelvis in length. Narrowing of the pelvis takes place usually in short (under 152 cm) women, and tall women can have both narrow (android) and wide pelvis.

**Classification.** Taking into consideration the female pelvis structure peculiarities, foreign obstetricians use the Caldwell—Moloy's classification of the female pelvis. Peculiarities of the form of plane of the pelvic inlet are in the base of it. According to this classification, there are *gynecoid* pelvis (normal female pelvis) and pathological types of the pelvis: *android* (male type) — with narrowing of subpubic angle and anterior segment of pelvis; *anthropoid* (alike with primates) — with enlargement of the direct diameter of the inlet, which exceeds the transverse diameter; *platypeloid* (flat) pelvis — with decrease in the direct diameters during the normal or enlarged transverse. "Mixed" types of the pelvis occur more often than "pure" ones.

In obstetrics of our country the classification of anatomically contracted pelvis by form and degree of its narrowing is used, in the base of which there is a classification of A. Ya. Krasovsky and Litzmann.

Classification according to the form of pelvic narrowing:

**A. Forms which occur often:**

1. *Dollichopellic pelvis* (with narrowing of transverse diameters by 1.5–2 cm and more during the normal direct diameters).

2. *Flat pelvis* (with reduce of the direct diameters):

a) simple flat pelvis (reduced all direct diameters);

b) flat rachitic pelvis (only the direct diameter of the plane of the pelvic inlet with normal or enlarged diameters of other planes);

c) pelvis with decrease in a direct diameter of the plane of wide part of the pelvic cavity;

3. *Pelvis justo minor* (proportionally decreased all diameters by 1–2 cm):

a) juvenile pelvis;

- b) dwarf pelvis;
- c) masculine pelvis.

#### B. Forms which occur rarely:

1. *Obliquely replaced pelvis* (asymmetric — shortening of the direct diameter of the pelvic outlet during the shortening or ankylosis of the one of extremities) and *obliquely contracted pelvis*.

2. The pelvis *deformed* because of fracture, tumour and exostoses.

Diameter of true (obstetrical) conjugate is in the base of classification of the **degrees of pelvic narrowing**. There are 4 degrees of pelvic narrowing.

*I degree*: true conjugate is less than 9–11 cm;

*II degree*: —“— 7.5–9 cm.

*III degree*: —“— 6–7.5 cm

*IV degree*: —“— 5–6 cm.

During I degree of pelvic narrowing and small sizes of the fetus labour finishes spontaneously, but clinically contracted pelvis can occur. During II degree of pelvic narrowing clinically contracted pelvis is observed more often; complicated labour, as a rule, is the reason to perform the caesarean section.

Alive and mature child birth is impossible in pregnant women with III degree of pelvic narrowing. Delivery of an alive child is possible only with caesarean section. During IV degree of pelvic narrowing the fetus can not be extracted with destructive operations, the only way of delivery is caesarean section. During III and IV degrees of pelvic narrowing an anatomically contracted pelvis is always narrow clinically (delivery of an alive mature child through the maternal passages is impossible).

Foreign obstetricians use **the classification of anomalies of the osseous pelvis depending on the extent of its narrowing**:

- a) narrowing of the pelvic inlet;
- b) narrowing of the pelvic cavity;
- c) narrowing of the pelvic outlet;
- d) general narrowing of pelvis (combined narrowing of the pelvic inlet, the pelvic cavity and the pelvic outlet)

*Diagnosis* of the contracted pelvis is made on the anamnesis, examination of the body of a pregnant woman, measuring of pelvic diameters, vaginal examination (Fig. 103), if necessary — US and X-ray pelvimetry.

Gathering the anamnesis, attention is paid to all factors which can cause the pathology of osseous pelvis: diseases, injuries in the childhood, intensive sports training, ballet and others. The previous labour course is cleared up (weight of the children, stillborn, labour injury, operational interventions).

During the general objective examination height and weight of pregnant women are measured, peculiarities of the constitution and deformations of the skeleton are detected.

During the external obstetrical examination, attention is paid to the form of the abdomen (sharp, drooped), position and presentation of the fetus (transverse, oblique, pelvic and straightening cephalic pres-

entation are usually observed), correspondence of the presenting part to the pelvic inlet: presenting part of the fetus is mobile above the pelvic inlet. However, the absence of the insertion of the fetal head in the pelvis is not always the evidence of the impossibility of vaginal delivery. Disproportion (clinical discrepancy) can occur during the inserted fetal head.

Measuring of the external diameters of the major pelvis helps to determine the type, form and degree of pelvic narrowing. If the contracted pelvis is suspected, the transverse and direct diameter of the pelvic outlet, form, length and height of the pubic arch are measured. During the asymmetry of the pelvis its oblique diameters and lateral conjugates are measured.

Form and sizes of the sacral rhombus (Michaelis') have the clinical importance: in a normal pelvis the rhombus approximates a square with the side of 11 cm; in pelvis justo minor the rhombus is prolonged; in transverse contracted pelvis the transverse diameter of the rhombus decreases; in flat rachitic pelvis the upper part is less than the lower one; in obliquely contracted and obliquely replaced one — the rhombus is irregular.

The thickness of the bones is determined by circumference of radiocarpal articulation (Solovyov's index, which is 14–18 cm). The larger the Solovyov's index the thicker bones of the pelvis and the less its volume.

During the examination the angle of the pelvic slope of a pregnant woman while standing is estimated; it can be measured more correctly with a special instrument — pelviciisometer (gonometer). If the angle of the pelvic slope is large (more than 55°), the sacrum is turned to the back and lordosis of the lumbar segment of the vertebral column is present. If the angle of the pelvic slope is inconsiderable (less than 55°), the sacrum locates vertically and the pubic symphysis is lifted up.

During the vaginal examination the diagonal conjugate, the volume of the pelvis, forms of the sacral cavity and coccyx are measured, the condition of the lateral pelvic walls, ischial spines, form, length and depth of the pubic arch, sizes of the subpubic angle are estimated, deformations and exostoses are revealed (see fig. 103). By the length of diagonal conjugate the true conjugate is evaluated and the degree of the pelvic narrowing is determined.

**The narrowing of the pelvic inlet** is diagnosed when the direct diameter of inlet is less than 10 cm or the transverse diameter is less than 12 cm. The direct diameter of the pelvic inlet is determined when measuring of diagonal conjugate, which is by 1.5 cm more than the diameter of inlet. If the diagonal conjugate is less than 11.5 cm, the narrowing of the pelvic inlet is diagnosed. The narrowing of the pelvic inlet is the frequent cause of straightening presentation (3 times as much), cord and extremities prolapse (4–6 times more often than during the normal sizes of the pelvis).



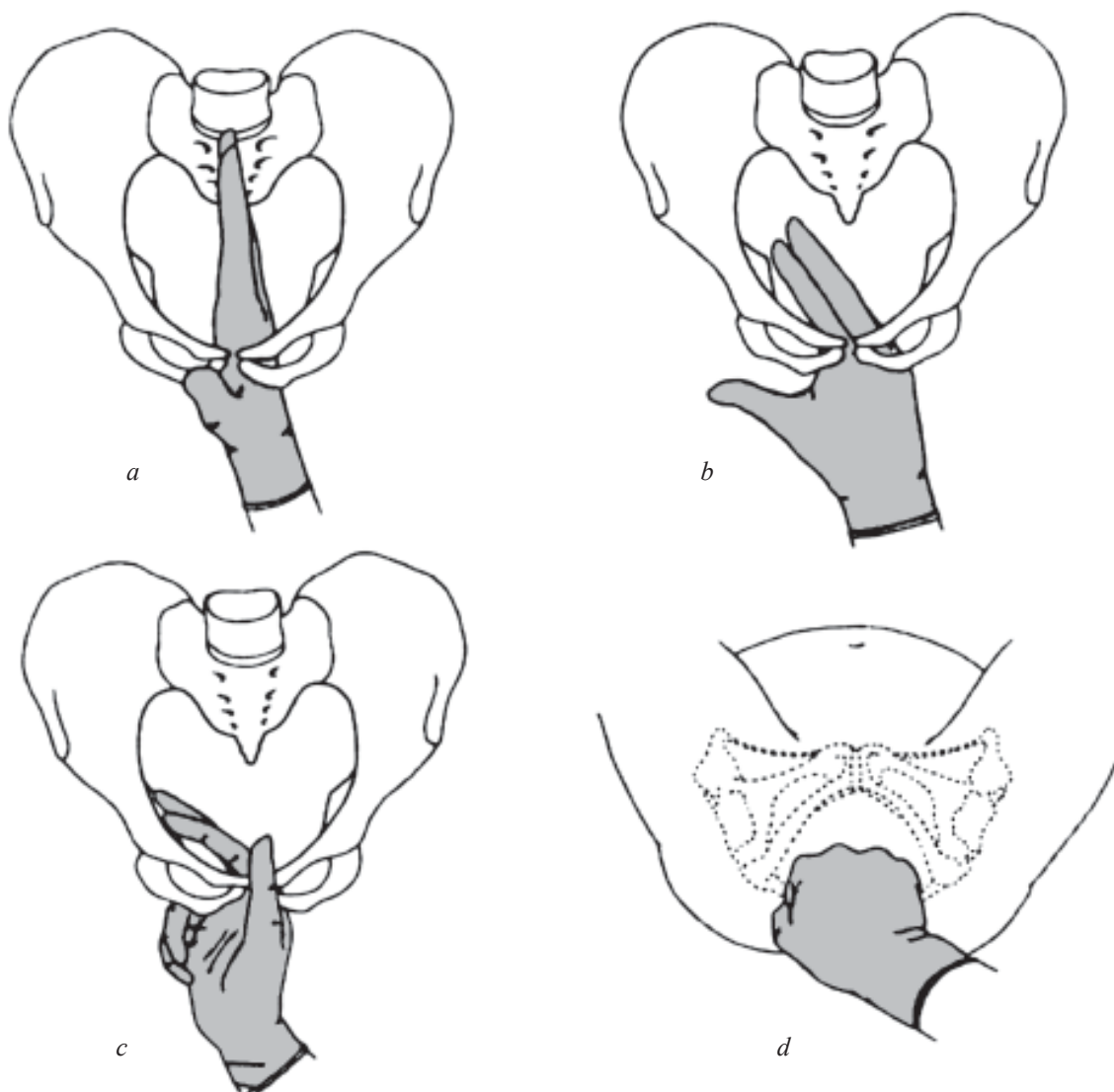


Fig. 103. Vaginal examination of the osseous pelvis:

- a* — examination of the form of the sacrum and the coccyx, detection of diagonal conjugate (the finger of obstetrician reach the promontorium of the sacrum, the pelvic narrowing is possible); *b* — estimation of the condition of position of the ischial spine; *c* — examination of the lateral walls of the pelvis (their narrowing can be the evidence of the masculine pelvis); *d* — examination of the transverse diameter of the pelvic outlet (during the normal sizes of the pelvis between the ischial tubers four fingers, bent in a fist, can be placed)

**Narrowing of the pelvic cavity** cannot be correctly determined like the narrowing of the pelvic inlet, however, it is more frequent. Interspinal distance (transverse diameter of the narrow part of the pelvic cavity), which is less than 10 cm, is a prognostic sign of narrowing of the pelvic cavity. If this distance is up to 9 cm, the cavity of the pelvis is considerably narrowed. During the vaginal examination protruded ischial spines, bringing of the pelvic walls nearer to each other and flattening of sacrum are detected.

**Narrowing of the pelvic outlet** takes place in 0.9% of cases and is diagnosed, if the decrease in intertuberous distance (transverse diameter of the pelvic outlet) is less than 8 cm. The accompanied narrowing of the anterior triangle of the plane of the

pelvic outlet causes the deviation of the fetal head from the pubic symphysis. The vaginal delivery in such case depends on the sizes of posterior triangle, i.e. on the size of *d.intertuberosa* and posterior sagittal diameter of the pelvic outlet. The larger the narrowing of subpubic angle the more the fetal head deviates from the pubic symphysis, which can cause ruptures of the perineum.

Narrowing of the pelvic outlet occurs more often in combination with narrowing of the pelvic cavity. Isolated narrowing of the pelvic outlet is rarely observed.

**General pelvic narrowing** is characterized by the narrowing of all parts of the pelvic canal. This type of pelvic narrowing is accompanied with primary uterine inertia.

The most correct data of the sizes of pelvis and their correspondence to the fetal head, if necessary, can be obtained by using modern instrumental methods: X-ray pelvimetry, nucleomagnetic resonance, computer tomography, ultrasound pelvimetry (true conjugate, sizes of the planes of pelvis, biparietal size of the head, its position and insertion, supposable weight of the fetus).

**Dollichopellic pelvis** is characterized by the decrease in transverse diameters of the pelvis during the absence of changes or increase in its direct diameters. External pelvimetry is less informative. During the examination of a pregnant woman attention is paid to the masculine type of the constitution, tall height, reduction of transverse sacral size of the rhombus (less than 10 cm). During the vaginal examination narrowing of the pubic arch (sharp subpubic angle) and approach of the ischial spines are detected.

**Biomechanism of labour** of small fetus and inconsiderable reduce of the transverse diameters of the pelvis does not differ from the one during the vertex presentation. If there are considerable decrease in the transverse diameters of the pelvis and enlargement of true conjugate and direct diameter of the pelvic inlet, the biomechanism of labour differs: the head inserts by the saggital suture in the direct diameter of the pelvic inlet, more often by the occiput, turned to the front (high straight station of the head). Then flexion of the head takes place, and in such a way it passes through all the pelvic planes, without making a rotation. On the pelvic floor posterior (minor) fontanel moves under the lower edge of the pubic arch. The deflexion of the head occurs the same as during the anterior kind of the vertex presentation. If the head can not move through the plane of the pelvic inlet, the signs of clinical discrepancy (disproportion) between the sizes of the head and pelvis manifest themselves.

If the direct diameter of the plane of the pelvic inlet is not enlarged, biomechanism of labour in parturient women with a transverse contracted pelvis differs by the development of anterior asynclitism, when the anterior parietal bone inserts in the plane of the pelvic inlet. Labour can occur in both anterior and posterior kind. The time period of expulsion increases, expressed configuration of the head and labour tumour are formed.

**Simple flat (platypeloid) pelvis** is characterized by the decrease in direct diameters of the pelvis and normal transverse sizes, on example: distantia interspinosa — 25 cm, distantia intercrystalis — 28 cm, distantia intertrochanterica — 31 cm, conjugata externa — 17.5 cm. Vertical size of the sacral rhombus (Mikhaelis') is decreased. During the vaginal examination flattening of the sacral cavity and approach of the sacrum to the pubic arch are detected, promontorium of the sacral bone is easily reached by the finger of the obstetrician.

Insertion of the head by the saggital suture in the transverse diameter of the pelvic inlet is the difference of **labour biomechanism** in parturient women with simple flat pelvis. During the insertion of the head in the pelvis its deflexion is possible. In connection with decrease in direct diameters of the pelvis sacral rotation of the head is complicated, its asynclitic insertions can occur. **Anterior asynclitism** (Naegele's), i.e. when the saggital suture stands near the promontorium of the sacrum, is more favorable than the posterior (Litzmann's) one. Displacement of the cranial bones and their move one on another occurs in the region of large sutures under the influence of powerful uterine contractions. Biparietal diameter of the fetal head can decrease by 0.5 cm, without injuring the brain, as the result of this process. However, if the bones are displaced more, the possibility of the intracranial injury increases.

During the **posterior asynclitism** with acute displacement of saggital suture to the front, passing of the head can stop, its internal rotation slows and can not be complete: head delivers in the oblique diameter of the pelvic outlet.

**Flat rachitic pelvis** can be in women who had a severe form of rachitis in the childhood (today it almost does not occur). Square form of the cranium, protruded frontal tubers, "hen" chest and curvature of lower extremities are the signs of rachitis. The wings of the iliac bones are turned, external sizes of the large pelvis approach one to another, on example: distantia interspinosa — 26 cm, distantia intercrystalis — 27 cm, distantia intertrochanterica — 30 cm, conjugata externa — 17.5 cm. The upper part of the sacral rhombus is flattened, the vertical size is decreased. During the vaginal examination attention is paid to the prominence of the promontorium of the sacral bone, existence of flat, deviated to the back sacrum, which augments the size of the pelvic outlet.

**Biomechanism of labour.** Insertion of the head, its deflexion and sacral rotation are performed the same as in the case of simple flat pelvis. Long-lasting high transverse station of the saggital suture, lowering on the entering axis of the pelvis of anterior (large) fontanel as the result of moderate deflexion of the head in the cavity of the pelvic inlet and anterior asynclitism can be observed. After passing the plane of the pelvic inlet, the head can rapidly pass all planes of the pelvis and lower down on the pelvic floor. Sometimes low transverse station of the head occurs.

**Flat pelvis with reduce of the direct diameter of the wide part of the pelvic cavity** is characterized with an essential flattening of the sacral cavity, enlargement of the sacrum (in length), absence of the differences between the direct diameters of all planes of the pelvis. This form of the pelvis is sometimes considered as the unexpressed form of flat rachitic pelvis. Pubic-sacral size — distance from the middle of the pubic symphysis till the place of connection of the II and III sacral vertebrae, is measured for ma-

king diagnosis. In a normal pelvis this size is 21.8 cm. Its reduction by 2.5 cm is an evidence of narrowing of the wide part of the pelvic cavity (reduction of its direct diameter).

Peculiarities of labour biomechanism are the same as in the case of flat pelvis. The plane of the pelvic inlet the head passes by the saggital suture in the transverse size with some deflexion and expressed asynclitism; internal turn of the head slows down.

**Pelvis justo minor** is characterized by the reduction of all its sizes by an equal number, on example: distantia interspinosa — 23 cm, distantia intercrystalis — 25 cm, distantia intertrochanterica — 27 cm, conjugata externa — 17 cm. It occurs in short women (less than 152 cm) of regular constitution. Sacral rhombus is symmetric, with even reduction of the vertical and horizontal sizes. During the vaginal examination even decrease in the pelvic cavity is detected.

Peculiarities of labour biomechanism during the pelvis justo minor are the following: 1) with some delay (additional flexion) insertion of the head occurs by the saggital suture in the oblique diameter; 2) maximal flexion of the head with installation of posterior (minor) fontanel on the entering axis of the pelvis occurs; 3) long-lasting internal turn of the head (sacral rotation) occurs; 4) in labour dolichocephalic configuration of the head forms with a large labour tumour in the region of posterior (minor) fontanel. The further stages of labour biomechanism occur similar to that during the occipital presentation, but at a slower pace.

**The course of pregnancy and labour.** During pregnancy high standing of the fundus of uterus and lifting of the diaphragm can cause the discomfort of a pregnant woman: dyspnea, fatigue, tachycardia. During a contracted pelvis anomalies of the position and presentation of the fetus occur more often (on example, pelvic presentation three times as much than during a normal pelvis).

The course of labour has the peculiarities. The fetal head is mobile for a long time above the pelvic inlet, absence of the girdle of contact and division of the amniotic fluid into posterior and anterior lead to their preterm discharge. After the rupture of the fetal bladder, absence of the pressure of the fetal head on the cervix causes the reduction of effectiveness of uterine contractions. Pelvic narrowing makes vaginal delivery impossible, and the progress in the cervical dilation is very rarely observed. The absence of the cervical dilation has a prognostic meaning.

A prolonged waterless period, primary and secondary uterine inertia often lead to hypoxia of the fetus and development of ascending infection (chorioamnionitis, intrauterine infection of the fetus). Mobility of the presenting part above the pelvic inlet makes the conditions for cord prolapse and small parts of the fetus.

While delayed passing of the head through the contracted pelvis active parturition is required. Strong thinning and overstrain of the lower segment of the

uterus as the result of disproportion (discrepancy between the sizes of head and pelvis) can contribute to the forming of a pathological contractile ring on the uterus (between the pubic symphysis and umbilicus, which demands an immediate arrest of parturition and performing caesarean section). Continuation of the parturition in such a case is the cause of the uterine rupture.

Prolonged station of the head in the pelvic planes and adaptation to its narrowed sizes can cause the compression of soft tissues, their necrosis and forming of urogenital and intestinogenital fistulas as well as to labour injury of the fetus (intracranial hemorrhage, impressions, cracks and even fractures of the cranium, clavicle and arm). If labour lasts more than 20 h or the II stage of labour lasts more than 3 h, the increase in the perinatal mortality is observed. A labour tumour forms (edema of subcutaneous fat as the result of complicated outflow of blood and lymph) on the fetal head, as the result of long passing through the maternal passages. A large labour tumour can reach the pelvic floor, when the fetal head is barely inserted. If this condition is not diagnosed in time, an unpractised doctor can perform preterm actions.

**Management of pregnancy and labour.** Pregnant women with a contracted pelvis are the group of increased risk of obstetrical and perinatal pathology. They should be hospitalized before labour for thorough examination with determination of form and degree of the narrowing of the pelvis, position, presentation and sizes and condition of the fetus. Concomitant obstetrical and somatic pathology should be revealed. A rational plan of labour management should be elaborated. It is supposed, that labour through the maternal passages with favorable outcome is possible in 80% of women having I degree and in 60% — with II degree of pelvic narrowing.

*Indications to the planned caesarean section* are the following: 1) pelvic narrowing of III–IV degree; 2) pelvic narrowing of II–III degree with presence of large fetus, pelvic presentation, anomalies of position of the fetus and prolongation of pregnancy, aggravated obstetrical anamnesis (stillborn, labour injuries, operations on the uterus); 3) presence of exostoses, considerable deformations and pelvic tumors; 4) condition after the operation of urogenital and intestinogenital fistulas.

Actively expecting policy is used in the case of minor pelvic narrowing, normal position, presentation and small sizes of the fetus. At I stage of labour, if the fetal head is mobile, a parturient woman is recommended to lie on her back in the bed, which corresponds to the position of the fetus, which contributes to intensification of parturition and prevents the preterm discharge of the amniotic fluid. The character of parturition, insertion and passing of the presenting part and condition of the fetus are kept under the constant observance; if any anomalies are detected, proper measures should be performed.

In connection with discharge of the amniotic fluid the vaginal examination is performed. If the cord prolapse is detected, the doctor, holding the hand inside, should push the head from the pelvic inlet; the parturient woman is transferred to the operational ward to perform an urgent caesarean section.

If the diagnosis of primary uterine inertia is made, stimulation of labour is performed with care. During the uterine inertia, which is accompanied with hypoxia of the fetus, caesarean section is done. It is necessary to detect in time the extent of clinical discrepancy between the sizes of the fetal head and maternal pelvis. If there is a *slight discrepancy* (peculiarities of labour biomechanism, configuration of the head, detected during the vaginal examination) and active contractile activity of the uterus is observed, labour can complete favorably. At the II stage of labour episiotomy is done.

The signs of *absolute discrepancy* between the sizes of the fetal head and maternal pelvis are: 1) absence of the passing of the head during the active parturition; 2) delay of urination or appearing of the blood admixture in urine; 3) edema of the cervix, which looks like its complete dilation; 4) appearing of prelum muscles contractions, when the head stands high; 5) positive Vasten's (Fig. 104) or Zangemeister's sign.

Presence of 2–3 signs of absolute incorespondence is the indication to caesarean section.

Estimation of the *Vasten's sign* is performed if the cervix is completely dilated, the amniotic fluid is discharged and the head is inserted in the plane of the pelvic inlet. In horizontal position of the parturient woman (urinary bladder is emptied), the doctor slides by the second and middle fingers from the anterior surface of the pubic arch to the fetal head and detects the correlation between the maternal pelvis and fetal head. If the head stands lower (deeper) than the pubic arch — the Vasten's sign is negative (Fig. 104, *c*), prognosis of labour is favorable; if the head locates on one level with pubic symphysis — the Vasten's sign is "at one level" or slightly positive (Fig. 104, *b*) prognosis is doubtful; if the head stands higher than the pubis — the Vasten's sign is positive (Fig. 104, *a*) prognosis of spontaneous labour is unfavorable, because there is an absolute discrepancy between the fetal head and osseous pelvis, which is an indication to caesarean section.

*Zangemeister's symptom* is detected when a parturient woman lies on her side. By pelvimeter external conjugate is measured, then — the distance between suprasacral fossa of mother and superior pole of the fetal head during the horizontal position of the pregnant woman. If the sizes of maternal pelvis and fetal head correspond to each other and external conjugate is more than the distance from the suprasacral fossa to the superior pole of the head — the Zangemeister's symptom is negative, prognosis of labour is favorable. When the both sizes are equal — the Zange-

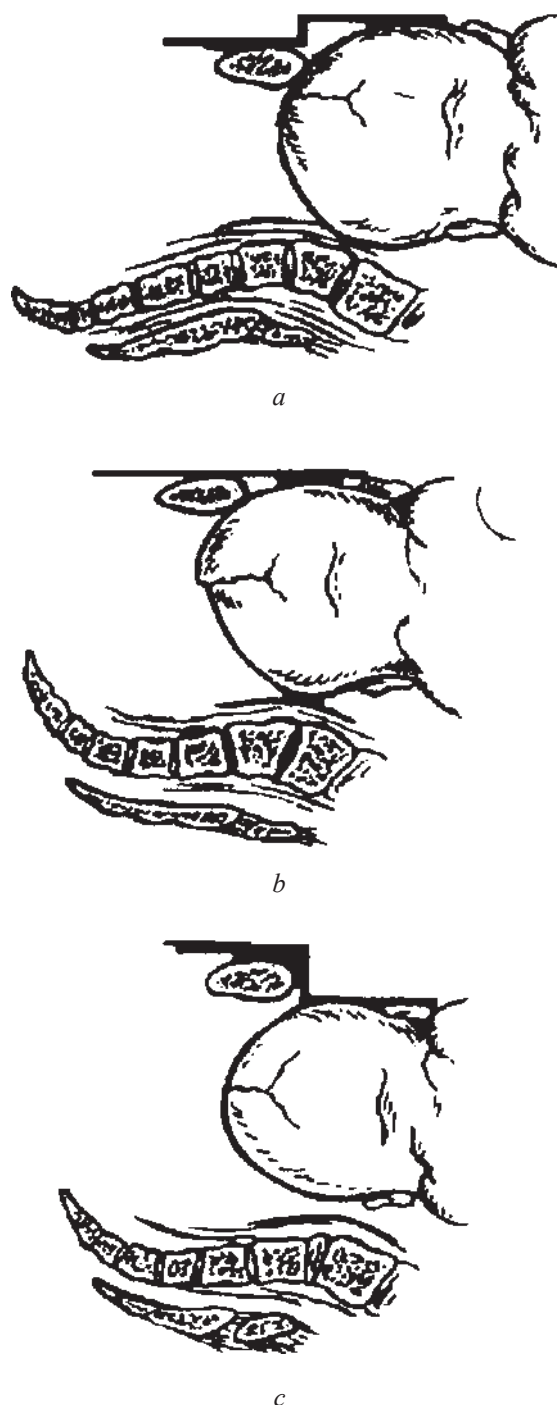


Fig. 104. Vasten's sign:  
a — positive; b — "at one level"; c — negative

meister's symptom is "at one level" or slightly positive, prognosis is doubtful. If the external conjugate is less than the second size, the Zangemeister's symptom is positive, prognosis is unfavorable.

*Prognosis* of a successful vaginal delivery during the direct diameter of the pelvic inlet less than 9 cm is unfavorable. If the direct diameter of the pelvic inlet is 10 cm, the prognosis of delivery through the maternal passages will depend on the type of presentation of the fetus (only the vertex one has a good prognosis), its sizes, form of the pelvic inlet and suc-



cessful cervical dilation. Results of previous delivery and weight of the delivered children are of an important prognostic meaning. Expressed asynclitism and considerable displacement of the cranial bones in this case is a prognostically unfavorable sign. Complications of pregnancy or maternal diseases, accompanied by the disturbance of uteroplacental blood circulation (late gestosis, or hypertensive disturbances, edema, proteinuria), aggravate the prognosis of vaginal delivery.

*Prophylaxis* of the contracted pelvis should begin with the intrauterine period of development of the child (rational nutrition of the pregnant woman), continue during childhood and teen age of the girl (diet and rest, physical trainings and sanitation).

#### RECOMMENDED READING

3; 5; 6; 7; 21; 22; 27; 46; 53; 56; 57; 61.

Fetus is considered to be big (gigantism or macrosomia), if its weight during delivery is 4,000 g and more, giant with weight of 5,000 g and more. The delivery rate of big fetus varies within 5.3–10 % of all labour. 0.4% of the pregnant women deliver the fetus with weight over 4,500 g.

*Etiology.* A big baby is delivered mostly in tall parents with large weight, especially mothers'; in multiparous women over 30 years old. Maternal obesity, diabetes mellitus, prolongation of pregnancy, delivery of the children with large weight in previous pregnancies, considerable augmentation of weight during pregnancy are the causes of fetal macrosomia. Boys predominate among big fetuses. Intensified receiving of glucose and lipid acids from a maternal organism contributes to the augmentation of the fetal weight.

*Diagnosis.* Before labour a supposable weight of the fetus can be counted, using the formula of I. F. Zhordania: weight of the fetus = (circumference of the abdomen) × (height of station of the uterine fundus). At the end of pregnancy in the case of big fetus, circumference of the abdomen is more than 100 cm, height of the standing of uterine fundus is 40 cm and more. During the cephalic presentation of the fetus with pelvimeter direct diameter of the fetal head can be measured, which in this case is more than 12 cm. US is the most correct method of diagnosis of a big fetus. The main fetometric parameters — biparietal size of the head, circumference of the abdomen, length of the femur and correspondence between the length of the femur and circumference of the abdomen. Modern computer programs count the supposable weight of the fetus on fetometric indicators. US detects the form of macrosomia — symmetric or asymmetric. During the symmetric form of macrosomia all fetometric indices are proportionally increased, and during asymmetric — circumference of the abdomen exceeds the norm and other indicators, which are observed during diabetes mellitus of pregnant women (diabetic macrosomia of the fetus).

**Course of pregnancy and labour.** Among the complications which appear in the pregnant woman

with big fetus, edemas, pathological augmentation of the weight, late gestosis occur 3 times as much, hydramnios and prolongation of pregnancy — 1.5 times as much.

If during the I stage of labour large fetal head is mobile above the pelvic inlet for a long time, inopportune discharge of the amniotic fluid, primary and secondary uterine inertia as the result of the uterine overstrain and disturbance of the contractile activity of the myometrium may be observed.

Course of the II stage of labour is often accompanied with the signs of clinically contracted pelvis, slowed passing of the fetal head through the labour canal, inertia of prelum muscles contractions, dystocia (impeded delivery) of the shoulder girdle of the fetus. After delivery of the head the umbilical cord is compressed and delay of delivery of the shoulder girdle can cause asphyxia of the fetus. Because of the long period of labour and dystocia of shoulders labour injuries of the fetus are possible (intracranial hemorrhage, cephalohematoma, injuries of the cervical part of the vertebral column, fracture of clavicle, Erb's paralysis). In mother injuries of the soft tissues of labour canal can appear. Afterbirth and early postnatal periods can be accompanied by considerable blood loss, hypotonic bleeding as the result of uterine overstrain.

Biomechanism of labour is alike with that one during the pelvis justo minor. Insertion of the head is slow, by the saggital suture in one of oblique diameters of the pelvic inlet. Then the intensified flexion of the head occurs, and posterior (minor) fontanel stands on the entering axis of the pelvis. Internal and external rotation of the head, rotation of the shoulders occur slowly. The shoulder girdle of the fetus is hardly delivered and can be accompanied by the injuries of the fetus. Even delivery of the fetal trunk can be difficult.

**Management of pregnancy and labour.** Women, which compose the group of the risk of delivery of a big fetus (tall height, obesity, diabetes mellitus, numerous labour, delivery of the children with large

weight in anamnesis), are revealed among pregnant women. An especial attention should be paid to the screening of pregnant women concerning gestational diabetes mellitus, as well as prophylaxis of postterm pregnancy. Hospitalization before labour for estimation of the weight and condition of the fetus, sizes of the pelvis of the pregnant woman as well as for preparation of the maternal passages, determination of rational term and method of delivery is recommended.

A planned caesarean section is performed in the pregnant woman with a big fetus and concomitant complications: unfavorable obstetrical anamnesis, pelvic presentation of the fetus, pelvic narrowing, postterm pregnancy, chronic hypoxia of the fetus, late gestosis, extragenital pathology in stage of sub-compensation, cicatrix on the uterus.

If labour occurs through the maternal passages, the character of parturition, appearing of the signs of clinically contracted pelvis and hypoxia of the fetus should be kept under observance. During aggravation of the condition of the fetus, expressed uterine inertia or signs of clinical incompatibility between the sizes of the fetal head and maternal pelvis, plan of labour management is changed for abdominal delivery.

At the II stage of labour episiotomy is performed. It should be remembered that reduction of the time between delivery of head and shoulder are vitally important for the fetus. Careless tractions or rotation of the head to release the shoulders can cause serious injuries of the fetus.

During the dystocia of the shoulders algorithm of the doctor's actions should be the following: 1) wide episiotomy is performed; 2) content of the nose and oral cavity of the fetus is evacuated; 3) pressing above the pubic symphysis, anterior shoulder is released; 4) if the previous efforts fail, the hips of the parturient woman are maximally pressed to the abdomen, increasing the direct diameter of the pelvic outlet (Mc Roberts method; fig. 105);

5) if all the mentioned above means are ineffective, the posterior shoulder is released (arm is placed beneath the posterior shoulder to the scapula and by rotation move it to the pubic symphysis, trying to move in the anterior shoulder — Woods method); during the rotation and moving of the shoulder girdle of the fetus to the oblique lie, the posterior shoulder, as a rule, delivers.

In exceptional cases, when no methods assist, it is recommended to bend the fetal head and move it to the back — to the uterus, or perform the fracture of the clavicle of the fetus.

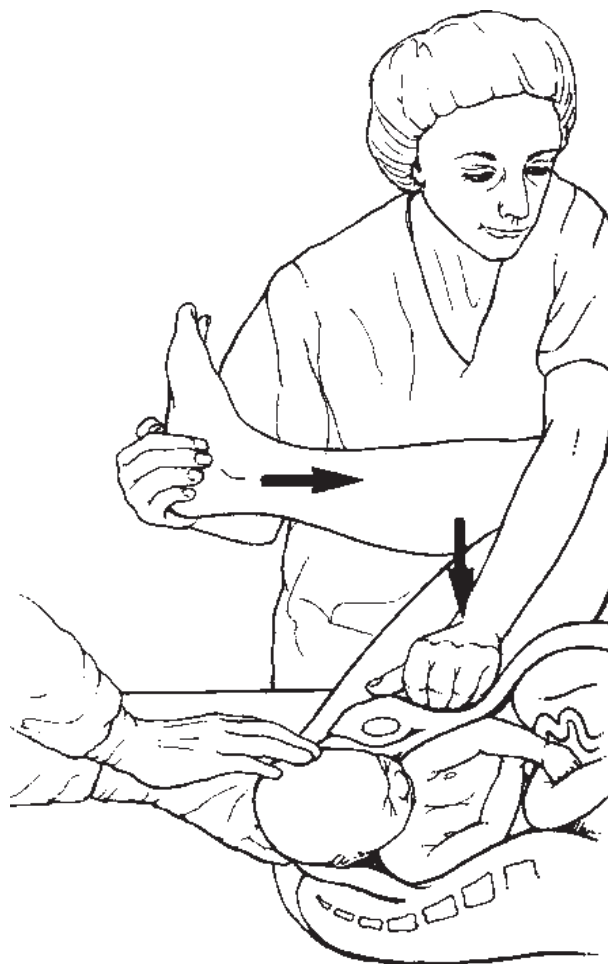


Fig. 105. Pressing above the pubis and Mc Roberts method to assist delivery of the shoulder girdle of the fetus

At the III stage of labour prophylaxis of hypotonic bleeding should be carried out by introduction of tonomotor drugs. In the postnatal period it is necessary to look after the temps of uterine involution rate and, if necessary, to prescribe the preparations which contract the uterus, and antibiotics.

*Prophylaxis* of delivery of big fetus and related to this complications consists in the rational diet of a pregnant woman, in-time detection and adequate correction of pathological augmentation of the weight, gestational diabetes mellitus, especially in the groups of high risk.

#### RECOMMENDED READING

5; 21; 22; 46; 56; 57; 61.

**Anomalies and diseases of the vulva.** *Partial vulvar atresy* occurs as the result of adhesions or cicatrices after infectious diseases, injuries and operations. These complications complicate the vaginal delivery even if performing episiotomy. *Growth of condylomes* can be the mechanic barrier for labour through the maternal passages.

**Anomalies and diseases of the vagina** can be related to other defects of development of urogenital system (Muller's anomalies). *Longitudinal septum of the vagina* can be complete (from vulva to cervix) or, which is more often, incomplete, and locate in the upper or lower third of the vagina. *Complete septum of the vagina* can not cause the disturbances of labour course, because the half of the vagina, through which the fetus passes, is able to strain enough. *Incomplete septum of the vagina* to a greater extent can prevent the passing of the presenting part of the fetus or, depending on its thickness, rupture and cause the bleeding. In connection with this incomplete septum of the vagina should be incised, blood loss is not great, because connective tissue predominates in the septum's structure.

*Atresy of the vagina* can manifest itself to various extent. During minor atresy of the vagina, obstruction of labour canal, as a rule, reduces thanks to pressure of the presenting part; if it is impossible to pass through the obstruction, caesarean section is performed with the beginning of delivery.

*Tumours of the vagina* (fibroma, carcinoma, sarcoma) are rare causes of labour canal obstruction.

**Anomalies and diseases of the uterus.** *Complete doubling of the uterus (and vagina), uterus bicornis, uterus unicornis and saddle-like uterus* can occur among the anomalies of development of the uterus. Pregnancy is often complicated by the threat of abortion, preterm labour and anomalies of position and presentation of the fetus, and labour — with uterine inertia and augmented postnatal bleeding. During the anomalies of development of the uterus operational delivery is often used.

*Cicatricial stenosis of the cervix* can arise after cauterization, conization, and postpartum ruptures of the cervix with further infection and considerable de-

struction of the cervical tissues. Cryosurgery and laser-surgery of the cervix, as a rule, do not cause its expressed stenosis. In majority of cases during pregnancy cervical tissues soften; stenosis reduces. In severe cases of cervical stenosis the caesarean section is preformed.

If *carcinoma of the cervix* is present, caesarean delivery with further treatment is required.

*Uterine myoma.* Combination of uterine myoma with pregnancy is detected in 0.2–2.5% of cases, predominantly in woman over 30 years old.

**Course of pregnancy and labour.** In majority of cases a small myoma does not influence pregnancy and is accidentally detected during US. Threat of abortion and disturbance of blood supply of myoma (haemorrhagic infarction), which are usually combined, are the most frequent complications. A localized pain, tenderness during palpation, sometimes rise of the temperature and leukocytosis are the symptoms of the disturbance of the blood supply of the node. Differential diagnosis is done to exclude acute appendicitis, distortion of the ovarian cyst, stone in the urethra and acute pyelonephritis.

Growth of myoma during pregnancy can not be predicted. If there are multiple nodes of myoma, the risk of anomalies of presentation of the fetus and preterm labour increases. In the case of the placenta localization in the uterine myoma's region, in contrast to the other localization of the tumor, spontaneous abortion, preterm labour, preterm separation of the placenta, intrauterine growth restriction and postnatal bleeding are possible. After a septic abortion or delivery, complicated with endomyometritis, myoma can be infected, especially, if it is in the region of the placenta's localization.

Myoma of the cervix or lower uterine segment can be the cause of obstruction of labour canal. In such cases, as a rule, caesarean section is performed.

**Management of pregnancy and labour.** Pregnant women suffering from disturbances of blood supply of the uterine node are treated in the hospital with reologically-active drugs (rheopolyglucin, curantil, trental), spasmolytics (no-spa, papaverin) and pain-



killers (baralgin, analgin). During the threat of abortion gestagens (turinal, acetomepregenol, oxyprogesterone capronate) and spasmolytics are prescribed; at the II and III trimesters —  $\beta$ -adrenomymetics (partusisten, bricanil).

Choice of the delivery mode depends on localization of myomatous nodes, their size and number, other complications of pregnancy and obstetrical anamnesis. A planned caesarean delivery is carried out during multiple nodes of large sizes, low position of the node, which prevents a childbirth, as well as during the disturbance of blood supply of the node, combination of myoma with anomalies of the position of the fetus and aggravated obstetrical anamnesis (age of a nulliparous woman, infertility, miscarriage, still-born). Indication to myomectomy during pregnancy is only a distortion of myoma on a pedicle, causing acute pain and necrosis of the tumor. During caesarean section those myomas are removed which locate on the line of the uterine incision or those on the pedicle, if the pedicle can be easily compressed and bandaged. In majority of cases a myoma should not be removed during pregnancy and delivery in connection with the risk of massive bleeding, postpartum pyo-septic complications. In connection with presence of multiple nodes and bleeding during operation supravaginal amputation or extirpation of the uterus is performed.

If the complications are absent, labour are performed in the actively-expecting manner through the maternal passages. During the uterine inertia labour are stimulated with prostaglandins (oxytocin can contribute to necrotization of the uterine nodes). Hypoxia of the fetus is detected in time and treated; if there is no effect after treatment, operational delivery is performed. After labour the growth of myoma in majority of women is not observed, in 25% — involution of myoma is possible, in 10% — a tendency to a tumour growth. In postoperational period control over the involution of the uterus is performed and prophylaxis of infection complication is done.

**Ovarian tumours** complicate pregnancy in 0.15–1.3% of cases. The ovarian cyst which can distort is met most often; it is usually observed at the I trimester of pregnancy.

**Course and management of pregnancy and labour.** During the distortion of the cyst in labour during surgical manipulations it can rupture with discharge of the content in the abdominal cavity and development of clinical picture of the acute abdomen, which requires the surgical treatment. As the result of block of the pelvic cavity with the ovarian tumour, rupture of the uterus is possible.

Making the diagnosis of the ovarian tumour in a pregnant woman is rather difficult, and vaginal examination should be always performed. With this purpose ultrasonography is used. During the progress of pregnancy diagnosis of the ovarian tumour is complicated, and even US is less informative. The period of 16 weeks of pregnancy is the most favorable time to remove the ovarian tumor, when the forming of the placenta completes. If the tumour is diagnosed in the second half of pregnancy, the operation is performed after the maturation of the fetus during the caesarean section or after delivery.

**Carcinoma of the ovaries.** If such a diagnosis is established, surgical treatment with removing of the uterus with appendages and greater omentum is performed at any term of pregnancy. At early term of pregnancy, if such disease is present, artificial abortion is done, and then the pregnant woman is prepared to operation. Very rarely tumour can be removed with preserving pregnancy. It is possible if in some weeks a pregnant woman can deliver a viable fetus. In all cases of ovarian carcinoma caesarean section is performed; further treatment is performed according to the general principles.

#### RECOMMENDED READING

3; 22; 46; 57.

## SPONTANEOUS ABORTION

Abortion (from Lat. *abortus* — miscarriage) is a pregnancy that ends till the viability of the fetus. Because of the spontaneous beginning it is often called spontaneous abortion. In Ukrainian obstetrics abortion is considered a pregnancy that ends before 28 weeks or the fetus reaches the weight of 1,000 g.

In many foreign countries abortion is considered the ending of pregnancy before 20th (22nd) week (139–153 days), counting the term from the first day of the last menstruation or till the fetus weight of 500 g. By the WHO nomenclature data, the term of 22–28 weeks of pregnancy is considered the early preterm labour and in many developed countries, beginning with this term, perinatal mortality is counted. In our country the term of abortion before the 28th week is not considered the preterm labour and is not counted in perinatal mortality, however, the care for a pregnant woman is done in a maternal house, proper means are carried out to care for such newborns; in the case of their death pathomorphologic examination is performed. If the immature newborn dies in 7 days after delivery, it is counted when making the indicator of perinatal mortality rate.

There are the following abortions: *spontaneous and induced*; *early* (before the 12th week of pregnancy) and *late* (till the 28th week).

The incidence of spontaneous abortion is 10%. However, a precise incidence is unknown, because 30% of abortions are undetected.

**Etiology.** Chromosomal anomalies are the causes of appearing of the half of all cases of early (before the 12th week) spontaneous abortion. Risk of spontaneous abortion increases with the advanced age of pregnant women — from 12% in women till 20 years old to 26% at the age over 40 years. Risk of abortion increases in those women who become pregnant during first three months after delivery.

Anomalous development of zygota, embryo, fetus or the placenta is the most frequent (up to 40%) cause of spontaneous abortion before 20 weeks. In

dead embryos (coccygeal-parietal size — CPS < 30 mm) the incident of anomalous morphological development is 70%; in fetuses (CPS from 30 to 180 mm) — 25%.

Anomalies of the development of the fetus, especially at the I trimester, are divided into 2 groups: 1) with anomalous set of chromosomes (aneuploid); 2) with normal set of chromosomes (euploid).

**Aneuploid abortion** (with anomalous set of the chromosomes in fetus) is observed in 50–60% of the cases of early spontaneous abortion (autosomal trisomia, monosomia X, tri- and tetraploidy, structural anomalies of chromosomes and others).

**Euploid abortion** (with normal set of the chromosomes in fetus), as a rule, occurs in late terms of pregnancy. 75% of cases of aneuploid abortion occur before 28 weeks of gestation, the greatest incidence of euploid abortion is in the term of 13 weeks of pregnancy. The incidence of euploid abortion increases, if the mother's age is over 35 years old. Its causes are as follows: 1) genetic anomalies (isolated mutations or polygenic factors); 2) maternal factors; 3) paternal factors.

Maternal factors compose the largest group of these causes, which includes:

1) *acute and chronic infectious diseases of the mother* (toxoplasmosis, ureaplasmosis, mycoplasmosis, chlamidiosis, rubella, cytomegaloviral infection, genital herpes and others);

2) *endocrine disturbances* (diabetes mellitus, hypothyroidism, steroido-resistance of the receptor apparatus of the uterus, lack of progesterone, hyperandrogenism, hyperprolactinemia);

3) *toxic factors*: a) *consuming the toxic substances* (tobacco, alcohol contribute to the increase in the incidence of euploid abortion); influence of *chemical toxins* (formaldehyde, gasoline, arsenic, lead); c) *using of contraceptives*; d) *irradiation*;

4) *immunologic factors*: a) *autoimmune* (systemic lupus erythematosus; presence of antiphospholipid antibodies, which injure thrombocytes and epithelium of the vessels and cause the forming of thrombi, destruction of the placenta); b) *alloimmune* (hysto-

compatible factors, circulating blocking antibodies, local factor of suppression, maternal and paternal antileukocytotoxic antibodies; antibodies against the placenta and fetal tissues, incompatibility by the HLA system);

5) *age of gametes* (augmentation of the age of spermatozoones and oocytes during the fertilization increase the frequency of spontaneous abortion);

6) *anomalies of development and defects of the uterus* (Aschermann's syndrome, isthmocervical insufficiency, surgical procedures during pregnancy — laparotomy);

7) *social-biological factors* (low social-economic status, unfavorable conditions of work and everyday life, unbalanced nutrition, deficiency of vitamins and microelements, ionized radiation, chemical contamination, age of the mother before 18 and over 35 years, migration of the population).

Among paternal factors of risk of spontaneous abortion chromosomal transpositions of spermatozoones are distinguished.

In the newborn genetic anomalies (isolated mutations of one gene) are detected in 2% of the children which were born alive; chromosomal — in 0.5% of children.

*Pathogenesis.* Abortion is accompanied with the bleeding in the basal layer of decidual membrane and necrotic changes in adjoining tissues. The fetal ovum separates completely or partially and as a heterogeneous is pushed from the uterus. It is important to differ spontaneous abortion, related to the disturbance of zygota, from less spread abortions, which occur in connection with maternal factors. During the early abortion cases of aneuploid anomalies are possible; during the abortion in the late term of pregnancy, fetus is, as a rule, euploid, and in genesis of abortion maternal diseases predominate.

*Clinical picture.* Signs of premenstrual syndrome, bloody vaginal discharge during the days corresponding the menstruation as well as disturbances of the neuroendocrine, vascular and other systems can be the early clinical symptoms of the threat of abortion.

There are following clinical types of spontaneous abortion:

- threatened;
- incipient;
- inevitable (abortion, that has already started);
- incomplete;
- complete;
- missed;
- recurrent or relapsing.

*A threatened abortion* (*abortus imminens*) is characterized with pain, increasing of the uterine tonus; in the first half of pregnancy bloody discharges from the vagina can appear. Nearly 20–25% of women have such symptoms during pregnancy; in each 2 of them abortion occurs. Bleeding is usually scanty, but prolonged (some days or weeks). Bloody discharge during pregnancy increase the risk of unfavorable

perinatal outcomes: preterm labour, low weight of the fetus, perinatal death. Risk of congenital defects does not increase considerably. If there is a spiral in the uterine cavity “with tendrils”, it is removed.

Pain during a threatened abortion can be spastic, rhythmic and localize in the lower segment of the abdomen, lower part of the back, which is related to elevation of intrauterine pressure. Discomfort in suprapubic region and painfulness of the uterus during the palpation can appear. If bleeding combines with pain, the prognosis for preserving pregnancy is poor.

*Incipient abortion* (*abortus incipiens*) is characterized by the same symptoms as the threatened one, but shortening and cervical dilation are added.

*An inevitable abortion* (abortion, that has already started, *abortus protrahens*) is accompanied with severe spastic pain in the lower abdomen, large rupture of the fetal membranes and cervical dilation, as well as with profuse bleeding. Fetal ovum loses the connection with uterus and lowers in its lower segment or cervical canal. If the rigidity of the isthmus uteri is present, fetal ovum can stay in the cervical canal (cervical abortion).

*Incomplete abortion* (*abortus incompletus*) is characterized by the presence of the remains of the fetal ovum in the uterus.

Fetus and placenta are pushed out the uterus together mostly till the 10th week of pregnancy (sometimes later). If the placenta is separated partially, the retained products of conception will prevent the full contractions of the adjoining parts of the uterus and cause bleeding. In the placental platform vessels do not constrict as the result of contractions and relaxation of the myometrium, which can lead to profuse bleeding and hemorrhagic shock. Bleeding during the incomplete abortion is usually massive, but rarely fatal.

During the prolonged course of incipient or incomplete abortion penetration of microflora from the vagina in the uterine cavity with further development of chorioamnionitis and endomyometritis is possible. Infected abortion, if the adequate treatment is absent, can cause the generalized septic infection.

During a *complete abortion* (*abortus completus*) fetal ovum discharges from the uterine cavity. Bloody discharge can stop, diameter of the uterine orifice (fauces) considerable decreases, the uterus contracts.

*A missed abortion* is retention in the uterus of the dead fetal ovum during 4–8 weeks and more. Vaginal bleeding, stop of the uterine growth, regression of the changes of the mammary glands and reduce of the pregnant woman's weight can be its symptoms. If during some weeks after the death of the fetus at the II trimester its expulsion does not occur, considerable disturbances of coagulation, caused by discharge of the massive doses of thromboplastin, can develop.

Diagnosis of a habitual abortion (*habitual miscarriage*) is made if 3 and more spontaneous abortions occurred in woman's anamnesis.

Probability of a habitual abortion is 25–30% independently on the number of previous abortion. If in anamnesis of the pregnant woman there were no delivery by an alive child, the risk of habitual abortion increases to 46%. Except the conditions related to syndrome of antiphospholipid antibodies and isthmicocervical insufficiency, the incidence of the further abortions after 3 spontaneous abortions is 70–85% independently on the method of treatment. In the case of habitual miscarriage of pregnancy it should be mentioned about a possibility of appearing of isthmicocervical insufficiency.

*Isthmicocervical insufficiency* (ICI) is an individual obstetrical pathology, which is characterized by the painless cervical dilation at the II trimester or at the beginning of the third trimester with prolapse of the fetal membranes through the cervix in the vagina. Abortion, as a rule, begins from the rupture of membranes. Without adequate treatment such condition will recur during every pregnancy. ICI can be of traumatic or functional etiology.

Cervical injury as the result of instrumental dilation of canal of the cervix, conization, cauterization or amputation, operational delivery, rarely — anomaly of the development of the cervix are the causes of ICI. Functional ICI often occurs during adrenogenital syndrome.

Diagnosis of spontaneous abortion, as a rule, is not complex. Complaints of patients are studied, anamnesis is gathered, diseases, which the patients had in the past and concomitant diseases are detected. During the objective examination attention is paid to signs of infantilism, hypo- or hyperoestrogenism, hyperandrogenism, hyperfunction of the cortical substance of the adrenal glands, hypo- or hyperthyroidism.

At the I trimester of pregnancy abortion is characterized predominantly by bloody discharge and pain syndrome. Differential diagnosis is performed to rule out the ectopic pregnancy, torsion of the ovarian cyst. At the II trimester of pregnancy in connection with spontaneous abortion first spastic pain appears, or amniotic fluid discharges, and after delivery of the fetus — bleeding (except the cases of the placenta previa, when bleeding, often profuse, is a leading symptom). Abortion among with hyperandrogenism, adrenogenital syndrome (AGS) often begins from bloody discharge, pains; missed abortion and intrauterine death of the fetus in the late terms of pregnancy can occur. The reduction of its sizes as the result of absorption of the amniotic fluid and maceration of the fetus are detected in these cases during a thorough palpation of the uterus.

Gynaecological examination is an evidence that a threatened abortion is not accompanied by structural changes of the cervix. Sizes of the uterus correspond to the term of pregnancy. The uterus reacts to palpation by contraction. With the abortion beginning the cervix can be short, uterine orifice dilates. An inevi-

table abortion is characterized by the presence of the fetal ovum in the lower parts of the uterus or the cervical canal, sizes of the uterus correspond to the term of delay of menstruation. With an incomplete abortion sizes of the uterus are reduced in comparison with the ones of such term of pregnancy; the cervical canal is dilated.

Bacterioscopic and bacteriologic examination of vaginal discharge (gonococci, trichomonades, chlamydiae, mycoplasma, ureaplasma, bacterial vaginosis and others) is performed, in the groups of risk — analysis for toxoplasmosis, cytomegaloviral infection, genital herpes, antiphospholipid and other autoantibodies. General clinical analysis of blood and urine are done, examination for HIV and syphilis is performed, blood group and Rh-factor are detected, titer of antirhesus antibodies, hemolyzines and immune ABO antibodies are determined. Bacterial carriage, leukocytosis, left shift of leukocytic formula to the left, elevation of SSE, positive C-reactive protein and other serologic reactions, subfebrile body temperature are the evidences of infection (development of chorioamnionitis).

The tests of functional diagnosis diagnose a threatened abortion before the clinical manifestations. The decrease in the basal temperature under 37°C is observed, symptom of pupil appears, arborization of cervical mucus takes place. Colpocytologic examination is an evidence of the fact that in the first 12 weeks of pregnancy caryopicnotic index (CPI) is no more than 10%, in 13–16 weeks — 3–9%, in later terms — 5%. Increase in CPI and augmentation of the superficial cells number (at the I trimester up to 10–15%) are the evidences of the threat of abortion. During ICI and adrenogenital syndrome the tests of functional diagnosis are less informative, the progesterone rate is usually normal or elevated, mechanism of abortion caused by structural changes of the cervix.

Prolonged scanty bleeding for several weeks is always related to the problem of viability of the fetus. Rate of chorionic gonadotrophin of the human (CGH) is not a prognostic sign, which detects whether fetus is dead or alive. If the uterus does not enlarge in sizes, fetus, as a rule, is dead (missed abortion). During the enlargement of the uterus a differential diagnosis should be done to exclude the progressive pregnancy and hydatidiform mole.

During hyperandrogenism investigation of the rate of excretion of 17-ketosteroids (17-KS) in the blood has the prognostic meaning. A threatened abortion is diagnosed if the level of 17-KS in the urine is 42 mmol/l. Diagnostic meaning of the reduction of the rates of estriol, progesterone and chorionic gonadotrophin increases while performing investigations. Both the value of chorionic gonadotrophin and the value of the ratio of its maximal rate to the term of pregnancy are important for estimation of pregnancy course. Reduction of the rates of T3, T4 among the



elevation of thyrotrophin (TTH) according to the norm is an evidence of hypothyroidism, and elevation of rates of T3, T4 at a background of elevating TTH is evidence of hyperthyroidism. Elevation of the rate of androgens among the level of insufficiency of cortisol, elevation of the progesterone's rate, absence of the changes of the rate of oestrogens, chorionic gonadotrophin and chorionic somatomammotrophin (the placental lactogen) are the distinguishing feature of adrenogenital syndrome.

On US deformation or eccentric position of the fetal (gestational) sac is an evidence of the fetal ovum death. During an inevitable abortion the diameter of the fetal sac is always less than the one which should be in a corresponding gestational age of the fetus. After 6 weeks of pregnancy visualization of the palpitation of the fetus is possible. Correct diagnosis is confirmed after some sonographic examinations. Dilation of the uterine orifice by 1 cm and more is an ultrasound criterion of ICI at the I trimester of pregnancy.

During 2 and more spontaneous abortions a karyotype is determined and chromosomal analysis of parents is performed.

Treatment of the pregnant women who have the threat of spontaneous abortion is performed with taking into consideration the term of pregnancy, stage of the clinical course and cause of the disease, thus the cause of the abortion is usually hardly detected. In connection with this examination and treatment of the couple, in which a woman has abortions in anamnesis and habitual pregnancy loss should be done before pregnancy (treatment of luteal phase defect, hyperandrogenism of adrenal or ovarian genesis, stimulation of ovulation with clomiphene; therapy of chronic endometritis of specific etiology, antiphospholipid syndrome, viral infection with using of immunomodulating drugs).

While prescribing a pregnant woman the drugs, their embryotoxic and teratogenic effect should be taken into consideration.

Treatment of the patient with the threat of abortion is performed at the hospital and should exclude the following points:

1. Rest, treatment-curing regimen, psychotherapy, sedative therapy (infusions of motherwort, radix of valerian, sibazon, relanium, tazepam); vitamin therapy (vitamins of group B, ascorbic acid, tocopherolum acetates — vitamin E, polyvitamins with microelements — cuprum, cobalt, zinc, selenium); esentiale.

2. Adequate diet to prevent constipation, regulation of intestine's function with the help of laxatives (extract of buckthorn, regulax, senade, bisacodil).

3. Treatment during extragenital pathology and complication of pregnancy.

4. Sanation of foci of chronic infection (vaginitis, pyelonephritis, caries).

5. Symptomatic treatment with prescription of spasmolytics (papaverin, no-spa, buscopan, metacin,

baralgin — 2–4 times a day at first parenterally, then orally or in suppositories). After the 20th week of pregnancy to reduce the contractions of myometrium  $\beta$ -adrenomimetics (partusisten, ritodrin, alupent), 25% solution of magnesium sulfate — 5 ml by 200 ml of isotonic solution of sodium chloride intravenously drop-by-drop (slowly) are prescribed. During the treatment with magnesium sulfate and  $\beta$ -adrenomimetics ABP is controlled because of the hypotensive effect of these preparations.

6. Non-medicamentous methods of influence (reflexotherapy, electric sleep, electrophoresis of magnesium by sinusoid modulated current, electrorelaxation of the uterus with "Amplipulse-4"), which effects the central and peripheral mechanisms of regulation of contractile activity of the uterus.

7. Hormonal therapy is prescribed during the progression of symptoms of threatened abortion among the symptomatic treatment; low rates of chorionic gonadotrophin, oestrogens, progesterone; positive tests of functional diagnosis; lack of correspondence of the uterine sizes with the term of pregnancy; low attachment of the placenta; because of the aggravated by abortion anamnesis if no rehabilitation measures were provided.

Gestagens (duphaston, utrogestan) are prescribed at the I trimester during the diagnosed before pregnancy of insufficiency of corpus luteum, beginning from 1 pill 3 times a day during the first week and gradually (during 1–2 weeks, reducing the daily dose). With ovarian hypofunction, hypoplasia or developmental defects of the uterus, oestrogen-gestagen therapy is performed, beginning from the 6th–7th week of pregnancy (microfollin — from 1/4 to 1/2 pill, dufaston — 5 mg 1–2 times a day or progesteron 5–10 mg once a day). In the case of reduction of the level of chorionic gonadotrophin, it is introduced intramuscularly (1,000–20,000 U 1–2 times a week). During the bloody discharge in the period of the 6th–10th week of pregnancy treatment should be started from the oestrogenic hemostasis: during first day — 1 ml of 0.1% solution of estradiol dipropionate intramuscularly 3 times (with interval of 8 h), on the second day — 2 times (with interval of 12 h), on the third day — one time a day. If effect is positive, from the fourth day microfollin is prescribed (1/3–1/2 of the pill), if the bloody discharge continue, the dose is augmented up to 1 pill a day. Dose of microfollin is slightly decreased (from the 5th day is reduced till 1/3–1/2 of the pill). With performing oestrogenic hemostasis 10 mg of progesterone 1 time a day is introduced. Hormonal therapy is performed under the control of the hormones rate and test of functional diagnosis till the 15–16 weeks of pregnancy (the end of the placental forming): in period of 11–12 weeks using of microfollin is stopped, in 15–16 weeks — of gestagens.

During hypofunction of the thyroid gland, taking into consideration the recommendation of endocrinol-

ogist, 50 mg of thyreoidin in a day during 2–3 months till the euthyreoid condition is prescribed.

During miscarriage caused by hyperprolactinemia, the rate of prolactin in the blood is controlled, if necessary parlodel is prescribed.

In connection with adrenogenital syndrome and hyperandrogenism applying of corticosteroids is the pathogenetic treatment (dexamethasone, prednisolone). Prednisolone is prescribed by 5 mg 1–2 times a day, dexamethasone — by 0.125–0.5 mg, dose is gradually reduced depending on the rate of testosterone and 17-KS. For prophylaxis of suppression of function of the adrenal glands of the fetus treatment should be stopped before the 32nd–33rd week of pregnancy. Together with glyocorticoids microphollin can be prescribed; in the presence of bloody discharge, hemostasis is done with oestrogens. Gestagenes are not prescribed to the pregnant women suffering from adrenogenital syndrome in connection with high level of progesterone.

For correction of the immune disturbances as factors of miscarriage, for prophylaxis of the placental insufficiency a pregnant woman is treated by immunotherapy with lymphocytes of her husband or a donor: intracutaneously or subcutaneously 120–200 mln of cells, starting with the I trimester and ending before the 35th week of pregnancy with interval of 5–8 weeks.

Pregnant women suffering from such a disturbance should be under the control over the possible reactivation of viral infection (cytomegaloviral, genital herpes and others); metabolic therapy (to prevent tissue hypoxia) is prescribed, introduction of normal immunoglobulin of the human intravenously drop-by-drop, as well as applying of instenone and actovegin.

For correction of the disturbances of coagulation, prophylaxis of the placental insufficiency pregnant women suffering from antiphospholipid syndrome are prescribed antiaggregants (curantil, trental, theonical), anticoagulants (heparin), glyocorticoids (dexamethasonee), and from II trimester — microdoses of acetylsalicylic acid (50–100 mg under the control of coagulogramm).

During inevitable, incomplete abortions, remained after a complete abortion parts of the separating (decidual) membrane and continuing of the bleeding the uterine curettage is preformed. Antibiotics and preparations which support the tonus of the uterus (uterotonics), are prescribed to prevent endomyometritis. Fever is not a contraindication to the uterine curettage if the adequate antibacterial treatment is performed. Majority of cases of incomplete abortion require cervical dilation before the curettage. However, very often remains of the placental tissues locate low in the cervical canal and are easily removed with an abortzang.

In the cases of missed abortion before the uterine curettage a coagulogramm is performed, correction of the disturbances of coagulation by transfusion of chilled plasma is done. In late terms of pregnancy

during the intrauterine death of the fetus to facilitate the abortion intraamniol introduction of 5 ml of gramicidin by 20 ml of 5% solution of glucose in anterior fornix of the vagina (transformically) prescribed; intravenous introduction of large doses of oxytocin, prostaglandins, intraamniol prostaglandins introduction in the posterior fornix of the vagina, cervical canal or amniotic cavity before the sleep the day before the curettage are applied.

Treatment of the pregnant women suffering from ICI of functional and traumatical etiology is carried out by surgical way in combination with medicament therapy. Surgical correction of ICI is in fastened suture (cerclage) application on the cervix, which is carried out after 14 weeks of pregnancy (except genetic causes of abortion), if the cervical dilation is less than 4 cm. Bleeding, uterine contractions and rupture of the fetal membrane are the contraindications to cerclage. Before the suture application US is done to determine the viability of the fetus and exclude developmental defects. Cytologic examination of the cervical epithelium and bacteriologic and bacterioscopic investigation are performed. In some cases both sexual partners require the treatment, during this their sexual activity should be stopped not less than for 1 week before and after the procedures.

Methods of surgical correction of ICI are as follows: *narrowing of the internal fauces* (by McDonald, Shirodkar, Lubimova, Michailenko); *putting the stitches on the uterine orifice* (by Scendy); *making the duplicature of the tissues along cervical sides* (by Orekhova and Karimova). The purse-string suture by McDonald with its various modification is the most spread (Fig. 106).

The Shirodkar's operation is more complex and can be accompanied by more severe injury and bleeding than McDonald's operation. During the circlage by Shirodkar a transverse section of the cervical mucus on the front under the place of attachment of the urinary bladder, and on the back — on the level of internal fauces is done. The suture is applied through the section of the mucous membrane in submucous membrane around the cervix on the level of internal surface and tied up in the front. Mucous membrane of the cervix is put stithes with a catgut. The circlage by Shirodkar is used in the cases of the lowering of the urinary bladder lower the level of internal fauces. The incidence of a successive procedure with application of each of these methods is 85–90%. Today rings-pessaries are applied on the cervix by Goldgi. In the postoperative period spasmolytics are prescribed, prophylaxis of infection — hormonotherapy — by indications are carried out. However, some authors consider that antibiotic therapy or applying of progestational agents or  $\beta$ -mimetics for prophylaxis of uterine contractions do not considerably improve the consequences of operation. In the case of unsuccessful procedure, appearing of the symptoms of abortion or labour, suture is immediately removed

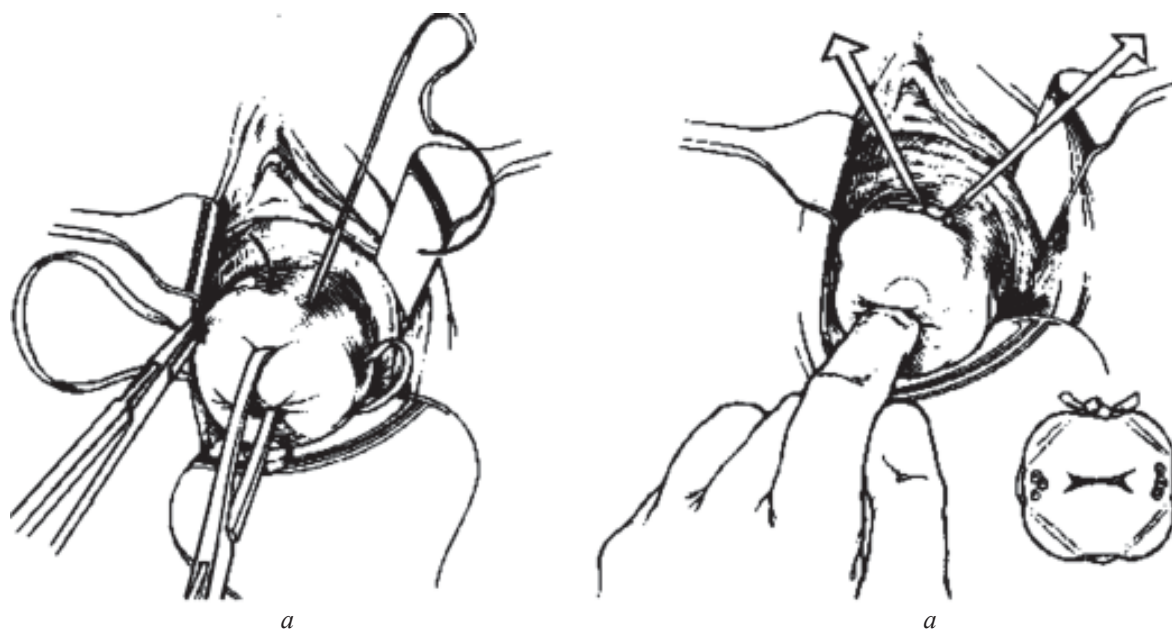


Fig. 106. Application of a purse-string (circular) suture on the cervix by McDonald's method (a, b)

to prevent uterine rupture or its cervix. Transabdominal cerclage on the isthmus uteri is performed in foreign countries. But this procedure requires two laparotomias: for application of the suture and for its removing before delivery.

*Prophylaxis. Ovulation*, as a rule, restores in 2 weeks after the abortion, in connection with which effective contraception is effective for further 6–12 months before pregnancy. During this period the causes of abortion are detected and removed (if possible), rehabilitation means are done (sanatorium-spa treatment).

## PRETERM LABOUR

Preterm labour in Ukrainian obstetrics is considered labour between the 28th and 37th week of pregnancy. By WHO recommendations, preterm labour is labour between the 20th (22nd) and the 37th week of pregnancy.

Preterm labour is one of urgent problems of medicine. The incidence of preterm labour (labour, which end by delivery of premature children) is 10%, but 50% of cases of perinatal morbidity and mortality are related to it. Consequences of preterm delivery the more severe and more serious the less gestational age of the newborn.

Before (till 1972) premature were considered all children who were born with weight less than 2,500 g. According to the last recommendations of WHO, premature are infants which were born till the 37 complete weeks of gestational age. Newborns which weigh less than 2,500 g are considered the infants having a low weight by the moment of birth (they can be premature, mature or over-term with intrauterine growth

restriction). Newborns which were delivered prematurely, can have low or appropriate weight to the term of pregnancy.

It is important to differ the terms “low birth weight infant” and “immature newborn”. The term “immature” means the gestational age, while the term “low weight” is based only on the weight data (as a rule, less than 2,500 g). So, a intrauterine growth restricted (IUGR) infant, born by the mother with late severe gestosis (toxicosis of pregnancy), chronic arterial hypertension can weigh less than 2,500 with 40 weeks of gestation. Such a newborn with low weight is not a premature one and is affected only by maternal arterial hypertension but not the preterm labour. A child which was delivered by the mother suffering from diabetes mellitus can weigh more than 2,500 g, deliver prematurely and have the risk of perinatal illness related to preterm labour. Perinatal mortality in premature newborns with delay of intrauterine development is 40 times as much than of full-term children with normal weight.

*Complications.* Respiratory distress-syndrome, intracranial hemorrhage, necrotic colitis, sepsis and convulsions are the most wide-spread complications of preterm labour. The incidence of infantile cerebral paralysis is 10 times and mental retardation 5 times as much than in full-term newborns. Disturbances of vision, audition, emotional lability and social desadaptation take place more often than in mature children. That's why, if there are no contraindications, one should contribute to preserve pregnancy and intrauterine development of the fetus.

*Etiology.* Overstrain of the uterus as the result of hydramnios, multiple gestation, disturbance of the placentation, systemic maternal diseases, spiral in uterus, death of the fetus, infection of the amniotic fluid, spontaneous rupture of fetal membranes, preterm la-



bour in anamnesis and iatrogenic preterm induction of labour are the factors of development of preterm labour. However, more often the true causes of preterm labour and spontaneous abortion are unknown. To detect the early signs of preterm labour, identification of pregnant women with high risk of their development is very important. This permits to perform prophylaxis in pregnant women who have the threat of preterm labour, or to treat them on the initial stage to avoid delivery of immature children. Preterm labour in anamnesis is the most important factor of risk in multiparous women.

*Clinical picture.* According to clinical manifestations there are threatened labour, beginning labour and labour "in progress".

**Threatened labour** (phase of predictors) is characterized by inconsiderable pain in the lower abdomen and loin, elevation of the uterine tonus. Condition of the fetus is not disturbed. During the vaginal examination structural changes of the cervix are not detected.

During the **beginning labour** (latent phase) pain intensifies, becomes spastic. Structural changes take place in the cervix (shortening, dilation of the uterine orifice). Rupture of fetal membranes and discharge of the amniotic fluid are possible.

Labour "**in progress**" (active phase) is characterized with regular labour pains, smoothing and cervical dilation more than by 4 cm, which is an evidence of irreversibility of labour. Peculiarities of labour course are: preterm rupture of fetal membranes; anomalies of parturition (inertia, discoordinance); increase in the duration of labour as the result of absence of labour dominant and unprepared maternal passages; not rarely — intrauterine hypoxia and labour injury of the fetus; postpartum bleeding as the result of disturbance of the placental separation; retention of the parts of fetal ovum in the uterus; postpartum infectious complications.

*Diagnosis* of preterm labour is based on the data of anamnesis, external and internal obstetrical examinations. In clinical practice it is often hard to determine the true beginning of preterm labour. This moment is very important for the early treatment. While waiting of change of "maturity" and cervical dilation to make a correct diagnosis is a loss of time which is necessary for effective treatment. Uterine activity, which is not related to preterm labour, can be caused by dehydration or infection of the urinary tract. Treatment in this case causes the stop of contractile activity of the uterus. Objective estimation of the frequency and duration of the uterine contractions can be done with external tocography.

*Laboratory analysis* includes clinical blood and urine analysis, detection of serum electrolytes, glucose rate; bacteriologic analysis of urine and vaginal discharge.

US can be used to detect the gestational age, weight, presentation, developmental anomalies of the fetus, volume of the amniotic fluid, localization and

condition of the placenta. Preterm rupture of fetal membranes with discharge of the amniotic fluid can forerun preterm labour and can not be noticed by the pregnant woman.

Intrauterine infection is determined by investigation of amniotic fluid obtained by amniocentesis. Presence of bacteriae and leukocytes in the amniotic fluid is an evidence of intrauterine infection, which causes preterm labour. Treatment with antibiotics is restricted and usually ineffective. Determination of the maturity of lungs during the investigation of the amniotic fluid is very important for choice of the treatment policy. Cells of alveoli of the fetus' lungs secrete the phosphatidylcholine (lecithin), which gets to the amniotic fluid. Correlation of lecithin and sphingomyelin in the amniotic fluid is the base of the test on maturity of lungs. If the correlation lecithin/sphingomyelin is more than 2 ( $L/S > 2$ ), fetal lungs are mature. In this case tocolysis of the uterine contractions with pharmacological drugs is not used.

**Management and treatment of pregnant women during preterm labour.** Delay of labour, till the maturation of the lungs of the fetus, is the purpose of treatment of the pregnant woman in the case of preterm labour. Treatment should solve two main problems:

- 1) determination and treatment of disturbances related to preterm labour;
- 2) management of preterm labour.

Management of preterm labour can be conservative or active and depends on their clinical stage term of pregnancy, obstetrical and extragenital pathology of the mother (severe gestosis, decompensation of somatic pathology), condition of the fetus (hypoxia, developmental defects), fetal bladder, cervical dilation, presence of infection and intensity of bleeding.

Though more than in 50% of pregnant women with preterm uterine contractions, the anomalous uterine activity stops spontaneously, this complication requires a detailed estimation and treatment. At the beginning of observance it is hard to detect the character of uterine activity (physiological or pathological). Sometimes it is hardly detected, whether as the result of treatment or spontaneously such pathological uterine activity stops.

*Conservative policy* (further course of pregnancy) is applied with the following conditions: cervical dilation up to 4 cm; threat or the beginning of labour till the maturation of the fetal lungs (before 36 weeks of pregnancy); intactness of fetal membranes; satisfactory condition of the fetus; absence of severe obstetrical pathology of mother and signs of infection.

Treatment is performed in the hospital: bed regimen, rest, balanced diet, application of sedative drugs, tocolytic therapy, physio-, reflexo- and psychotherapy. Taking to consideration the fact that dehydration can increase the uterine sensitivity, treatment of a pregnant woman with the threatened preterm la-



Table 15. Tocolytic therapy of pregnant women during preterm labour

Preparation and mechanism of its effect	Characteristics
Magnesium sulfate (magnesium competes with calcium while penetrating the cell)	Highly safe. Is usually used as a first agent. May cause face reddening and headache. In large doses (120–150 mg/l) can lead to the suppression of breathing and disturbance of the heart activity (>150 mg/l)
$\beta$ -adrenomimetics (partusisten, ritodrin, terbutalin); contribute to the increase in cells of cAMP, which decreases the rate of free calcium in the blood	There are $\beta$ -receptors of two types: $\beta_1$ — predominantly in the heart and intestine and $\beta_2$ — predominantly in the uterus, lungs and blood vessels. Arterial hypotension, tachycardia, anxiety, compression or pain in the chest, disturbances of ECG and possible pulmonary edema, especially during overdosage of fluid, are the side effects.
Inhibitors of prostaglandin synthetase (indometacin); decrease the production of prostaglandins blocking of their conversion from free arachidonic acid	Preterm closing of arterial duct in the fetus, especially after the 34th week of pregnancy, bradycardia, delay of the fetal development
Blocker of the calcium canals (nifedipine); prevents penetration of calcium in smooth muscular cells	The newest tocolytic preparation; the decrease in uteroplacental blood circulation, hypoxia of the fetus, hypercapnia, arterial hypotension, headache, nausea and edema are possible
Ethanol (10% solution); is an inhibitor of endogenous oxytocin	50 ml of 96% ethylic alcohol on 500 ml of isotonic solution of sodium chloride or 5% solution of glucose 20–30 drops per minute are introduced; effect of preparation — 6–8 h; treatment is performed during 2–3 days

bour should be begun with intravenous hydration. Application of hydrational therapy helps preventing uterine contractions in the majority of patients. Sedative therapy (valerian, motherwort, sibazon, seduxen, tazepam) is an important component of a complex treatment. Spasmolytics (papaverin, no-spa, buscopan, baralgin, metacin),  $\beta$ -adrenomimetics (partusisten, bicanil — 0.5 mg by 250–400 ml of sodium chloride intravenously, beginning the introduction from 5–8 drops increasing the dose gradually; after the effect they are prescribed per os); inhibitors of prostaglandin synthesis (indometacin), antagonists of calcium; 10% solution of ethanol are prescribed. Tachycardia, nausea, vomiting can occur as the result of  $\beta$ -adrenomimetics overdosage in mother, that's why tocolytic therapy is combined with finoptin 1 pill 3–4 time a day. Under the influence of  $\beta$ -adrenomimetics tachycardia can also develop in fetus; the correction of the preparation's dose is required in such cases. Before the beginning of tocolytic therapy ABP and the pulse rate are evaluated and monitoring of heart activity of the fetus is carried out.

Variants of tocolytic therapy are presented in table 15.

Different methods of treatment of pregnant women with preterm labour are turned on specific mechanisms which cause the uterine activity and, consequently, the unequal effect in different clinical situations. As a rule, one of methods of treatment is prescribed to pregnant women with the threat of preterm labour; if it is ineffective, other methods are applied. Tocolytic treatment can also cause the side effects, sometimes very considerable, which are dangerous for the mother's life. These complications, as

well as the maturity of the fetus should be taken into consideration when choosing the method of treatment. As the result of augmentation of the fetal gestational age, intensity of tocolytic therapy reduces. The less the gestational age of the fetus, the carefully should be the tocolytic therapy, which can cause the complications. As a rule it is stopped at 36 weeks of pregnancy. Methods of the treatment of a pregnant woman with preterm labour, which are applied in different clinics, can be various, which is related to personal skills of the medical stuff and frequency of positive outcomes when using of a proper method.

*Contraindications* to applying  $\beta$ -adrenomimetics: thyreotoxicosis, cardio-vascular diseases, glaucoma, diabetes mellitus, intrauterine infection, fever (above 38°C), hydramnios, bleeding as the result of presentation or separation of the placenta, disturbance of the fetal heart rhythm, progressing labour, rupture of the fetal membranes, protrusions of the fetal bladder, hemolytic disease of the fetus, severe arterial hypertension, expressed intrauterine growth restriction of the fetus, maturity and developmental defects of the fetus and other somatic and obstetrical complications, during which the side effects of tocolytic therapy can intensify.

Electrophoresis of magnesium with sinusoid modulated current, electroanalgesia, electrorelaxation of the uterus and acupuncture are the non-medicamental ways of treatment.

Treatment of the pregnant women with preterm labour and preterm rupture of fetal membranes should include *prophylaxis of syndrome of respiratory disturbances* (distress-syndrome) by prescribing corticosteroids, which contribute to synthesis of surfactant

and maturation of the fetal lungs: dexamethasone — 8–12 mg per os during 3 days, or prednisolone — 60 mg a day per os or intramuscularly, or dexone — 8 mg a day intramuscularly. In a week, if necessary, glucocorticoids are prescribed in such doses again. Contraindications to applying glucocorticoids: peptic ulcer of the stomach and duodenum; acute and chronic infectious diseases, insufficiency of blood circulation of III degree, endocarditis, pyelonephritis, active tuberculosis; diabetes mellitus, osteoporosis; late gestosis.

*Mucosolvan* (ambroxoli dehydrochloride), which intensifies synthesis of surfactant, as the result of which maturation of the pulmonary tissues of the fetus, and *alveofact* — pure natural surfactant of animal origin, are the effective drugs of prophylaxis of syndrome of respiratory disturbances (distress-syndrome) of the newborns. Advantage of mucosolvan is in its inconsiderable side effect (allergic reactions, nausea, vomiting, hemodynamic disturbances, elevation of the body temperature). If these symptoms manifest themselves, introduction of mucosolvan is stopped or its dose is reduced. 1,000 mg of mucosolvan (1 bottle — 50ml) by 250–500 ml of 5% solution of glucose or isotonic sodium chloride per day is introduced intravenously slowly, 20–40 drops per minute, during 4 h during 3–5 days. A repeated course is performed in 14 days.

Alveofact is prescribed to premature newborns if the syndrome of respiratory disturbances is present, as a substitutive therapy by the surfactant; it is introduced by intratracheal instillation. Preparation has no contraindications but is rather expensive.

Pregnant women with *preterm rupture of membranes (PRM)* — complete or partial discharge of amniotic fluid before the parturition during the preterm pregnancy (10–15% of cases), require a special care. Such complication as chorioamnionitis, cord prolapse and separation of the placenta are related to PRM. Consequences of PRM depend on gestational age of the fetus and duration of waterless period. Sexually transmitted diseases and reduction of concentration of ascorbic acid in the blood as the result of smoking of pregnant women, are the etiological factors of PRM. Excrements of bacteriae make the fetal membranes weaker, cause the uterine contraction as the result of stimulation of synthesis of prostaglandins. Infection of the fetal membranes can cause chorioamnionitis, which is a huge threat for mother and fetus and which contribute to the development of sepsis. Severe fever, tachycardia in mother and fetus and painfulness of the uterus during palpation are also the symptoms of intraamniotic infection. Puerulent cervical discharge is, as a rule, a late symptom. Number of leukocytes amount in the mother's blood increases, but it cannot be detected by two reasons. At first, amount of leukocytes increase during a physiological pregnancy, and can be  $(12-13) \cdot 10^9$  in 1 l. At second, with labour pains during labour leukocy-

tosis increases till  $20 \cdot 10^9$  in 1 l. When making the diagnosis of chorioamnionitis, if labour is not finished rapidly, antibacterial therapy is applied and immediate delivery is done by induction or stimulation of parturition.

#### **Diagnosis of preterm rupture of membranes.**

The fluid which discharges from the vagina, should be considered amniotic till it isn't completely and detailly estimated to exclude this diagnosis. Sometimes the fluid discharges immediately; as some authors consider, equal discharge of small portion of the amniotic fluid is possible. Intermittent discharging of the urine and increase in vaginal secretion are the typical events during pregnancy, especially before labour, and they can be mistakenly considered as discharge of the amniotic fluid.

One should use *nitrosine test* to differ the amniotic fluid from urine and vaginal secrete. The amniotic fluid has more alkaline reaction (pH 7.1–7.3) than vaginal secrete of the pregnant women (pH 4.5–6.0). This fact is in the base of the nitrosine test. One should place the proper amount of fluid from the vagina on a strip of a nitrosine paper to carry out the nitrosine test. If this fluid is amniotic, the paper is dark-blue. The cervical mucus, blood and sperm can be the source of false-positive results.

*Fern-test* is based on the phenomenon of forming the mosaic of the fern-leaf (arborization), which appears after the placing of proper amount of amniotic fluid on the glass, which keeps during 5–7 min in the room temperature. Such a phenomenon takes place thanks to sodium chloride, which is in the amniotic fluid. A leaf of fern, formed as the result of arborization of the amniotic fluid, had more branches than during the cervical mucus arborization. The fern-test is more correct than the nitrosine one, but it is not true for 100%.

*Ultrasonography* can also be informative in diagnosis of possible rupture of fetal membranes. If US reveals enough amount of the amniotic fluid, prognosis of PRM can be doubtful. If a few amount of the amniotic fluid discharges, on the screen of ultrasonograph usual amount of the amniotic fluid can visualize. Everyday measuring of the circumference of the abdomen and height of standing of the uterine fundus also has a diagnostic meaning to detect PRM. If the insufficient volume of the amniotic fluid was detected, oligohydramnios should be excluded.

#### **Management of pregnant women with PRM.**

Such pregnant women require hospitalization and further examination, which is performed quickly and effectively because of a possible necessity in labour induction. The necessary stages of examination of the pregnant women with PRM are as follows: 1) determination of the gestational age of the fetus; 2) detection of the time of rupture of the fetal membranes; 3) detection of uterine contractions and symptoms of chorioamnionitis; 4) ultrasound estimation of the amount of the amniotic fluid around the fetus;

5) determination of the fetal viability and degree of maturation. The fluid from the posterior vault of the vagina is examined to detect the maturity of the fetal lungs (rate phosphatidilglycerol), and is examined with bacteriologic and bacterioscopic investigation. Presence of bacteria in the amniotic fluid is a more correct indicator of infection than the presence of leukocytes.

If the gestational age of the fetus is between the 34th and 36th week (transitional), antibiotic therapy and delivery should be performed to detect the intrauterine infection. Antibacterial therapy is performed with wide-spectrum preparations taking into consideration polymicrobial etiology of intrauterine infection. Delivery is usually performed by induction of labour. If the uterus contracts spontaneously, labour is not stopped.

During severe immaturity of the fetus and absence of infection, as a rule, conservative management is performed. The temperature, sensitivity or painfulness of the uterus during palpation, tachycardia in mother and fetus are kept under everyday and attentive observance. Daily or with interval of some days the amount of leukocytes is detected. Frequent US detects the quantitative changes of the amniotic fluid, which can be restored. The enough amount of the amniotic fluid is the buffer for the umbilical cord and protects it from external influence and compression. In connection with that the reduction of the volume of the amniotic fluid can cause the compression of the umbilical cord and deceleration of the heart contractions of the fetus. Frequent severe decelerations are the indications to the careful delivery to prevent hypoxic injuries or death of the fetus. A pregnant woman is recommended to count every day the movements of the fetus to estimate its condition. Monitoring of fetal heart activity is done (external tocography). To intensify the maturation of the fetal lungs, pregnant women with preterm rupture of membranes are prescribed corticosteroids (dexamethasone) and mucosolvan. Despite of immunosuppressive effect of steroids, they are not dangerous as for the elevation of the risk of infection.

Sometimes the discharge of the amniotic fluid stops, and fetal membranes adjoin. But even in this case a pregnant woman should control the body temperature and painfulness of the uterus. It is a pity that such adjoining of fetal membranes is rare. More often during the first week after the rupture of membranes, uterine contractions appear and parturition begins.

Preterm rupture of membranes during the early gestational age presents some difficulties. Besides of the risk of preterm labour and infection, hypoplasia of lungs and syndrome of amniotic septums can occur in immature infants.

A fetus requires the respiratory movements for normal development of lungs. During the intrauterine period a fetus swallows and evacuates the amniotic

fluid. The substances, which it contains, contribute to the development in respiratory tract the depot of the amniotic fluid, including phospholipids, which are the base of multiple tests for detecting maturation of the fetus. If the rupture of membranes occurs till the 25th–26th week of gestation, the absence of the amniotic fluid prevents the normal respiration and, in such a way, the development of lungs. It causes the disturbance of normal growth and differentiation of the respiratory tract, and in severe cases — to hypoplasia of the lungs and death of the newborn because of impossibility of performing gas metabolism.

*Syndrome of amniotic septums* develops as the result adjoining of the fetal parts with amniotic membranes. Amniotic adhesions and septums can cause any type of deformation of the fetus, including vital amputations of the extremities, fingers and other anatomical injuries. Pregnant women with preterm rupture of membranes in early terms of pregnancy have an additional risk of the development of this complication, if the expecting tactics is chosen, though the restoring of amniotic fluid is possible too.

**Active management** of treatment during the threat or beginning of preterm labour is chosen if a pregnant woman has severe somatic diseases as well as severe forms of late gestosis, developmental defects and death of the fetus, signs of infection.

**Delivery during preterm labour.** As the result of ineffective tocolytic therapy or in connection with contraindications to its application, the pregnant woman delivers pretermly. The more immature the fetus, the larger the risk for it in labour. Pelvic presentation, which is usual for immature fetus, increases the risk of complications during delivery.

*The main principles of the preterm labour management* are following:

1. Preterm labour should be performed carefully through the maternal passages with monitoring the heart activity of the fetus and uterine activity.

2. Spasmolytics and painkillers are rationally used during labour (in the active phase repeating if necessary in 2–4 h, and abolition 2 h before childbirth).

3. Large doses of oxytocin and prostaglandins are not used for medicamentous correction of uterine inertia.

In the case of disturbance of parturition and accelerated labour, tocolytic therapy with  $\beta$ -adrenomimetics (partusisten) is performed; it is recommended to introduce buscopan (parenterally or rectally in suppositories). During the cervical rigidity a lytic mixture (no-spa by 2 ml, 2% promedol solution — 1 ml, seduxen — 2ml or pipolphen — 2 ml) or painkiller with a spasmolytic effect (baralgin — 5ml) is introduced. During labour prophylaxis of intrauterine hypoxia of the fetus is performed.

The second stage of labour is very dangerous for immature child, that's why it is performed very care without the protection of the perineum. Episiotomy and pudendal anaesthesia are done to reduce the re-

sistance of the muscles of the pelvic floor. Forceps of the proper size are applied only, if the vital indications are present, under the adequate anaesthesia and if the actions turned on the free expulsion of the fetus failed. During the pelvic presentation at the II stage of labour intravenous introduction of oxytocin is performed (5 U by 400 ml of isotonic solution of sodium chloride). Active intervention is necessary only from the moment of entering the presenting part. During the deep immaturity the Tsovyanov's method is not applied; the trunk of the fetus is supported.

At the III stage of labour the means for prophylaxis of postpartum bleeding are performed.

A caesarean delivery during premature pregnancy is performed by strict indications on the mother's part: presentation or preterm separation of the placenta, severe forms of late gestosis, anomalies of the uterine development and parturition. The indications on the fetus' part: transverse lie and pelvic presentation; hypoxia and hypotrophy in combination with preterm discharge of the amniotic fluid as the result of immaturity of maternal passages; presentation and cord prolapse. Qualification of the surgeon and level of neonatal assessment in the hospital should be taken into consideration when performing the caesarean section during the premature pregnancy. Uterine spasm, incorrect type and place of incision on the uterus and complicated extraction of the fetus are the factors, which make labour traumatism to the immature fetus during the caesarean section. Incision on the uterus should be 12–14 cm in length, which permits carefully to extract the fetus and not to disturb its position. At the period of 28–32 weeks of pregnancy isthmicocorporal caesarean section, which provides the conditions for the careful extraction of the

fetus and avoids the injury of cervicothoracic segment of the vertebral column, is predominantly performed. Right after delivery the fetus is placed on one level with the placenta. During the presentation or separation of the placenta *the finger placental-umbilical perfusion of the blood* is performed for prophylaxis of syndrome of respiratory disturbances (distress-syndrome) and anemia of the newborn, if there are no contraindications. Preserving of pregnancy, even during some days, among with performing active prophylaxis of the syndrome of respiratory disturbances will contribute to reduction of perinatal complications and mortality of immature newborns.

After delivery of an immature newborn, its primary processing and all medical means are done in a couveuse. Besides of estimation of the newborn on the Apgar's score, they are estimated with Silverman—Andersen's score (1956) in dynamics: each 6 h after delivery during 1–2 days, till the liquidation of the respiratory disturbances (Table 16).

There are 4 degrees according to the weight on the moment of birth: I — 2,500–2,002 g, II — 2,000–1,501 g, III — 1,500–1,101 g, IV — 1,000 g and less. However, weight is not always the indicator of the maturity of the newborn (intrauterine growth restriction, diabetic macrosomia). Outward appearance of the immature newborn is characterized with disproportional constitution: the lower extremities and neck are short, the umbilical ring located low, the head is large in comparison with trunk, the bones of the skull are soft, sutures are wide, the posterior fontanel is open. Intensified growth of vertigo is observed on the skin of the back, shoulder girdle and hips. The skin is thin, physiological erythema is expressed, sub-

Table 16. Estimation of the respiratory disturbances according to Silvermann—Anderson score

Clinical sign	Point		
	0	1	2
Movements of the chest (synchrony of participation of the upper segment of the chest and the anterior abdominal wall in respiration)	Upper part of the chest and the anterior abdominal wall synchronically participate in respiration	Absence of synchrony or minimal stick of the upper part of the chest among the lifting of the anterior abdominal wall during inspiration	Considerable stick of the upper part of the chest among with lifting of the ante-abdominal wall during inspiration
Stick of the intercostal area during inspiration	Does not draw in	Inconsiderable stick	Expressed stick
Stick of the xyphoid process during inspiration	Is absent	Insignificant	Considerable stick
Position of the mouth, maxilla, participation of the wings of the nose during respiration	The mouse is closed, the maxilla do not stick	The mouth is closed, lowering of the chin during inspiration, the maxilla sticks, the nose wings participate in respiration	The mouth is open, the maxilla sticks, the nose wings are blown
Character of respiration	Regular, quiet	Complicated inspiration during auscultation	Moan respiration, expiration murmurs are heard at a distance



cutaneous layer is not developed. The nails do not extend to the end of the fingers, large pudendal lips in girls do not cover the small ones, the testes in boys do not descent in the scrotum.

Flabbiness, drowsiness, incomplete thermoregulation, reduction of the muscular tonus, insufficient development of swallowing and sucking reflexes are functional peculiarities of the immature newborns.

Sanitation of the girls, women with aggravated anamnesis, who plan pregnancy and detection of the pregnant women of high risk in women's consultation clinics, their in-time examination and hospitalization and adequate treatment are the prophylactical means of miscarriage of pregnancy.

#### RECOMMENDED READING

3; 5; 21; 22; 39; 46; 56; 57; 61.

A full-term pregnancy is the one which ends with the child birth, intrauterine period of development of which is 38–42 weeks ( $\pm 2$  weeks according to a supposable date of labour). Pregnancy which lasts more than 42 weeks (more than 294 days from the first day of the last normal menstruation) is *prolonged*. Labour of a prolonged pregnancy is the *late* ones. This complication is observed in 4–10% of the pregnant women and related to the increase in perinatal morbidity and mortality. Ukrainian obstetricians determine the prolonged and true prolonged pregnancy. *Prolonged* pregnancy finishes in 40–42 weeks by delivery of a mature and functionally mature child without signs of overmaturity. *A true prolonged* pregnancy lasts more than 42 weeks, accompanied with the pathological changes in the placenta and ends with late labour with an overmature fetus, which has the signs of the Ballentein—Runge syndrome and high risk of perinatal complications.

*Etiology and pathogenesis.* The true cause of the postterm pregnancy is unknown. It is considered that absence of biological readiness of a female organism to labour is in the base of this complication. Bearing in mind that postterm pregnancy is accompanied by anencephalia of the fetus, the conclusion was made that dysfunction of hypophysial-adrenal system of the fetus, which has in important meaning in labour initiation, can cause such a complication. Decrease in contractile function of the uterus during the postterm pregnancy makes one think about the fact that the reason of this complication is in properties of the myometrium, disturbance of the uterine function as a receptor effector. Changes of the placenta are secondary, which lead to the development of the placental insufficiency and disturbance of the condition of the fetus. It was detected that there is a tendency to repeating of prolongation during future pregnancies in the same patient (50% of cases), despite of the causes of a prolonged pregnancy.

Diagnosis of prolonged pregnancy is based on correct determination of gestational age of the fetus and detection of the disturbances in its condition, which were caused by postmaturity and overmaturity. A cor-

rect date of the last normal menstrual period of the pregnant woman and results of US at the I and II trimesters of pregnancy are the most important criteria for detection of the gestational age of the fetus. If such data are absent, other criteria of diagnosis are used:

- rate of chorionic gonadotrophin at the early term of gestation;
- a possible date of fertilization, term of gestation during the first visit to the women's consultation clinics;
- the date of appearing of first movements of the fetus, the date of prelabour vacation;
- results of US at the III trimester of pregnancy;
- data of external and internal obstetrical examinations, monitoring of the heart activity of the fetus, colpocytologic test, rates of estriol, chorionic somatomammotrophin in the blood;
- amnioscopy, amniocentesis.

During the *objective examination* attention is paid to decrease in the weight, circumference of the abdomen, height of standing of the uterine fundus above the pubis.

An “immature” cervix is detected during the internal *obstetrical examination*, and in labour — a flat fetal bladder, tighten on the fetal head membranes, thick bones of the cranium, narrow sutures and fontanel.

Weight of the fetus and thickness of the cranial bones are estimated, developmental defects, oligoamnios, reduction of the thickness, calcinosis and expressivity of the interlobular septums of the placenta are detected. During amnioscopy attention is paid to thick fetal membranes, reduction of the amount of the amniotic fluid, which can be green, contain the admixtures of meconium, turbid as the result of resorption of vernix caseosa. Absence of the parts of vernix caseosa is also an evidence of a prolonged pregnancy. During investigation of the amniotic fluid by amniocentesis, increase in the concentration of creatinine, urea, protein, milky acid, quantity of lipid cells 2–3 times among the reduction of glucose level are detected. Increase in coefficient lecithin/sphingomyelin up to 4 : 1 (in mature fetus 2 : 1) is an early sign of a prolonged pregnancy.

**Course of pregnancy and labour.** Perinatal morbidity and mortality during prolonged pregnancy increases several times in comparison with a full-term pregnancy. This is related to some causes. Firstly, 20–40% of overmature newborns have the signs of overmaturity — the syndrome of overmaturity, which results in the increase in perinatal risk. Overmature fetus is extremely sensitive to hypoxia as the result of more mature central nervous system. A considerable part (nearly 25%) of overmature newborns are born with large weight (macrosomia), a part of other children can have intrauterine growth restriction, reduces subcutaneous layer, and they look like “old men”. In children with macrosomia disturbances of metabolism of glucose and bilirubin can be present. Such a newborn has an increased risk of labour injury (*especially dystocia of the shoulders* and related to it injury of the brachial plexus) both during the vaginal and abdominal delivery. With prolonged pregnancy reduction of the volume of amniotic fluid — *olygoamnios* is always related, which is accompanied with increasing risk of fetal hypoxia in ante- and intranatal periods. The volume of the amniotic fluid reaches the highest rate (nearly 1–1.5 l) in 36–37 weeks of pregnancy and reduces two times at 42 weeks of pregnancy. The umbilical cord “freely swims” in the amniotic fluid, when the considerable reduction of the amount of the amniotic fluid, as a rule, leads to the high risk of its compression in labour.

A prolonged pregnancy is often accompanied with the placental insufficiency, which causes the reduction of transplacental transport of the water, electrolytes, glucose, amino acids and oxygen. Almost in every second placenta during a prolonged pregnancy infarctions, calcificates and fibrous changes, caused by the reduction of its functional capacity, appear. Intrauterine hypoxia and disturbance of the providing of the fetus with nutritional substances can cause asphyxia in labour and development of the syndrome of overmaturity.

Aspiration of meconial amniotic fluid — *syndrome of meconium aspiration* is a very dangerous complication of a prolonged pregnancy, especially during the growth restriction of the fetus. It causes severe disturbances of respiration as the result of mechanic obstruction of the respiratory tract and the aspirational (chemical) pneumonia.

During a full-term pregnancy discharge of meconium in labour is observed in 13–15% of cases. The incidence of this complication increases with advance in the term of pregnancy. Reduction of the volume of the amniotic fluid is a characteristic feature of a prolonged pregnancy, as the result of which overmature newborns can be affected by aspiration of more concentrated solution of the amniotic fluid, including meconial. Complications which appear as the result of meconial aspiration: athelectases, pneumothorax, pneumomediastinum, — can rapidly transfer into the fatal ones if diagnosis is late and treatment is inadequate.

Even the thorough evacuation of the meconial fluid from the nasal part of the pharynx of the fetus in the moment of its birth not always prevents the aspiration and development of the severe form of the syndrome of respiratory disturbances (distress-syndrome) of the newborn.

**Management of a prolonged pregnancy.** The most correct determination of the gestational age of the fetus is one of the first actions which a doctor performs during a prolonged pregnancy. If the gestational age of the fetus was determined correctly, two main moments will influence the choice of the management of pregnancy — condition of the fetus and cervical “maturity”.

Examination of the condition of the fetus includes actography (every day count of the movements of the fetus), cardiomonitoring (the non-stress test and, if necessary, oxytocin test), ultrasound fetometry and placentography, biophysical profile of the fetus, amnioscopy. The reactive nonstress test is characterized by the presence of 2 episodes of movements of the fetus during 30 min, which are accompanied by acceleration of the heart rate of the fetus more than by 15 per 15 s (2 spontaneous acceleration). Investigation of the biophysical profile includes, besides the results of the non-stress test, determination of the amount of the amniotic fluid, tonus and movements of the body and also respiratory movements of the fetus.

Examination of pregnant women, using the non-stress test and biophysical profile is repeated in a day. Depending on received results, as well as the degree of “maturity” of the cervix 1 of 2 variants of obstetrical policy is chosen: 1) induction of labour (active management); 2) waiting for spontaneous beginning of labour under the constant observance of condition of the fetus.

During satisfactory condition of the fetus the expecting *management* is performed. Observances are done before the beginning disturbances of the fetus; condition or spontaneous beginning of parturition.

The supporters of the *active* management of overterm pregnancy prefer the stimulation of labour by intravenous injection of solution of oxytocin or prostaglandins. If cervical “maturity” is insufficient, prelabour preparation, using the prostaglandins, oestrogens and spasmolytics, is performed; in pathological preliminary period  $\beta$ -adrenomimetics are introduced. Intracervical gel with the prostaglandin E for acceleration of cervical “maturation” is applied before the induction of labour. Supporters of the active policy determine the necessity of its using with increasing of perinatal morbidity and mortality after 42–43 weeks of pregnancy. In case of fetal hypoxia, confirmed by the objective methods of examination, caesarean section is performed without previous attempts for stimulation of labour. To avoid the risk of labour injury, related to macrosomia, US is carried out before delivery for more correct determination of the fetal

weight during a prolonged pregnancy. The reduction of the possibilities for configuration of the fetal head, caused by a prolonged pregnancy, decreases the tolerance of the fetus to the labour act, causes the augmentation of labour injuries and causes posthypoxic encephalopathy in the newborns.

Labour management includes the artificial rupture of fetal membranes (amniotomy) to observe the meconium discharge; performing the monitoring of heart activity of the fetus and contractile activity of the uterus (external or internal cardiotocography); spasmolytics introduction every 3–4 h; performing prophylaxis of hypoxia of the fetus; if it is necessary, stimulation of labour is performed. During the complicated course of the I stage of labour (hypoxia of the fetus, uncorrecting anomalies of parturition) plan of labour management is changed and abdominal delivery is performed.

An elective caesarean section is performed during the absence of maturity of the maternal passages in combination with hypoxia of the fetus, as well as with infertility in anamnesis, old age of the nulliparous woman, cicatrix on the uterus, contracted pelvis, complicated obstetrical anamnesis. Caesarean section is a method of choice, if the supposable weight of the fetus is more than 4,500 g.

Labour is performed with the anaesthesiologist (abdominal delivery is possible) and pediatrician-neonatologist (to perform the resuscitation means in connection with hypoxia and neonatal aspiration syndrome of the newborn). During labour, if the meconium is detected in the amniotic fluid, the means

turned on prophylaxis of aspiration of the fetus are done. Before delivery of shoulders content of the nasal part and stomatopharynx of the fetus is evacuated (the chest of the fetus is compressed with maternal passages, because of which it cannot make a deep inspiration, and aspirate the meconial fluid). Assistance of the pediatrician in labour is in examination of the newborn, release of the nasal part of the pharynx from the meconial fluid, which reduces the risk of aspiration.

Taking into consideration a possible macrosomia, one should make measures to prevent dystocia of the fetal shoulders: maximal abduction of the hips of parturient women to the abdomen and pressing above the pubis simultaneously with careful rotation of the delivered head.

The typical external features of the overmature child are following: thick skull bones, narrow sutures and fontanelles, maceration of the skin on palms and soles, desquamation of epidermis, long nails and also contamination of nails, skin and umbilical cord with meconium.

*Prophylaxis.* It is necessary after 42 weeks of gestation to hospitalize a pregnant woman to the obstetrician clinic to estimate the term of pregnancy, evaluate the fetus' condition, perform the prelabour preparation for prophylaxis of a prolonged pregnancy.

#### RECOMMENDED READING

3; 5; 21; 22; 29; 39; 46; 56; 57; 61.



## Chapter 28

# PATHOLOGICAL CHANGES OF AMNIOTIC FLUID

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The amniotic fluid begins to produce from the early terms of pregnancy. It is a product of fetal urine; it constantly penetrates through the lungs and skin of the fetus and is excreted by the cells of amnion. The amniotic fluid as a buffer makes the condition for the free movements and growth of the fetus; they are the protection of the fetus and umbilical cord from injuries, infections and also is the source of tracheo-bronchial fluid. It contributes to the respiration movements and development of the respiratory system of the fetus. During pregnancy metabolism between the fetus, amniotic cavity and maternal organism is constantly performed.

The volume of the amniotic fluid is controlled by some ways: in early terms of pregnancy the amniotic fluid is close by the content to the extracellular fluid. At the I trimester of pregnancy transport of the water and other small molecules is possible both through the amnion and skin of the fetus. The whole surface of amnion performs the secretion, if pregnancy progresses metabolism occurs predominantly through the amniotic surface of the placenta. At the II trimester fetus begins to produce the urine, swallow and inspire the amniotic fluid, i.e. its lungs and kidneys participate in metabolism of the amniotic fluid. These processes play the main role in regulation of the volume of the amniotic fluid.

Amount of the amniotic fluid increases from 12 ml in 8 weeks of pregnancy till 800–1,500 ml in the middle of III trimester of pregnancy. In 10 weeks of pregnancy volume of the amniotic fluid is 30–35 ml, at 15 weeks — 125–150 ml, at 20 weeks — 450–500 ml, at 36–37 weeks — 500–1,000 ml. At 20 weeks of pregnancy a fetus swallows 10–15 ml of the amniotic fluid during a day, in labour — 400–500 ml per day. Complete metabolism of the amniotic fluid is performed during 3 h. Because of the swallowed amniotic fluid, fetus receives 25% of necessary proteins, that's why during the reduction of its volume the disturbances of its condition often occur. In labour the amniotic fluid regulates the intrauterine pressure, the inferior pole of the fetal ovum becomes the physiological stimulus of the receptors of internal fauces of the uterus.

## HYDRAMNION

*Hydramnion* is the increase in the volume of the amniotic fluid more than 1.5 l during a full-term pregnancy. Often clinical detection of hydramnion is possible as the result of increase in amniotic fluid up to 2,500 ml and more. The incidence of hydramnion during a single pregnancy is 1%, but as the result of thorough US its frequency becomes more and reaches 8%. Increase in the amount of the amniotic fluid can be gradual (*chronic polyhydramnion*) or rapid (*acute polyhydramnion*). Acute hydramnion is observed in 5% of all cases of hydramnion and develops during several days. In severe cases amount of the amniotic fluid can reach 15 l.

*Etiology.* Hydramnion is a frequent cause of the development of complications of pregnancy. Developmental defects of the fetus (anencephalus, spina bifida, umbilical hernia, ectopy of the urinary bladder, atresy of esophagus and duodenum) occur during hydramnion in 20% of cases. The other causes of hydramnion: disturbance of an ability of the fetus to swallow the fluid (developmental defects of the brain, tumors, edema of the fetus, straightening positions of the head); disturbance of the venous circulation as the result of inimmune fetal edema; multiple gestation, more often with monoovular twins. Diabetes mellitus, rhesus-conflict pregnancy, chronic infection of the urogenital tract (pyelonephritis, mycoplasmosis, clamidiasis, cytomegaloviral infection, syphilis) are mother's diseases, which contribute to the development of hydramnion. 10% of cases of hydramnion are related to diabetes mellitus, 10% — to pregnant woman with preeclampsy. Every second case of hydramnion during a single gestation is caused by the large weight of the fetus or mother and is not connected with developmental defects of the fetus or complications of the mother.

*Clinical picture and diagnosis.* Symptoms of hydramnion is more expressed during the acute form and is related to compression of internal organs attaching to the overstretched uterus: dyspnea; edema of the lower extremities, vulva, anterior abdominal

wall as the result of compression of veins; pain in the abdomen and loin. Frequently the symptom of vena cava inferior is observed (Fig. 107): when lying a pregnant woman feels weakness, dizziness, murmur in the ears, flashing of the “spots”.

After the change of position on the side, the symptoms disappear (compression of vena cava inferior stops and heart blood circulation increases).

Severe oliguria as the result of obstruction of ureters occurs rarely.

Diagnosis is based on the data of clinical examination and US. During the objective examination paleness of the skin and expressed vascular picture are detected. Circumference of the abdomen and height of standing of the uterine fundus is more than usual for such term of pregnancy. The uterus is enlarged, strained, elastic, ball-like; fluctuation can be detected during palpation. Overstrain of the uterus makes hardships for palpation of the fetus and prevents to hear cardiac tones. The presenting part of the fetus locates high, ballotates. Sometimes movements of the fetus increase.

During the vaginal examination a shortened cervix, dilated internal fauces and strained fetal bladder can be detected.

US can determine the volume of the amniotic fluid (index of the amniotic fluid can increase more than by 20 cm, in the norm — 6–8 cm), morphofunctional condition and gestational age of the fetus, pathological changes in the placenta, perform the differential diagnosis to exclude hydatidiform mole, ascitis and ovarian cystoma.

**Course of pregnancy and labour.** Pregnancy during hydramnion (especially acute before the 28th week of pregnancy) can be complicated with miscarriage and preterm labour, preterm rupture of membranes. Immediate discharge of the amniotic fluid can cause the cord prolapse and small parts of the fetus and preterm separation of the placenta.

Uterine inertia and hypotonic postpartum bleeding as the result of overstrain of the myometrium can complicate labour.

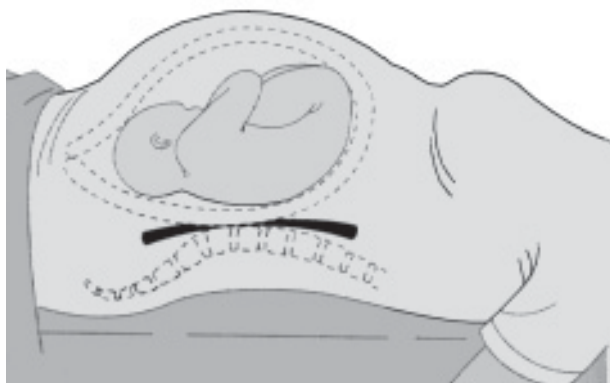


Fig. 107. Symptom of vena cava inferior (compression of vena cava inferior as the result of hydramnion)

**Management of pregnancy and labour.** Pregnant women with hydramnion are hospitalized to make the diagnosis, detect the cause of development of hydramnion and choose the rational policy of delivery.

With developmental anomalies of the fetus, abortion is done through the natural maternal passages. If the infection is present, antibacterial therapy is performed, with diabetes mellitus — treatment, turned on compensation of the disease. During acute hydramnion, amniocentesis is done. To reduce diuresis of the fetus prostaglandins synthesis inhibitors — indometacin is prescribed in the dose of 2 mg/kg of the weight per day. Because of the polyethiologic origin of hydramnion applied means are not always effective. In order to improve the condition of the fetus the drugs which contribute to uteroplacental blood circulation (spasmolytics, reocorrectors, desagregants), the drugs which improve the metabolism and antioxidants are prescribed.

During labour it is recommended to perform *early amniotomy*. The amniotic fluid should be evacuated carefully to prevent prolapse of the cord and small parts of the fetus and preterm separation of the placenta. If the active parturition is absent, stimulation of labour is begun in 2 h after amniotomy. At the III stage of labour prophylaxis of bleeding is carried out.

Preventing means in pregnant women with hydramnion include the detection of the groups of risk (diabetes mellitus, rhesus-conflict and multiple gestation), sanation of the organs of chronic infection, especially urogenital tract.

## OLIGOAMNIOS

**Oligoamnios** — reduction of the volume of the amniotic fluid till 600–200 ml (by different authors), sometimes till some milliliters. Oligoamnios occurs more rarely than hydramnion (0.5–5% of all cases of pregnancy).

**Etiology, pathogenesis.** Like with hydramnion, 40–50% of pregnancies with oligoamnios are not accompanied with the developmental defects of the fetus. The main causes of oligoamnios; 1) the placental insufficiency and growth restriction of the fetus; 2) prolonged pregnancy; 3) developmental defects of the fetus; 4) preterm rupture of membranes (chronic loss of the amniotic fluid as the result of defect of membranes). Oligoamnios is accompanied with the increased risk of compression of the umbilical cord, reduction of the placental circulation and hypoxia of the fetus. Oligoamnios at the early terms of pregnancy causes unfavorable perinatal consequences and can be the evidence of fetal lungs hypoplasia. As the result of early oligoamnios amniotic septums, deformations of the vertebral column and extremities, talipes and adhesion of the fetus' skin with amnion

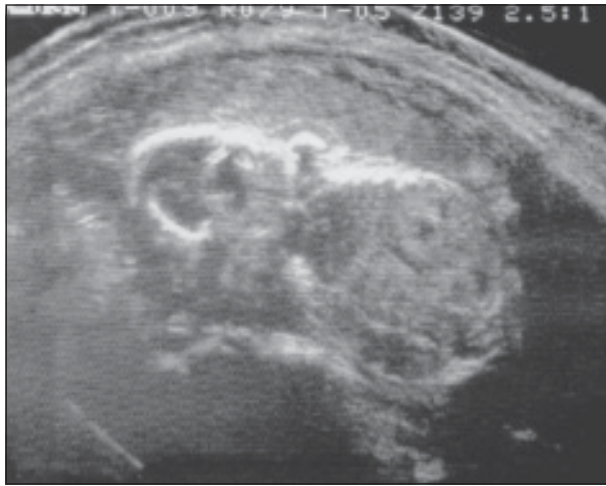


Fig. 108. Ultrasonogramm: expressed oligoamnios and microcephalus of the fetus on the 25th week of pregnancy (pelvic presentation, the placenta is on the anterior uterine wall)

(Simonart's bands), which can lead to the amputation of the extremities, can develop. Olygoamnios can develop in one of the fetuses (donor), if the twins transfusion syndrome exists.

*Clinical picture and diagnosis.* Oligoamnios can be accompanied with less weight in comparison with the norm. During the expressed oligoamnios pregnant woman complains on weakening of the fetal movements and pain in the abdomen. During the external obstetrical examination in correspondence of the uterine size to the term of pregnancy is detected. With US the term of pregnancy can be detailed, agenesis of the kidneys and other developmental anomalies of the fetus can be detected, reduction of the index of the amniotic fluid till  $\leq 5$  cm (Fig. 108).

One should make an amnios copy to detect the meconium in the amniotic fluid (in 10% of cases of pregnancy of high risk). It can detect the rare cases of presentation of umbilical cord and its vessels.

**Course and management of pregnancy and labour.** Miscarriage, late gestosis, the placental insufficiency and intrauterine growth restriction and fetal hypoxia are the complications of pregnancy during oligohydramnion. Oligoamnios is an evidence of restricted capacities of the placenta. Cardiomonitoring, dopplerometry of the vessels of umbilical cord (dopplerosonography) and biophysical profile of the fetus are done to estimate the condition of the fetus. Examinations are performed twice a week. There is no effective treatment of oligohydramnion, in connection with which the rational management of pregnancy and labour are performed to improve the perinatal consequences.

Course of labour can be accompanied with uterine inertia because of the fetal membranes tighten on the presenting part, that's why early amniotomy is performed with diagnostic and treatment purpose (observation under the discharge of meconium). If there is no active parturition, stimulation of labour is performed in 2 h after amniotomy. Insufficient amount of the amniotic fluid can cause the compression of the umbilical cord during labour pains and aggravate the condition of the fetus. Abdominal delivery is performed during the acute hypoxia of the fetus, which occurs in labour and is accompanied by late decelerations of the heart rhythm, discharge of meconium, especially during a prolonged pregnancy, and in the case of old age of the nulliparous woman and aggravated obstetrical anamnesis. During oligoamnios and colouring of the amniotic fluid with meconium some authors recommend to perform in labour an amnio-infusion of warm isotonic solution of sodium chloride.

#### RECOMMENDED READING

3; 22; 39; 46; 56; 61.

## EXTRAGENITAL PATHOLOGY AND PREGNANCY

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Any disease of a pregnant woman can complicate the gestational process. Pregnancy for its part aggravates the course of extragenital pathology. In this situation it is also decided whether a pregnant woman should carry pregnancy because of the possible risk for the mother and fetus. A decision about a possibility of pregnancy and labour and their rational management is done together with the obstetrician-gynaecologist and doctor-therapist or surgeon of the proper profile.

Iron-deficiency anemia, pyelonephritis, cardiovascular diseases and diabetes mellitus are the most frequent extragenital diseases during pregnancy.

### DISEASES OF CARDIO- VASCULAR SYSTEM

Cardio-vascular diseases complicate the course of pregnancy very often and are the most frequent cause of the maternal mortality. The consequences of these diseases for mother and fetus depend on many factors: functional capacity of the heart, influence of other complications of pregnancy, which can increase the load on the heart; possibility of performing qualified medical care.

Physiological changes which occur in the cardiovascular system during pregnancy, make the diagnosis of the correct cardiac disease difficult.

Such physiological changes are following: increase in the cardiac outflow by 40%, the heart rate — by 10–15 beats per 1 min, increase in the plasma's volume — by 45–50%. As the result of the increase in the blood volume from the 12th week of pregnancy functional systolic murmur in the apex of the heart appears. During labour pain the heart output in a parturient woman augments by 15–20%, ABP elevates, especially during acute pain. After delivery of the fetus as the result of liquidation of the uteroplacental blood circulation and absence of compression of vena

cava inferior in a puerpera the volume of circulating blood increases, which can cause heart failure.

**Acquired heart diseases** (6–8% of the pregnant women) are predominantly of rheumatic origin. The left atrioventricular or mitral valve is impaired more often (mitral stenosis, combined insufficiency of the mitral valve with stenosis, prolapse of the mitral valve), aortal or left atrioventricular or tricuspid — rarely. Today in the patients with rheumatism its unexpressed forms predominate. Rheumatic process in a pregnant woman intensifies rarely, as a rule, as the result of hormonal and immunologic changes, which occurs during pregnancy. I trimester and the 20th–32nd weeks of pregnancy (hospitalization and courses of antirelapsing treatment), as well as the postnatal period are the critical periods of intensification of rheumatism.

**Insufficiency of blood circulation** in the pregnant women with acquired heart diseases can develop at the end of II trimester, in labour and within first 2 weeks of the postnatal period (period of maximal hemodynamic loads), which depends on the age of the woman, period of the existence of the defect, functional capacity of the heart, adjoining of infection, as well as from the effectiveness of anaesthesia and management of labour. In Ukraine the classification of chronic insufficiency of the blood circulation by N. D. Strazhesko and V. Kh. Vasilenko: I stage — symptoms of the disturbance of blood circulation (dyspnea, weakness, tiredness), which occur after the physical load; II A stage — dyspnea and palpitation are almost constant, manifest during a minor load; II B, C stage — congestive changes in the lesser and greater blood circulation; III — irreversible changes of the internal organs.

In the majority of pregnant women suffering from heart diseases the diagnosis of the disease is made before pregnancy. Such symptoms give the reason to suspect the cardiac disease: diastolic, presystolic or constant murmur in the heart; inadequate dilation of the heart; rude systolic murmur, especially in combination with tachycardia; arrhythmia, which is the frequent complication in women suffering from acquired or congenital heart diseases and cardiomyopathy.



There are 4 degrees of risk of unfavorable consequences in pregnant women suffering from heart diseases: I — absence of the signs of the cardiac insufficiency and intensification of the rheumatic process; II — initial symptoms of the cardiac insufficiency (dyspnea, cyanosis), presence of minimal signs of intensification of rheumatic process; III — decompensated heart disease with manifestations of predomination of right ventricular insufficiency, mild signs of activation of rheumatic process, cardiac fibrillation and pulmonary insufficiency; IV — decompensated heart disease with signs of left ventricular or total cardiac insufficiency, maximal manifestations of the intensification of rheumatism, cardiac fibrillation, thromboembolic complications and pulmonary hypertension.

**Congenital heart diseases** are observed in 5% of cases of all heart diseases in the pregnant women. They are divided into three groups: 1) defects during which the left to right shunt takes place (defect of the septums of the atriums and ventricles of the heart, patent ductus arteriosus) — is the most frequent group of the defects; 2) defects during which the right to left shunt takes place (Fallot's tetrad, transposition of main vessels, which are accompanied with cyanosis, — "dark blue" defects); 3) defects during which there is a barrier for the blood flow (stenosis of the pulmonary artery, aortal stenosis, coarctation of the aorta).

**Pregnancy after cardiac operations.** After the mitral commissurotomy pregnancy is possible not earlier and not later (danger of restenosis) than in a year after operation, if the signs of cardiac insufficiency disappear.

In women who have artificial cardiac valves despite of the constant anticoagulant therapy there is a high risk of thromboembolic complications.

**Course and management of pregnancy and labour.** Prognosis of consequences of pregnancy is determined by the presence of insufficiency of the blood circulation, pulmonary hypertension and degree of hypoxemia in major degree than by the type of defect. Insufficiency of blood circulation, pulmonary hypertension and defects, which are accompanied with cyanosis and severe form of arterial hypertension are the indications to the abortion. Pregnancy is contraindicated for the women who were operated on the heart and suffer from bacterial endocarditis, activation of rheumatic process, restenosis, traumatic insufficiency of the mitral valve and excessive enlargement of atrio-ventricular foramen.

Nearly 80% of the pregnant women suffering from cardio-vascular diseases do not have considerable disturbances of condition, that's why physical activity is not contraindicated (I and II degree of risk). More than 85% of cases of the maternal mortality are observed in women with decompensation of the cardiac disease (III and IV degree of risk), that's why pregnancy is permitted to the women with I and II degree of risk. Pregnant women suffering from car-

diac diseases of III degree of risk (on example, with mitral stenosis) mitral commissurotomy is performed after 32 weeks of pregnancy, if necessary. If the operation is not performed, strict bed regimen and avoiding of any physical load are prescribed. If the disease is decompensated, abortion at the I trimester is performed.

The pregnant women suffering from inoperable cardiac anomalies (IV degree of risk) are performed by the medical abortion at the I trimester and sterilization.

Determination of the extent of risk depending on the compensation of cardio-vascular disease is performed before the 12th and after the 30th weeks of pregnancy. In critical periods of possible subcompensation of cardiac disease (the 12th–16th, the 28th–32nd and the 37th week) women are hospitalized for complete examination and correction of the plan of labour management.

Treatment of the pregnant women suffering from cardio-vascular diseases depends on the functional capacity of the heart and is done by the gynaecologist with the therapist, cardiologist and, if necessary, cardiac surgeon. Strict diet, oxygen therapy, using of drugs and phytotherapy are included in treatment. Cardiac glycosides (strophanthin, corglicon, digoxin, digitoxin), ephillin, diuretics, B group vitamins, ascorbic acid, tocopherol acetate — vitamin E, preparations of potassium and anabolic steroids are used in women suffering from cardiac insufficiency.

Women after a cardiac operation should be observed by a cardiac surgeon during the whole course of pregnancy. Patients with mechanic prosthesis of the cardiac valves require the anticoagulant therapy with fenilin. At the I trimester of pregnancy and before 3 weeks before labour fenilin because of its teratogenic effect and possible hemorrhagic complications is substituted with heparin.

If pulmonary edema is present, 2–4 ml of 0.25% solution of pipolfen, 2 ml of 0.5% solution of seduxen and 1 ml of 2% solution of promedol, 1 ml 0.5% solution of strofantin by 10 ml of 20% solution of glucose are introduced. If ABP elevates, ganglioblockers and nitroglycerin are used.

During the treatment of the pregnant women suffering from paroxysmal atrial tachycardia 2 ml of 0.25% solution of verapamil by 8 ml of isotonic solution of sodium chloride or 5–10 ml of 10% solution of novocainamide on 10 ml of isotonic solution of sodium chloride are introduced slow intravenously.

During pulmonary embolism measures of emergency directed at the liquidation of bronchospasm and spasm of the lesser circulation, improvement of rheological properties of the blood, in severe cases — artificial pulmonary ventilation, are performed. 2 ml of 0.25% solution of droperidol, 1–2 ml of 0.005% of fentanil and 1–2 ml of 1% solution of dyphenhydramine hydrochloride are injected intravenously. Injections of rheopolyglucin and aurophylline are done.

Thrombolytic therapy is performed (streptokinase, urokinase, fibrinolysin).

Pregnancy can be complicated by the threat of abortion, preterm labour and disturbance of uteroplacental circulation, the placental insufficiency, hypoxia and hypotrophy of the fetus. Development of combined forms of late gestosis is very dangerous. Arterial hypotension is frequent complication in pregnant women with defects of the cardiac septums and patent ductus arteriosus.

Rational management of pregnancy in such women includes: 1) excluding of indirect anticoagulants because of their possible teratogenic effect; 2) correction of anemia, hyperthyroidism, obesity; 3) treatment during the congestive complications, pulmonary edema, infectious endocarditis, arrhythmia; 4) prophylaxis and treatment during hypertensive complications and combined form of late gestosis; 5) treatment during any intercurrent infectious diseases; 6) careful prescriptions of diuretics to prevent hyponatremia and hypokaliemia.

Women during pregnancy and postnatal period with possible manifestations of intensification of the cardiac insufficiency require a special care.

The pregnant women suffering from cardiac diseases if the indications to caesarean section are absent deliver through the maternal passages. During delivery cardiac glycosides and other cardiotropic drugs, inhalation of the oxygen are performed, adequate anaesthesia, early amniotomy and in-time correction of anomalies of parturition and means to make the II stage of labour shorter are performed.

At the II stage of labour to reduce the postpartum bleeding it is recommended to introduce oxytocin intravenously. Ergometrin preparations in such cases are contraindicated.

Pregnant women suffering from congenital heart diseases in labour and at the postnatal period are recommended to perform the prophylaxis of infectious endocarditis with using antibiotics.

In puerperas with stenosis decompensation can occur during first hours after delivery (acute hemodynamic disturbances).

Coarctation or aortal aneurysm is the contraindication to the conservative delivery. Caesarean section is performed during the insufficiency of blood circulation of II B and III stages, septic endocarditis, acute cardiac insufficiency, expressed pulmonary hypertension, during aortal coarctation.

**Essential hypertension.** Arterial hypertension is observed in 5–10% of the pregnant women. In 70% of them arterial hypertension caused by pregnancy is diagnosed, in 15–20% — essential hypertension (essential arterial hypertension), in 2–5% — secondary hypertension (among with diseases of the kidneys, heart and vessels, endocrine pathology).

In Ukraine the A. L. Myashnikov's classification is applied: I A stage — latent, characterized by the normal indices of ABP in rest and elevation during

the psychical load; I B stage — transitor hypertension, during which episodes of elevation of ABP occur, rarely — hypertensive crises, objective changes are absent; II A stage — constant, but unsteady hypertension, hypertensive crises, spasms of cerebral and coronary arteries are possible, signs of hypertrophy of the left ventricle; II B stage — steady and considerable elevation of ABP, frequent hypertensive crises, attacks of angina pectoris, signs of hypertrophy of the left ventricle, hypertensive retinopathy; III stage — sclerotic (atherosclerosis of the renal and cerebral vessels); III A stage — compensated, without disturbance of blood circulation; III B stage — decompesated with development of cardiac and renal insufficiency, disturbance of the cerebral circulation.

According to the WHO's classification, there are 3 stages of essential hypertension: I stage — elevation of ABP from 160/95 till 179/104 mmHg, but without organic disturbance of the cardio-vascular system function; ABP is labile, can change during the day; II stage — elevation of ABP from 180/105 till 199/114 mmHg, hypertrophy of the left ventricle without signs of injury of other organs; III stage — elevation of ABP from 200/115 mmHg and higher with injury of the heart and other vitally important organs (brain, kidneys, retina).

*Clinical picture and diagnosis.* Clinical picture of essential hypertension depends on the stage of disease. Woman with III stage of disease pregnancy is contraindicated and do not almost occur.

Anamnesis is gathered noticing the inheritance of the patient, ECG is performed, the condition of the retina (fundus oculi) and function of kidneys is investigated for diagnosis, including differential, of late gestosis. Changes in the urine are absent, edema, hypoproteinemia and decrease in diuresis are not observed during I and II stage of disease.

**Course and management of pregnancy and labour.** During the essential hypertension of II B and III stages abortion is recommended at the I trimester. The women who have the II A stage of disease pregnancy is permitted if expressed changes in the cardio-vascular system and kidneys are absent. During pregnancy the patient is kept under observance of the obstetrician and therapist. Planned hospitalization of such pregnant women is done 3 times: at the I trimester, in period of maximal hemodynamic loads (the 28th–32nd week) and in 2–3 weeks before labour, as well as in any cases of accompanying complications.

Late gestosis, which is characterized by the early beginning (often before the 30 weeks), severe course and resistance to treatment, is the most often complication of essential hypertension of the pregnant woman. Contraction of vessels causes the disturbance of uteroplacental blood circulation, development of hypoxia, hypotrophy and in severe cases — death of the fetus and preterm separation of the placenta.

Assessment of the condition of the fetus is performed using the modern capacities of functional diagnosis: monitoring of the cardiac rhythm, biophysical profile of the fetus, dopplerometry of the blood flow.

Hypotensive therapy should include  $\alpha$ - and  $\beta$ -adrenoblockers (clonidine, dopegit, anaprillin), cardi-dilatators and calcium antagonists (apressin, verapamil), spasmolytics (dibazol, papaverin, no-spa) and diuretics, reserpin, magnesium sulphate, neuroleptics (droperidol). Adequate regimen and appropriate diet, which is strictly observed by the pregnant women, sedative drugs (valerian, motherwort, elenium, sibason, relanium) should be included in the treatment. In the case of elevation of ABP droperidol and non-medicamentous drugs are applied: electric sleep, renal inductotermia, cervical galvanization, diathermia. Treatment is performed during the placental insufficiency and intrauterine hypoxia of the fetus (reocorrectors, desagregants, antihypoxants) and accompanying complications of pregnancy.

During the moderate arterial hypertension, absence of the severe form of gestosis labour is done through the maternal passages, applying anaesthesia and controlling the ABP, directed hypotensive therapy, early amniotomy, prophylaxis of anomaly of parturition and hypoxia of the fetus are performed. The duration of the II stage of labour is shortened (perineotomy, obstetrical forceps). At the III stage of labour prophylaxis of bleeding is done. Caesarean section is recommended in cases of combined obstetrical pathology, hypoxia of the fetus, severe forms of gestosis, separation of the retina and preterm separation of the placenta.

**Arterial hypotension** of pregnancy is a decrease in ABP less than 100/60 mmHg; it is observed in 12% of pregnant women and can correspond to 2 hemodynamic variants: hypokinetic (minute volume of blood reduces, peripheral vascular resistance does not change) or eukinetic (minute volume of blood does not change, peripheral vascular resistance reduces). The pregnant women complain of weakness, emotional lability, reduce of working capacity, unpleasant sensation in the heart, sweating, chilling of hands and feet and paresthesia.

During examination of pregnant women one should pay attention at asthenic constitution, paleness of the skin, hyperhidrosis, acrocyanosis, sometimes bradycardia, breathing arrhythmia and extrasystolia can manifest.

Threat of abortion, hypoxia of the fetus, uterine inertia and postpartum hypotonic bleeding are the frequent complications of the gestational period.

Non-medicamentous therapy play's an important role in treatment of the pregnant women: adequate regimen of rest and work, massage, exercise therapy, aerophitoionotherapy, balneotherapy. Adaptogens are also used: preparations of radix of ginseng, Maintain angelica, schizandra, eleuterococcus, rhaponticum carthamoides, pantocrin. Panangin, ryboxin, B group vitamins and ascorbic acid, oxygenotherapy are used

to improve the metabolic processes in the myocardium.

The incidence of cerebrovascular disturbances in pregnant women is 4:100 thousand of women aging 25–35 years, and older — increases 13 times. Aneurysm, or other developmental defects of the vessels, embolism and thrombosis of cerebral vessels are these disturbances. Cerebrovascular disturbances begin spontaneously with the acute headache, disturbances of vision, consciousness or its loss and also cardiovascular insufficiency. Diagnosis is made on clinical manifestations and confirm with computer tomography and angiography. Treatment includes the support of the activity of the cardiovascular system of the mother and observance under the condition of the fetus till the viable gestational age. Special treatment depends on etiology of cerebrovascular disturbances.

**Aneurysm** is asymptomatic before its rupture, which occurs in women over 30 years. Rupture of the aneurysm occurs at the end of pregnancy and requires the supporting, and, if necessary, surgical treatment (arterio-venous shunt).

**Embolism of the cerebral vessels** is the most frequent cause of paralysis during pregnancy. Mitral stenosis with fibrillation of atriums, cardiomyopathy with parietal thrombi, cerebral vasculitis, thrombotic, thrombocytopenic purpura, polycythemia and sickle-cell anemia are the factors of risk of this complication. Treatment is turned on detection and liquidation of the cause of disease.

## DISEASES OF BLOOD AND HEMOPOIETIC ORGANS

**Anemia of pregnancy** — is a disease which is characterized by the reduce of hematocrit number (less than 0.3 or 30%) or quantity of hemoglobin (less than 100 g/l), erythrocytes (less than  $3.2 \cdot 10^{12}$  in 1 l) in the blood. The incidence of anemias is 15–20% of all diseases during pregnancy and in recent years grows (it is the most frequent extra-genital disease of the pregnant women). Iron-deficient anemia is the most spread, which is 95%. During the physiological pregnancy volume of blood plasma increases in major degree than volume of erythrocytes. Because of this the reduction of hematocrit number occurs (physiological anemia, hyperplasmia of the pregnant women). Such condition is not true anemia and is observed in majority of women in 28–30 weeks of pregnancy.

**Etiology, pathogenesis.** Monthly loss of iron with menstrual blood in combination with insufficient amount of iron and proteins, which are consumed with food, is the cause of low indices of hematocrit,



rate of hemoglobin and serum iron in women before pregnancy and its beginning. As the result of increase in the volume of erythrocytes in the pregnant woman's blood and also requirements of the fetus and the placenta in iron additional consumptions of iron, which exceed its supply are necessary as the result of which **iron-deficient anemia** develops. During a physiological single pregnancy a mother needs nearly 800 mg of iron, 300 mg of which are consumed by the fetus and placenta and 500 mg provide the increase in the mother's hemoglobin amount. Nearly 200 mg of iron is lost with the skin, intestine and excreted with urine. A pregnant woman requires nearly 100 mg of iron. Despite of the difference between the iron accumulation and requirement in it during pregnancy is partially compensated by the increase in its absorption through the digestive tract, iron-deficient anemia develops.

With each pregnancy a woman loses 500 mg of iron, in connection with a which future pregnancies, especially with a short intergenetic interval (less than 2 years between labour), aggravate the iron deficiency in the maternal organism. Deficiency of folic acid, vitamins — pyridoxine (B6), cyanocobalamin (B12) and ascorbic acid (C) play a certain role in the reduce of iron accumulations.

**Clinical picture and diagnosis.** Weakness, dizziness, dyspnea as the result of physical load, headache, "spots" flashing are the clinical symptoms of anemia. During the objective examination paleness of the skin and visible mucous membranes, slight tachycardia and tachypnoe, arterial hypotension can be detected, systolic murmur in the cardiac apex and in the place of projection of the pulmonary artery can be auscultated.

Laboratory indicators of anemia: decrease in hemoglobin content (less than 100 g/l), hematocrit (less than 0.3, or 30%), colour indicator (less than 0.85), amount of the iron in blood plasma (less than 13 mmol/l), decrease in iron-binding capacity of transferrin and indicator of transferrin saturation with iron (35–50% in the norm). During the severe cases of iron deficient anemia erythrocytes become hypochromic, change their form and sizes, reduce in volume (micro-, aniso- and poikilocytosis). Ferritin's rate in the blood serum is the evidence of iron accumulations in the organism.

**Treatment and prophylaxis.** Pregnant women are prescribed an adequate diet with increased content of iron, protein, vitamins and microelements (ham, liver, greenery, beans, apples and honey), oral iron preparations (325 mg of iron sulfate per day). Ferroplex, actiferin, ferogradumed and tardiferon are recommended to apply. Only intolerance of oral iron preparations or insufficient absorption in the intestine is the indication to parenteral (intramuscularly) introduction of iron (250 mg on each 1 g of hemoglobin lower the norm). Approximately in 1 week after the beginning of treatment with iron preparations increase

in reticulocytes quantity occurs. Hematocrit number stabilizes lower because of the physiological hypervolemia in the pregnant women.

Blood transfusion to pregnant women should be performed only by vital indications before labour (threat of immunization of the pregnant woman as the result of insufficient utilization of iron).

For prophylaxis of iron-deficient anemia pregnant women of group of risk and during the reduce of hemoglobin's content lower than 110 g/l are prescribed oral application of iron preparations and complex of vitamins ("Hendevit", "Undevit", "Unicap").

**Course and management of pregnancy and labour.** Anemia increases the risk of miscarriage, preterm separation of the placenta, anomalies of parturition, obstetrical bleeding, intrauterine hypoxia and hypotrophy of the fetus, postpartum infectious complications in mother and newborn.

Labour is recommended to perform conservatively (danger of the massive bleeding during the abdominal delivery).

**Megaloblastic anemia** (pernicious) can be folic-deficient and caused by the deficiency of cyanocobalamin (vitamin B12). Folic-deficient anemia occurs in multiparous women over 30 years, and during the multiple gestation, during eclampsy, long application of antiepileptic drugs with antifollic effect and as the result of using oral contraceptives. Folic acid is contained in greenery, that's why inadequate diet can also cause the disease. Megaloblastic anemia, caused by deficiency of cyanocobalamin (vitamin B12) in pregnant women occurs very rarely (as the result of atrophy of the mucous membrane of the stomach or its resection).

Clinical symptoms include fatigue, anorexia, depression. Glossitis, gingivitis, vomiting, diarrhea can develop. Decrease in folic acid or cyanocobalamin quantity during the normal content of hemoglobin and serum iron, hypersegmentation of neutrophilic granulocytes are detected in the blood. Lack of cyanocobalamin or folic acid can hide the deficiency of iron in the organism.

Folic deficient anemia can be complicated by development of secondary infection, bleeding and separation of the placenta.

**Treatment** is with 100–200 mg of cyanocobalamin (vitamin B12) or 15 mg of folic acid till the hematologic remission, as well as in strict diet with high content of vitamins and protein (meat, eggs, milk, liver, curds, fruits and vegetables). After labour spontaneous remission of the disease can occur, but during the future pregnancy FDA, as a rule, repeats.

**Combined iron and folic deficient anemia.** Microcytic changes related to deficiency of iron neutralize the megaloblastic changes as the result of insufficient amount of folates, causing the normocytic, normochromic anemia. During the treatment oral preparations of iron and folic acid in usual doses are prescribed.



**Hemolytic anemia** (1.5% of all cases of anemias of pregnant women) caused by the augmented hemolysis of erythrocytes and can appear as the result of congenital disturbances of metabolism, on example, deficiency of glucoso-6-phosphatdehydrogenase in erythrocytes (inherited by the autosome-dominant type). Anemia can develop after diabetic acidosis, bacterial or viral infection, chemical poisoning (on example, inhalation of naphthalin), using of nitrofurane preparations and sulfanilamides.

Jaundice, enlargement of the liver and spleen, excretion of dark-coloured urine and fecal masses are *the clinical manifestations*. Microspherocytosis and reticulocytosis are detected in blood.

*Treatment* is begun with the liquidation of contact of the pregnant women with toxic substances and includes the prescription of antimicrobial drugs and preparations of iron. Necessity in blood transfusion occurs rarely.

**Hypoplastic (aplastic) anemia** (0.44% of all cases of anemias of pregnant women) occurs as the result of acute suppression of bone marrow hemopoiesis and is accompanied with pancytopenia. Excessive ionized radiation, intoxication, autoimmune aggression against the cells of the bone marrow are the causes of hypoplastic anemia.

When hypoplastic anemia is detected, it is recommended to perform an abortion. Treatment is in introduction of corticosteroids, performing antibiotic therapy of infectious complications, transfusion of washed off erythrocytes and splenectomy.

**Drepanocytic anemia, drepanocytic C-hemoglobinopathy and drepanocytic  $\beta$ -talacemia** are the most frequent from the group of **drepanocytic hemoglobinopathias**. The incidence of the maternal mortality during these diseases is high, and nearly one half of the pregnancies is finished with abortion, stillborn or neonatal death. Pregnancy aggravates the course of drepanocytic anemia. The incidence of the episodes of vessels occlusion, which cause the acute pain, increase — drepanocytic crisis, which is accompanied by the most frequent complications. Such diseases as pyelonephritis and pneumonia aggravate the severity of anemia. For prophylaxis of severe anemia and drepanocytic crisis and with the aim of treatment hemotransfusion is performed. If the acute pain exists, painkillers are prescribed.

**Talacemias** compose the group of genetically determined hematologic disturbances, which characterized by the disturbance of production of peptidic components of globulin and accompanied by slight hypochromic microcytar anemia, during which the iron preparations are ineffective.

**Thrombocytopenia** can be idiopathic or (more often) combine with such diseases as acquired hemolytic anemia, severe preeclampsy and eclampsy, massive obstetrical bleeding with further hemotransfusion, separation of the placenta, hypofibrinogenemia and disseminated intravascular coagulopathy, septi-

cemia, tuberculosis coagulopathy, systemic lupus erythematosus, antiphospholipidic syndrome, viral infection, intoxication, allergy, megaloblastic, anaplastic or folic deficient anemia, excessive radiation, HELP-syndrome, related to arterial hypertension.

**Immune thrombocytopenic purpura (Werlhof's disease)** is characterized by the production in the spleen of antibodies against own thrombocytes. Thrombocytes, connected with antibodies, destroy in the system of mononuclear phagocytes (reticuloendothelial system), predominantly in the spleen. Treatment with corticosteroids (prednisolon, 20–60 mg per day), which should be performed during pregnancy, contributes to the delay of this process. If the effect is absent, splenectomy is performed. Immunoglobulins G (IgG), which form during the disease, penetrate through the placenta causing thrombocytopenia in the fetus and newborn. In severe cases of the disease there is a high risk of dangerous intrauterine bleeding in fetus during labour. If in blood, taken from the umbilical vein or the skin of the fetal head, considerable thrombocytopenia is tested, in prophylaxis of labour traumatism of the fetus abdominal delivery is performed.

**Disseminated intravascular coagulopathy** related to separation of the placenta, intrauterine death of the fetus, sepsis, preeclampsy, and embolism with amniotic fluid. The increase in the bleeding duration, decrease in factors of coagulation of the blood and high content of products of degeneration of fibrinogen are laboratory indicators of coagulopathy, besides thrombocytopenia.

**Syndrome of antiphospholipid antibodies** (presence of *anticoagulant of lupus erythematosus* in the blood serum) related to disturbance of phospholipid-bound coagulation as the result of paradox increase in activated thrombocytolastic time and is accompanied with excessive high perinatal death (95%), spontaneous abortion and delay of intrauterine growth restriction of the fetus (IUGRF). Unknown cause of the fetus' death at the II or III trimester of pregnancy can be related to *antiphospholipid syndrome*. Treatment of the pregnant women suffering from syndrome of antiphospholipid antibodies includes the using of steroid and low doses of acetylsalicylic acid.

**Leucosis** is a systemic malignant disease of the blood, which is characterized by the severe course. Pregnancy during leucosis is contraindicated, but if it is present, at the I and II trimester artificial abortion with further treatment of the basic disease corresponding to the general principles of therapy is performed.

## DISEASES OF URINARY ORGANS

Infection of the urinary organs is the most spread bacterial infection during pregnancy (up to 15% of

cases). Enlargement of the ureters, renal pelvices and stasis of urine — vesicoureteral reflux, hormonal and immunological changes during pregnancy are the factors of risk. Injury of the soft tissues of maternal passages in labour and delay of urine also contribute to exacerbation of the urinary tract infection.

**Asymptomatic bacteriuria** (more than 100,000 microbic bodies in 1 ml of urine) is detected in 2–12% of the pregnant woman and depends on number of labour in anamnesis and social-economic status of the pregnant woman. In pregnant women suffering from bacteriuria pyelonephritis develops in 30% of cases, when during the previous bacteriuria — only in 1–2% of cases. In 5% of women infection of the urinary tract develops after delivery. In the majority of cases infectious diseases of the urinary tract are caused by the usual perineal gram-negative microflora: *Escherichia coli* up to 90% of cases in both monoculture and in combination with enterobacteriae, proteus, staphylococci, streptococci, clebsiella and pseudomonas aeruginosa.

**Cystitis** is characterized by the frequent urination, disuria, discomfort in the urinary bladder, sometimes hematuria.

Treatment of the patients with mild forms of the urinary infections (asymptomatic bacteriuria, cystitis) includes per os using of antibiotics — semisynthetic derivatives of penicillin: ampicillin (250 mg 4 times a day) or nitrofuranes (50–100 mg 4 times a day).

**Pyelonephritis** (8–12% of cases) is an infectious disease of bacterial origin with predominant injury of interstitial tissue and system of renal pelvices. Pyelonephritis can develop during pregnancy.

**Chronic pyelonephritis** which existed before pregnancy can progress or have a latent course.

**Acute pyelonephritis** is one of the most severe complications of pregnancy in the middle or at the end of II trimester. In 50% of cases it develops in right kidney, in 25% — in both kidneys. Bacteriae penetrate renal pelvices from the lower urinary tract.

**Clinical picture and diagnosis.** Gestational pyelonephritis develops often at the end of II — beginning of III trimester of pregnancy or on the 2nd–5th day after labour. Acute pyelonephritis is characterized with high temperature, fever, pain in bones and muscles, lumbar region, disuria, general fatigue, sometime dehydration and is the indication to hospitalization of the pregnant women.

Chronic pyelonephritis during the latent course does not have the characteristic manifestations. During the intensification of the chronic inflammatory process in kidneys clinical picture is alike with that one during acute pyelonephritis.

Diagnosis is based on the data of anamnesis, typical clinical symptoms, results of laboratory analysis of the urine (clinical, Netchiporenko's, Hamburger's, Kacovski—Addis', Zimnitsky's methods) and blood (anemia, leukocytosis with neutral left shift). Leuko-

cyturia, bacteriuria, sometimes microhematuria, inconsiderable proteinuria and isohypostenuria are detected in the urine; in the sediment of the urine — salts (oxalates, phosphates, urates). Glomerular filtration (by Reberg's test) does not decrease, despite of chronic glomerulonephritis. US of kidneys reveals the enlargement of canaliculo-pelvic system of the injured kidney.

**Course and management of pregnancy and labour.** Concomitant complications of pyelonephritis: threat of abortion or preterm labour, preterm rupture of fetal membranes, iron deficient anemia, late gestosis, hypoxia and hypotrophy of the fetus. It is known, that *Escherichia coli* produces phospholipase A, which contributes to the synthesis of prostaglandins and intensification of uterine activity. Besides, hyperthermia also intensifies the uterine contractions. In 2–3% of cases generalization of the infection of the urinary tract — urosepsis can appear. If the condition of the patient does not improve during 48–72 h, obstruction of the urinary tract should be excluded and antibacterial therapy should be changed. Course of treatment includes antibiotics, uroantiseptics and spasmolytics, vitamins, adaptogens, desensitizing drugs, antioxidants, and lasts for 10–15 days. Before the results of bacterial analysis of urine, electrolytes, dextranes and antibiotics (cephalosporines) are parenterally introduced. It is expedient to use the non-medicamentous methods of treatment: renal tea, vegetable adaptogens, quant hemotherapy, external laser radiation, reflexotherapy.

Labour is recommended to perform conservatively, but in the case of acute forms of late gestosis abdominal delivery, often preterm with intra- and postoperational using of cephalosporines, is done.

Pregnancy is contraindicated during pyelonephritis, complicated with arterial hypertension and nitrogenemia and during the pyelonephritis of a single kidney.

**Urolithiasis** can be detected occasionally during pregnancy (0.2% of cases). Pregnancy does not influence forming of concretions in the urinary tract. Urolithiasis often complicates pyelonephritis caused by proteus, especially during the alkaline reaction of the urine. Obstruction of the urinary tract (concretions more than 10 mm in diameter) can be the reason for surgical intervention with draining of pelvis of injured kidneys with stent or nephrostoma. Antibacterial therapy is performed in postoperational period. Lithotripsy during pregnancy is contraindicated. To confirm the diagnosis one should use the excretory urography with minimal exposition. Symptomatic treatment includes using of spasmolytics and painkillers. Labour is performed conservatively.

**Glomerulonephritis** (up to 0.2% of cases) is an infectious-allergic disease with immunocomplex injury of the renal glomeruli.  $\beta$ -Hemolytic streptococcus of B group is its causative agent. Glomerulonephritis can have acute and chronic course. There are neph-

rotic, hypertensive, combined and latent forms of glomerulonephritis.

**Clinical picture and diagnosis.** Clinical picture depends on the form of disease. *Latent* form is characterized with hematuria and mild proteinuria; *nephritic* — with edema, proteinuria, hypoproteinemia, hypercholesterinemia, sometimes renal insufficiency; *hypertensive* — with elevation of systolic and diastolic ABP during unexpressed urinary syndrome.

During microscopy of the urine sediment hematuria, leukocyturia and cylindruria are detected. In investigations done by Netchiporenko's, Hamburger's, Kacovski—Addis' methods quantity of erythrocytes predominates over the quantity of leukocytes. Elevation of fibrinogen, cholesterol rates is observed, in severe cases — urea, creatinine, uric acid, rest nitrogen. Glomerular filtration by Reberg's test decreases by 40–50%, concentration function of kidneys does not change. Decrease in the renal blood circulation takes place. As the result of acute infection titres of antistreptococcal antibodies increase.

**Course and management of pregnancy and labour.** Pregnant women suffering from renal insufficiency, who are on hemodialysis or had renal transplantation should avoid pregnancy till the decrease in the creatinine level up to 177 mmol/l (2 mg%) or diastolic ABP up to 90 mmHg. Chronic glomerulonephritis is accompanied with spontaneous abortion, chronic arterial hypertension, severe forms of late gestosis, preterm labour, anemia, preterm separation of the placenta, the placental insufficiency, intrauterine growth restriction of the fetus.

First attack of acute glomerulonephritis occurs very rarely during pregnancy. The majority of the obstetrical problems related to the chronic form of this disease. Combination of late gestosis with glomerulonephritis is characterized with early beginning, expressed proteinuria, resistance to treatment and unfavorable perinatal outcome. During the combined severe late gestosis and the placental insufficiency abdominal delivery is the method of choice. Prognosis of the pregnancy course of patients with chronic glomerulonephritis depends on the presence of renal insufficiency, degree of arterial hypertension and proteinuria. Elevation of proteinuria and (or) arterial hypertension during pregnancy aggravates the prognosis of its consequences.

Pregnancy in women with a **transplanted kidney** has better consequences if no less than 2 years passed after the transplantation and there is no rejection or disease of the kidney.

Pregnant women suffering from glomerulonephritis should be kept under the observance of the obstetrician together with the nephrologist. Symptomatic treatment is performed in the in-patient department (spasmolytics, diuretics, hypotensive, antianemic drugs, antihypoxants, reocorrectors, desensitizing drugs). As the result of disturbance of the renal function (reduction of diuresis, glomerular filtration, renal blood cir-

ulation) and protein metabolism, elevation of ABP, combined severe forms of gestosis and the placental insufficiency, preterm delivery is performed. Prophylaxis of bleeding in labour is performed. Caesarean section is done during severe combined forms of gestosis and hypoxia of the fetus.

## DISEASES OF RESPIRATORY SYSTEM

Mechanic and hormonal effects related to pregnancy disturb the functional characteristics of respiratory organs. The majority of women in the second half of pregnancy have dyspnea related to elevation of intraabdominal pressure as the result of uterine growth and decrease in the diaphragmal excursion. Reassuring conversation of the doctor with a pregnant woman and recommendations of sleeping at a sitting position help to solve this problem.

**Pneumonia** is an infrequent, but very severe complication of pregnancy. It is caused by predominantly *streptococcus pneumoniae* and *mycoplasma pneumoniae*. X-ray of the chest and detecting the gas content of the blood for in-time correction of the mother's hypoxia, which influences the fetus, are used to confirm the diagnosis. Treatment includes rehydration, sanation of the bronchial tree, application of antibiotics, antipyretic drugs and, if necessary, oxygen therapy to improve the condition of the fetus.

**Bronchial asthma** is observed in 1% of the pregnant women, 15% of which have 1 or more severe asthmatic attacks during the gestational period. Pregnancy does not directly influence the clinical course of bronchial asthma. Its influence on pregnancy is in elevation of the risk of chronic hypoxia, IUGRF and (rarely) intrauterine death of the fetus. In connection with this treatment of the pregnant women suffering from bronchial asthma should be turned on the reduce of the asthmatic attacks incidence.

Patients with infrequent and mild attacks are recommended to avoid physical load, dehydration, contact with allergens; they should rest enough and in-time detect the symptoms of infectious complications. Women suffering from severe course of bronchial asthma should be consulted in a doctor before fertilization to determine a possibility of pregnancy carrying (sensitivity to  $\beta$ -adrenomimetics). To detect the diagnosis one should make the X-ray examination of the chest to determine the lungs' function. Stimulators of  $\beta$ -adrenoreceptors of bronchi (terbutalin and others), xantines preparations (theophillin, aminophyllin) for treatment of the pregnant women suffering from bronchial asthma. Xantines inhibit phosphodiesterase and contribute to accumulation of cyclic adenosine monophosphate, prevent the development of bronchospasm. During the severe attacks of bronchial asthma 10 ml of 2.4% solution of ami-



nophyllin, 1 ml of ephidrin by 200 ml of 5% solution of glucose and 30–60 mg of prednisolon are introduced. Glucocorticoids penetrate through the placental barrier and cause the IUGR of the fetus. Risk of these complications intensifies with acute hypoxia during the severe form of bronchial asthma.

Pregnant women suffering from bronchial asthma should be kept under observance of the obstetrician with pulmonologist. Such patients are hospitalized at early terms of pregnancy for their complete examination, as well as if other complications are absent, before labour for the detection of the rational plan of management. In pregnant women suffering from bronchial asthma development and activity of the heart of the fetus is kept under observance.

Labour are performed in majority of cases through the maternal passages. Prostaglandins are not used for correction of uterine inertia (they can provoke asthmatic attacks).

**Tuberculosis of bronchi, lungs and pleura** is not a frequent disease in pregnant women, however, influences the elevation of the incidence of spontaneous abortions and preterm labour. Abortion in early terms is recommended to perform in the case of fibrous-cavernous pulmonary tuberculosis with forming of caverns, active tuberculosis with injury of the osseous-muscular system and also during bilateral tuberculosis of the kidneys.

X-ray examination of the chest after 20 weeks of pregnancy, immediately after labour and in 6 months after delivery is used to confirm the diagnosis. Treatment includes the antituberculous drugs (PASA, isoniasid, tubasid), vitamins of B group and ascorbic acid. If the tuberculosis process is not active (positive skin tests and negative results of X-ray examination), treatment with isoniazid is performed during 1–2 years. Patients with active form of tuberculosis (during the positive cultures) are treated as a rule with isoniazid, rifampicin and pyridoxin during 3–5 years.

Labour is performed predominantly through the maternal passages; caesarean section is done by obstetrician indications. During the closed form of tuberculosis breast-feeding is permitted.

## ENDOCRINE DISEASES

**Diabetes mellitus (DM)** is one of the most frequent (after anemias and urogenital infection) causes of complication of pregnancy, which can cause high perinatal mortality (to 5%). More than 1% of women suffer from diabetes mellitus before pregnancy (pregestational diabetes). Such pregnant women are recommended to perform optimal control over the glucose rate in the blood before the fertilization and during pregnancy, this contributes to the reduce of risk of congenital developmental anomalies and complications for mother and fetus.

**Diabetes mellitus type I or insulin-dependent diabetes mellitus (IDDM)** related to the deficiency of secretion of insulin and develops predominantly in young persons. **Diabetes mellitus type II or insulin-independent diabetes mellitus (IIDM)**, as a rule, begins at the age over 30 years and is characterized by the insensitivity of the insulin-dependent tissues to insulin. Diabetes mellitus type I and II develops irrespective of pregnancy, it is called **pregestational diabetes**.

DM of pregnant women is characterized by the disturbance of the tolerance to glucose during pregnancy; pregnancy is considered as diabetogenic factor. Presence of glucosuria is not a still criterion to make the diagnosis of this disease: as the result of elevation of the permeability rate of kidneys for glucose during pregnancy, glucosuria can be detected in healthy pregnant women.

There are 3 forms of DM of the pregnant women (according to the degree of severity): 1) mild, during which glycemia on an empty stomach is no more than 7.7 mmol/l (in the norm 4.4–6.6 mmol/l); 2) moderate — glycemia on an empty stomach is no more than 12.21 mmol/l; 3) severe — glycemia on an empty stomach is more than 12.21 mmol/l. Very often in patients with a mild form of DM the disease is compensated with appropriate diet. During the mild form insulin is applied in the dose of 60 U/day; during the severe form the dose of insulin is, as a rule, more than 60 U/day. Complications as ketoacidosis, lability of the diseases' course, insulinoreistence and generalized angiopathias are observed.

Depending on the course of disease, time of its appearing and presence of the vascular complications in the pregnant woman, foreign obstetricians divide DM into classes (A, B, C, D, F, R, H).

Preserving of pregnancy depends on the stage of compensation of DM and concomitant complications. Contraindications to carriage of pregnancy: insulin-independent DM, lability of the course of diabetes mellitus with predisposition to ketoacidosis; presence of DM in both parents; DM complicated with angiopathias; combination of DM and rhesus-deficiency immunization; combination of DM and active pulmonary tuberculosis.

Pregnancy aggravates the course of DM. Contrinsular effect of the hormones of pregnant women and fetoplacental system (chorionic somatomammotrophin, oestrogens, progesterone, insulinase of the placenta) causes the reduction of tolerance to glucose. Intensification of lipolysis, ketogenesis and concentration of free lipous acids in the blood serum contributes to the development of diabetic ketoacidosis.

Pregnancy during DM if there is no adequate control over the glucose rate in the blood can be complicated by spontaneous abortion, infection of the urinary tract, preeclampsy (30–50%), retinopathy (15%). The incidence of congenital anomalies of the



fetus with predomination of defects of the heart, vertebral column and extremities increases 3 times, polyhydramnion — 10 times. During polyhydramnion risk of the placental separation and preterm labour elevates, especially in pregnant women suffering from DM for a long time (class > C).

*Macrosomia of the fetus* is usually observed in pregnant women suffering from a mild form of DM and not for a long time with gestational DM; and *intrauterine growth restriction of the fetus* — in pregnant woman with the severe form of diabetes mellitus and for a long time, which is accompanied by vascular complications. As the result of instability of the rate of glucose in mother's blood, frequent ketoacidosis, the incidence of antenatal death of the fetus and stillborn increases, which is related to the development of the placental insufficiency and acute hypoxia of the fetus. In newborn risk of labour injury, RDS-syndrome, hypoglycemia, hypocalcemia, hyperbilirubinemia and polycytemia increases. DM of pregnant women is often observed during the perinatal screening in women with factors of risk of this disease: births of children with weight more than 4,000 g, spontaneous abortion, family DM, obesity, constant glucosuria.

The tests of glucose tolerance are carried out in pregnant women to detect the gestational DM at the term of 24–28 weeks of pregnancy. A pregnant woman receives 50–100 g of glucose per os. If in 1 h the rate of glucose in the blood plasma is more than 9.99 mmol/l, and in 2 h after the load is 8.32 mmol/l, the test is positive and it should be repeated. 2 abnormal (or more) results of the test are the evidences of gestational DM.

**Management of pregnancy and labour.** Informativity of the patient as for this disease is in the base of management of pregnant women suffering from DM. Only the optimal control over the glucose rate in the blood helps to prevent multiple complications of pregnancy and DM.

Treatment is in strict observance of adequate diet (126 kJ or 30 kkal/kg of the weight per day; 25% of lipids, 25% of proteins and 50% of carbohydrates), during this the majority of women suffering from gestational diabetes mellitus (class A-1) do not require the additional prescription of insulin. Insulin is prescribed during the symptoms of subcompensation of the disease (xerostomia, thirst; xeroderma and itching, high appetite among with weight loss).

Women suffering from DM during pregnancy insulinotherapy are performed under the control of the glucose rate in the blood. Dose is counted by endocrinologist (approximately, 6–8 U on each 2.77 mmol/l of glycemia above the norm). If the glycosuria is present (over 1.1%) in all portions of urine, the increase in the insulin dose by 4–8 U during each injection is required. Women suffering from IIDM during pregnancy should also be transferred to insulinotherapy in connection with teratogenic effect of per oral

antidiabetic preparations. Insulin does not penetrate through the placenta and does not directly influence the fetus.

Pregnant women, as a rule, are introduced the combination of insulin of prolonged (or semi-prolonged) and short effect during morning (2/3 of the dose) and evening (1/3 of the dose) injection. During pregnancy the need in insulin increases because of elevation of resistance to it under the effect of contrainsular hormones.

Control over the glycemia rate in women with insulinotherapy should be performed 4 times a day (at 7:00, 11:00, 16:00, 22:00). The rate of glucose on an empty stomach is no more than 6.6–7.3 mmol/l and in 2 h after the meal — no more than 8.8 mol/l is an “ideal” glucose rate.

It is necessary to know that the level of glucose on an empty stomach characterizes the adequacy of the evening dose of insulin of the past day; at 11:00 and 16:00 — of a morning dose and at 22:00 — of an evening dose of insulin.

Fraction of glycolized hemoglobin reflects the glucose rate during 6–8 further weeks. This test is used for control over the glucose rate to prevent the congenital developmental anomalies of the fetus in the early term of pregnancy.

Diabetic ketoacidosis, which develops as the result of insufficient control over the glucose rate, is a severe complication in pregnant women suffering from DM. Treatment of pregnant women with ketoacidosis includes the correction of the insulin's dose (frequent introduction of insulin of the short effect under the control of glycemia), rehydration, introduction of 5% solution of glucose, potassium's preparation and stabilization of the electrolyte content of the blood.

Development of hypoglycemic condition in a pregnant woman requires the immediate introduction of 20–50 ml of 40% solution of glucose.

Monitoring of the condition of the fetus in pregnant women suffering from DM is begun from the 30th–32nd week of pregnancy (daily count of the fetus' movements, the nonstress test, biophysical profile usually 1–2 times a week depending on the condition of the pregnant women). US is done several times during pregnancy to detect the developmental anomalies of the fetus and polyhydramnion and to observe under the growth of the fetus (macrosomia, IUGRF).

Delivery during the adequate control over the glucose rate, absence of obstetrical complications and macrosomia and prepared maternal passages is recommended to perform by labour induction during the maturity of the fetus. Preterm delivery is usually done by vital indications on the mother's part. If the gestational age of the fetus is no more than 37 weeks, risk of neonatal RDS-syndrome increases. This is related to the reduction of production of phospholipids and surfactant during DM. Because of this it is necessary to detect antenatal “maturity” of the lungs of the fe-

tus during DM of the pregnant woman with not less than 2 tests. Caesarean section is performed if the fetus weighs more than 4,000 g, there are obstetrical and diabetic complications and pelvic presentation. During the spontaneous or induced labour it is necessary to control the rate of glucose, pH and gases in blood. In labour intravenous introduction of 5% solution of glucose and insulinotherapy is performed according to the level of glycemia (insulin of short effect).

At the postnatal period the glucose rate normalizes in 95% of women suffering from gestational diabetes. In parturient women suffering from pregestational diabetes a necessity in insulin during the first days after delivery decreases 2 times, which is related to elimination from the blood or decrease in the content of hormonal antagonists of insulin (chorionic somatomammotrophin, progesterone, oestrogens). However, in some weeks the necessity in insulin elevates till the level before pregnancy.

**Diseases of the thyroid gland.** *Hyperthyroidism* is observed in 0.2% of the pregnant women and does not directly influence the incidence of spontaneous abortions, congenital developmental defects of the fetus, however, causes the increase in the frequency of preterm labour, postpartum bleeding, complications of the cardio-vascular system, psychosis, preeclampsy and IUGRF. Pregnancy is contraindicated during severe hyperthyroidism.

Pregnant women suffering from *hyperthyroidism* complain of rapid palpitation, nervousity, rapid fatigue, disturbance of sleep, feeling of heat, sweating, arms tremor and exophthalmia. Arterial hypertension and high pulse pressure are the characteristic features.

In pregnant women suffering from hyperthyroidism increased content of thyroxin and protein-bound iodine among the normal level of TTH and increased main metabolism is detected. On ECG sinus tachycardia and elevated voltage of waves are detected.

Treatment of such pregnant women is in using antithyroid drugs (on example, diiodthyrosin in the dose of 50–200 mg per day or methyluracil by 0.1 g 2–4 times a day per os). Antithyroid preparations penetrate through the placenta and can be the cause of hypothyroidism and goiter of the fetus. During pregnancy a necessity in surgical treatment appears rarely (operation is performed in the second half of pregnancy, if necessary).

*Hypothyroidism* rarely occurs during pregnancy. Its severe forms are accompanied with infertility, spontaneous abortions, preterm labour, developmental defects of the fetus. Function of the thyroid gland is controlled with laboratory analysis of thyroxin and triiodthyronin. Complains of the patients: flabbiness, drowsiness, xeroderma, shedding of the hair (alopecia), brittleness of the nails and steady constipation. Bradycardia and paleness of the skin and slowed speech are observed. The decreased content of thyroid hormones is detected in the blood.

Pregnant women suffering from hypothyroidism are prescribed thyroxin (0.05–0.1 mg, sometimes to 0.3 mg per day), thyreoidin and triiodthyronine.

**Diseases of parathyroid glands.** *Hyperparathyroidism* is a rare disease, which is accompanied by the high level of perinatal morbidity rate and mortality. Newborns have low weight. Convulsions take place in 50% of children, related to the termination of receiving calcium from a mother's organism. Surgical removal of the parathyroid glands is the method of choice.

*Hypoparathyroidism* is a very rare disease during pregnancy, which can be connected with accidental removing of the parathyroid glands during thyroidectomy. Calcium preparations and ergocalciferol (vitamin D) are prescribed for treatment.

**Chronic insufficiency of cortical substance of adrenal glands** (Addison's disease), **Cushing's syndrome, congenital hyperplasy of the adrenal glands, hyper- and hypopituitarism** occur rarely in combination with pregnancy.

*Diabetes insipidus* also rarely occurs and does not directly influence on pregnancy.

Women suffering from *prolactinoma of hypophysis*, which use bromcriptin, should avoid its using during pregnancy. With the symptoms of the enlargement of hypophysial tumour (headache, change of the binocular field) a necessity in surgical treatment can appear.

*Pheochromocytoma* (tumour of the meningeal substance of the adrenal glands) is a rare but very dangerous disease during pregnancy. Maternal mortality from hypertensive crisis with pheochromocytoma can be 50%, especially if this disease was not diagnosed before labour. Computer tomography and nuclear magnetic resonance help to detect the tumor. Some patients require the surgical intervention during pregnancy.

*Obesity* contributes to the increase in the frequency of such complications of pregnancy as DM, arterial hypertension, prolonged pregnancy, uterine inertia, induced labour, stimulation with oxytocin, macrosomia and dystocia of the fetus' shoulders, caesarean section, increased blood loss and infection of the wound. Pregnant women suffering from obesity are recommended to keep a balanced diet. Starvation is a contraindication because of ketoacidosis and its negative effect on the fetus.

## INFECTIOUS DISEASES

**Streptococcal infection.** *Streptococcus of B-group* ( $\beta$ -hemolytic streptococcus of B-group) is the main cause of perinatal infection. Asymptomatic cervical colonization of  $\beta$ -hemolytic streptococcus of B-group occurs in 30% of the pregnant women. Clinical manifestations of infection are observed in 1–4 in

1,000 of children, born alive. Early beginning of streptococcal infection is characterized with septicemia, pneumonia and (or) meningitis. Premature newborns are more affected by this infection. Late beginning of infection is observed in 4 weeks after delivery and in majority of cases manifests with meningitis (mortality is 25%). Meningitis develops with equal frequency in both premature and full-term newborns.

If the streptococcal culture was discovered, especially in pregnant women with factors of risk of preterm labour and preterm rupture of membranes, treatment is performed with natural or semisynthetic preparations of penicillin.

Streptococcal endometritis takes place in 24 h after delivery and is accompanied with tachycardia, fever and a tendency to generalization of septic process.

**Syphilis.** *Treponema pallidum*, which transmitted during the direct contact, penetrate through intact mucous membranes or districts of ruptured skin, is the causative agent of syphilis. Women who ignore treatment have the high risk of spontaneous abortion, stillborn and neonatal death of the fetus. Congenital syphilis can be asymptomatic or be accompanied by the classical stigmas of this syndrome. The majority of the newborn does not have the manifestation of disease before the 10th–14th day of life. The early manifestations of disease: maculo-papulous rash, disturbance of nasal respiration, maculae on the mucous membrane of the nasal part of pharynx, hepatosplenomegaly, jaundice, lymphadenopathy. Late signs of congenital syphilis are Hutchinson's teeth, saddle-like nose and saber shin. Serologic tests are used to confirm the diagnosis (Wasserman's reaction).

Treatment of the patients with syphilis in Ukraine is performed by venerologists, in the USA treatment of such patients is performed by obstetricians-gynaecologists and is in parenteral single introduction of 2.4 mln U of benzylpenicillin, if the period of primary, secondary or latent infection is not longer than 1 year. If latent infection lasts more than a year, 3 injections with a week interval are introduced. Fourfolds elevation of serologic titre is an evidence of inadequate treatment or reinfection.

**Gonorrhoea.** Frequency of *gonorrhoea* in pregnant women is 1–8%. In labour mother can transfer to the newborn microorganisms, which cause the gonococcal blenorrea and (in severe cases) even blindness. Routine prophylaxis of gonorrhoea is in prescription of eye drops of sulfacil sodium.

In a pregnant woman symptoms of local infection of lower segment of the urinary and genital tract, the rectum and pharynx cannot manifest. Without adequate treatment persistence of infection can cause the gonococcal arthritis, infection of the fetus in labour (blenorrea), postpartum infectious complications (endometritis, pyosalpinx) with tendency of generalization of septic process.

Treatment of an adult patient should be performed taking into consideration the possible concomitant chlamydial infection. Control over the effectiveness of the treatment is performed in 5–7 days after its finishing.

**Chlamydial infection** is caused by obligate intracellular bacterial organism *Chlamidia trachomatis*. Its course is often asymptomatic. Cervicitis with white or flabby mucous discharge, in which polymorphic-nucleic leukocytes are detected, can be the manifestation of infection. Verification of chlamydial infection is possible with the help of serological diagnosis, immunofluorescent, immunoenzymatic methods, polymerase chain reaction and bacterial examination. Erythromycin in the dose of 500–800 mg 4 times a day during 7 days is prescribed in the case of confirmation of diagnosis of the pregnant woman.

**Herpetic infection.** Genital herpes is caused by the virus of simple herpes type 2 (VSH-2), which contains deoxyribonucleic acid (DNA) and penetrates the genital tract during the sexual contacts (coitus). Herpetic infection can be primary and recurrent. Primary form of herpes genitalis is very dangerous for the fetus. During delivery through the maternal passages the fetus is infected in 50% of cases, neonatal death among the infected patients is 60%. Severe neurological complications develop in every second survived child.

Cytologic method, immunoenzymatic analysis of antibodies (is informative in the period of acute stage and healing), polymerized chain reaction and virological method are used for diagnosis. Tender vesicles on the skin, which rupture and transform in small ulcers, are the clinical signs of infection. Visualization of herpetic infection of the pregnant women in the lower genital tract is very important. If there are no manifestations of infection, delivery is performed through the maternal passages. If the infection on the cervix, in the vagina and on the vulva during labour and in the case of the preterm rupture of membranes is discovered, caesarean section is done. Herpetic infection develops in 1 of 20 newborns even during a caesarean delivery. In severe cases acyclovir is prescribed for pregnant women suffering from genital herpes, but it is rather dangerous for mother and fetus.

Infection in newborns manifests itself in three forms: 1) disseminated with injury of internal organs; 2) localized with injury of the CNS, eyes, skin and mucous membranes; 3) asymptomatic.

**Cytomegaloviral infection.** It is detected in 1% of the newborn and can be the cause of congenital infections. Cytomegalovirus (CMV) contains DNA, can reproduce in the saliva, sperm, secrete of the cervix, breast milk, blood and urine. CMV-infection is often asymptomatic, but can cause a brief disease with subfebrile temperature. CMV like herpetic infection can have latent period and activates later. Presence of both primary maternal infection and recur-



rent is 0.5–1.5% risk of intrauterine infection of the fetus. Severe injuries of the newborn more often connected with primary seroconversion during pregnancy. Nearly 10% of infected newborns have congenital defects of different degree of severity, including microcephalus, intrauterine calcification, IUGRF, hepatosplenomegaly. In 10% of infected newborns with asymptomatic infection senso-neural loss of audition and chorioretinitis develop and neurological disturbances appear.

Diagnosis is based on clinical, cytological, serological, virological data. Normal immunoglobulin of the human for intravenous introduction is used. Despite of herpetic infection, acute CMV-infection of the lower genital tract is not related to increase in the risk of fetal injury as the result of delivery through the maternal passages and is not an indication to caesarean section.

**Papillomaviral infection** is caused by some types of papillomaviruses of human and can cause the development of mucous-cutaneous condylomas. *Condyloma acuminatum* (genital or venereal) is, as a rule, caused by viruses of types 6 and 11. Viral types 16, 18, 31, 33 and 35 can be the cause of development of intraepithelial and, possibly, invasive carcinoma of the cervix and vulva. During pregnancy the growth of condylomas can be intensified because of the increase in production of vaginal secret. Treatment is often ineffective, but after delivery spontaneous regression of pointed condylomas is possible.

**Rubella** is caused by RNA-containing virus, which can cause the severe perinatal injuries. Approximately 15% of women of reproductive age do not have immunity to this virus and are susceptible to infection. Rubella is transferred by aero-dropped way; its incubational period is nearly 2–3 weeks. Primary rash appears, as a rule, in 7 days after the contact with patient, and disappears in 4 days.

If a pregnant woman is infected by the rubella virus at the I trimester, the risk of spontaneous abortions and congenital syndrome of rubella of fetus increases. In 50–70% of children with congenital rubella symptoms of disease develop gradually. Such symptoms as congenital heart diseases, delay of psychological development, deafness, cataract, dysplasia of the teeth in a child are connected with the disease. The risk of congenital rubella depends on the gestational age of the fetus and time of infection: 9/10 of children acquire this syndrome, if infection develops before the 11th week of pregnancy, 1/3 — at the period of the 11th–12th week, 1/4 — at the 13th–14th week, 1/10 — at the 15th–16th week and 1/20 — at the III trimester of pregnancy.

Primary infection can be diagnosed with serological methods (rates of Ig M- and Ig G-antibodies). Specific antibodies reach the maximal level in a week and disappear in a month after the beginning of the disease. To prevent the infection of rubella virus vaccinations are recommended, but not earlier than before 3 month before the planned pregnancy. If the

antibodies against the rubella virus are absent, it is recommended to perform vaccination at the postnatal period. Breast-feeding is permitted. There is no effective treatment of rubella in pregnant women. Immune gammaglobulin does not prevent the infection and does not improve its course.

Rubella in pregnant women at the I trimester is an indication to abortion. In women who had the rubella pregnancy is permitted not earlier than in 6 months after healing.

**Toxoplasmosis** is a multisystemic disease, caused by intracellular parasite *Toxoplasma gondii*. In majority of cases chronic infection is not dangerous for the fetus, but acute disease during pregnancy can cause severe injuries of the fetus.

Human is infected after consuming the fresh or not enough thermally processed meat contaminated with cysts and during the contact with infected cats, which excrete spore-forming oocytes. They can preserve in damp ground more than a year. The cats which during the hunting kill their victims are the reservoir of infection.

Asymptomatic infection is very spread: nearly 1/3 of women of reproductive age have antibodies to toxoplasma. Infection at the I trimester causes the more severe injuries of the fetus than at the III trimester; however, the frequency of infection is higher in the 2nd half of pregnancy. Nearly 60% of children delivered from the mothers infected during pregnancy, have the serological confirmation of the presence of infection. Signs of infection do not manifest in 75% of them in labour. Congenital toxoplasmosis can cause the delay of psychological development, chorioretinitis, blindness, epilepsy, forming of intracranial calcificates and hydrocephalus.

Serological confirmation is the base of diagnosis during the asymptomatic course of toxoplasmosis.

If the infection is suspected, monitoring of fetal condition is performed.

Treatment of pregnant women suffering from toxoplasmosis is problematic because with potential teratogenic effect of the drugs (chloridin, pyrimetamin and others), especially at the I trimester. For the treatment of the newborns mentioned preparations are combined with folic acid, which neutralizes their toxic effect; sulfadiazine is prescribed additionally. Treatment with sulfanilamide preparations is rather effective, however it should be finished before labour to prevent hyperbilirubinemia of the newborn (sulfanilamide preparations have more affinity with albumin than bilirubin has).

Prophylaxis of infection is an important part of perinatal care and is based on thorough thermic processing of meat and control over the food of domestic cats.

**Viral hepatitis** has some forms: 1) viral hepatitis A (VHA); 2) viral hepatitis B (VHB); 3) viral hepatitis C (VHC), or non-A, non-B hepatitis, which is transmitted parenterally; 4) viral hepatitis D (VHD); 5) vi-



ral hepatitis E (VHE), or endemic non-A, non-B hepatitis.

*Viral hepatitis A* is transmitted with consuming of contaminated food, water or by a fecal-oral way and composes 10% of all cases of hepatitis during pregnancy. Its symptoms manifest after the incubational period (15–50 days) and are predominantly dyspeptic disturbances (nausea, vomiting, sense of load in the hypogastrium, asthenic syndrome); latent course of the disease is possible.

Course of *viral hepatitis C, D and E*, as a rule, is mild, together these forms compose nearly 10% of all cases of viral hepatitis during pregnancy.

*Viral hepatitis B* is the most spread form during pregnancy (80% of cases). It is transmitted with infected blood or serous of the body (sperm, saliva, vaginal discharge), through the skin and mucous membranes; its incubational period is 15–50 days. Drug-addicts, homosexualists, medical staff and everybody, who potentially contacts with contaminated material, persons, who have many sexual partners, patients with hemophilia and other diseases, which require the regular treatment by the blood preparations compose the group of infection of VHB.

Viral hepatitis B can have asymptomatic course or can be accompanied with elevation of the body temperature, nausea, coma, in rare cases — cause the lethal outcome. Rate of transaminases (AST, ALT) and albumin elevate in the blood serum. The majority of the patients heal in 3–6 months.

Pregnancy aggravates the course of viral hepatitis. In patients suffering from viral hepatitis A and B it can be complicated with the symptoms of abortion, preterm labour. In labour and early postnatal period the risk of bleeding (development of DIC-coagulation) increases.

Treatment of pregnant women suffering from viral hepatitis should be supporting. It is based on observance of balanced diet, hospitalization, performing of detoxicational therapy. Transplacental transmission of the virus from the mother to the fetus (except labour) is rare, because the maternal antibodies against the virus penetrate through the placenta easier than superficial antigen HBs-Ag. If the disease occurred at the I trimester of pregnancy, 10% of children are infected, at the III trimester — up to 85% of children. There can be no clinical signs of disease or the viral hepatitis with lethal outcome can develop in newborns. Children which are the carriers of virus of hepatitis B have the increased risk of development of cancer or cirrhosis of the liver in future.

If in mother during pregnancy VHB-antibodies are detected, active (hepatitis-B-vaccine) and passive (hepatitis-B-immunoglobulin) immunization is performed to the newborns. Combined vaccine is recommended to introduce the pregnant women with increased risk of disease of viral hepatitis B no later than in 48 h before the clinical manifestations of viral hepatitis B.

During the acute viral hepatitis occurred in the early term of pregnancy abortion is recommended (possible teratogenic effect of virus) in the period of healing.

*Acquired immunodeficiency syndrome (AIDS)* is caused by human immunodeficiency virus (HIV), which its own RNA can transform into DNA with specific enzyme — reverse transvertase. Annually only in the USA 50,000 of people are infected. Virus injures only T-lymphocytes-helpers. Constant destruction of them as the result of reproduction of HIV causes the exhaustion of lymphocytic population, change of correlation of T-helpers/T-suppressors and, as a result, the clinical manifestation of the defect of cellular immunity.

Alive virus was received both from the blood, urine, sperm, breast milk, vaginal secrete and majority of the tissues of the body. Transmission virus occurs during the direct contact with infected material, especially with blood and vaginal discharge. The duration of incubational period is not determined (from 2 months to 5 years). Mortality is very high: 60–80% of people in which AIDS develops die during the 2 years. The majority of HIV-infected patients compose 3 main groups of risk: 1) homosexuals-bisexuals; 2) drug-addicts; 3) recipients of blood specimens.

Two more groups, the number of which increases, are the newborn with perinatal infection and heterosexuals occasionally infected during the sexual contact. Modern investigations are the evidence of the fact that HIV-infection is not transmitted with contact way, with animals and during other routine contacts, except sexual. HIV-infection causes seroconversion of antibodies, as the result of which they lose their protective abilities. Seroconversion means that a human carrier of alive virus, can be transmitted to others. Seroconversion varies from some weeks till 4 months. Perinatal incubation can last 1–80 months, averagely 10 months. Risk of transmitting of virus from HIV-positive mother to the fetus, is 30–40 % (transplacental).

The course of HIV-infection can be asymptomatic or can be alike with mononucleous-like syndrome. Diagnosis is based on the data of serologic, enzyme-linked immunosorbent assay (ELISA), which detects HIV-antibodies and is confirmed with immunoblot-electrophoresis (Western blot). Positive results of ELISA and immunoblot are the evidences of HIV-infection.

HIV-infected women should avoid pregnancy.

Newborns for some time can have HIV-antibodies, which passively penetrate through the placenta from contaminated mothers. If the newborns are infected too, the antibodies disappear in some months. Average time interval between seroconversion and development of AIDS is 7 years. The American “Protocol 076” of prophylaxis of perinatal infection of the fetus during HIV-infection of mother foresees the introduction all the infected pregnant women of zido-

vudine (azidothymidine), starting with the 14th–34th week of pregnancy by the scheme: 100 mg 5 times a day during the whole period of pregnancy.

Question as for labour management in HIV-infected pregnant women is discussional. It is supposed, that caesarean section does not reduce the perinatal transmission, if the infection of the fetus occurred intrauterine. In connection with this, if the complications of pregnancy are absent, delivery is recommended to perform through the maternal passages. In labour excessive operational interventions (amniotomy, episiotomy, invasive methods of diagnosis of the fetal condition) are avoided; sanitation of labour canal of mother with 2% solution of chlorhynidin each 2 h during the whole labour act. Intravenous introduction of zydovudin in the dose of 2 mg/kg of weight during the first hour of labour is recommended, then — 1 mg/kg of the weight every hour during the whole labour act.

A newborn is washed in a soap solution and dried with blotting. Breast-feeding is not recommended. At the postnatal period rules of hygiene should be kept: washing of the hands before the contact with newborn.

Prophylaxis of HIV-infection is very important and is in the safety of sexual contacts, using disposal syringe, prevention of transfusion of infected blood and its preparations.

## VASCULAR COMPLICATIONS OF PREGNANCY

The increase in coagulational potential of blood and venous stasis contribute to the development of varicosis and thromboembolic complications during pregnancy and at the postnatal period. This group includes phlebitis and thrombophlebitis of superficial and deep veins and pulmonary embolism.

**Varicose veins** in pregnant woman require a conservative therapy (elastic bandage, exercise therapy, escusan — 20 drops 2 times a day).

During the *thrombophlebitis of superficial veins* hyperemia and painfulness during palpation appear in injured zone, as a rule, in gastrocnemial muscles. This complication does not have severe consequences, if the patient has his feet lifted as well as rest and applied warm and painkillers.

If the signs of hypercoagulation are present, 2,500–5,000 U of heparin in 6 h prescribed, controlling the indicators of blood coagulation. After the abolition of heparin acetylsalicylic acid is prescribed (0.5 g 2 times a day) during 10 days.

Risk of *thrombophlebitis of deep veins* during pregnancy increases, especially in a few weeks after delivery. Clinical manifestations are various and depend on the level of injury of lower extremities. Pregnant women feel pain in gastrocnemial muscles during palpation and edema of different degree. Pain-

fulness of popliteal fossa can appear. It is hard to make the diagnosis; Doppler investigation and phlebography are used for this purpose, which are the base of the diagnosis. Treatment of the pregnant women suffering from thrombosis of profound veins includes the using of anticoagulant of direct action heparin, analgesics and rest. Anticoagulants of indirect action (cumadin and others) can have the teratogenic effect in early terms of pregnancy and cause the bleeding in fetus in its late terms. As a rule, symptoms of the disease regress after a week of treatment, however, heparin should be applied at the postnatal period.

Thrombosis of deep veins usually foreruns the obstetrical *pulmonary embolism* (PE), however, it can also be primary. Such clinical symptoms as tachycardia, superficial breathing and changes of ECG are often absent, which complicates the diagnosis. During the suspicion on embolism of pulmonary artery gas content is detected in arterial blood. The decrease in  $pO_2 < 80$  mmHg is an evidence of PE. Pregnant women with decreased  $pO_2$  despite on any cause require the oxygen therapy.

Ventilation-perfuse scanning of lungs detects the rate of PE. Data of pulmonary angiography confirm the diagnosis. If PE appears during pregnancy, anticoagulant therapy should be performed at the postnatal period. In the case of PE after delivery, treatment with anticoagulants of indirect effect (cumadin) is performed after the application of heparin.

## DISEASES OF NERVOUS SYSTEM

*Epilepsy* is observed in 0.5% of pregnant women and is characterized with paroxysmal changes of sensitivity, detection capacity, emotional or psychomotor function because of the disturbances of brain function. Epilepsy can be caused by injury of the nervous system, injury of the brain or idiopathic causes. During pregnancy elevation of oestrogens rate stimulates the center of pathological activity, when the elevation of progesterone concentration neutralizes this effect. As the result of this epileptic activity does not change in 50% of the pregnant women, increases — in 40% and decreases — in 10%. Frequency of appearing of epileptic attacks before pregnancy is the most important sign of epileptic activity during gestation.

The risk of congenital anomalies in children, delivered from the mothers with epilepsy, is 3–4 higher (6–10%) than in general population. Taking into consideration the fact that majority of standard anticonvulsant drugs have the teratogenic effect, this dependence is not determined. In children delivered from the mothers with epilepsy the frequency of such disturbances also increases (1/30). During the attack in

a pregnant woman the risk of acute placental insufficiency increases.

Fenitoin (dilantyn) is a standard anticonvulsant in treatment of epilepsy. Its using during pregnancy can cause the specific syndrome of the fetus, which includes microcephalus, dysmorphism, defects of extremities, distal hypoplasia of phalanges and nails. Using phenobarbital can contribute to forming of cleft lip and palate in fetus. For this reason relanium is used to stop the attacks because of this. The majority of anticonvulsants cause the suppression of bone marrow and suppress the vitamin-K-dependent coagulant blood factors. Because of this the risk of bleeding in fetus and newborn increases. To prevent this complication newborns are prescribed follates and philochinones (vitamin K).

**Myasthenia** is an autoimmune disease of pregnant women, which is characterized by muscular weakness and slight tiredness as the result of circulation of antibodies against acetylcholine receptors. The incidence of such complication is 1 case in 20,000 of patients. The course of the disease during pregnancy can vary with a tendency to aggravation after labour. Anticholinesterase preparations (neostigmin, pyridostigmin and others) are used for treatment. It should be taken into account that pregnant women suffering from myasthenia are contraindicated to use the blockers of neuromuscular receptors (magnesium sulfate), which can cause the crisis. Nearly 10% of newborns have the transitor miasthenic symptoms as the result of transport of maternal antibodies through the placenta.

**Disseminated sclerosis** is an autoimmune demyelinating disease, which occurs in 5 in 10,000 of pregnant women and is characterized by the different course during pregnancy and triple increase in the relapses at the postnatal period. Treatment should be only supporting. Newborns delivered from the ill mothers have 3% of risk of disseminated sclerosis in comparison with 0.5–1% of risk in general population.

## DISEASES AND DISTURBANCES OF DIGESTIVE ORGANS

The majority of women complain of *nausea, salivation and vomiting* during pregnancy. These symptoms are of different degree of manifestation — *morning vomiting of pregnant women, excessive vomiting of the pregnant woman*. They are called early gestosis (early toxicosis of pregnant women) in Ukrainian obstetrics.

**Gastroesophageal reflux** is observed in no less than 50% of pregnant women at the III trimester. This symptom does not have negative consequences for mother and fetus, however, causes discomfort in pregnant women. Decrease in the intraabdominal volume and pressure as the result of uterine growth are

the causes of this. Besides, the elevation of progesterone concentration decreases the tonus of sphincter of esophagus. During the treatment a patient should be reassured as for the favorable finishing of pregnancy, lift up the head ending of the bed, prescribe frequent partial nutrition and using of antacids at night and after the meal.

**Appendicitis** is detected in 0,1% of cases and is the most frequent surgical disease in the pregnant women. Maternal mortality rate is 2% at the I and II trimesters and increases till 10% at the III trimester in comparison with 0.25% of non-pregnant women. The elevation of mortality is related to late diagnosis and possible perforation of appendix during pregnancy.

Threat of abortion and preterm labour are the most frequent perinatal complications. Nausea, vomiting, anorexia and pain in the umbilicus in the right inferior part of the abdomen are the clinical signs of the appendicitis in pregnant women. The Shchetkin—Blumberg's symptom is not always expressed. Because of the disposition of appendix and isolation of inflammatory exudation, localization of pain can be unusual. Immediate surgical treatment with further prescription of antibiotics is necessary for such patients. During surgical operation monitoring of the heart activity of the fetus is performed. Labour is recommended to perform conservatively; caesarean section is done by obstetrician indications.

**Pancreatitis** is observed in 0.1% of pregnant women. This complication develops predominantly at the III trimester of pregnancy, which is related to the maximal elevation of the triglycerides rate in the blood plasma. Women suffering from cholelithiasis, chronic alcoholism, severe arterial hypertension during pregnancy and also patients with chronic diseases of the liver compose the group of risk of the development of such complications. Maternal mortality can be 10%, perinatal — 10–40%.

Diagnosis is based on such symptoms as nausea, vomiting, pain in epigastrium, which spreads to the back and becomes belted. Leukocytosis, transitor elevation of serum amylase and lipase, amylase (diastase) of the urine, in severe cases — hypocalcemia and hyperglycemia are laboratory indicators of the disease.

Treatment is performed together with the surgeon, it includes: symptomatic therapy, intravenous introduction of solutions to restore the volume of circulating blood and adequate diuresis, starvation to suppress the pancreatic secretion, nasogastral aspiration, prescription of spasmolytics and painkillers, introduction of inhibitors of proteolysis (contrical, gordox, trasilol). Infusive therapy is performed under the control of the rate of hematocrit, daily diuresis, taking into consideration the loss of fluid with vomiting and respiration. Wide spectrum antibiotics are prescribed if the body temperature elevates up to 38°C and above. If the treatment is adequate, pancreatitis, as a rule, regresses during pregnancy.



Labour is performed per vias naturalis, performing prophylaxis of bleeding.

**Peptic ulcer of stomach and duodenum** during exacerbation (in 20–25% of pregnant women) is characterized with the pain in the epigastrium, caused by the feeding, which reduces after vomiting, consuming of milk or alkaline solution, as well as dyspeptic disturbances (nausea, eructation, meteorism). Hidden blood is detected in fecal masses.

Diagnosis is done with fibrogastroscopy, detection of the basal secretion of the stomach. Peptic ulcer usually exacerbates at the I trimester of pregnancy or in 2–3 weeks before labour. The complex stationary treatment includes: diet N1–1b by Pevzner, antacids (almagel, caolin, phospholugel) and astringent drugs (white clay, decocture from the flores of chamomil of common St John's wort and others), spasm- and cholinolytics (metacin), polyvitamins, alkaline mineral waters.

**Ileus** is a severe complication and in majority of cases is related to elevation of mechanic pressure of enlarged uterus on comissures after the previous abdominal operations. The rate of mortality is very high because of the late diagnosis, refuse from surgical intervention and unsuccessful operation. Conservative treatment is begun from the infusive therapy, introduction of atropine sulfate, evacuation of the stomach content, prescription of enema. If the conservative treatment is ineffective, surgical intervention is recommended. Operation is determined by the surgeon. Abortion is made during the dynamic ileus, caused by pregnancy, if the surgical treatment was unsuccessful. During the caesarean section with peritonitis it is recommended to remove the uterus.

**Chronic inflammatory intestinal diseases** (ulcerous colitis, regional enteritis, or the Crohn's disease) are observed in the women of reproductive age and can complicate pregnancy. In majority of cases pregnancy does not influence the course of these diseases. In women suffering from active form of the disease at the beginning of pregnancy considerable improvement or aggravation of the condition is not observed. Surgical treatment if necessary is performed before or after pregnancy.

**Gingivitis** related to pregnancy is observed in 50% of patients. Gingivae hypertrophy, hyperemia, under the influence of hormonal changes their inflammation and sometimes bleeding appear. In papillae between the teeth pyogenic granuloma can form. Hygiene of the oral cavity and gingivae prevents these processes, which disappear after labour.

**Hepatitis** is the most frequent disease of the liver, which causes the jaundice (elevation of the bilirubin level more than 40 mg/l) during pregnancy. It is often of viral origin (see "Infectious diseases").

**Cholestasis** (bile congestion, intrahepatic cholestasis of the pregnant women) occur in 0.1% of cases and is the second cause of jaundice in the pregnant women. More often it occurs at the III trimester, but can appear

in any term of pregnancy. It is related, probably, with the increase in the liver sensitivity to oestrogens, which causes cholestasis without injury of hepatocellular cells as during cholecystitis or cholelithiasis.

Generalized, often intensive, jaundice is detected in pregnant women. It is accompanied with fatigue, skin itching of various intensity and darkening of the urine. The rate of bile acids increases 10–100 times in the blood serum, of thermolabile (hepatic) fraction of alkaline phosphatase — 10 times as well as amount of bilirubin elevates. US of the liver, sublimite and thymol tests are performed. Activity of transferases (AST, ALT) during this disease is increased inconsiderably. The decrease in phylochinones absorption (vitamin K) can cause the disturbance in the blood coagulation system.

Treatment is in prescription of low-molecular dextrans, solutions of electrolytes, glucose, vitamins and essentielle. Antihistamines, legnin, clophibrat, cholesteramin and local drugs on the base of lanolin are applied to reduce the itching of the skin. Complete termination of the itching is possible only after delivery. Cholestasis can be repeated during the future pregnancies or when using oral contraceptives.

**Exacerbation of chronic cholecystitis** (often at the III trimester of pregnancy) is accompanied with pain and feeling of load in right hypochondrium, nausea, vomiting and heartburn. During the objective examination of Zacharyin—Head's zones in the right hypochondrium, the right subscapula, positive Kehr's symptoms (pain during the palpation in the right hypochondrium during the inspiration), Ortner's (pain during the beating by the edge of the palm on the right subcostal arch), Murphy's (pain during introduction of the hand in the right hypochondrium during inspiration), Georgievsy—Mussy (pain during the palpation between the crura of sternocleidomastoid muscle) and others.

Besides of clinical signs, ultrasonography and bile analysis are used for diagnosis.

Pregnant women are prescribed a proper diet, cholagogues (flores of Helichrysum, maize, fruits of wild rose, seeds of fennel, leaves of pepper mint), cholosatum, lipotropic drugs (methionine, lipoic acid), polyvitamins, if necessary — antibiotics.

**Cholelithiasis** is observed in 0,1% of cases of pregnancy (as in general population). During the late or inadequate treatment perinatal mortality increases. Overfilling of the bile with cholesterol with further crystallization and forming of the bile concretions causes the discomfort in the region of the gall bladder and causes the block of the bile duct and billiary colic or jaundice. Consuming fatty meal is one of the reasons of this complication. The increase in oestrogens and progesterone rates contributes to the elevation of concentration of cholesterol and forming of billiary concretions. Rate of hepatic enzymes and bilirubin elevate in the blood. Data of ultrasonography confirm the diagnosis.



Asymptomatic cholelithiasis during pregnancy does not require the treatment except the restriction of fatty meal. During the colic nasogastral aspiration is performed, hydration, spasmolytics and painkillers are introduced, antibacterial therapy is prescribed if necessary. Ineffective treatment or concomitant pancreatitis is the indication to cholecystectomy.

**Acute lipous dystrophy of the liver** is rare complication, but maternal mortality rate can be 30% of all cases of the disease. In-time diagnosis and treatment of this complication have a significant meaning. The disease, as a rule, develops at late terms of pregnancy in nulliparous women, and is characterized with unexpressed dyspeptic symptoms, which intensify during some days. Headache, disturbance of consciousness, pain in the epigastrium appear in some time. If the treatment is absent, coagulopathy, coma and polyorganic insufficiency develop, which is finished with the lethal outcome. In blood serum at first rates of bilirubin and transaminase elevate slightly. Incorrect data of laboratory analysis contribute to the late diagnosis. Treatment includes the correction of coagulopathy and electrolytic balance, supporting of the function of cardio-respiratory system and immediate delivery through the maternal passages.

As the result of severe preeclampsy the liver also undergoes pathological changes. Appearing of the pain in the epigastrium or in the right superior quadrant of the abdomen during eclampsy can be the evidences of intrahepatic or subcapsular hemorrhage and even of the liver rupture or its capsule with fatal bleeding.

## OTHER CONDITIONS WHICH COMPLICATE THE COURSE OF PREGNANCY AND LABOUR

**Injury of the abdomen** is often observed during pregnancy and can be related to a car accident. Application of car belts with fixation of the knees and shoulders of pregnant women is contraindicated and can be the cause of a specific injury which a pregnant woman does not feel. Somatic complains can be absent. From the point of opinion of obstetrical aspect, preterm separation of the placenta is the most severe complication of the abdominal injury; because of this, monitoring of the heart activity of the fetus to detect the anomalies, related to reduction of oxygenation, and observance under a possible vaginal bleeding should be performed immediately after the injury. Symptoms of the placental separation can manifest itself by the painfulness of the uterus during the palpation and pain in the region of separation.

**Influence of smoking.** Number of the smokers among the women increases annually, more often than among the men. Sometimes young women begin to smoke at the early age. Complications of pregnancy because of smoking are related to toxic effect of monoxide of carbon and nicotine, which causes the contraction of the vessels and disturbs the placental perfusion. **Alcohol abuse** causes IUGRF, dysmorphism of the face, defects of the cardio-vascular system and extremities of the fetus. In 1/3 of the children restriction of mental development is observed.

**Drug addiction**, on example cocaine, causes contraction of vessels, tachycardia and arterial hypertension. Drugs easily penetrate through the placenta and elevate the risk of IUGRF, preterm labour, separation of the placenta, atresy of intestine and developmental defects of the urogenital tract. At the first days of life of the newborns *syndrome of stimulation of CNS* is observed. In children delivered by the mothers who consumed drug the incidence of the *syndrome of immediate death increases*.

**Cancer and pregnancy.** Approximately 1 of 1,000 of complications of pregnancy is cancer. In majority cases it is carcinoma of the cervix or mammary glands. Management of such pregnant women should be performed taking into consideration the toxic effect of the treatment on the condition of mother and fetus.

**Cervical displasy (anomal cytology)** is observed in 3% of the pregnant woman. Colposcopy is used to confirm the diagnosis. Biopsy during pregnancy is performed during the suspicion on invasive cancer. Treatment is performed in 6–8 weeks after delivery (spontaneous regression of displasy is possible).

**Cervical carcinoma *in situ* (intraepithelial)** develops from the progressive displasy. Surgical treatment is performed at the postnatal period. Management of the patients with cervical invasive carcinoma depends on gestational age and maturity of the fetus.

Frequency of **breast carcinoma** is 0.3 in 1,000 of pregnancies. Correlation between the incidence of breast carcinoma and pregnancy is not detected. Diagnosis of breast carcinoma is problematic because of the change of consistence and sizes of the mammary gland. Treatment should be individual. Abortion does not contribute to the treatment of carcinoma of the mammary gland and does not improve the prognosis. There are no conformations as for the unfavorable effect of breast carcinoma on pregnancy. Mammography and aspiration biopsy of the mammary gland can be used to confirm the diagnosis.

## RECOMMENDED READING

3; 5; 21; 22; 29; 39; 46; 56; 57; 61.

## Chapter 30

# GESTOSIS (TOXICOSIS OF PREGNANCY)

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### EARLY TOXICOSIS

**Gestosis (toxycosis of pregnancy)** — pathological conditions, which appear because of pregnancy. The fetal ovum is considered an etiological factor of gestosis. In Ukrainian obstetrics there are concepts of early and late gestosis.

Early gestosis develops at the I trimester of pregnancy; it is characterized by the disturbances of functions of gastro-intestino-hepatic complex, and often its symptoms disappear till II trimester (period of finishing of forming of the placenta).

*Pathogenesis.* There are many theories of development of early gestosis: reflector, neurogenic, hormonal, allergic, immune, cortico-visceral. Neuroendocrine and metabolic disturbances, which can cause the break of adaptation of a maternal organism to pregnancy and manifestation of pathological reflector reactions (loss of appetite, nausea, salivation, vomiting), play an important role in development of early gestosis.

Vomiting of pregnancy is accompanied by the maximal increase in level of chorionic gonadotrophin, sometimes — decrease in secretion of corticosteroids. The most severe course of early gestosis, as a rule, occurs during the multiple gestation and hydatidiform mole, which is an evidence of considerable effect of the influence of chorionic gonadotrophin on the symptoms of this disease.

Among the clinical forms of early gestosis are those which often (vomiting of pregnancy, salivation) and rarely (dermatosis, jaundice, tetany, osteomalacia) observed. Foreign obstetricians do not use the term “early gestosis” and consider nausea, morning vomiting and salivation as manifestations of mother’s adaptation to neuro-immunoendocrine changes, related to pregnancy, which intensify during the presence of extragenital and obstetrical pathology.

**Vomiting of pregnancy** (emesis gravidarum) is observed in every second pregnant woman. There are 3 forms (degrees) of the pregnant women’s vomiting: mild, moderate and severe. The degree of se-

verity of the disease is determined by the expressivity of the disturbances.

During the *mild form of vomiting of pregnancy* (I degree) general condition, hemodynamics, indicators of blood and urine analysis are satisfactory. Frequency of vomiting is no more than 5 times a day. Vomiting can be on an empty stomach, can appear because of unpleasant odors and eating. There is no weight loss, or its does not exceed 2–3 kg.

*Vomiting of pregnancy of moderate severity* (II degree) repeats 6–10 times a day and is accompanied by the disturbance of general condition of pregnant women, weakness, vertigo, subfebrile temperature, weight loss more than 3 kg per 1–2 weeks. Tachycardia (90–100 per minute), mild arterial hypotension and acetonuria can take place.

*Severe or excessive vomiting of pregnancy* (III degree) repeats till 20 times and more a day and is accompanied with the symptoms of general intoxication: elevation of the body temperature till 38°C and more, tachycardia (till 120 per minute), weak pulse, expressed arterial hypotension (up to 80 mmHg), dehydration, metabolic disturbances. Pregnant women considerably lose weight; signs of dehydration are detected: xeroderma, decrease in diuresis, jaundice. Leukocytosis, decrease in albumin, cholesterol, potassium and chlorides rate, increase in bilirubin, urea, remaining nitrogen amount and increase in hematocrit number are detected in the blood. Urobilin, billiary pigments and acetonuria are detected in the urine. In severe cases there are symptoms of the CNS disturbance.

Treatment during the mild form of vomiting is outpatient, during which the dynamics of weight is controlled and repeated investigation of the urine on the presence of acetone is performed. Pregnant women suffering from moderate and excessive vomiting require the in-patient treatment.

Complex therapy includes treatment-rest regimen, diet (frequent eating while lying with small portions, drinking of the alkaline mineral waters), rehydration, normalization of activity of CNS, aqueous-electrolytic balance, antihistamine drugs and vitamins.

For rehydration and detoxication, restoration of acid-base balance, correction of hypoproteinemia infusive therapy is used in amount of 2–2.5 per day during 5–7 days (Ringer—Lock solution, isotonic solution sodium chloride with vitamins — thiamine (B1), pyridoxine (B6), cyanocobalamin (B12), cocarboxylase, 5% solution of glucose with ascorbic acid (3–5 ml) and insulin (6–8 U), albumin (10% or 20% solution 100–150 ml), plasma. During acidosis 5% solution of sodium hydrocarbonate is introduced intravenously. For normalization of the CNS function different variants of reflexotherapy, hypnosuggestive therapy, physical methods (electric sleep, electric analgesia) 6–8 sessions by 60 min each, inductothermy on the region of plexus solarius, intranasal electrophoresis with dyphenhydramine hydrochloride are used. Antihistamine drugs (pipolfen, suprastin, tavegil, diasolin) perform the sedative effect on the CNS. In order to suppress the vomiting center cerucal, torecan, droperidol and aminasin are used. Lipotropic, hepatotropic and immunomodulating drugs (methionin, splenin, seripar) are applied.

Absence of the treatment effect and progression of early gestosis are the indications to abortion.

**Salivation** of the pregnant women (ptyalism) can accompany vomiting of pregnancy or be an independent form of early gestosis. During the excessive salivation a pregnant woman can loose nearly 1 l of fluid per day, which causes dehydration of an organism, hypoproteinemia, skin maceration and disturbs the psychical condition of the woman.

Treatment of pregnant women with excessive salivation should be performed in the in-patient department. Infusive, metabolic and reflector therapy is done according to the same principles as during vomiting of pregnancy. In order to reduce the secretion of the glands 0.1% solution of sulfate atropine is introduced intramuscularly. It is recommended to rinse the oral cavity with infusion of garden sage, chamomil, oak rind, solution of menthol and other astringent drugs, process the skin near the mouth with zinc paste and protective creams.

**Itching of pregnancy** (pruritus gravidarum) which can be restricted by the region of the vulva and spread all over the body causing irritability and disturbances of sleep is the most frequent form of dermatoses. Itching of pregnant women should be differentiated with allergic reactions, mycoses, trichomoniasis, diabetes mellitus and helminthoses.

Antihistamine and sedative drugs, vitamins of B group and ultraviolet radiation are used for the treatment.

**Jaundice of pregnancy** (icterus gravidarum) can develop in any term of pregnancy and is characterized by the disturbance of the liver function, yellow colour of the skin and mucous membranes and itching. Differential diagnosis is done with viral hepatitis, cholelithiasis, cholestatic hepatitis and intoxications.

Treatment is performed with the same principles as during the vomiting of pregnancy.

**Tetany of pregnancy** (tetania gravidarum) can manifest by convulsions of the upper (“obstetrician’s hands”) or lower extremities (“ballerina’s leg”), face (“fish’s mouth”). Disease is related to the reduction of function of parathyroid glands, disturbance of calcium metabolism, rheumatism. Parathyreoidin, calcium preparations, vitamin of B groups, calciferol (D) and tocopherol acetate (E) are used. During the severe course of the disease or ineffective treatment it is recommended to make an abortion.

**Osteomalacia of pregnancy** (osteomalacio gravidarum) in expressed form is very rare. Pregnancy in this case is contraindicated. Unexpressed form of osteomalacia — syphysiopathy, is observed more often. The disease is related to the disturbance of phosphoric-calcium metabolism, decalcination and malacia of the bones. Pain in the legs, bones of the pelvis and muscles is the main manifestation of symphysiopathy. General weakness, tiredness and paresthesia appear; waddling gait, tendon reflexes intensify. During the palpation of the pubic symphysis a pregnant woman feels painfulness. On X-ray examination of the pelvis sometimes divergence of the bones of the pubic symphysis is detected, however, despite of real osteomalacia, destructive changes in bones are absent. Fish fat, calciferol (vitamin D) and ultraviolet radiation are used.

Prophylaxis of early gestosis is in treatment of women suffering from chronic extragenital diseases before pregnancy, psychoemotional rest of pregnant women, reduction of the influence of unfavorable factors of environment.

Pregnant women suffering from early gestosis compose the group of risk for obstetrical and perinatal pathology (miscarriage, late gestosis).

## LATE TOXICOSIS

**Late toxicosis** complicates the second half of pregnancy and is a syndrome of polyorganic and polysystemic functional insufficiency, which is characterized by a triad of classical symptoms: Edema, Proteinuria, arterial Hypertension (EPH-gestosis). Late gestosis is a cause of maternal mortality (40%). The incidence of gestosis varies from 7 to 17%; eclampsia can develop in 5% of women suffering from late gestosis and nearly 5% of patients with this complication die. In 95% of cases late gestosis develops after the 32 weeks of pregnancy, 75% of the patients with such diagnosis are pregnant women. In 40% of cases there is gestosis with extragenital pathology, which appears in reproductive age women (under 20 and over 35). A possibility of development of late

gestosis during the multiple gestation, polyhydramnion, hydatidiform mole increases almost two times. Low social-economic status of pregnant women, insufficient nutrition, family predisposition, chronic vascular and renal diseases, diabetes mellitus and systemic lupus erythematosus are the factors of risk of late gestosis.

In different countries of the world different *classifications* of the late gestosis are used, however, no one of them satisfies the necessities of practical obstetrics. In Ukrainian obstetrics there were 4 stages of late gestosis: 1) *edema (swelling of pregnant women)*; 2) *nephropathy of I, II, III degrees* (is characterized by a triad of symptoms — arterial hypertension, edema and proteinuria); 3) *preeclampsia* (addition of disturbances of vision, headache, pain in epigastrium, nausea to the symptoms of neuropathy); 4) *eclampsia* (addition of convulsions to symptoms of preeclampsia).

There is also arterial hypertension of pregnancy (without edema and proteinuria) as a monosymptomatic form of late gestosis and preclinical stage of gestosis — pregestosis (pretoxicosis).

This classification has some disadvantages. On example, peripheral edema is observed during the physiological pregnancy, and is absent in 40% of pregnant women with preeclampsia. Besides, in practice it is impossible to differentiate nephropathy of II and III degree or nephropathy of III degree and preeclampsia.

The research group of the WHO recommends to consider *preeclampsy* any development of hypertension with proteinuria and (or) edema during pregnancy (predominantly in the 2nd half).

According to the recommendations of WHO (1989) and requirement of ICD of X revision (1995) the Association of Obstetricians-Gynaecologists of Ukraine recommended and the Ministry of Health of Ukraine approved the following classification of gestosis:

1. Arterial hypertension during pregnancy.
2. Edema during pregnancy.
3. Proteinuria during pregnancy.
4. Preeclampsia of mild degree (corresponds to the nephropathy of I degree of severity by the previous classification).
5. Preeclampsia of moderate degree (corresponds to the nephropathy of II degree of severity by the previous classification).
6. Preeclampsia of severe degree (corresponds to the nephropathy of III degree of severity by the previous classification).
7. Eclampsia.

There are “pure” and combined forms of gestosis; the latter appears together with extragenital pathology: essential hypertension, renal, hepatic and cardiac diseases, diabetes mellitus, hypothalamic neuroendocrine syndrome, other somatic pathology. In modern obstetrics the increase in amount

of combined, asymptomatic and atypical forms of late gestosis is observed.

Preeclampsia by some authors is divided into mild and severe. Severe preeclampsia is characterized by elevation of ABP > 160/110 mmHg, proteinuria > 1g/day, oliguria, disturbances of vision (scotoma), headache, pain in the epigastrium or in right upper quadrant of the abdomen, disturbance of the liver function and thrombocytopenia.

*Arterial hypertension during pregnancy* is an elevation of diastolic arterial pressure (DAP)  $\geq 90$  mmHg and of systolic arterial pressure (SAP)  $\geq 140$  mmHg, or elevation of DAP by  $\geq 15$  mmHg and SAP  $\geq 30$  mmHg in comparison with the arterial pressure before pregnancy.

*Chronic arterial hypertension* is the one which existed before 20 weeks of pregnancy and lasted for more than 6 weeks after pregnancy.

*Etiology and pathogenesis.* Despite of numerous hypotheses as for the development of late gestosis (“disease of theories”) its etiology is unknown today, however, the connection of this pathology with pregnancy is obvious.

In recent time the majority of researchers relate the development of late gestosis to morphological, functional and biochemical changes in the placenta.

Incomplete invasion of trophoblast in maternal spiral arteries, caused by immune and genetic factors, causes the anomalous reaction of the vessels, which do not maximally enlarge, as during the physiological pregnancy, preserve an ability to react on the vasoactive stimuli. This causes hypoperfusion and hypoxia of trophoblast, gradual changes of its functional and biochemical activity. Vascular spasm contributes to the increase in resistance of blood circulation and development of arterial hypertension. Phospholipids of cellular membranes of trophoblast eliminate the biologically-active substances, which influence predominantly on thrombocytes and epithelium of uteroplacental vessels. During hypoperfusion and hypoxia the endothelium function disturbs as for the support of the intactness of the vascular system, regulation of tonus of the vascular wall and preventing the intravascular coagulation. Synthesis of prostacycline decreases and production of thromboxane considerably increases, which causes the vascular spasm and destruction of thrombocytes. Endotheliocytes participate in activation of angiotensin and inactivation of bradykinin. Synthesis of the vasodilator (endothelin, vasopressin) increases and production of vasoconstrictive factors (nitrogen oxide) decrease; the aggregation of thrombocytes increases; forming of thrombin activates, which is the cause of the deposition of the fibrin in the vessels of microcirculatory flow (uteroplacental, vessels of the kidneys, liver, lungs and brain).

During the physiological pregnancy volume of circulating blood (VCB) increases approximately by 1,500 ml and is 5,000 ml. During the late gestosis



(preeclampsia) VCB does not increase. This causes the excessive sensitivity of such patients to both blood loss and intensive infusive therapy.

Generalized spasm of the vessels with the disturbance of permeability of capillaries, elimination of the fluid and proteins in the tissues, hypovolemia with decrease in oncotic pressure and hemoconcentration compose the pathophysiological base of the clinical manifestations of late gestosis (edema, arterial hypertension and proteinuria).

*Clinical picture and diagnosis.* Clinical diagnosis of late gestosis is based on classical symptoms: edema, proteinuria and arterial hypertension (Zange-meister's triad) in their different combinations. Early diagnosis and estimation of the degree of severity of late gestosis are the most complex problems.

**Pregestosis (pretoxicosis)**, which is detected by Ukrainian obstetricians, is a "background" condition or preclinical form of late gestosis, is characterized by the complex of pathological changes, which occurred in the organism of pregnant women and fore-ran the clinical picture of the disease and can be detected only with special methods. It is a condition of maximal strain of functional systems of an organism of pregnant women with signs of the beginning exhaustion of adaptational mechanisms. Syndrome of lability and asymmetry of ABP (difference between the numbers of ABP on the left and right hands is more 10 mmHg), arterial hypotension, pathological weight gain of a pregnant woman, hydrophilicity of the tissues and transitory proteinuria are related to this form of disease. Pretoxicosis during the absence of adequate treatment transfers to clinically expressed gestosis in every second patient. Because of this systematic and thorough observation of pregnant women to detect the early signs of gestosis (weighing, measuring of ABP on the both hands, control of blood and urine analyses) is very important.

Every week weight gain should be no more than 22 g by each 10 cm of height and 55 g by each 10 kg of the initial weight of a pregnant woman. Spontaneous increase in the weight of a pregnant woman (more than 900 g per week or 3 kg per month) can forerun the development of late gestosis or be its first symptom.

In order to detect the hidden edemas test on hydrophilicity of tissues by McClure—Oldridge: a vesicle after the intracutaneous introduction of isotonic solution of sodium chloride resorbs less than during 35 min.

**Edemas of pregnancy** are estimated according to the degree of their severity: I degree — edemas of the lower extremities; II degree — edemas of the lower extremities and abdominal wall; III degree — edemas of the lower extremities, abdominal wall and face; IV degree — generalized edemas (anasarca). If the treatment is absent, edema of pregnancy can transform into more severe stage of gestosis — preeclampsia.

At late terms of pregnancy in the majority of women hypostatic edemas can manifest as pastosity of

the feet and crura, which disappear after a 12-hour rest and do not require a special treatment. The majority of obstetricians consider generalized edemas which appear after a 12-hour rest in horizontal position and also morning edemas of face or arms to be pathological.

**Arterial hypertension** of pregnancy also has 3 degrees of severity: I degree — ABP is not higher than 150/90 mmHg; II degree — ABP from 150/90 to 170/100 mmHg; III degree — ABP is more than 170/100 mmHg.

To detect arterial hypertension one should detect the average arterial pressure ( $AP_{\text{average}}$ ) by the formula:

$$AP_{\text{average}} = (SAP + 2DAP)/3,$$

where SAP — systolic arterial pressure;

DAP — diastolic arterial pressure.

In healthy pregnant women  $ABP_{\text{average}}$ , as a rule, is more than 100 mmHg. Elevation of  $ABP_{\text{average}}$  by 15 mmHg and more according to the initial level or more than 105 mmHg is an evidence of arterial hypertension.

To detect arterial hypertension it is necessary to take into consideration no less than 2 measurements of ABP with interval between them not less than 6 h. ABP is the lowest during its measuring on the side, the highest — while standing and has an average meaning while sitting. It should be remembered that at the II trimester of pregnancy physiological decrease occurs as the result of increase in heart output and blood volume and decrease in the systemic vascular resistance.

In 0.4–0.5% of pregnant women chronic arterial hypertension is observed, 80% of cases of which are related to idiopathic and 20% — to chronic renal diseases. Adrenal arterial hypertension (Itsenko—Cushing's disease, hyperaldosteronism, feochromocytoma) and other forms (thyreotoxicosis, aortal coarctation and other) compose the less part. Chronic arterial hypertension is diagnosed if it took place before pregnancy or appeared before the 20 weeks of gestation and persisted for more than 6 weeks after labour.

There are 3 degrees of severity of preeclampsia: mild — elevation of ABP up to 150/90 mmHg (up to 30% of the initial level of SAP), edemas of the lower extremities, proteinuria up to 1 g/l; moderate — ABP is up to 170/100 mmHg, expressed edemas of the lower extremities, anterior abdominal wall, proteinuria from 1 to 3 g/l, edema of the retina; severe — ABP higher than 170/100 mmHg, edemas of the lower extremities, anterior abdominal wall, face, proteinuria more than 3 g/l.

Arterial hypertension reflects the degree of vascular spasm and is the criterion to establish the diagnosis. DAP has a significant prognostic meaning to detect the severity of late gestosis.

Detection of preeclampsia severity in practice, especially during its atypical forms, with mentioned

classical criteria, is very difficult. That's why, in order to estimate the severity of preeclampsia, additional criteria are used, on example, Vitlinger's score (Table 17).

Total points from 2 to 10 are the evidence of preeclampsia of mild degree, from 11 to 20 — moderate, 21 points and higher — severe.

Late gestosis is considered severe if it lasts more than 2 weeks despite of treatment and during its combination with extragenital pathology (essential hypertension, renal diseases, diabetes mellitus, neuroendocrine-metabolic syndrome and others).

Changes on the fundus oculi (hypertensive angioretinopathy, edema of the retina) and disturbances of the concentrational and eliminational renal function (by the Zimnitskiy's test) have the important meaning for estimation of the degree of the severity of late gestosis. Daily diuresis in a pregnant woman is 1,100–1,200 ml in the norm. Its decrease, steady morning isohypostenuria (density of the urine 1,010–1,015), increase in the urine amount more than by 1/3 in comparison with the daily urine, daily proteinuria more than 1g/l, elevation of the levels of urea higher than 7.5 mmol/l and creatinin more than 100 mmol/l are the evidences about the severity or progression of late gestosis.

Table 17. Estimation of the degree of preeclampsia severity by Vitlinger's score

Symptom	Estimation, point
<i>Edemas</i>	
Absent	0
Local	2
General	4
<i>Increase in the weight, kg</i>	
Till 12	0
12–15	2
More than 15	4
<i>Proteinuria, g/day</i>	
Absent	0
Till 1	2
1–3	4
More than 3	6
<i>AP, mmHg</i>	
120/80	0
140/90	2
160/100	4
180/100	8
<i>Diuresis, ml/day</i>	
More than 1,000	0
900–600	4
Less than 500	6
Anuria more than 6 h	8
<i>Subjective symptoms</i>	
Absent	0
Manifest	4

The degree of proteinuria can vary even in one patient, which confirms rather its functional than organic character and dependence on the vascular spasm. Proteinuria always begins later than pathological increase in the weight and arterial hypertension.

Hypo- and disproteinemia are the characteristic features of late gestosis: the decrease in the content of the general protein in blood serum till 50–60 g/l, hypoalbuminemia (till 50% of albumins). Delay of the ions of electrolytes (especially of sodium) in tissues and decrease in their excretion with urine occurs during preeclampsia. Osmolarity of the blood depends on the concentration of sodium ions (osmotic pressure).

Changes in the system of hemocoagulation (chronic DIC-syndrome) give the important information about the severity of late gestosis. Severe gestosis is characterized with thrombocytopenia (till  $120-180 \cdot 10^9$  in 1 l), increase in concentration of the products of degradation of fibrinogen (PDF) and fibrinogen B, hematocritic number (0.36–0.42), decrease (3–6 times) of fibrinolytic activity, concentration of fibrinogen ( $\leq 2$  g/l), activity of antithrombin III ( $\leq 60\%$ ). The increase in hematocritic number is an evidence of intensification of vascular spasm, hemoconcentration, decrease in intravascular volume.

Obstetricians always notice combined forms of late gestosis. They appear much earlier than the "pure" forms (on the 24th–28th week), are hardly diagnosed, in majority of cases resistant to the treatment, often cause an unfavorable outcome for mother and fetus, because of which they are considered to be a severe pathology.

Late diagnosis and incorrectly detected degree of severity of late gestosis are the causes of development of its most severe forms — preeclampsia and eclampsia, which are especially dangerous for pregnant women.

Especial attention during late gestosis should be paid to the examination of the condition of the fetus in order to detect hypoxia, hypotrophy (the nonstress test, biophysical profile, ultrasound feto- and placentometry, dopplerometry of the uterine and fetal vessels and others).

Headache, vertigo, disturbances of vision and tinnitus are the symptoms of hypertensive encephalopathy during severe preeclampsia. Headache in the forehead or occiput area, resistant to any painkillers, can be related to edema of the brain and is always the predictor of the further convulsions. Nausea, vomiting, pain in the epigastrium are the evidences of the circular hepatic disturbances, strain and rupture of the hepatic capsule as the result of its edema or intrahepatic bleeding. Disturbances of vision can be expressed in different degree — from slight maculation of the vision and scotoma till complete blindness, which is related to the spasm of vessels, ischemia and petechial hemorrhages in the occipital part of the cortex of the brain. Visual symptoms can be the re-

sult of the spasms of arterioles of the retina, its ischemia and edema; amotio retinae is possible.

Complains of the patient related to the consequences of hypovolemia (deficiency of the plasma volume is 30%), disturbance of hemodynamics (elevation of ABP, especially diastolic, as the result of increase in general peripheral vascular resistance), exacerbation of the rheologic capacities of the blood and also progression of chronic DIC-syndrome. These changes disturb uteroplacental blood circulation, function of the placenta, microcirculation in vitally important organs of the mother (kidneys, liver, lungs, brain, heart).

Preeclampsia is an evidence of the readiness of a woman's organism to convulsive manifestations. Any stimulus (loud volume, bright light, pain and even vaginal examination) can cause convulsions, i.e. eclampsia.

**Eclampsia** is the most severe form of late gestosis, which can develop during pregnancy (75% of cases), in labour and postnatal period. Disease is characterized by the addition of convulsions, which are not of neurogenic origin, to the symptoms of preeclampsia. Nearly 50% of cases of postnatal preeclampsia develop in the first 48 h after labour. Eclampsia is rarely observed, however, is accompanied by the high maternal mortality rate.

Headache, pain in the abdomen or disturbance of the vision are the symptoms which predict the development of preeclampsia. Attack of convulsion is the main manifestation of preeclampsia, which leads to the loss of consciousness. Attack develops consequently, in 4 stages: I stage lasts for 20–30 s and is accompanied with fibrillar twitching of the mimic muscles, sometimes of the upper extremities, the look is fixed at one point; II stage lasts till 30 s and is characterized by the expressed tonic convulsions, which spread from the head on the trunk and extremities, head throw to the back, opisthotonus can be observed. Respiration stops, pulse is not palpated, pupils are widened, occlusion of the tongue can occur; III stage lasts up to 2 min — clonic convulsions, which also spread from up downwards, cyanosis develops, saliva with admixture of blood discharges from the mouth (as the result of the tongue's bite); IV stage — begins with deep interrupted inhalation, respiration gradually restores, however, the patient is without consciousness for a long time (in coma).

Eclampsia is an evidence of the development of the further severe polyorganic disturbances, which can cause death of a woman. Haemorrhage in the brain or in other vitally important organs, acute reno-hepatic insufficiency, respiratory or cardiac insufficiency, DIC-syndrome, pulmonary edema and distress syndrome are the most frequent causes of the death. As the result of hemorrhage in the brain hemiplegia can develop. Fetus can die because of hypoxia due to disturbance of the uteroplacental circulation, including the preterm separation of the placenta, as well as because of immaturity during the preterm labour.

During preeclampsia one or several (till 100 and more) convulsive attacks in a short gap of time — *eclamptic status* may develop. If an adequate treatment is absent, *eclamptic coma* develops; patient is consciousnessless after convulsive attack. Unconscious condition without attack of convulsions is called “eclampsia without convulsions” or “eclampsia without eclampsia”.

**HELLP-syndrome** (hemolysis, liver dysfunction, low platelets) is a syndrome, which is characterized with hemolysis, disturbance of the liver function and reduce in the thrombocytes amount. This syndrome often manifests itself in multiparous women of old age, which have inconsiderable arterial hypertension. A possible clinical symptom may be pain in right superior quadrant of the abdomen, which requires differentiation with cholecystitis and disturbance of digestion. Treatment is in urgent delivery, correction of the disturbance of coagulation and stabilization of activity of the cardio-vascular system. Maternal and perinatal mortality because of this complication is high.

**Management and treatment of pregnant women.** Abortion (delivery) is the pathogenetic treatment during gestosis. Management of pregnant women suffering from late gestosis should be turned on improvement of consequences for mother and fetus.

Pregnant women suffering from late gestosis should be hospitalized. Principles of treatment and management of such pregnant women were developed by a Ukrainian obstetrician V. V. Stroganov (development of treatment-resting regimen, normalization of hemodynamics, microcirculation, liquidation of vascular spasm and hypovolemia, regulation of metabolism, water-electrolyte metabolism, uteroplacental blood circulation, if necessary — careful delivery). Volume, duration and effectiveness of treatment depend on the correct estimation of clinical form and degree of severity of late gestosis.

*Treatment of the pregnant women suffering from edemas* (during the pathological weight gain and edemas of I degree) can be performed in women's consultation clinics. If the therapy is ineffective or in the case of edemas of II and III degrees, a pregnant woman is hospitalized. Treatment is in performing calm surrounding and prescription of protein-vegetable diet. The majority of authors recommend not to restrict consuming salt and fluid. Once during 7–10 days a fasting day is carried out: curds 500 g or apples till 1.5 kg per day, or curds-apple (250 kg of the curds and 1 kg of apples per day). It is recommended to use preparations which improve uteroplacental and renal blood circulation (aminophylline, papaverin), vegetable sedative and diuretics (tincture of valerian root, herb of motherwort, fruits of wild rose, renal tea, bearberry), vitamins (tocopherol acetate, ascorbic acid, routine). Accupuncture, inductothermy or UHF-therapy on the renal region are used from the physical methods of treatment. Using of diuretics with-



out adequate correction of hypovolemia is not recommended.

Treatment of pregnant women with preeclampsia of mild and moderate degrees should be performed only in the in-patient department and requires the individual and complex approach. Prescription of treatment-resting regimen (placing in individual ward); normalization of function of CNS (sedative, antihistamine drugs — sibazon, elenium, nozepam, suprastin, dyphenhydramine hydrochloride), vascular tonus (hypotensive drugs); volemic indicators, rheologic and coagulational capacities of the blood (curantil, trental — pentoxifyllin, heparin, low doses of acetylsalicylic acid), prophylaxis and treatment of the fetus with hypoxia and hypotrophy (essentiale, panangin, co-carboxylase, ascorbic acid, thiamine, pyridoxine, tocopherol acetate, n-3-polyunsaturated lipous acids, immunoglobulinotherapy during the pathological rate of antiphospholipidic antibodies) are necessary. Diet does not require the restriction of fluid. Food should contain full-blooded proteins (boiled meat, fish, curds, yogurt, fruits and vegetables). A fasting day is performed once a week.

Intensity of hypotensive therapy depends on the degree of severity of late gestosis. During preeclampsia of mild degree one should perform the enteral or parenteral introduction of no-spa, aminophylline, papaverin, dibazol; during preeclampsia of moderate degree clonidine, apressin, methyl dopa are prescribed.

Magnesium sulfate is very important in treatment of pregnant women with symptoms of late gestosis. It is the calcium antagonist, performs a sedative, hypotensive, spasmolytic and diuretic effect, suppresses the aggregation of thrombocytes, intensifies the production of prostacycline and improves the functional activity of endothelium's cells. During preeclampsia of mild degree 2 times a day 10 ml of 25% solution of magnesium sulfate are introduced intravenously. During preeclampsia of moderate degree intravenous way of introduction predominates: an initial dose of magnesium sulfate is 1.25–2.5 g/h of dry substance, a day dose — 7.5 g.

Indications to infusive therapy (rheopolyglucin, reogluman, rheopolyglucin-heparin mixture, glucose-novocain mixture, salt isotonic solutions — Ringer, Ringer-Lock, during hypoproteinemia — albumin, plasma) are relapses during preeclampsia of mild degree, preeclampsia of moderate and severe degree and eclampsia, syndrome of the growth restriction of the fetus. The total volume of infused solutions during preeclampsia of mild and moderate degree is 800 ml, moderate and severe — till 1,200–1,400 ml, during eclampsia — till 2,200 ml. Infusive therapy is performed under the control of hematocritic number (0.27–0.35), diuresis (not less than 30–40 ml per hour), CVP — 60–80 mmHg, osmolarity of blood. The usage of diuretics (lasix, osmotic diuretics) is recommended in the case of reduce of renal excretional function, after normalization of VCB, osmotic

and colloid pressure of plasma. In order to prevent severe forms of gestosis, it is recommended to use non-medicamentous drugs, which have multicomponent and multispread effect on homeostasis (hemisorption, plasmapheresis, quantum hemotherapy, laserotherapy and others).

*Treatment of the pregnant women suffering from preeclampsia of severe degree.* Treatment is performed in the intensive therapy department by obstetrician and reanimatologist. In mentioned cases there is the danger for the fetus life. Because of this therapy should be intensive, pathogenetic, complex and individual.

A pregnant woman should keep the bed regimen, prescribe the tranquilizers and antihistamine preparations (elenium, sibazon — seduxen, nozepam — tazepam, dyphenhydramine hydrochloride, pipolphen, suprastin) should be prescribed. In order to prevent convulsions 2–3 ml of 0.25% solution of droperidol and 2 ml of 0.5% solution of diazepam (relanium) are introduced intravenously. Sedative effect intensifies when using 2 ml of 1% solution of promedol and 2 ml of 1% solution of dyphenhydramine hydrochloride. Before introduction of these preparations inhalatory nitrogeno-photorotane narcosis with oxygen can be used. Liquidation of vascular spasm and hypovolemia is performed simultaneously. As a rule, treatment is started from the drop-by-drop intravenous injection of magnesium sulfate and rheopolyglucin. Depending on the initial level of ABP to 400 ml of rheopolyglucin 30–50 ml of 0.25% solution of magnesium sulfate are added (if  $AD_{\text{average}}$  110–120 mmHg — 30 ml, during 120–130 mmHg — 40 ml, more than 130 mmHg — 50 ml). The average speed of introduction of solution is 100 ml per hour. During the intravenous injection of magnesium sulfate the patient should be kept under observance (acute decrease in ABP, suppression of respiratory center and tendon reflexes are possible). After the hypotensive effect is achieved speed of introduction is reduced till the maintaining dose — 1 g/h of dry substance of magnesium sulfate.

In order to liquidate hypovolemia, besides of rheopolyglucin, one should use medio- and low-molecular dextrans, crystalloid solution, 5% solution of glucose, glucose-novocain in mixture, albumin, plasma and reogluman. Choice of the medicines and volume of infusion depend on the degree of hypovolemia, colloid-osmotic content and osmolarity of the blood, condition of central hemodynamics, function of the kidney.

Diuretics inclusion is recommended in the therapy of severe forms of gestosis during the generalized edemas, high diastolic ABP after normalization of VCB, as well as in the case of acute insufficiency of the left ventricle and pulmonary edema. In order to support the function of the vitally important organs cardiac glycosides (corglycon), hepatotrophic drugs, vitamins of B group, ascorbic acid, tocoferol acetate are prescribed.

It is impossible to liquidate eclampsia completely. Effectiveness and duration of treatment depend on



the degree of severity of the disease: during the mild degree therapy is effective, during the moderate one — effect can be short-term.

*Treatment of pregnant women with eclampsia* is in performing of emergency assistance and intensive complex therapy, which is common for the severe forms of gestosis. First aid during the convulsions: 1. A patient is laid on the surface, her head is turned on the side. 2. The mouth is carefully opened by a dilatator or spatel, the tongue is extracted, the upper respiratory tract is released from saliva and mucus. 3. Assistant ventilation with mask or artificial pulmonary ventilation is performed. 4. Catheterization of the vein is carried out, 4 ml of 0.5% solution of sibazon (seduxen) is introduced intravenously and repeat the introduction in an hour in a dose of 2 ml, droperidol — 2 ml of 0.25% solution and pipolfen — 2 ml of 2.5% solution are also introduced intravenously. 5. Drop-by-drop intravenous introduction of magnesium sulfate (5 g of dry substance of 200 ml of rheopolyglucin) is begun during 20–30 min under the decrease in the ABP; then a maintaining dose — 1–2 g/h is introduced under the control of ABP, frequency of respiration, knee reflexes, diuresis (constant catheter) and concentration of magnesium in the blood. 6. Naso-gastral aspiration is performed.

Solutions of colloids are used as infusive solutions because of the small osmotic pressure in such patients (correlation between colloids and crystalloids not less than 2:1). In order to prevent the dextran kidney syndrome using of dextrans is restricted till 500 ml per day. General volume should not be more than 2–2.5 per day. During the infusion one should control the ABP, pulse, every-hour diuresis, CVP. Immediate delivery is an important moment of complex therapy during eclampsia.

**Management of labour** is one of the complex problems during the late gestosis. The indications to delivery: eclampsia, preeclampsia of severe degree during the absence of effective treatment during 3–4 h; preeclampsy of mild degree during the absence of the effective therapy during 1–3 days; chronic hypoxia and growth restriction of the fetus in the case of ineffective therapy.

In pregnant women suffering from mild forms of gestosis and prepared maternal passages labour is performed through the natural maternal passages, using thorough anaesthesia (method of choice — epidural anaesthesia) and controlling ABP, pulse, maternal diuresis and heart activity of the fetus. Inhalation of oxygen, segitin, ascorbic acid, cocarboxylase are introduced for prophylaxis and treatment of fetal hypoxia. Taking into consideration the tocolytic effect of magnesium sulfate, it is not used during labour. Delivery through the maternal passages is performed with amniotomy and further introduction of uterotonics. Prostaglandin gels are introduced into the cervical canal or the posterior vault of the vagina in order to prepare the cervix before the labour induction.

Duration of the II stage of labour is made shorter by episiotomy or application of obstetrical forceps; at the III stage of labour prophylaxis of bleeding is performed (intravenous dropped introduction of oxytocin or methylergometrin).

Indications to caesarean section during late gestosis: 1) eclampsia; 2) severe complications of late gestosis (haemorrhage in the brain, retinal detachment, acute renal-hepatic insufficiency, coma, preterm separation of a normally located placenta); 3) absence of effectiveness of treatment during the severe forms of preeclampsia and unprepared maternal passages; 4) absence of effect of labour stimulation or presence of anomalies of parturition; 5) aggravation of pregnant woman's condition (elevation of the ABP, tachycardia, dyspnea, appearing of neurologic complaints) or hypoxia of a viable fetus in labour during the absence of conditions for their rapid finishing through natural maternal passages; 6) combined obstetrical pathology (pelvic presentation, large fetus).

Abdominal delivery is recommended to perform during chronic hypoxia and syndrome of growth restriction of the fetus, during pregnancy in term till 36 weeks.

**Management of postnatal period** includes the control under blood loss, ABP, diuresis, concentration function of the kidneys, degree of proteinuria and necessity in complex post-syndrome therapy, especially in women in whom getsosis combines with somatic pathology (among essential hypertension, renal diseases and others).

After the discharge from the hospital such patients should be on the books in the women's consultation clinics as well as at the therapist's, oculist's, neuropathologist's and nephrologist's. Medical rehabilitation of women which have gestosis contributes to their complete healing. Thorough observation of the newborns delivered by the mothers suffering from late gestosis is necessary.

*Prophylaxis* is in adequate antenatal management of pregnant women, especially of patients of group of risk of late gestosis development; revealing of premorbid conditions (pretoxicosis) in pregnant women and in time correction; early diagnosis and hospitalization of pregnant women with gestosis to prevent their severe forms. Group of increased risk of development of gestosis includes: 1) primigravidas before 18 and older than 35 years; 2) pregnant women with multiple gestation, polyhydramnion, rhesus-conflict pregnancy, professional harmful conditions or work, disturbed regimen of work and rest; 3) presence of late gestosis in hereditary anamnesis; 4) pregnant women who have extragenital pathology (essential hypertension, chronic renal, cardiac, hepatic diseases, diabetes mellitus and other endocrinopathias, obesity, arterial hypotension, systemic diseases of the connective tissue and others).

#### RECOMMENDED READING

3; 5; 21; 22; 29; 39; 46; 55; 57; 61.

## PLACENTAL INSUFFICIENCY AND INTRAUTERINE GROWTH RESTRICTION OF THE FETUS

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**Placental insufficiency (PI)** is a clinical syndrome, caused by morphological and functional changes in the placenta, which causes the disturbances of condition, growth and development of the fetus. Such a syndrome is the result of the complex reaction of the fetus on different pathological conditions of a maternal organism and manifests itself as disturbances of trophic, endocrine and metabolic function of the placenta, which cause an inability to support an adequate metabolism between mother and fetus. Syndrome of the placental insufficiency is of multifactorial origin and appears in the majority cases of complicated pregnancy.

Hormonal insufficiency, functional and structural inferiority of the endometrium, chronic endometritis, developmental defects of the uterus, autoimmune and other disturbances of the reproductive system, which are often accompanied by promoted chronic hypoxia and hypotrophy of the fetus are the premorbid background for development of PI.

There is no general classification of PI. According to the degree of morphological changes 3 forms of PI are detected (K. H. Wulp, 1980): 1) *hemodynamic*, caused by the disturbance of uteroplacental and fetoplacental blood circulation; 2) *placento-membranous*, which is characterized by the decrease in the abilities of the placental membrane to the transport of metabolites; 3) *cellular-parenchymatous*, related to the disturbance of the cellular activity of the trophoblast and placenta.

Isolated forms of PI are rarely revealed in clinical practice because of their close interconnection between each other. Besides, PI develops as the result of pathological variants of maturation, which manifests itself by the changes in the structural elements of the placenta (preterm, prolonged and dissociated maturation of the placenta), which causes chronic hypoxia and (in severe cases) intrauterine growth restriction of the fetus.

Nervous tissue is one of the most affected by hypoxia. Lack of the oxygen causes delay of maturation of structures of stem parts of the embryo's brain, beginning from the 6th–11th week of its development, displasy of the vessels, delays the maturation of hematoencephalic barrier, imperfect and increased permeability of which are the key points in the development of organic pathology of CNS. In the postnatal period neurological disturbances of hypoxic origin vary in wide range (from functional disturbances of CNS till severe syndromes of disturbances of psychical development) and compose 60–90%.

Determination of *primary* and *secondary* PI is very important in clinical practice. **Primary PI** develops before the 16th week of pregnancy and is the consequence of disturbance of endocrine function of the ovaries, change of endo- and myometrium (inability of receptor apparatus), anatomical disturbances of structures, location and separation of the placenta, defects of vascularization and disturbances of chorion's maturation as well as somatic diseases of pregnant women and unfavorable factors of environment.

**Secondary PI** develops in late terms of pregnancy and is the result of the bleeding of the uterus, caused by arterial hypo- or hypertension in mother, infarctions of the placenta, its partial detachment, changes of rheological properties of blood as well as inflammatory changes as the result of infective agent. Today a **mixed form of PI** is detected.

Besides, there are *acute* and *chronic* courses of the PI, which can develop during both primary and secondary forms. Disturbance of utero-placental circulation plays an important role in pathogenesis of *acute secondary PI* as the result of anatomo-physiological peculiarities of the placenta (absence of anastomoses between the cotyledons); acute disturbance of decidual perfusion, which transfers in the circulatory injury of the placenta, plays the leading role. This kind of PI appears as the result of large infarctions

of the placenta, preterm detachment during its normal localization with forming of retroplacental hematoma and further death of the fetus and abortion. Preterm separation of a normally presented placenta can occur as the result of disturbance of implantation and placentation, hormonal insufficiency, mechanic and psychical injury.

**Chronic PI** is detected in every third woman, which compose the group of high perinatal risk. Perinatal mortality in this group is 60%. At first chronic PI can manifest itself with the disturbance of nutritional function, later — with hormonal disturbances, insufficiency of respiratory function of the placenta. In pathogenesis of this kind of pathology chronic disturbance of decidual perfusion with disturbance of the placentation and placental regulation has the main role. Chronic PI can develop in early term of pregnancy among with primary pathology of the placenta or at the beginning of the second half of pregnancy because of progression of somatic diseases, or development of obstetrical pathology.

Chronic PI is often characterized by the clinical picture of the long-lasting threat of abortion and growth restriction of the fetus at the II and III trimesters of pregnancy. Development of chronic PI among with disturbances of compensatory reactions and microcirculation can result in **absolute PI** and intrauterine death of the fetus. Presence of compensatory processes is an evidence of **relative PI**. In these cases pregnancy finishes with in-time labor, however, the ante- or intranatal hypoxia and (or) intrauterine growth restriction of the fetus can develop. Some authors (V. E. Radzinskiy, 1985) determine *compensated, subcompensated and decompensated* forms of PI.

Despite of multifactorial origin of PI, there are certain terminated laws of development of this syndrome. As a rule, chronic PI develops in two main ways: 1) disturbance of nutritional function or trophic insufficiency, as the result of which absorption and assimilation of nutritional substances as well as synthesis of the main products of metabolism of the fetus disturb; 2) respiratory insufficiency, as the result of which the transport of oxygen and carbon dioxide disturbs.

Appearing of PI in first case occurs in the early term of pregnancy and often causes the intrauterine growth restriction of the fetus.

The consequences of PI for the fetus: syndrome of IUGRF, intrauterine hypoxia and intrauterine death of the fetus. In favorable conditions (predomination of compensatory mechanisms, proper treatment effect), delivery of the healthy child is possible.

The concept “improper growth of the fetus” includes the conditions during which the fetus is very large or very small for its gestational age.

The fetus which weighs less than 10th percentile (according to standard tables), is small; fetus, which weighs more than the 90th percentile, is large. The fetus which weighs between the 10th and 90th percentiles, accords to its gestational age. A small or large fetus for its gestational age can be constitutionally small or large, which is not a pathology. Pathological development causes macrosomia, or intrauterine growth restriction of the fetus.

Classification of the newborn depending on the weight:

1. With low weight — < 2,500 g.
2. With very low weight — < 1,500 g.
3. With considerably low weight — < 1,000 g.

Classification of the newborns depending on the gestational age:

1. Mature —  $\geq 37$  and  $\leq 42$  weeks.
2. Immature — < 37 weeks.
3. Overmature — > 42 weeks.

The concept “**intrauterine growth restriction of the fetus**” (IUGRF) is used for the newborns which weight is by 10% less for the given gestational age. Prevalence of IUGRF is 6–10%. Despite of the concept “low weight during delivery” (for the newborns with weight till 2,500 g) the concept “intrauterine growth restriction of the fetus” is used for the determined gestational age. That’s why correct estimation of the gestational age of the fetus is the most important criterion in diagnosis of IUGRF.

Newborns with IUGRF are weak, the subcutaneous layer is reduced (Fig. 109); there is a lack of potential sizes for both intrauterine existing and for neonatal adaptation.

They are subjected to great risk of intrauterine or neonatal death, hypoxia in antenatal and intranatal periods, meconial aspiration, hypoglycemia, hypothermia, thrombocytopenia, RDS-syndrome, sepsis and so on.

*Etiology.* Fetus, which develops in the uterus should have adequate amount of cells with proper differentiation and, besides, adequate nutrition and function of the utero-placental system.

Factors of IUGRF can be divided into 3 groups: 1) maternal and placental (30–35%); 2) fetal (10–20%); 3) combined (5–10%), however, in every second case they are unknown. That’s why, the possibility of IUGRF in diagnosis of each pregnant woman during the antenatal management (during each visit to doctor) should be excluded.

Maternal and placental factors: 1) arterial hypertension; 2) renal diseases; 3) cardiac and respiratory diseases; 4) severe anaemia; 5) infarctions of the placenta; 6) multiple gestation; 7) unknown.

Fetal factors: 1) genetic anomalies and congenital developmental defects; 2) teratogenic





Fig. 109. Newborn with promoted intrauterine growth restriction (weight — 840 g, gestational age — 36 weeks). Unceasing monitoring of cardiac activity, function of respiration and body temperature is performed

influence; 3) congenital infections (rubella, cytomegaloviral infection).

Combined factors: 1) severe insufficiency of nutrition; 2) drugs addiction; 3) consuming alcohol; 4) smoking; 5) others.

Hypertensive disturbances (essential hypertension — 25–30%) and late gestosis are the most spread maternal factors of IUGRF risk. As the result of vascular spasm utero-placental circulation reduces, providing the oxygen and nutritional substances to the fetus through the placenta restricts. Maternal smoking during many years, causing the loss of weight and its low increment during pregnancy (less than 250 g in a week), can contribute to the development of IUGRF. During the multiple gestation even the adequate nutrition does not prevent the intrauterine growth restriction of the fetuses.

Congenital infections and developmental defects are the fetal causes of IUGRF. Infection of the fetus in early gestational period with

viral or other agents composes nearly 5% of cases of IUGRF. Bacterial infections do not influence the appearing of IUGRF. Congenital developmental defects of the fetus (defects of the heart, dismorphic syndromes) occur in 15% of cases. Trisomias 21, 18, 13 among the chromosomal anomalies related to IUGRF appear.

Symmetric (type I) and asymmetric (type II) are the most spread types of IUGRF. In scientific publications of some authors an intermediate type of IUGRF is described.

**Symmetric type (type I)** is observed in 20% of cases. Its development is possibly related to effect of early injuring factors, which appear when the fetus grows by cellular hyperplasia. This form of IUGRF, as a rule, is caused by the structural or chromosomal anomalies, congenital developmental defects, consuming of alcohol, drugs, cigarettes by the mother and congenital infections.

**Asymmetric type (type II)**, as a rule, develops as the result of effect of injuring factors, which appear during the cellular hypertrophy, i.e. in the second half of pregnancy. The degree of the fetal injury will depend on the early time of effect of unfavorable factor. *Maternal vascular diseases* (arterial hypertension of pregnancy and caused by it disturbances of the utero-placental circulation) are the causes of asymmetric intrauterine growth restriction of the fetus. During the asymmetric type of intrauterine growth restriction vitally important organs of the fetus — brain and heart, in which cellular changes occur in less degree and later, are injured selectively (*syndrome of brain's preserving*).

**Diagnosis and management of pregnant women with PI and IUGRF.** Antenatal diagnosis of PI and especially of IUGRF is actual and is not perfect. Diagnosis of PI is made on the basis of the results of complex examination of pregnant women, data of anamnesis, influence of harmful factors of environment, extragenital diseases and complications of pregnancy. If a woman has given birth to children with IUGRF, there is high risk of the repeated delivery of children with low for the gestational age weight. In such cases it is detected whether the pregnant woman consumes alcohol, smokes, and chronic diseases are diagnosed.

The most informative methods of diagnosis of PI are following: 1) data of physical examination of pregnant women: estimation of growth and development of the fetus during the dynamic observation under the height of standing of the uterine fundus, circumference of the abdomen, height and weight of pregnant women; 2) ultrasound fetometry and placentography; 3) estimation of the fetal condition while observing its movements and cardiac function; 4) biophysical profile of the fetus and investigations of blood



circulation with dopplerometry; 5) biochemical diagnosis of the disturbances of the fetoplacental system (detection of the content of the fetoplacental hormones in pregnant women's blood and  $\alpha$ -fetoprotein); 6) estimation of indicators of metabolism and hemostasis of the mother.

**Physical examination** of pregnant women has a restricted informativity for diagnosis of IUGRF, however, it is an important screening test to detect the anomalies of fetus' growth. Indicators of the increment and increase in the mother's weight are also less informative, but can be useful. Height of standing of the uterine fundus above the pubis (cm) during its measuring between the 15th and the 36th weeks of pregnancy should approximately accord to the gestational age in weeks. *The lag of the size of the height of the uterine fundus (HUF) by 2 cm and more from the supposable with this gestational age (counting from the first day of the last menstruation or results of fetometry at the I trimester of pregnancy), absence of increment of HUF during 2–3 weeks during the dynamic observance under pregnant women is an evidence of IUGRF.* High frequency of false-positive results and inability to differ the symmetric and asymmetric types of IUGRF are essential problems. During the multiple gestation, hydramnios, transverse location of the fetus, this examination is less important. Clinical methods of diagnosis of IUGRF, as a rule, are informative during the severe cases.

*Ultrasound fetometry and placentography* can detect the dynamics speed of fetal growth, thickness, localization and degree of maturity and structure of the placenta; detect the amount of the amniotic fluid. During the ultrasound fetometry it is necessary to detect both biparietal size (BPR) of the head and length of the hip (LH) of the fetus and its average diameter of the chest (CD) and diameter of the abdomen (AD); detect the correspondence between the circumference of the head and abdomen, volume of the amniotic fluid. True sign of IUGRF is *delay of the fetometric indicators by 2 weeks and more from parameters, which accord to this gestational age.* The reduce of the abdominal diameter of the fetus is the most informative criterion of IUGRF. Diameter of the cerebellum of the fetus does not change under the effect of the factors which cause IUGRF; because of this, if there are hardships in determination of the gestational age, it is important to measure this diameter of this cerebral structure. There are 2 degrees of IUGRF by data of ultrasound fetometry: I — incorrespondence in development by 2 weeks; II — by 3–4 weeks; III — more than 4 weeks.

US detects the type of IUGRF: if the form is symmetric, all structures of the fetus are reduced

equally; if asymmetric — there is a reduction of the circumference of the fetal abdomen according to the head (*syndrome of brain's preserving*). Combination of oligohydramnios with IUGRF is a prognostically unfavorable sign (decrease in diuresis of the fetus as the result of restriction of renal blood circulation).

Dynamic fetometry is done with interval (2 weeks or more), the weekly increase of fetal weight is detected and compared with percentile curves (normative tables) for this gestational age.

US of the placenta (placentography) reveals its localization, structure and degree of maturity; placentometry is performed.

Restriction or preterm maturation of the placenta contributes to the aggravation of the fetal condition. Thickness of the placenta increases up to 36–37 weeks of pregnancy and is 3.5–3.6 cm. A thin placenta (thickness up to 2 cm at the III trimester of pregnancy) is observed during gestosis and IUGRF. Volume and thickness of the placenta are related to extent of severity of late gestosis.

**Observing under the movements and heart activity of the fetus.** Decrease in the activity of fetal movements, which pregnant women feels, as a rule, foreruns by 12–48 hours the changes registered on cardiotocogram (CTG). Increase or decrease in the fetal movements by 50% is the evidence of the disturbance of the fetal condition. Such criterion as reduction of the fetal movements by 10 and less during 12 h can also be used. While analyzing the movements and data of CTG of the fetus, it is necessary to pay attention on its circadian rhythms (minimal activity from 1.00 to 6.00, increase in activity — at 7.00–8.00, moderate activity — from 10.00 to 18.00, maximal activity — at 21.00–23.00).

During interpretation of CTG indicators it is necessary to pay attention on the gestational age of the fetus, because when progressing of pregnancy variability of the heart rate and number of accelerations increase.

Typical changes on CTG during the restriction of the fetal development are following: decrease in amplitude, low frequency of immediate oscillations, appearing of expressed spontaneous decelerations, decrease in amplitude and duration of acceleration.

*Biophysical profile of the fetus* contents 5 indicators of its condition, each of which is estimated in points (0–2). These are data of the non-stress test (reactive — 2 points, irreactive — 0 points) and 4 indicators of the viability of the fetus, which are detected by US (count of the respiratory movements, movements of body and extremities of the fetus, detection of its tonus as well as volume of the amniotic fluid). Perinatal

consequences depend on the total estimation of these parameters.

*Investigation of the blood circulation in the system mother — placenta — fetus* with dopplerometry is performed in the thoracic segment of the descending branch of the aorta, umbilical veins, internal carotis artery of the fetus, the umbilical and the uterine arteries.

Increase in the peripheral vascular resistance in all parts of the system of mother — placenta — fetus, decrease in diastolic component of the blood flow and increase in systolo-diastolic correlation in uterine arteries are the evidences of which, are the characteristic features of IUGRF.

Change of the utero-placental circulation is a primary moment of hemodynamic disturbances. While PI progressing the signs of decompensation of fetal heart appear, which is expressed by the decrease in the maximal speed of the blood flow through all cardiac valves and causes functional insufficiency of the right atrio-ventricular (tricuspid) valve. During IUGRF pulsational index in the fetal aorta increases, which is caused by the decrease in the peripheral vascular resistance of the fetus and fetal part of the placenta. Zero or negative indicator of diastolic component of blood flow in the umbilical artery is an evidence of critical condition of the fetus. These changes occur earlier than in the aorta, which requires an immediate delivery. Appearing of the critical indicators of fetoplacental hemodynamics is in direct dependence on the severity of the disease.

**Biochemical diagnosis of disturbances** in the fetoplacental system (determination of content of fetoplacental hormones in pregnant women's blood and  $\alpha$ -fetoprotein) is performed with the detection of proper parameters in biological fluids of maternal and fetal organisms. Dynamic detection in the blood serum of pregnant women of content of chorionic somatomammotrophin, progesterone, activity of alkaline phosphatase assists to detect the function of the placenta, rate of estriol,  $\alpha$ -fetoprotein and characterize the adequacy of the functions of the placenta and endocrine status of the fetus. Each of these parameters taken separately is less informative because of the wide range of individual variations. These indicators should be estimated in dynamic correlation between each other and with other methods of investigation.

**Estimation of the indicators of maternal metabolism and homeostasis of mother.** Pathogenesis of PI, caused by the vascular diseases of pregnant women, late gestosis, antiphospholipid syndrome, is related to development of chronic syndrome of disseminated intravascular blood coagulation (DIC-syndrome). Disturbances of *hemostasis* are secondary among the promoted

disturbances of the utero-placental vascular channel. There is a direct correlation between the disturbance of the utero-placental circulation and rheologic properties of the blood. Slowing of the blood flow in the vessels of the uterus and intervilliar space causes the hypercoagulation in microcirculator channel of the fetoplacental system with the increased tissue thromboplastin release in the blood circulation and intensification of the aggregation of the blood cells.

Examinations of the fetal condition in the case of restriction of his development are performed using all possible perinatal technologies. Count of the movements of the fetus, the nonstress test, contractile stress test and biophysical profile are done 1–2 times a week or more frequently.

With amniocentesis and cordocentesis investigation of the tissues and blood of the fetus is possible. In fetal blood the level of immunoglobulins is detected to diagnose possible viral infection as a cause of IUGRF. Rates of the oxygen in the blood and acid-base condition of the fetus are detected.

**Treatment and management of pregnancy and labor.** Treatment of pregnant women with PI is performed using the complex of treatment means to liquidate the symptoms of obstetrical and extragenital pathology. In the case of diagnosis of IUGRF the safest delivery of the fetus in optimal term is the main purpose of pregnant women's management. In order to detect the time of delivery attention is paid to the degree of maturity of the fetus and extent of danger for the intrauterine life during chronic hypoxia.

Antenatal management of pregnant women is in detection of IUGRF cause, contribution to the fetal growth and monitoring of its condition. Possible developmental anomalies of the fetus, volume of the amniotic fluid, type and degree of IUGRF are detected with US.

Treatment-resting regimen, independently on the severity of the main disease (hospitalization, an individual ward), is the most important moment in management of such pregnant women. It is important to make a contact with a pregnant woman, liquidate her anxiety and perform the conditions for emotional and physical rest. Bed regimen with reduction of physical activity is prescribed; it is recommended to lie on the left side to improve the utero-placental circulation, which contributes to the growth of the fetus.

Balanced and rational diet of a pregnant woman has an important meaning for prophylaxis and treatment of PI. Food should be diverse, with optimal content of proteins, lipids and carbohydrates, vitamins, salts of potassium, magnesium and iron.

To improve the utero-placental circulation (on microcirculation level too) spasmolytics, va-

sodilator preparations (aminophylline, no-spa, papaverin),  $\alpha$ -adrenomimetics (partusisten, bricanyl), remedies which improve microcirculation (xantinol nikotat, complamin), desaggregants (curantil, trental), microdoses of acetylsalicylic acid, anticoagulants (heparin, flaxiparin), low-molecular dextrans (rheopolyglucin, reogluman), stabilizations of capillary permeability (ascorbic acid, ascorutin) are used.

Infusive therapy causes (reoplyglucin, reogluman, solutions of amino acids, electrolytes and microelements, glucose) improvement of rheological properties of the blood, metabolic processes, microcirculation, decrease in hypoxemia, correction of electrolytic disturbances.

Application of curantil (dipiridamol, persantin) and trental (pentoxyphylline) is based on the breaking of activity of phosphodiesterase (enzyme which destroys cyclic adenosin-monophosphate — c-AMP) and potentiation of antiagregant effect of prostaglandins (prostacyclin). Using of small doses of acetylsalicylic acid decrease synthesis of tromboxane without considerable effect on the rate of prostacyclin. Because of this thromboxane effects as vasoconstrictor is blocked, activation of thrombocytes decreases and the utero-placental circulation improves. Increase in the amount of tromboxane as compared to prostacyclin provides vasodilatation, contributes to the decrease in aggregation and adhesion of thrombocytes and increase in the utero-placental circulation. In women with high risk of the gestosis development small doses of acetylsalicylic acid (60–300 mg per day in the morning after breakfast) and heparin (depending on the clinical manifestations of late gestosis and PI, expressivity of hemorrheologic and hemocoagulational disturbances) are used for prophylaxis of late gestosis. Using of acetylsalicylic acid is stopped 2 weeks before delivery, of heparin — 3–4 days before delivery (prophylaxis of bleeding).

For normalization of metabolic processes in maternal and fetal organisms oxidants of the direct effect (vitamins of B group, ascorbic acid), cocarboxylase, folic acid, atioxydants of indirect effect (methionin, glutamic acid), glucose, as energetic material are used; for normalization of function of the placental membrane — essentielle and tocopherol acetate (vitamin E). Normalization of trophic process of the fetoplacental complex is provided by introduction of solutions of amino acids and solcaseril. In order to improve the gas metabolism between maternal and fetal organisms and liquidation of hypoxia inhalations of oxygen and hyperbaric oxygenation (HBO) are used. Methods of sorptional detoxication are used for elimination of toxic substances and their metabolites from an

organism: enterosorption, hemosorption (sorbents cKH-2M, cKH-4M, cKH -112), plasmapheresis.

Methods of quantum hemotherapy: autotransfusion of the blood irradiated by ultraviolet radiation, intravenous laser irradiation of blood by low-energetic helium-neon laser. They perform multicomponent and multispread effect on homeostasis, contribute to immunocorrection, improving of microcirculation, rheological properties of blood, normalization of fetal condition.

Advantages of non-medicamentous methods of treatment are following: possibility of prophylactic use, absence of allergization, using of low amount of drugs, restriction of the treatment term.

During infection of pregnant women with virus of genital herpes and cytomegalovirus, treatment is performed with normal immunoglobulin of the human for intravenous introduction, which increases the immune status of women and reduces the frequency of intrauterine infection of newborns. 25–50 ml of immunoglobulin on 5% solution of glucose or isotonic solution of sodium chloride (1 : 4) are introduced on drops intravenously with speed of 20–25 drops per minute at the II and III trimesters of pregnancy. 3–4 sessions with intervals 1.5–2 months are performed.

Pregnant women with antiphospholipid syndrome during PI should be treated with acatovegin in the dose of 2–4 ml on 250–400 ml of isotonic solution of sodium chloride (5 procedures with 1 day interval), alternating with instenone in the dose of 2 ml on 250–400 ml of isotonic solution of sodium chloride. Essentiale (drop-by-drop introduction or streamly slowly or in capsules) and troxevasin intravenously or in capsules are included in treatment. Treatment of pregnant women with chronic placental insufficiency should be performed with control by dopplerometry, fetoplacental blood circulation, determination of coagulogram to estimate the effect of therapy, choice of the optimal term and method of delivery and preventing of iatrogenic complications.

Detection of the time of delivery is based on many factors. During promoted hypoxia of the fetus a planned caesarean section without augmentation of labour is a method of choice. Such policy is performed because of restricted abilities of the fetus to endure the long-lasting induced labor. Induction of labour should be performed during the constant monitoring of the heart rate of the fetus with oxygen therapy of the mother. In the cases of appearing of decelerations, related to the reduction of the volume of the amniotic fluid, amnioinfusion is performed (introduction of warm isotonic solution of sodium chloride with a transcervical catheter). Dur-

ing the complicated course of I stage of labour abdominal delivery is performed. Because of the increased frequency of meconium discharge during labour and meconial aspiration, content of the nasal part of the pharynx and oral cavity is eliminated, visually controlling the vocal cords.

Neonatal care is very important because of the restricted adaptational mechanisms of newborns with IUGRF. Newborns with expressed IUGRF are very sensitive to hypothermia; severe hypoglycemia and polycytemia can develop and blood viscosity increases.

The further development of the newborns with IUGRF is more optimistic, but approximately in one half of such children vocal and behavior problems appear; they hardly study because of mental retardation. Social-economic status of parents considerably influences further development of children with IUGRF.

#### RECOMMENDED READING

3; 5; 21; 22; 29; 39; 46; 56; 57; 61.



## FETAL HYPOXIA, ASPHYXIA AND BIRTH INJURY OF A NEWBORN INFANT

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### FETAL HYPOXIA

**Fetal hypoxia** is a pathological condition, related to disturbance of the fetoplacental gas metabolism and development of oxygen insufficiency, hypercapnia and metabolic disturbances during pregnancy and labour, which are accompanied (in severe cases) with anatomical injury of cells, organs and systems of the fetus. Frequency of fetal hypoxia is 5–10% of all labour, however, mild forms are not taken in to consideration.

*Concepts “hypoxia” and “asphyxia” of the fetus and newborn do not reflect the essence of all disturbances in the organism which are present during this pathology. Concepts “distress” and “depression” are used in foreign medicine, however, they are not correct too.*

Actuality of the problem of fetal hypoxia, asphyxia and birth injury of the newborn is related to their leading role in the structure of perinatal morbidity and mortality (till 50%). More than 80% of all nervous-psychical diseases of children are related to perinatal hypoxia. Leading scientists investigated and now develop this problem — L. S. Persianinov, A. P. Nikolayev, Ye. T. Mikhailenko, G. M. Savelyeva, M. V. Fedorova, K. N. Vikhlayeva, N. P. Shabalov, L. V. Timoshenko, V. I. Grishchenko, G. K. Stepankovska, B. M. Ventskovky and others.

According to the type of the disturbance of providing the fetal tissues with oxygen there are some kinds of hypoxia determined: 1) **hypoxic** (decrease in saturation of hemoglobin with oxygen); 2) **hemodynamic** or **circulatory** (perfusion of the tissues with oxygen reduces as the result of the disturbance of blood circulation during the normal partial pressure of oxygen —  $pO_2$  in arterial blood); 3) **bloody** or **hemic** (amount of erythrocytes decreases, on example, during the hemolytic disease of the fetus, content of hemo-

globin in erythrocytes and ability of hemoglobin to connect the oxygen decrease); 4) **tissue** (as the result of disturbance of the ability of oxygen consuming by tissue cells); 5) **mixed**.

*Etiology and pathogenesis.* There are *acute* and *chronic* forms of fetal hypoxia. According to the degree of severity there are *mild*, *moderate* and *severe* hypoxia. Causes of the fetal hypoxia are divided into 3 groups: 1) preplacental; 2) placental; 3) fetal (postplacental).

*Preplacental causes* (the majority of cases of chronic fetal hypoxia) related to insufficient saturation of the mother's blood with oxygen (cardiac and pulmonary pathology), disturbance of its transport by the blood (anaemia, disturbance of utero-placental circulation during severe gestosis, pathology of contractile activity of the uterus), with tissue and mixed hypoxia (diabetes mellitus). *Placental causes* include anomalies and pathological changes of the placenta, occlusion of its vessels, excluding of the regions of the placenta from blood circulation (late gestosis, prolonged pregnancy, presentation and preterm separation of the placenta). Disturbance of the transport and assimilation of the oxygen by the fetus (anaemia, IUGRF, hemolytic disease of the fetus, pathological changes of the umbilical cord) or increased requirement in the oxygen (large fetus, multiple gestation) are the *fetal (postplacental) causes* of hypoxia. Problem of fetal hypoxia is organically related to the syndrome of the placental insufficiency and IUGRF.

Acute hypoxia of the fetus occurs as the result of disturbance of fetoplacental and utero-placental circulation (preterm separation of the placenta, compression of the umbilical cord with stop of blood circulation, exhaustion of the compensatory reactions of the fetus during the normal parturition and its anomalies); under the effect of preparations which suppress the respiratory centers (labour anaesthesia). A physiological organism of the fetus is more resistant to hypoxia than organism of an adult because of

the high affinity of fetal hemoglobin to the oxygen, more capacity of the tissues to utilize the oxygen from the blood and considerable tissue resistance to acidosis.

Disturbance of the gas metabolism between mother and fetus results in the following changes: compensatory intensification of the utero-placental circulation; tachycardia of the fetus; increase in the production of vasoactive substances (catecholamines, corticosteroids, vasopressin, rennin); increase in the vascular tonus; excluding a considerable part of the blood channel from the blood circulation; deposition of the blood in liver with predominant blood supply of vitally important organs (the brain, heart, adrenal glands); increase in the cardiac output, systolic ABP and central venous pressure.

Because of the intensification of hypoxia, maximal strain with signs of exhaustion of functional reserves of the fetus occurs: intensification of anaerobic glycolysis, mobilization of glycogen from depot (the liver, heart, kidneys); tissue hypoxia and acidosis of the blood develop. Progressive hypoxia is accompanied with bradycardia (compensatory reaction to support the cardiac output and ABP), decrease in the respiratory movements and movements of the fetal trunk and discharge of meconium.

During the exhaustion of compensatory reaction pressure of oxygen considerably reduces,  $P_{CO_2}$  increases, metabolic acidosis, which is accompanied with the reduction of vascular tonus, increasing of the capillary permeability, edema of the tissues, intensification of thrombocytes aggregation and disturbance of microcirculation, develops and progresses. Cardiac output and ABP decrease, central venous pressure elevates, hypoperfusion, ischemia and disturbance of the cerebral metabolism develop, which causes inevitable changes (necrosis of nervous tissue and death of the fetus).

*Diagnosis* of fetal hypoxia is done with all possible methods (see chapter 11): 1) estimation of the movements; 2) estimation of the cardiac activity and its changes (cardiotocography), if the internal and external stimuli are present (movements of the fetus, stress influence); 3) electro- and phonocardiography of the fetus; 4) US and estimation of biophysical profile of the fetus; 5) dopplerometry of the blood flow in the uterine and fetal vessels; 6) estimation of biochemical parameters of fetoplacental complex (rates of chorionic gonadotrophin, progesterone, estriol, chorionic somatomammotrophin,  $\beta$ -fetoprotein, thermostable alkaline phosphatase, oxytocinase in the blood serum and other).

*Estimation of the movements.* Considerable decrease in fetal *movements* is a dangerous sign

of fetal hypoxia. Not less than 10 movements during 12 h is the normal condition of the fetus.

*Antenatal monitoring of the cardiac activity of the fetal heart* (cardiotocography) is performed during 60 min, taking into consideration periods of its sleep and activity. *The reactive non-stress test* (2 accelerations and more on  $\geq 15$  per 1 min during  $\geq 15$  s as a response to its movements) is an evidence of normal condition of the fetus. Hypoxia of the fetus is characterized by the monotony of the cardiac rhythm during a long period (more than 50% of records of cardiotachogram), tachy- or bradycardia. *The unreactive nonstress test* (during the absence of accelerations) requires its repeating, performing tests with functional load or using of the stress (oxytocin) test.

As the result of breath-holding during inspiration decrease in the heart rate of the fetus occurs, and during expiration — its increase (on average by 7 per 1 min); during the chill test the heart rate of the fetus decreases by 10 per 1 min. Acoustic stimulation with artificial pharynx causes the changes of the heart rate of the fetus in the norm by 15–20 per 1 min. As the result of hypoxia the paradox reaction or change of the heart rate of the fetus is observed.

*Oxytocin test* makes the conditions to influence the fetus with uterine contractions and related to them decrease in utero-placental circulation. Because of fetal hypoxia monotony of the heart rate, late decelerations (decrease in the heart rate by 15 and more per minute as a response to labour pain), tachy- and bradycardia appear.

*Electro- and phonocardiography of the fetus.* Deformation of the *QRS* complex, its increase by more than 0.07 s, increase in interval P-Q till 0.12 s at the ECG and murmurs of the heart at the PCG are the evidences of fetal hypoxia.

*Ultrasound fetometry and placentography* detect the sizes of the trunk and head of the fetus and their correspondence to gestational age, as well as sizes and structure of the placenta. Intrauterine growth restriction, a thin placenta, oligohydramnios are the signs of fetal chronic hypoxia.

*Estimation of the biophysical profile* of the fetus by F. Manning and co-authors (1980) includes the result of the nonstress test, especially of respiratory movements and movements of the fetal trunk, its muscular tonus, volume of the amniotic fluid. Estimation of the biophysical profile, equal to 8–10 points, is an evidence of satisfactory condition of the fetus, 4–6 — of promoted hypoxia and necessary rapid delivery, if the lungs of the fetus are mature, 0–2 points — of the necessary immediate delivery.

Cardiotocography and biophysical profile of the fetus is the more informative the more the

gestational age. In the case of preterm pregnancy, frequency of false-negative results related to immaturity of the fetus is very high. **Doppler estimation of the disturbances of blood circulation, which occurs in the vessels of the fetus, placenta, in the uterine arteries**, is the most informative evaluation of the condition of the fetus beginning with II trimester of pregnancy (16–20 weeks).

**Estimation of the biochemical parameters of the fetoplacental complex.** Investigation of the fetal blood, obtained by cordocentesis, helps to detect pH of blood,  $P_{O_2}$ ,  $P_{CO_2}$  and level of glycaemia of the fetus.

Reduction of the rates of *hormones, specific proteins, enzymes and other biochemical markers* of the fetoplacental complex, detected during the serial examinations, also can be the evidence of pH and hypoxia of the fetus.

*In I stage of labour* expressed tachycardia (more than 180 per minute), bradycardia (less than 100 per minute), late decelerations of the cardiac rhythm, which appear at the beginning of labour pain and finish after it by 20–40 s, are the signs of fetal hypoxia.

Discharge of meconium during the occipital presentations, acidosis (decrease in pH of blood, received from the skin of the head of the fetus < 7.2) are the signs of the fetal suffering. If during the repeated determination of pH blood does not increase, immediate delivery is performed according to obstetrical situation (caesarean section, obstetrical forceps).

*Prophylaxis and treatment* are the same as during PI, and turned on improvement of utero-placental circulation, increase in oxygenation of the fetus and liquidation of metabolic acidosis. In-time treatment of pregnant women with extragenital diseases and obstetrical complications plays an important role.

Oxygenic therapy is performed during 10–15 min (10–12 l per minute) with intervals of 10–15 min. Long-lasting (more than 30 min) oxygenic therapy can cause hyperoxygenation and contraction of the vessels of the umbilical cord.

To activate the metabolic processes of pregnant women or parturient women intravenous introduction of 20–40 ml of 40% solution of glucose is performed. Calcium gluconate (10–20 ml of 10% solution) contributes to the liquidation of hypocalcaemia; during the acidosis it is recommended to introduce 150–200 ml of 5% solution of sodium hydrocarbonate.

To improve the utero-placental circulation one should use spasmolytic and vasoactive substances (no-spa, papaverin, aminophylline),  $\beta$ -adrenomimetics (partusisten, bricanil), disaggregate remedies (curantil, trental), reologically-active preparations (rheopoluclucin, reogluman and others).

In the case of delivery during a preterm pregnancy mucosolvan, glucocorticoids (prednisolone in a dose of 12 mg during 3 days) and ethimisol are used to intensify the maturation of the fetal lungs.

To improve the transport function of the placenta and the utero-placental circulation, treatment of chronic hypoxia of the fetus includes essentielle, lipin, actovegin, instenone, cocarboxylase, vitamins of B group, ascorbic acid, tocopherol acetate, physical factors: hyperbaric oxygenation, quantum hemotherapy, sorption methods, aeroionophytherapy and others.

## ASPHYXIA OF A NEWBORN INFANT

Asphyxia of a newborn infant is a complex of pathological changes in an organism, at first disturbances of the respiration, which causes the development of oxygen insufficiency (hypoxia), hypercapnia and acidosis. In 70% of cases asphyxia of newborns is the result of intrauterine hypoxia of the fetus. Asphyxia during delivery is accompanied with the high perinatal mortality and invalidization of survived children in their future life. There are primary (during delivery) and secondary (first hours or days of life) asphyxia.

*Etiology and pathogenesis.* *Acute* (preterm separation of the placenta, compression and prolapse of the umbilical cord, disturbance of the uterine circulation as the result of anomalies of parturition, overdosage of oxytocin, acute decrease in ABP of the mother) and *chronic intrauterine hypoxia of the fetus* (chronic placental insufficiency together with extragenital and obstetrical pathology of the mother), intracranial injury of the fetus, immunologic incompatibility of the blood of the mother and fetus, intrauterine infections, aspiration of the amniotic fluid (aspirational asphyxia), developmental defects of the fetus and medicamentous depression of the newborn (iatrogenic asphyxia) are the main causes of **primary asphyxia**.

**Secondary asphyxia** can be related to the disturbances of the cerebral blood circulation, pneumopathias and aspiration of stomach content in the newborn.

Restructuring of metabolic processes, hemodynamics and microcirculation depending on the degree and duration of hypoxic hypoxia occur as the result of asphyxia in the newborn. Metabolic or respiratory-metabolic acidosis, hypoglycemia, nitrogenemia, hyperkalemia, later — hypokalemia gradually develop. Misbalance of electrolytes and acidosis causes the cellular



hypohydration. Acute hypoxia is accompanied with the increase in erythrocytes' number. As the result of chronic hypoxia hypovolemia develops, which is accompanied by the increase in blood humidity, aggregation of the cellular elements (erythrocytes, thrombocytes). In the brain, heart, liver, kidneys and adrenal glands of the fetus oedemas, hemorrhages, focuses of necrosis and tissue hypoxia appear. Cardiac output reduces, ABP decreases and eliminational function of the kidneys disturbs.

*Clinical picture and diagnosis.* Degree of asphyxia is determined by the Apgar's score (heart rate, character of breathing, muscular tonus, reflexes, skin colour). If the total points are 8–10, this is an evidence of satisfactory condition of the fetus, 6–7 — of mild asphyxia, 4–5 — of moderate and 1–3 points — of severe one. If the total points are 0 — it is the evidence of clinical death. To determine prognosis and effectiveness of reanimation means, condition of the fetus is estimated in 5 min after delivery. Increase in the points by the Apgar's score on the 5th minute of life as compared with the one on the 1st minute predicts a favorable prognosis.

According with ICD X review there are mild and severe asphyxia of the newborn. Mild asphyxia — estimation by Apgar's score on the 1st minute is 4–7 points, in 5 min — 8–10 points; severe asphyxia — estimation by Apgar's score on the 1st minute is 0–3 points, in 5 min — over 6–7 points. In immature newborn degree of respiratory insufficiency by the Silverman—Anderson score is determined.

The indices of the acid-base condition of the newborn's blood are evidence of the extent of the severity of asphyxia. In healthy newborns pH of the umbilical blood is 7.20–7.36, deficiency of base (BE) — 9–12 mmol/l, during mild and moderate asphyxia these indices are 7.19–7.18 and 13–18 mmol/l, during severe asphyxia — pH is less than 7.1, BE — more than 19 mmol/l.

During mild asphyxia a newborn makes the first inspiration during the first minute after delivery, but his respiration is weakened, acrocyanosis, cyanosis of the nasolabial triangle and decrease in the muscular tonus are observed. During the mild asphyxia a newborn makes the inspiration during the first minute, respiration is weakened, scream is weak; brady- or tachycardia manifests itself, muscular tonus and reflexes are decreased; cyanosis of the face, palms and soles and cord pulsation are observed. During severe asphyxia respiration is irregular (individual inspirations) or absent, a newborn does not scream, sometimes moans, expressed bradycardia or single irregular contractions of the heart, muscular hypotonia are observed, reflexes are absent, the skin is pale because of the

spasm of peripheral vessels; cord pulsation is absent and adrenal insufficiency often develops.

Within first hours of life in the newborn which had asphyxia **posthypoxic syndrome** develops, the main clinical manifestations of which are various forms of the CNS injury: 1) *syndrome of stimulation*; 2) *syndrome of suppression* (is accompanied by worse prognosis, especially expressed during the acute adrenal insufficiency); 3) *convulsive syndrome*; 4) *hypertensive-hydrocephalic syndrome or their combinations*. In every third child with mild asphyxia disturbance of cerebral blood circulation of I–II degrees develops, and in all children which had severe asphyxia — disturbance of hemo- and liquorodynamics of II–III degree. Insufficiency of oxygen and disturbance of external respiration break the forming of hemodynamics and are accompanied by the persistence of fetal blood circulation, development of RDS-syndrome. On the 2nd–3rd day of life as the result of disturbance of renal function the edematous syndrome develops. In the case of combination of hypoxia with birth injury, subdural, subarachnoidal, intraventricular hemorrhages, convulsive syndrome, focal neurologic symptoms appear.

*Treatment* depends on the extent of asphyxia. Primary reanimation is performed in a puerperal ward; it includes:

1. *Providing of the passage of respiratory tract* (content of the nasal part of the pharynx and oral cavity is evacuated from the moment of disengagement of the fetal head, in case of severe asphyxia — immediate intubation of trachea); toilet of the newborn finishes with the evacuation of the stomach content.

2. *Active warming of the child* (lies on the warm table under the source of the ray warm, head of the fetus is bent by 15°).

3. *Tactile stimulation of respiration* (drain position of the fetus, perform the vibrating massage of the chest, continuing the evacuation of the content from the respiratory tract, during the severe aspiration — under the control of laryngoscope).

4. During the absence or irregular spontaneous respiration during 20 s after delivery or in the case of bradycardia (heart rate is less than 100 per minute) *mask artificial pulmonary ventilation (APV)* with 90–100% oxygen with the frequency of 40 per minute; if the apparatus for APV is absent — breathing “mouth-to-mouth”.

5. During the aspiration of the amniotic fluid, which requires the sanitation of trachea, ineffective of the mask APV during 1 min, inadequate spontaneous respiration, *intubation of trachea* is performed and APV *through the endotracheal tube*.

6. If the heart rate is less than 80 per minute among with APV, *closed-chest massage* is per-



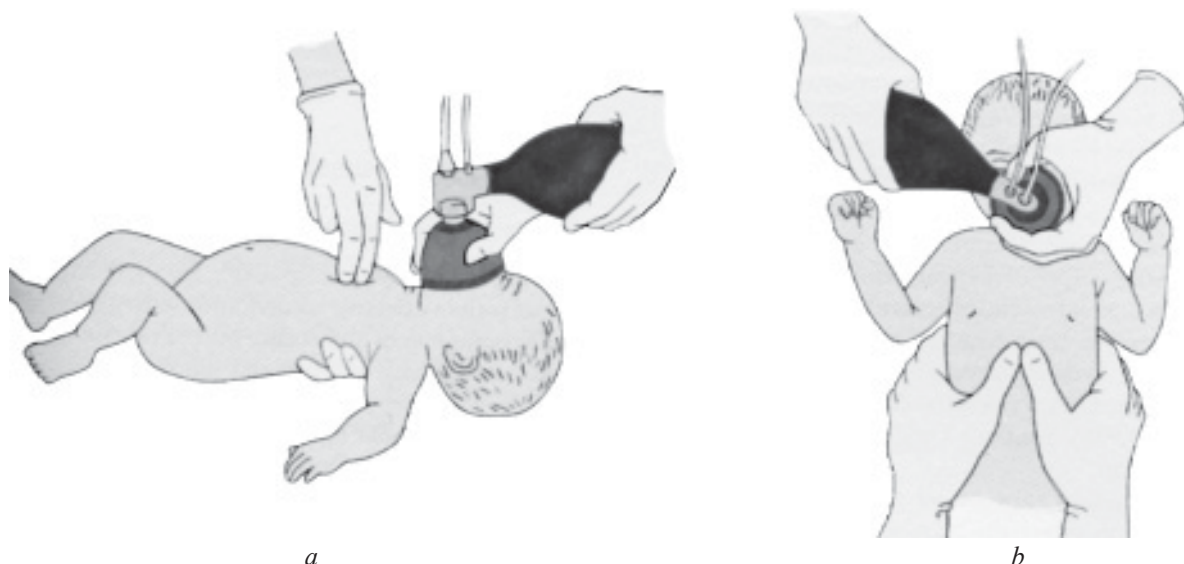


Fig. 110. Reanimation of a newborn: methods of closed-chest massage (a, b)

formed (3 pressings on the chest — 1 inspiration (Fig. 110), till the cardiac rhythm becomes 100 per minute); if it is ineffective during 30 s, solution of adrenalin (1:10,000) in a dose of 0.12–0.3 ml/kg is introduced in the umbilical vein or endotracheally; repeated introduction is possible in 5 min.

7. If bradycardia is less than 80 per minute and goes on, there is a suspicion on hypovolemic shock and decompensated acidosis, among with APV and closed-chest massage in order to restore the volume of circulating blood the solution is introduced into the umbilical vein (5% solution of albumin, isotonic solution of sodium chloride or Ringer's solution in a dose of 10 ml/kg during 5–10 min; 4% solution of sodium hydrocarbonate in a dose of 4 ml/kg during 2 min), if there are signs of adrenal insufficiency — hydrocortisone in a dose of 8–10 mg/kg, prednisolone — 1–2 mg/kg.

8. In case of medicamentous suppression of breathing narcotic analgesics' antagonists are introduced: naloxone in a dose of 0.01–0.02 mg, or ethimizol — 0.2–0.5 ml of 1.5% solution; aminophylline — 0.1 ml of 2.4% solution.

9. If the resuscitation means are ineffective during 15–20 min (absence of spontaneous breathing and heartbeats), they should be finished (irreversible injury of the newborn's brain).

After the restoration of respiration, cardiac activity, stabilization of his condition, a newborn is transferred to the intensive therapy department. A neonatologist performs means for prophylaxis and liquidation of cerebral edema, restoration of hemodynamics and microcirculation, normalization of the gas metabolism and renal function. Treatment means are performed depending on the condition of the newborn.

## BIRTH INJURY OF A FETUS

Birth injury of the fetus is the injury of the organs and tissues of the fetus, which appears in labour. Birth injury of the fetus can be related to complicated delivery (anatomically and clinically narrow pelvis), application of operative methods during delivery per vias naturalis (obstetrical forceps, vacuum extraction, cutaneous-cephalic forceps, internal podalic version, extraction by the pelvic ending), however, the traumatism of the fetus is possible during the natural complicated labour and even in the case of abdominal delivery (premature, immature fetus, complicated release of the head and shoulder girdle). Possibility of injury depends on the maturity and adaptational abilities of the fetus. Extragenital and obstetrical pathology (cardio-vascular and endocrine diseases, infections, preterm labour, gestosis, rhesus-incompatibility, prolonged pregnancy and others), chronic and acute intrauterine hypoxia of the fetus are the factors of risk of disturbance of resistance of the fetus to labour stress and traumatism. Recently it was detected that hypoxic component plays an important role in pathogenesis of birth injury including injury of the CNS; birth injuries related to mechanic impairments (anatomically and clinically narrow pelvis) are rare.

Birth injury can cause injury of the central and peripheral nervous system, skin, skeleton and other vitally important organs of the fetus (adrenal glands, liver).

**Injuries of the fetal head** are often (2:1000 of the newborn) and dangerous for the further development of the fetus.

**Cephalohematoma** is a hemorrhage under the periosteum of parietal or occipital bone (0.2–2.5% of cases). A fluctuating tumour never spreads over the limits of the bone as labour tumour does.

Painfulness and pulsation are absent. If cephalohematoma is large or bilateral, in order to exclude the crack of the skull bone one should make the X-ray examination. Uncomplicated hematoma resorbs during 6–8 weeks.

If the newborn has small and uncomplicated cephalohematoma, it does not require treatment. Puncture is done when the hematoma is large as well as if it enlarges or is complicated by the inflammatory process.

**Cracks and fractures of the skull bones**, as a rule, related to the narrow maternal pelvis, extensional insertions of the fetal head and application of obstetrical forceps. Surgical intervention is recommended in the case of intensification of neurological symptoms, which are the evidences of the elevation of intracranial pressure and compression of the cerebral tissues.

**Intracranial birth injury** is accompanied by the injury and rupture of the brain tissues with further edema.

There are *epidural, subdural, subarachnoidal, intracerebral and mixed hemorrhage*. Mechanism of this injury is complex; combination of the multiple factors influences it. Intrauterine hypoxia of the fetus is accompanied with expressed disturbances of central and peripheral hemodynamics, which can finish with intracranial hemorrhages. Mechanic injury faster causes different disturbances of intracranial blood circulation.

More often hemorrhage during birth injury appears from venous sinuses — saggital and transverse, which are in the leafs of dura mater of the falciform process and tentorium of the cerebellum. Massive intracranial hemorrhages, which localize under the tentorium of the cerebellum and under it form as the result of sinus' rupture. Clinical manifestations depend on the degree of disturbance of hemo- and liquorodynamics of the brain. In severe cases death occurs within first hours of a child's life. During a slight injury changes can be reversible.

*In order to diagnose* birth injury, besides of clinical examination, one should examine the cerebrospinal fluid, perform US, electroencephalography (EEG) and computer tomography.

In acute period of intracranial birth injury general cerebral symptoms predominate as the result of swelling and edema of the brain, ischemia of the tissues, disturbances of hemo- and liquorodynamics. At the *I stage* symptoms of suppression of the functions are observed: decrease in the muscular tonus, absence of active movements, reduce or absence of the reactions on the external stimuli, paleness with skin cyanosis,

suppression of reflexes, weak scream of the child, adynamia, absence of sucking reflex, deep, intensified or irregular rare respiration, decrease in ABP. For *II stage* (stimulation) general anxiety, disturbance of sleep, scream, chaotic movements with tremor of limbs and clonic convulsions are typical. Muscular hypotony changes with extensional hypertension, cyanosis of the palms and soles and nasolabial triangle is observed, intensification of the heart rate and still disturbance of sucking reflex and expressed suppression of respiration takes place. At the *III stage* decrease in activity of all vital processes occurs as the result of slow restoration of function of CNS; often clinical syndromes develop: vegetovisceral dysfunctions, motor disturbances, muscular hypotension or hypertension, convulsive and hydrocephalic syndromes.

In immature children intracranial injury occurs more often and has a more severe course.

*Treatment* of the child during the first stage of posttraumatic period, when suppression and disturbance of the pulmonary respiration are present, should include the following: 1) complete rest; 2) adequate oxygenation; 3) improvement of microcirculation, dehydration (infusive therapy); 4) reduce of the convulsive activity; 5) normalization of metabolic disturbances. Oxygenic therapy is performed with using of oxygen tents, cuveuses and barocamera. In order to restore the energetic material of the organism 20% solution of glucose, albumin, native plasma and other preparations are introduced intravenously. In order to improve the metabolic processes vitamins of B group and ascorbic acid, cocarboxylase are used, for correction of acidosis — 4% solution of sodium hydrocarbonate.

During II stage of the disease remedies which contribute to the decrease in stimulation are added: seduxen, droperidol, sodium oxybuterate (GDOA), sodium bromide, aminasin, phenobarbital and pipolfen. To improve the microcirculation and peripheral blood circulation, correction of the reduced BV, blood-substitutive solutions are introduced (rheopolyglucin, plasma, albumin). Prophylaxis of the bleeding is done, as well as, if necessary, dehydration-therapy is applied.

In the case of subarachnoideal or subdural hemorrhage it is recommended to perform lumbar punctures 1 time a day during first 2–5 days.

During III stage general stimulation remedies are applied: vitamins of B groups and ascorbic acid, blood transfusion; during the adrenal insufficiency — corticosteroids (hydrocortisone, prednisolone); during the threat of pneumonia — antibiotic therapy.

*Prophylaxis* of intracranial hemorrhage in the newborn is in prevention of complications of

pregnancy and labour, which cause intrauterine hypoxia of the fetus and asphyxia of the newborn, as well as correct management of labour, which excludes the possibility of mechanic injury of the fetus.

**Injuries of the spinal cord** occur as the result of forced extraction of the fetus by the head and its excessive rotation. Injuries of the spinal cord, interspinal disks, hemorrhages in the spinal cord and its membranes and cellular tissue (epidural space), as well as ischemia of the region of the vertebral arteries can appear.

Clinical picture depends on the kind of injury and level of the vertebral cord, where the injury has occurred. During the injury of the *cervical segment of the vertebral column*, expressed pain syndrome and torticollis appear. In the case of the injury of the cervical segment on level C<sub>I</sub>–C<sub>IV</sub> muscular hypotonia, areflexy, respiratory disturbances, symptom of “short neck”, “position of a frog” manifest, which can be accompanied with the symptoms of injury of the trunk of the spinal cord and disturbance of the function of pelvic organs. During the injury of the cervical segment on the level C<sub>III</sub>–C<sub>IV</sub> paresis of diaphragm can appear, often — right-sided. As the result of the injury of the spinal cord of the *lumbo-sacral part of the vertebral column* flaccid lower paraparesis develops during the preserving of the movements of the upper extremities.

*Diagnosis* is performed by data of clinical, X-ray and electromyographic examinations.

*Treatment* is turned on the liquidation of bleeding, pain and normalization of cerebral blood circulation.

**Injury of the peripheral nervous system.** Paralysis of the face nerve is observed in 1% of all labour, which is applied with obstetrical forceps and is accompanied by the smoothing of the nasolabial fold and lowering of the angle of the mouth. During the cry the mouth of the child moves to the uninjured side, sucking is complicated. Central paralysis of the face nerve is simultaneously accompanied with the paralysis of the limbs. Prognosis as for liquidation of peripheral paresis of the face nerve is favorable.

**Paralysis of the brachial plexus** is the result of excessive extraction of the fetus or of the direct pressing by the fingers on the region of the neck and brachial nervous fascicle during the extraction of the fetus (in the case of its extraction by the pelvic ending).

Depending on localization of the injury of the brachial plexus three types of paralysis of upper extremities can occur: 1) *superior* (Dushenne—Erb type) as the result of injury of fascicles of C<sub>V</sub>–C<sub>VI</sub> segments; 2) *inferior* (Klumpke—Dejerine type) as the result of injury of C<sub>VII</sub>–C<sub>VIII</sub> and Th<sub>I</sub> fascicles; 3) total (complete) paralysis dur-

ing the combined injury of all components of the brachial plexus (occurs very rarely).

Treatment is in application of splint or plaster bandage on the injured extremity of the child in its physiological location. In 2 weeks slight passive movements in all articulations and massage are performed to restore the functions. Vitamins of B group and ascorbic acid are prescribed.

**Other birth injuries.** *Subcapsular hepatic hematoma* can occur because of pelvic presentation, presence of a large fetus, hemolytic disease of the newborn. Rupture of hematoma is accompanied with shock and collapse. Besides of clinical examination, US is used for diagnosis.

**Adrenal glands hemorrhage** is closely related to hypoxic component of birth injury and can be bilateral in 8–10% of cases. Clinical symptoms include anorexia, vomiting, diarrhea, flaccidity, disturbance of the respiration rhythm, hematuria and anaemia. US and intravenous pyelography are used for diagnosis.

**Fracture of the clavicle** is one of the most frequent birth injuries. Presence of large fetus, narrowing of the pelvic outlet, accelerated labour and preterm release of the posterior shoulder are the factors of risk.

Fracture of the clavicle is detected right after delivery by crepitation in the region of clavicle and restriction of the active movements of the fetal arm; fracture of the periosteum and without replacement can be detected later — on the 5th–7th day after the forming of cartilage callus on the place of fracture.

Treatment is in application of the fixating bandage on the shoulder girdle and arm. At the end of the 2nd week of the child's life the osseous callus forms at the place of clavicle's fracture.

**Fracture of the brachial bone** occurs rarely, predominately because of complicated release of the fetus' arm in labour during the pelvic presentation in labour as well as during the extraction of the fetus by the pelvic ending. Injury is diagnosed by the absence of the free movements of the injured arm, as well as during the palpation and X-ray examination.

*Treatment* is in immobilization in plaster bandage for three weeks.

**Fracture of the femur and bones of the crus** occurs very rarely, usually as the result of fetal extraction by the leg. In the case of inconsiderable replacement of the fragments of the femur special traction of the extremity is necessary.

Children which have suffered from birth injury should be kept under observance of the neuropathologist and orthopedist.

#### RECOMMENDED READING

3; 5; 21; 22; 39; 46; 56; 57; 61.

## Chapter 33

# ISOIMMUNIZATION AND HEMOLYTIC DISEASE OF A FETUS AND NEWBORN INFANT

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**Isoimmunization** (isosensitizing) is the formation of antibodies to foreign erythrocyte antigens, getting from another organism of the same biological type.

The fetus is a semi-foreign organism for mother because of inheriting of half father's antigens. When fetal erythrocytes get into mother's blood flow during pregnancy or delivery, the antibodies against fetal antigens can be produced in her organism. In late terms of pregnancy and especially often during the next pregnancy these antibodies can penetrate through the placenta and cause fetus erythrocytes hemolysis, which leads to the development of anaemia in it — hemolytic disease. During pregnancy, complicated with isoimmunization the production of mother's antibodies destroying the fetal erythrocytes is opposed to the fetal possibilities to restore the enough amount of own erythrocytes for keeping its life and development.

Isoimmunization can appear in some hundreds of erythrocytes' antigens (Rhesus, AB0, Kell, Duffy, Kidd and oth.). The most dangerous is **isoimmunization by rhesus system** — by antigens D (Rh), C (Rh<sub>I</sub>), E (Rh<sub>II</sub>) and three varieties of antigen Hr: d, c, e. Haemolytic disease is connected with Rh (D)-antigen most often. In case of birth by rhesus-negative mother of rhesus-positive fetus which inherited Rh-antigen from the father, hemolytic disease is observed nearly in 16% of cases.

**Isoimmunization by the AB0 system** is the most spread but as a rule it doesn't cause the development of severe newborn's hemolytic disease. Women with 0 blood group can have anti-A and anti-B agglutinins still before pregnancy and their amount can increase during gestational period. In spite of that 20% of newborns are incompatible with mother by AB0 system, only 5% of them can have signs of hemolytic disease which can never be so severe and do not lead to the death of the fetus as in Rh-isoimmunization).

*Aetiology and pathogenesis. Haemolytic disease of the fetus and newborn* in 98% of cases occurs as the result of mother and fetus blood incompatibility by Rh and AB0 systems.

Specific gravity of hemolytic disease in the structure of perinatal mortality is 3.5%.

The process of pregnant women immunization starts with the moment of rhesus-antigen differentiation in fetal erythrocytes. As the antigens of Rh system are defined in the fetal blood from the 9th–10th week of pregnancy and AB0 systems — in embryo's blood from the 5th–6th week the early sensitizing of mother's organism is possible in suitable conditions which promotes the production of antirhesus-antibodies in her organism. Mother's antibodies can penetrate to fetus and be connected by rhesus-antigen which is contained in lipoprotein membrane's part and lead to its hemolysis. This mechanism is the basis of the development of fetus and newborn hemolytic disease (Fig. 111).

Direct connection between the degree of mother's isoimmunization and heaviness of child's hemolytic disease does not always exist. In some cases in consequence of low antibodies' titre in maternal and fetal blood, the severe disease can be developed. The presence of maternal extragenital diseases (diseases of the heart, liver, kidneys), endocrine pathology (diabetes mellitus), Obstetrical complications (late gestosis).

If pregnancy is first, the fetus is not affected as a rule. However, during delivery even the minimal getting of fetal erythrocytes into mother's blood flow promote the production of antibodies in her organism. During next pregnancy the penetration of fetal erythrocytes through the placenta can lead to immune response and production of mother's antibodies (immunological memory). If Ig M-antibodies are producing, so thanks to its big molecular mass and sizes they can not penetrate through the placenta and destroy the fetal erythrocytes. However, in most



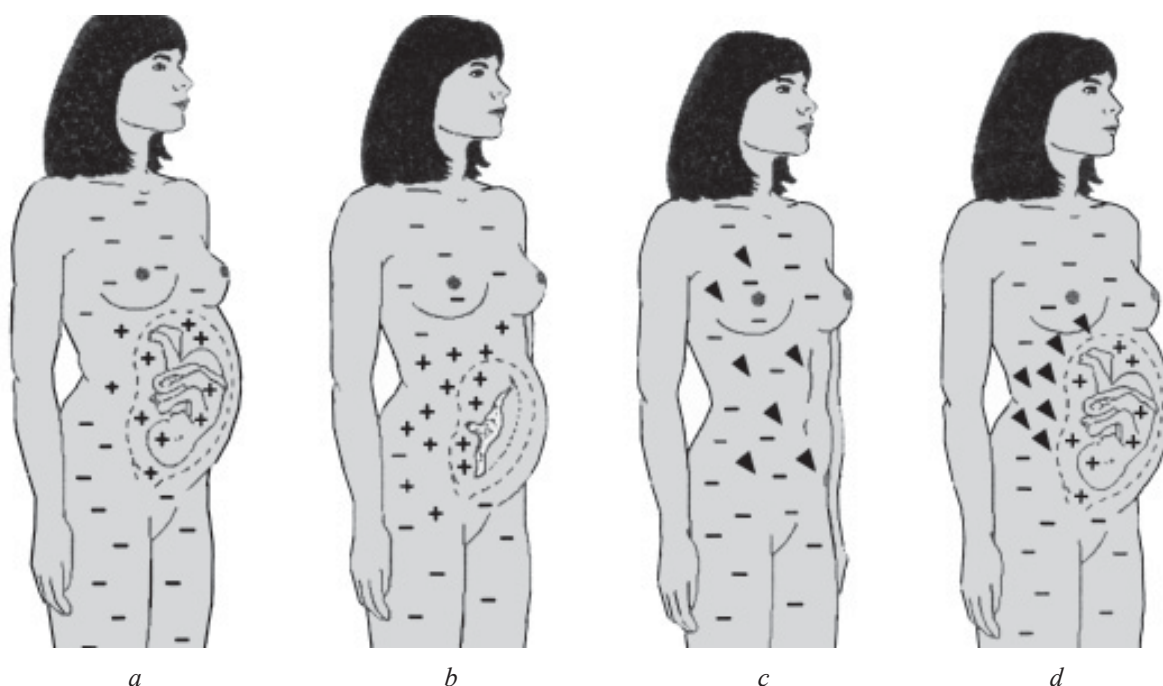


Fig. 111. Mechanism of rhesus-immunization in a pregnant woman:

*a* — pregnancy in rhesus-negative woman (-) by rhesus-positive fetus (+), definite quantity of rhesus-positive erythrocytes get in the mother's blood flow; *b* — with separation of the placenta some part of rhesus-positive erythrocytes of the fetus gets to the mother's blood flow; *c* — mother is isoimmunized by rhesus-positive erythrocytes with forming of anti-rhesus positive antibodies (triangle); *d* — during the further pregnancy by a rhesus-positive fetus, anti-rhesus-positive mother's antibodies, which pass through the placenta, attack rhesus-positive erythrocytes of the fetus and cause hemolytic disease of a newborn

cases IgG-antibodies are predominantly producing, having smaller sizes, owing to which exactly they penetrate through the placenta and get into the fetus blood flow.

In fetal circulatory system the antibodies attack Rh-positive erythrocytes, causing their hemolysis (antibodies-haemolysins).

Lysis of erythrocytes, accompanied by disorder of the liver function kidneys, cerebrum, happens as a result of incomplete antibodies' formation. When complete antibodies are forming, the capillary thrombosis and tissue ischemic necrosis develop. The intense erythrocyte lysis causes the increasing of unconjugated bilirubin. Bilirubin which is formed as the result of hemoglobin's degeneration, transports to the maternal organism and metabolised. The condition of the fetus depends on the mother's antibodies amount, penetrating through the placenta and its possibility to restoring own erythrocytes instead of destroyed ones. During the first pregnancy the fetus anaemia can be developed in delivery; hemolysis, as a rule, takes place after birth. In case of next pregnancies with an Rh-positive fetus the process of antibodies' production and transport can be accelerated and promote the development of more severe form of anaemia. The fetal liver is functionally imma-

ture and doesn't manage with increased load connected with transformation of unconjugated bilirubin. The process of increasing of bilirubin level occurs, the fetal skin coloring intensifies; fetal liver should remake the additional amount of erythrocytes, in consequence of which the protein production decreases. Fetal hypoproteinemia causes the decreasing of oncotic pressure in the fetal vascular system which leads to development of ascites and subcutaneous edema — **hydrops fetalis**. The latter can be accompanied by hepato- and splenomegaly, hydrothorax, placental edema, sometimes — fetal death as a result of severe anaemia as well as blood circulatory disturbance and heart insufficiency.

Insufficiency of the liver and kidneys intensifies with bilirubinic encephalopathy as the unconjugated bilirubin affects subcortical and stem nuclei of the cerebrum. In consequence of fetal erythrocytes destruction a great amount of thrombogenesis' and fibrinolysis' ferments are secreting. Under the influence of thromboplastic factors the DIC-syndrom develops in fetus, which promotes the increasing of microcirculation's disturbances in vitally important organs (the liver, kidneys, brain). Severity of the fetus condition rises in accordance with the develop-

ment of hemolytic hypoxia, lowering of fetal hemoglobin content.

Haemolysis of the fetus' considerable erythrocytes amount leads to the development of severe hemolytic disease form, which results in antenatal fetus or child death during first hours of life in consequence of cardio-pulmonary insufficiency. However, in most cases the disease develops rapidly just after the child's birth because of getting of great amount of antibodies in its blood when placental vessels intactness is affected as well as in consequence of increasing of newborn's blood coagulation. Decreased enzymatic activity of the newborn's liver plays an important part in pathogenesis of hemolytic disease. In the norm free (unconjugated) bilirubin forms from hemoglobin in mononuclear phagocytes (reticuloendothelial cells) as the result of erythrocytes hemolysis, which later on binds with glucuronic acid with the help of enzymes and is transformed in conjugated bilirubin. The latter is easily soluble in water and takes out by the liver cells into the bile duct and then extracts with urine and excrement.

Within first days of life the newborns still have low activity of liver enzymes, even physiological hemolysis promotes the accumulation of increased amount of conjugated bilirubin (physiological hyperbilirubinemia) and leads to so-called *physiological newborn's jaundice*. During hemolytic disease when the intensive hemolysis accumulated on depressed liver ability to transform bilirubin, the pathological accumulation of free unconjugated bilirubin takes place in the newborn's blood.

Free bilirubin circulates in the blood as complexes with albumen, in this condition it doesn't penetrate through the cellular membranes. In considerable accumulation of conjugated bilirubin its binding with albumen is affected, and it easily penetrates from the vascular channel in tissues through the cellular membranes, especially rich in lipids — fatty, nervous. Insufficient albumen, shift in acid-base balance to acidosis, the presence of increased amount of bilirubin substances competitors in binding with albumen (hormones, free fatty acids and oth.) in blood promote the penetration of bilirubin in tissues. In the cells of the nervous system bilirubin shows its toxic effects, breaks the processes of cellular respiration. It leads to disorders of CNS functions, promoting the development of clinical symptoms of bilirubinic encephalopathy (nucleus jaundice), owing to this the child's death or development of stable neurologic disorders which are kept during the whole life may occur.

There is a tendency to the growth of lesion's severity and degree of fetus isoimmunization with each next pregnancy as well as in conse-

quence of invasive procedures, which were doing during pregnancy but it not always happened (Table 18). If the fetus is Rh-negative, it doesn't undergo the pathological changes.

**The course of pregnancy and labour** during immunization is often complicated (threat of abortion and premature birth, anaemias, late gestosis, postnatal bleeding, mother's and neonatal infectious complications).

The clinical picture of fetus hemilytic disease has some variants: 1) hemolytic anaemia without jaundice and dropsy; 2) with jaundice; 3) with jaundice and dropsy.

*Hemilytic anaemia without jaundice and dropsy* (anemic factor) is seldom observed. Anaemia becomes apparent, as a rule, during 2–3 week of child's life and progresses fast. The amount of erythrocytes is decreasing till  $2 \cdot 10^{12}$  in 1 l, hemoglobin — up to 60–80 g/l. Anaemia is not connected with increased erythrocyte hemolysis but with suppression of the marrow's function. Reticulocytosis and erythroblastosis are absent, hyperbilirubinemia is revealed. Anaemia can be normo- or hypochromic and microcytary. The prognosis is favourable.

Haemolytic anaemia with jaundice (icteric form) is mostly observed. It can have a light course with moderate but long-term elevating of bilirubin level without enlargement of the liver and spleen, however, frequently accompanied by moderate anaemia.

A mild form of the disease is often observed in case of incompatibility between maternal and fetal blood by group antigens of AB0 system.

A severe icteric form of hemolytic disease is revealed sometimes during child's birth, his/her skin has pale icteric colour, the liver and spleen are enlarged, the muscular tone and reflexes are reduced, the cry is faint. Even during a severe course of the disease the child may look healthy, however, within first hours of life he/she gets skin icteric, progressing fast. The child becomes drowsy, languid, muscular tone and reflexes are reduced, sucking activity is disturbed; if the

Table18. **Isoimmunization risk by erythrocyte antigens**

Risk factors	Risk of isoimmunization, %
Ectopic pregnancy	< 1
Complete pregnancy	1–2
Amniocentesis	1–3
Spontaneous abortion	3–4
Induced abortion	5–6
Delivery with a full term fetus	14–17
Transfusion of incompatible blood	90–95

treatment is absent, the symptoms of bilirubinic encephalopathy develop (nuclear jaundice). During this the first symptoms are reduction of sucking activity and the change of muscular tone: rigidity of the occipital muscles arises. Then hyperesthesia, anxiety, cries, symptoms of sunset, cramps, respiratory disorders, tachycardia arise, the body temperature suddenly rises till 40–41°C and the death comes. In the agonal period the hemorrhagic symptoms are often found out: hemorrhages under the skin, intestines, brain, lungs; lung edema and pneumonia occur.

In some cases the recovery comes after the icteric jaundice, when all the symptoms disappear, the child becomes active, the body weight increases. However, in most cases the neurologic consequences occur in future: from little motor disorders (coordination of movements) till considerable disorders, combined with deafness and intelligence disorders.

In the clinical picture of hemolytic disease's severe icteric form, the degree of child's anemia before birth doesn't have a decisive prognosing importance. The main factor of disease severity is the intensity of bilirubin level increase in the blood.

The presence of hemolytic anaemia with jaundice and dropsy (the most severe form of the disease — dropsical) the fetus often dies prenatally. If the fetus doesn't die, so it is born prematurely and has a typical appearance: pale mucous membranes and skin, considerable petechias and hemorrhages, the abdomen is enlarged because of ascites and hepatosplenomegaly. The erythrocyte amount in the blood doesn't exceed  $1.5 \cdot 10^{12}$  in 1 l, the hemoglobin content is till 80 g/l, the amount of erythrocytes nuclear forms (fetal erythroblastosis) is considerably increased.

*Diagnosis.* All rhesus-negative pregnant women have antirhesus antibodies — immunoglobulins of A, M, G classes. The most wide-spread methods of their revealing are direct and indirect Coombs' tests.

The titre of antibodies is the marker of their production by mother but not always a precise criterion of fetus condition prognosis. During first sensitized pregnancy the definition of antibodies' titre has the important meaning, the antibodies' titre, as a rule, doesn't reflect the true fetus' condition during next pregnancies. Usually the critical antibodies' titre is 1:16 and more.

For the establishment of the hemolytic disease prognosis, the genotype of father's blood has some importance. If the father is rhesus-positive and this sign is homozygous, so the fetus has Rh+antigen in all cases and the hemolytic disease can be developed. If father's rhesus-pos-

itive blood is a heterozygous sign, so the fetus will be Rh-positive in every second case.

The antibodies' titre in pregnant women is defined in dynamics: up to 32nd week — once a month, from 32nd up to 35th weeks — once in 2 weeks, since the 35th — once a week.

If a pregnant woman has 0 (I) group and her man has another one, the examination on the presence of group immune antibodies is realized.

US is used for revealing prenatal fetus condition, the heart activity is estimated on the data of KTG, ECG and PCG. The revealing of the head's double contour, hepatosplenomegaly, ascites, enlargement of the placental thickness by more than 5 cm, "empty zones" of the placenta are evidence of the presence of hemolytic disease's severe (dropsical) form. The decreasing in estriol level and increasing in chorionic somatotrophin level in the blood serum are typical for hemolytic disease. Sinusoidal heart rhythm can be the sign of severe anaemia and the threat of fetus death.

Examination of the amniotic fluid obtained by *amniocentesis* gives an important information about fetus condition and the course of hemolytic disease. The amniotic fluid is taken for examination, as a rule, in the period between the 20th and the 30th weeks of gestational period, depending on peculiarities of previous pregnancies course. Spectrometric index of the amniotic fluid optical density has the biggest meaning for diagnosis and prognosis of hemolytic disease course. Its 2–3 fold increasing in comparison with the norm (0.15 U), measured with 450 nm wave's length, is an evidence of the progressive worsening of the fetus condition.

It was discovered during the examination of the amniotic fluid (Liley, 1960) that the bilirubin level in the amniotic fluid is evidence of the fetus condition. The mechanism of bilirubin penetration into the amniotic fluid is not ascertained yet. However, it is found out that the bilirubinic level begins progressively decrease at the second half of pregnancy whereas it truly exceeds the norm in the isoimmunization.

The size of the amniotic fluid optical density thanks to spectrophotometry helps to reveal the severity of fetal anaemia. Comparing the anaemia severity with the fetal maturity degree, they define the subsequent policy of labour management and fetus treatment.

The definition of blood group and fetus sex also has a prognostic meaning. The incompatibility of maternal and fetal blood by the ABO system "protects" the fetus from severe forms of hemolytic disease in rhesus-conflict. The boys have a severe course of this disease more often than the girls have.



The appearance of antibodies in the amniotic fluid of a rhesus-positive fetus is evidence of severe form of hemolytic disease, the absence of antibodies — of a mild form.

**Management of pregnancy and labour.** All rhesus-isoimmunized pregnant women should be observed in a special maternity hospital or perinatal centre. Pregnant women are examined in terms of 8–10, 24, 28, 32 weeks, define the antibodies' titre, realize the course of treatment (intravenously — glucose, ascorbic acid, cocarboxilase; orally — diasolin, rutin, calcium gluconate, teonicol; oxygen therapy, transplantation of a piece of husband's skin — antibodies are fixed on transplant's antigens).

Infusive therapy with solutions low- and middlemolecular dextrans and albumen is realized since the second half of pregnancy for elimination of rhesus-antibodies from mother's blood; plasmapheresis, hemosorption is made.

Modern policy during hemolytic disease consists in realization of puncture through the cord skin (cordocentesis) with the purpose of taking fetal blood and to define the levels of hemoglobin and hematocrit number in it.

If the deficiency of fetal hemoglobin is more than 20 g/l (in comparison with middle level for a given gestational age), the intravenous infusion of washed erythrocytes 0 (I) Rh+ group in the fetus' abdominal cavity or umbilical vein under the control of US is recommended. The umbilical vein is well visualized since the 28th week of pregnancy. Since the same term of pregnancy the cortocosteroid therapy can be prescribed (dexametazone, prednizolone).

The question about the pre-term labour is always solved individually. In a mild disease form it is desirable to preserve pregnancy till the fetal maturity (37 weeks). In case of treatment inefficiency and during progressing of hemolytic disease severity the pregnancy is ceased at any term, though it is impossible to guarantee the fetal survival in such a situation. In the presence of a "mature" cervix and the absence of concomitant pathology, delivery are realized through natural maternal passages. Caesarean section is carried out by obstetrical indications. In order to avoid the massive entrance of antibodies in the child's organism the umbilical cord is cut as quick as possible.

*Treatment of newborns with hemolytic disease* consists in carrying out immediate blood trasfusion which is made till decreasing and stabilization of bilirubin level preventing from development of bilirubin encephalopathy.

The positive direct Coombs' test which sets the presence of fixed by newborn's erythrocytes antibodies, the bilirubin level in the blood of the umbilical vessels is more than 51  $\mu\text{mole/l}$  (by

Van-den-Bergh), anaemia, normoblastosis and reticulocytosis are evidence of rhesus-conflict. Mother's anamnesis (spontaneous abortion, still-birth, child's death because of jaundice within first days after birth) has an important meaning for diagnosis.

The indications for substitution blood transfusion in full-term newborns are the positive Coomb's test, the hemoglobin content is below 90 g/l, bilirubin — 342  $\mu\text{mole/l}$ , the rate of bilirubin's increasing (per hour) is more than 6  $\mu\text{mole/l}$  and its level in the umbilical vessels' blood—60  $\mu\text{mole/l}$ . Donor's blood fulfils the usual blood function temporarily; newborn's own bleeding supresses for the first time. Rhesus-negative blood was used for substitution blood transfusion before. It was discovered later that there was almost no free antibody in the newborn's blood as they are predominantly bound with erythrocytes. Owing to this it is possible to use less unprofitable rhesus-positive blood, however, in most severe cases of the disease the rhesus-negative blood should be used only. If there is AB0-incompatibility, the blood of 0 (I) group, coincided with newborn's blood by rhesus-factor is used. The bulk of poured blood is calculated depending on the gestational age, newborn's weight, amount of hemoglobin and hematocrit number (150–160 ml in 1 kg of fetus weight). On average 500 ml of donor's blood is injected during operation, the same amount of child's is removed or less by 50 ml. If jaundice still progresses after the first substitution blood transfusion, the bilirubin level elevates again till critical, it is necessary to repeat this procedure.

Haemosorption is used in complex of medical measures (in 12–24 h after substitution blood transfusion in the amount corresponding to two BV).

The treatment of a newborn with hemolytic disease includes: the use of 10% albumen, glucose solutions intravenously droply; realization of phototherapy — child's irradiation with a source of light, 450 nm wave long which leads to the formation of the bilirubin isomer, soluble in water which easily eliminates from a child's organism.

Feeding of newborns with hemolytic disease by maternal milk can begin not earlier the 5th–10th day of life. Children who have got treatment in time, develop well in future. During the development of nuclear jaundice the organic lesion of the CNS takes place, lag in mental development is marked.

*Prophylaxis.* The opening of the mother's blood circulation (mix of maternal and fetal blood) with subsequent isoimmunization by fetus blood happens mostly during labour and self-dom during pregnancy. At the end of 60-s of



XX century it was discovered that antibodies to Rh-antigen can be obtained from donors, earlier sensitized by this antigen. It was proved later that the use of these antigens in most cases can (by way of passive immunization) prevent the active production of mother's antibodies directly after labour. Antirhesus immunoglobulin is effective only for Rh-antigen. There are no similar preparations for prevention of isoimmunization by other antigens.

Modern standard prophylaxis of rhesus-isoimmunization consists in administration of 300 mg of antirhesus immunoglobulin during 24–72 h after delivery to all Rh-negative mothers who gave birth to Rh-positive children. Thanks to this procedure the risk of next isoimmunization decreases from 15 to 2%. Isoimmunization in mentioned 2% of women arises during pregnancy (usually at the III trimester) but not during labour. The prescription of 300 mg of anti-Rh-immunoglobulin to rhesus-negative pregnant women in 28-week term promotes the risk reduction of next isoimmunization till 0.2%. If the child's father is rhesus-negative, there is no necessity in such prophylaxis. The fetal Rh-factor is defined after delivery and if it is positive, the mother gets the second dose of Rh-immunoglobulin in 72 h after labour.

As the amount of fetal erythrocytes which cause the antibodies production is very little (at about 0.01 ml), pregnant women with any conditions in which the fetal-maternal bleeding can occur, the prescription of anti-Rh-immunoglobulin is necessary. Besides, taking into account that embryo starts the production of blood cells in pregnancy term of 6 weeks, isoimmunization

can occur in women who had spontaneous or artificial abortions in anamnesis. A dose of antigens in these situations, as a rule, is little, these pregnant women get 50 mg of anti-Rh-immunoglobulin for prophylaxis of rhesus-isoimmunization. Amniocentesis or the other trauma (car and etc.) during pregnancy is the indication for routine prescription of 300 mg of antirhesus-immunoglobulin.

In case of trauma or bleeding during pregnancy (fetal-maternal bleeding) and its degree is defined with the help of tests on identification of fetus erythrocytes in maternal circulation (Kleihauer—Betke). Maternal erythrocytes are more sensitive to the change of pH, because of which exposed to hemolysis fast. The fetal erythrocytes are the most stable to similar changes and remain intact. The ratio of maternal and fetal cells is counted under the microscope. In contrast to maternal erythrocytes, the fetal ones look more dark. After definition of the maternal blood volume and mentioned correlation, the size of fetal-maternal hemotransfusion is calculated. The routine dose of anti-Rh-immunoglobulin (300 mg–1.5 ml) neutralizes effectively 10–15 ml of fetus erythrocytes, hence it is necessary to prescribe a proper preparation's dose. During caesarean section, manual placental separation the use of obstetrical forceps, the transplacental bleeding can become stronger, what needs 1.5-fold increasing of injected dose of anti-D-globulin.

#### RECOMMENDED READING

3; 5; 21; 22; 39; 46; 56; 57; 61.

The incidence of obstetrical hemorrhage is 5–10% of all labour cases, however, it itself represents the most often cause of maternal morbidity, invalidity and death (20–25%). The one of the main factors which influences the obstetrical hemorrhage incidence is the increasing of abdominal delivery cases. The profuse obstetrical hemorrhage during some minutes can become fatal because of belated elimination of blood and its components deficiency. During hemorrhage at the III trimester of pregnancy, the acute fetus hypoxia which requires immediate labour when there is no time for waiting of stable normalization of hemodynamics index and the fulfilment of full capacity of infusion-transfusion therapy often occurs. Besides, blood loss often combines with promoted pain syndrom, disturbances of systemic hemodynamics, which leads to fast exhaustion of adaptative mechanisms especially in women with extragenital and obstetrical pathologies.

On the eve of delivery 15 ml of blood streaming with the mucous plug of the cervix can be lost. Physiological postnatal hemorrhage after the ending of the III labour stage should be no more than 0.5% of a woman's body weight (or according to data of foreign authors no more than 500 ml). If blood loss during pregnancy and delivery is above these indices, the hemorrhage is pathological. The profuse obstetrical hemorrhage can lead to hemorrhagic shock or accompanied by disorders of homeostasis system.

### HEMORRHAGE IN THE SECOND HALF OF PREGNANCY AND IN LABOUR

Placenta previa, maternal hypovolemia, birth trauma, coagulation disturbance can be the conditions which cause hemorrhage during pregnancy and in labour.

### PLACENTA PREVIA

**Placenta previa** occurs during its development in the lower uterine part, which turns into the lower uterine segment during pregnancy. If the placenta covers the uterine aperture, it presents to fetus, as the result of which the vaginal labour becomes impossible. Placenta previa after the 28th week of pregnancy is observed with the rate 1:200–1:250 of pregnancies. Premature labour happen in 60% of cases with this complication, the perinatal death can reach 10–11%. If there is a good observation and treatment of pregnant women with placenta previa the maternal mortality is no more than 0.2–2%.

There are 3 degrees of placenta previa (Fig. 112). Having **complete presentation** the internal cervical os is fully covered with the placenta (Fig. 112, *b*). Having the **partial presentation** the placenta covers the internal os partially (Fig. 112, *c*). **Marginal presentation** is characterized by such location where placenta's border is close to the margine of the internal os (Fig. 112, *a*).

Besides, there is also the **lower placenta previa** (lower placentation) i.e. when placenta is implanted in the lower uterine segment but its edge does not reach the internal os.

*Aetiology* of the placenta previa is not finally elucidated, however, it is determined that the abnormal vascularization is in the basis of this pathology. In cases of multiple pregnancy, placental edema, the latter can occupy the bigger area in the uterus and reach its internal os. Mother's advanced age, the presence of some deliveries in anamnesis, inflammatory and dystrophic changes of the endometrium, previous caesarean section can be the reasons of this phenomenon.

US reveals the lower placental localization and the internal os covered by it in about 5% of women in the middle of pregnancy. This phenomenon is observed as often as the term of pregnancy is less. The placenta can migrate from

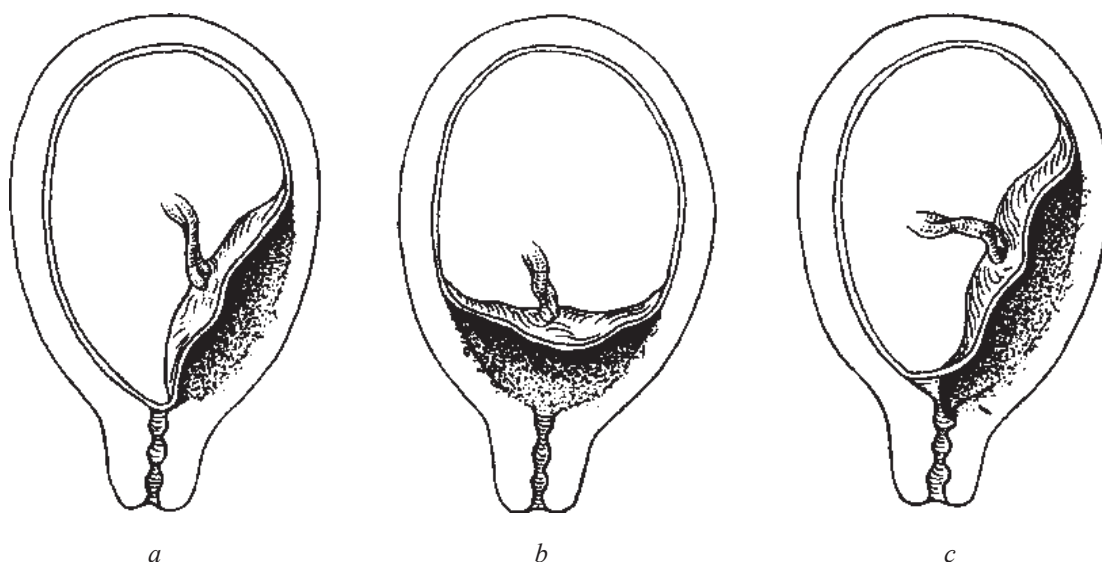


Fig. 112. Placenta previa:  
a — marginal; b — complete; c — partial

the internal os (if it settled on the anterior uterine wall) owing to the consequent growth of the upper and lower uterine segments during pregnancy. The possibility of such placental displacement decreases during the increasing of gestational age and placental localization on the posterior uterine wall.

**Diagnosis.** The main symptom of the placenta previa is vaginal hemorrhage. The first hemorrhage episode is observed more often on the 29th–30th week of pregnancy. In spite of the hemorrhage can be profuse, it stops spontaneously almost often if there was no vaginal examination or any other trauma. The reason for hemorrhage with the placenta previa is the separation of its part from the lower uterine segment, possibly as a response to weak uterine contraction (Brexton—Heeks'). Bleeding is stopped as the result of uterine contraction cessation and vessels thrombosing; occurrence of new uterine contractions leads to hemorrhage renewal. The blood discharged during placenta previa is usually of mother's nature. Bleeding appears suddenly, without any previous symptoms. As a rule, if the birth activity doesn't develop, the hemorrhage episodes are not accompanied with pain during placenta previa in contrast to the placental separation process. If there is suspicion at the placenta previa, the vaginal examination shouldn't be done till revealing of the placental localization with the help of US. If the placenta is attached along the posterior wall of lower uterine segment, sometimes it can be quite difficult to define the distance from its edge to the internal os, especially at the end of pregnancy. Pregnant women should take Trendelenburg's position for better examination of the internal os.

The size of blood loss is defined by hemoglobin level, hematocrit number, number of thrombocytes, leucocytes, fibrinogen content, products of fibrinogen degradation (PFD), time of hemorrhage and fibrillation.

Placenta previa slows the maternal BV increase during pregnancy (hypovolemia) and repeated hemorrhage episodes cause anaemia. Hypotensive syndrome often develops. The fetus disposition often gets broken (pelvic, straightening head presentation, transverse and oblique fetus position). Against a background of hypovolemia and anaemia the prenatal fetal hypoxia occurs, the frequency of its traumatism (haemorrhage) increases in delivery. Cervical rupture in labour is connected with the development of massive hemorrhage, embolism by the amniotic fluid.

**Pregnancy and labour management** consists in hospitalization, hemodynamic stabilization, monitor observation of mother's and fetus' condition till maturity ascertainment of the latter. Pregnant women with placenta previa need long hospitalization because of the possible necessity in labour or blood transfusion. It is necessary to make immediate renewal of BV to avoid the development of hypovolemic shock and syndrome of disseminated intravascular fibrillation (DIC-syndrome) during hemorrhage in consequence of the placenta previa.

If fetal maturity is confirmed by some tests, delivery should not be detained. The earlier the hemorrhage episode took place during placenta previa the more important to delay delivery till reaching fetal maturity. The extent of hemorrhage severity and fetal maturity should always be in the focus of doctor's interest if he has such pregnant women.

In complete placenta previa, labour is made by *caesarean section* in the term more than 36 weeks when as a rule the fetus reaches maturity. The obstetrical policy depends on blood loss volume in incomplete placental presentation.

During profuse hemorrhage it is recommended to make immediate caesarean delivery irrespective of pregnancy term. The uterine stimulation is oppressed by the use of tocolytic (magnesium sulfate, partusisten), antiholinergic drugs (methacin) and spasmolytics (no-spa, papaverine) in case of single little hemorrhage (300 ml) in incomplete pregnancy. Antianemic therapy is carried out by preparations of silver, the fetus treatment with chronic hypoxia is realized. The caesarean section is recommended in incomplete placenta previa, blood loss more than 250 ml and the absence of conditions for fast labour through natural maternal passages as well as if there are anomalies of fetus location and presentation. In cases when placental location can not be ascertained for sure with US, labour method is defined with the help of careful vaginal examination in the operating room prepared for caesarean section. If placental tissues are visualized or palpated in the internal os area, the caesarean section is performed. If the placental border is not found out close to the internal os, so the artificial rupture of the fetal membranes is made (amniotomy) and labour stimulation by intravenous injections of oxytocine is made. If the hemorrhage does not stop, the caesarean section is realized. The prophylaxis of hypotonic hemorrhage is realized, manual examination of the uterine cavity with the consequent prescription of antibiotic therapy is made at the postnatal period. Massive hemorrhage during the caesarean section is the indication to bandaging arterial vessels and uterine extirpation (hysterectomy) — supravaginal and complete.

The lower placental attachment in the area of the internal os and cervical duct (cervical presentation) leads to the development of **cervical pregnancy**. The cervix looks exaggerated: hemorrhage can occur since the first months of pregnancy. During pregnancy breaking the separation of fetal ovum from the uterine wall can not be complete. However, the attempts of the fetal ovum removal should not take place (doctor's mistake). The only method of treatment in cervical pregnancy is the uterine extirpation with the tubes and simultaneous realization of the therapy directed to the hemorrhage stoppage and elimination of coagulatory disorders.

## PREMATURE PLACENTAL SEPARATION IN ITS NORMAL PRESENTATION

*Premature placental separation in its normal presentation* is its premature pathological separation from uterine walls before fetus birth. The frequency of this complication is from 1 to 2% and composes at about 30% of all hemorrhages in the second half of pregnancy. Approximately in each second case the placental separation takes place before labour; in 10–15% of cases it is not diagnosed till the second period of labour.

*Aetiology and pathogenesis.* A direct reason for premature placental separation is unknown. However, there are many factors which can cause this complication. Premature placental separation happened during previous pregnancy has a tendency to recurrence in 10–17% of cases and in the presence of it during two preceded pregnancies — more than in 20% of cases. Maternal arterial hypertension is found out in 2.5–18% of mentioned complication cases and 50% of perinatal death (essential hypertension, hypertension disturbances during pregnancy) are connected with it. The factors which lead to appearance of given complication are smoking, uterine overdistension (hydramnios, multiple pregnancy), mother's vascular diseases, hemolytic anaemia, maldevelopments and uterine tumours. In 1–5% of cases the premature placental separation can be connected with the uterine trauma (car or another accident, especially simultaneous fixing of knees and shoulders by belt), sudden decreasing in amniotic fluid volume, short umbilical cord, severe mental stress.

The main pathophysiological mechanisms of premature placental separation are following: 1) local lesion of vessels which leads to their rupture in the main decidua membrane; 2) pressure increasing in the uterine veins; 3) dilation and separation of intervillous spaces; 4) hemorrhage in basal layer of the decidua membrane; 5) mechanical factors (short umbilical cord, sudden decreasing of the amniotic fluid volume); 6) possible initiation of coagulatory mechanisms (trauma with consequent excretion of tissue thromboplastin).

Bleeding can occur in the basal layer of decidua membrane or retroplacentally during the rupture of spiral arteries. If blood breaks the placental membranes, the maternal-fetal and fetal-maternal hemorrhage, hemorrhage in the amniotic fluid, embolism by the amniotic fluid takes place. Sometimes the profuse hemorrhage in thenomyometrium leads to uterine induration by blood (utero-placental apoplexy, Couvelaire's



uterus). Such a uterus looks cyanotic or purple, it is soft, incapable of contraction. In severe form the placental separation can be developed as DIC-syndrom. Coagulatory disturbance, fibrin sediment in microcirculatory canal can cause the renal tubular and cortical necrosis, acute cor pulmonale, necrosis of the adeno-hypophysis (Shien's syndrom).

*Clinical picture and diagnosis.* Premature placental separation can be complete (separation of the full placenta) or partial (regional and central; Fig. 113, a, b, c). Clinical symptoms of this complication become expressed during the separation of 1/4–1/3 and more placental area and include: 1) vaginal hemorrhage (in 80% of cases); 2) pain in the lower abdomen or lumbar area, uterine tenderness during palpation (in 2/3 of patients), frequent uterine contractions; 3) disorder of the fetus condition.

During placental separation the connection with uterine wall disturbs, uterine-placental vessels are lesioned, hemorrhage leads to formation of retroplacental haematoma. Depending on haematoma localization, the hemorrhage can be internal, external and combined.

If the placenta is high in the uterus and the hemorrhage occurs in its centre, the placental edge slows down the blood outflow and external hemorrhage can be absent. The hemorrhage in the basal layer of the decidual membrane stimulates the uterine contraction which causes pain. Big retraplacental haematoma stretches the placental area, the placenta is swelling in this area, the diffusive impregnation of the myometrium with blood occurs, which reduces the retractive ability (utero-placental apoplexy, Couvelaire's uterus). Coagulatory disorders as the result of getting of massive thromboplastin doses in maternal blood flow often occurs. Steady uterine

tension because of intrauterine pressure increasing is marked. Pain syndrome develops during uterine serous membrane extension. An erroneous diagnosis of premature birth is revealed in 20% of cases which can lead to fatal consequences because of the time loss and prescription of inappropriate treatment (magnesium sulfate and oth.). If insignificant part of the placenta separates (till 20% of the total area), the pain is absent. In this case the diagnosis is often determined retrospectively, during placenta's survey after delivery.

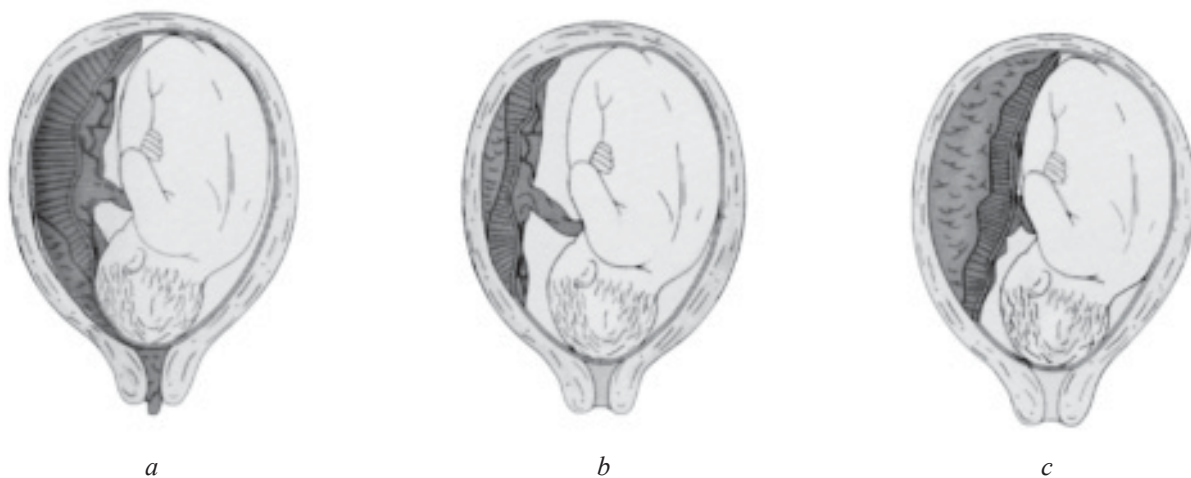
Acute prenatal fetal hypoxia is observed in 50% of cases, that's why the monitoring of fetal heart activity is necessary.

Coagulatory disturbances intensify the severity of the patient's condition. Premature placental separation is the most often reason of *consumption coagulopathy*, which shows as hypofibrinogenemia (fibrinogen level < 1.5 g/l), thrombocytopenia. Prothrombin and partial thromboplastin time also increases. This consumption coagulopathy is the consequence of desseminated intravascular coagulation. Intravascular fibrinogen transforms in to fibrin, the thrombocytes exhaustion and other coagulatory factors occur.

US has a restricted meaning in diagnosis of the placental separation, it is carried out for exclusion of the placenta previa during vaginal hemorrhage. A relatively big retroplacental haematoma can be found out with US but the absence of precise ultrasound criteria of its identification do not allow to make a correct diagnosis.

At the same time the retroplacental hypoechoic zone can be visualized in the case when there is no placental separation.

*Differential diagnosis* is realized in pregnant women for exclusion of the placenta previa, ute-



*Fig. 113.* Separation of the placenta:  
*a* — marginal partial with external bleeding; *b* — central partial with internal bleeding;  
*c* — complete

rine rupture, other hemorrhage reasons (till 20% of cases) as well as the syndrome of vena cava inferior.

**Pregnancy and labour management.** The obstetrician's policy depends on placental separation extent (and amount of blood loss) and directed to prevent the development of hemorrhagic shock and DIC-syndrome. Urgent treatment is in renewal of BV, its oxygen volume and coagulatory factors before fetus birth by cryoprecipitate's transfusion, freshfrozen plasma, fresh blood.

Antishock therapy and monitoring of heart activity is realized.

In complete premature placental separation, labour is realized if there are vital indication on maternal part (in spite of the fetus condition) during the 1st hour. Expecting tactics is expedient in case of incomplete unprogressing placental separation when the fetus condition keeps satisfactory. The method of choice of labour is defined by severity on maternal part, the size of blood loss first of all and (more seldom) by the condition of maternal passages.

First aid in considerable and progressing placental separation consists in fast hemorrhage stoppage achieved by immediate labour. The method of choice in pregnant women's labour with premature placental separation is caesarean section, thanks to which the fast and effective hemostasis can be provided and extent of operation increased if it necessary (removal of Couvalaire's uterus).

Cesarean section is also carried out in case of the placental premature separation at the first stage of labour. Irrespective of the chosen labour method, it is recommended to realize preliminary amniotomy for decreasing intrauterine pressure.

In case of the placental separation, developed at the end of first or at the second stage of labour and in the presence of conditions for accelerated labour through the natural maternal passages, the following labour procedures are recommended: *application of obstetrical forceps, extraction of the fetus by the pelvic end*. In the transversal position of the second fetus of twins the *version* with fetus extraction by the leg is admissible. If the fetus is dead, embryotomy is possible.

Irrespective of the labour method, the manual placental separation and the placenta removal should be done as well as the manual examination of the uterine cavity, prophylaxis of hypotonic postnatal bleeding should be realized. In development of hypertensive hemorrhage 1–2 most effective conservative methods of its stoppage are used; if they are ineffective and blood loss is more than 500–700 ml, laparo-

tomy and uterine extirpation are performed, the correction of coagulatory disturbances is realized.

## OTHER REASONS OF HEMORRHAGES

**Vasa previa of the umbilical cord** is a seldom complication, however, connected with considerable risk for the fetus.

In case of vasa previa of the umbilical cord, the latter fastens to fetal membranes but not to the placenta itself and vessels are lower than the fetus presenting part close to the internal uterine os. The fetal hemorrhage occurs during the rupture of these vessels. Because of a little blood volume of the fetus, even little hemorrhage causes tachycardia and can lead to anaemia and death. Urgent diagnosis consists in examination of blood smear under the microscope with addition of alkaline fluid (fetal erythrocytes have a nucleus in contrast to maternal erythrocytes). Immediate abdominal labour is necessary in the presence of hemorrhage caused by vasa previa of the umbilical cord.

**Uterine rupture** can arise during pregnancy (asymptomatic uterine rupture on the cicatrix's place after the caesarean section) and in delivery.

## HEMORRHAGE IN AFTERBIRTH AND EARLY POSTNATAL PERIOD

Bleeding in some minutes or hours after labour is severe and potentially fatal complication. It can be sudden and profuse or slow and long.

**The reasons** of postnatal hemorrhage are: 1) anomalies of the placentation, delay of the placental parts; 2) hypo- and atonia of the uterus; 3) traumas of the maternal passages; 4) coagulatory disturbances.

Bleeding in delivery, composed till 0.5% of the puerpera's body weight, is physiological and determined by hemochorion type of the placentation. After the child birth, the uterine body contracts fast with spiral arteries in the area of the placenta's attachment. This muscular contraction to a greater extent than coagulation prevents massive blood loss from the site of placentation.

The stoppage of the hemorrhage occurs as a result of uterine contraction at the placental area thanks to the compression of blood vessels, thromboformation in small vessels and capillar-

ies. Increasing retroplacental haematoma and own placental mass promote its separation and move to the lower maternal passages. The placenta lowers down to the lower uterine segment; muscular contraction of the abdominal wall and vagina promote its expulsion. The process of the placental separation can start with the centre (by Schultze) and periphery (by Duncan).

If uterine contractions do not arise, the postnatal hemorrhage occurs. Uterine overextension (multiple pregnancy, hydramnios), anomalies of birth activity (prolonged delivery, hyperstimulation), conditions which prevent uterine contractions (uterine myoma, the use of magnesium sulfate).

The normal mechanism of placental separation is necessary for providing hemostasis. The duration of the placental separation is about 6 min in the norm and 10 min at the placental stage of delivery. If the hemorrhage is absent, the observation lasts for no more than 30 min at the postnatal period. If the signs of placental separation are absent or the blood loss is more than 250 ml, a manual placental separation and the removal of the placenta is realized.

## PLACENTAL ANOMALIES AND RETAINED PLACENTA

The disturbance of the placental separation can be the result of its abnormal ingrowth into the myometrium. So, compact placental adherence to the uterine wall is called **placenta adhaerens**; pathological fastenings to the endometrium (porous layer is absent) — **placenta accreta**; penetration into the myometrium — **placenta increta**; invasion of all myometrium thickness — **placenta percreta** (Fig. 114). Placenta accreta is met very seldom (1:24,000 of labour).

*Aetiology and pathogenesis.* The reasons of pathological placental attachment can be: decidual membrane's porous layer structural changes in consequence of chronic endometritis, cicatric and dystrophic changes as the result of numerous abortions, uterine malformations, thromboplast's enzymes activity decrease.

*Clinical picture and diagnosis.* Compact placentation or accretion of the placenta can be *complete*, not accompanied by hemorrhage, or *incomplete* with strong hemorrhage at the III trimester of labour in consequence of separation of the placental part.

Diagnosis is based on the clinical picture and specified during manual placental separation, which is done after intravenous anaesthesia and examination of the uterine cavity. In case of

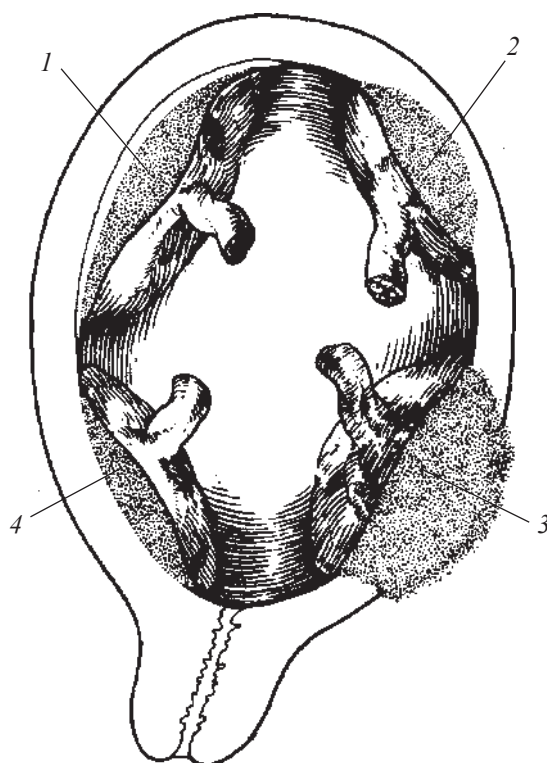


Fig. 114. Variants of attachment of the placenta (placentation):  
1 — normal; 2 — placenta increta; 3 — placenta percreta; 4 — placenta accreta

compact fastening it becomes possible to separate placenta from the uterine wall and to remove the placenta; the hemorrhage stops after this manipulation. If there is placenta accreta, it is impossible to separate it (threat of uterine perforation); the only method of treatment in these cases is laparotomy and removal of the uterus and at the same time with carrying out of transfusive therapy depending on the extent of blood loss.

At the III trimester of labour the hemorrhage can be connected with the delay or jamming of a separated placenta. The reasons of this condition are insufficient contractile activity of the myometrium (uterine inertia, overdistension of the uterus if the fetus is big, hydramnios, multiple pregnancy), muscles weakness of the anterior abdominal walls, overdistended urine bladder, fatigue of a puerpera, accelerated operative labour. The treatment consists in attempt of the placental separation by external methods (by Abuladze, Henter, in exceptional cases — by Krede—Lazarevitch); if they are ineffective or there is hemorrhage — the manual separation of the placenta and examination of the uterine cavity.

The remains of the placental tissue in the uterus, malformations of the placenta (additional part of the placenta, tunicary or regional attachment of the umbilical cord, placenta biloba sur-

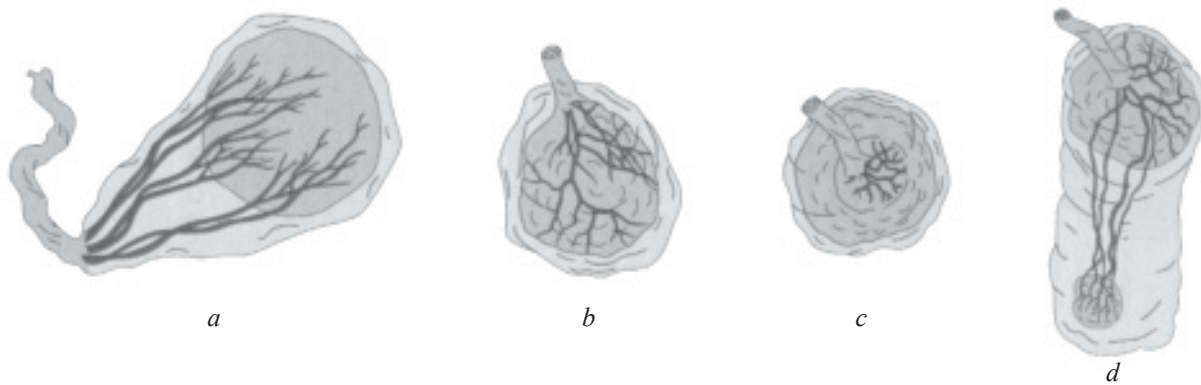


Fig. 115. Anomalies of the placenta's development:  
*a* — membranous attachment of the umbilical cord; *b* — marginal attachment of the umbilical cord; *c* — the placenta, surrounded by torus (placenta circumvallata); *d* — supplying lobe of the placenta

rounded by a roller — placenta circumvallata and oth.; Fig.115, *a, b, c, d*) can be the source of hemorrhage at the postnatal period.

The placental separation is realized during exfoliation between porous and basal layers of the decidual membrane thanks to strong uterine contractions. Retaining of placental parts takes place if one or both these processes are disturbed or are not completed. Uterine changes caused by numerous abortions as well as uterine myomas and caesarean section are among the factors which initiate this complication.

The placental tissue which remains too long in the uterus can hinder its adequate contractions and cause profuse hemorrhage. That's why each placental part should be examined thoroughly for revealing absent cotyledones. During the defect of the placental tissue this placental area looks more dark, has rough contours. Prolongation beyond the borders of the placental vessels and their rupture is evidence of the presence of additional placental part. With suspicions at the presence of the placental tissue remains the manual examination of the uterine cavity with the removal of the rest of the placental tissue, clots of blood is carried out. Tonomotives usage (oxytocin, methylergometrine) is obligatory. It is also recommended to use such a method: two fingers are put through the cervix into the uterus and to remove placental parts if they are found. It would be expedient to make uterine US before the placental parts removal.

## HYPOTONIA AND ATONIA OF UTERUS

The hemorrhage within first two hours after delivery is mostly caused by hypotonia or atonia of the uterus (lowering of the uterine tone or

full loss of contractile ability of the myometrium).

*Aetiology.* The risk factors of uterine hypotonia or atonia are following: accelerated or lingering labour, labour stimulation by oxytocin or prostaglandins, uterine overdistension in consequence of hydramnios, multiple pregnancy, fetus macrosomia, uterine myoma, uterine distension by blood clots, anaesthesia and analgesia, chorioamnionitis in labour, uterine hypotonia in previous labour, embolism by the amniotic fluid, the use of magnesium sulfate during labour.

*Clinical picture and diagnosis.* During uterine hypotonia, the tone of the myometrium is reduced: the uterus is soft, compliant, the cervix is gaping during palpation. Atonic hemorrhage has the character of profuse since first minutes and soon results in hemorrhagic shock.

During hypotonic hemorrhage, uterine massage promotes its contractions, however, the uterus relaxes again after this manipulation. The periods of hemorrhage stoppage alternate with the periods of its renewal; blood loss is in portions by 150–300 ml. It provides the temporary organism adaptation to hypovolemia. But the contractile activity of the uterus decreases gradually, organism's adaptative possibilities exhaust because of untimely rendering obstetrical aid. The uterus loses an ability to react at irritation, the hemostasis disturbances come, the hemorrhage is getting profuse, hemorrhagic shock develops.

The postnatal hemorrhage can arise against a background of coagulatory disturbance in consequence of the development of consumption coagulopathy (premature separation of the placenta and oth.). In order to avoid uterine hypotonia after placenta birth, the intravenous injections of oxytocin, which intensifies the uterine contractions and decrease the probability of atonia are performed. After confirmed



diagnosis of uterine hypotonia, the treatment of women should be active — therapeutic and surgical.

**The conduct of puerperal women with hypotonic hemorrhage.** The doctor's policy during hypotonic hemorrhage is defined by amount of blood loss and severity of patient's condition. The only method of treatment is laparotomy and uterine ablation with adequate recovery of BV and coagulatory factors in case of atonic hemorrhage and hemorrhagic shock development.

From the beginning of hypotensive hemorrhage the medical measures should be fast, without wasting of time for repetition of ineffective manipulations.

After emptying of the urinary bladder, the external uterine massage through the anterior abdominal wall is realized, the local hypothermia is used. At the same time the medications which stimulate the myometrium are used (5–10 U of oxytocin, 1 ml of 0.02% of methylethylergometrine solution for 20 ml of 40% glucose solution). If the hemorrhage doesn't stop and reaches 300 ml, the manual examination of the uterine cavity is realized (removal of blood clots, the rest of the placenta, check-up of uterine wall integrity). If uterine hypotonia was detected, its massage on the fist is made (the danger of tissue thromboplastin big doses release into the blood flow). In order to strengthen the effect the sutures can be put on the transversal posterior cervical labia by the Lositska's method, clamps by Bucksheyev, Kvantiliany, ether tampon — into the posterior fornix of the vagina, oxytocin or prostoglandins — into the cervix.

If conservative measures (administration of the preparations which contract the uterus, manual examination, external-internal uterine massage) give no effect, hemorrhage continues and reaches about 1,000 ml, they perform urgently laparotomy and bandage of the uterine and ovarian vessels or ablate the uterus. The operation should be made not later than 30 min after the beginning of hemodynamic disorders (fall in the ABP till 90 mmHg). If the blood loss doesn't exceed 1,500 ml, the indices of hemodynamics and hemocoagulation stabilize, it is possible to perform supravaginal uterine amputation. If there are promoted hemostasis disorders, DIC-syndrom, the presence of infection, it is recommended to make uterine extirpation. The bandage of internal iliac arteries is made after the uterine extirpation for the stoppage of parenchymatous hemorrhage. Infusive therapy is a necessary component in volume and speed (warm donor blood, blood preparations, colloid and cristalloid solutions, which amount is determined by extent of blood loss and the condition of a puerperal woman).

## TRAUMAS OF MATERNAL PASSAGES

Injuries and traumas of the reproductive tract can become the hemorrhage reason at the postnatal period (rupture of the uterus, vagina, perineum, cervix uteri, traumas and haematoma of the vulva). The ruptures of the reproductive tract are divided into *spontaneous* and *violent* or *traumatic* (in consequence of operative delivery). These conditions are unified under the name "maternal or obstetrical traumatism". Operative delivery (the use of forceps), fetus extraction during pelvic presentation, large fetus, decreasing of tissues' elastic properties in advance aged women which give birth for the first time and women who gave birth many times, reproductive tract infections can be the risk factors of maternal traumatism in labour. The examination of reproductive tract condition is made to all women to detect ruptures after the end of the III stage of labour.

**Rupture of the vulvar and vaginal mucous membrane.** The rupture of lateral and posterior walls of the vagina's lower third takes place most often. The rupture of upper lateral vaginal fornix can be continuation of cervical rupture. The vaginal rupture can be accompanied by vessels' lesion of paravaginal and paracervical cellular tissue with the formation of dangerous haematomas.

Promoted hemorrhage occurs during clitoris trauma. The trauma of the vaginal fornix can be accompanied by moderate external and considerable internal hemorrhage into the parametrium.

All revealed ruptures are taken in anatomically with catgut during adequate anaesthesia (infiltration anaesthesia, intravenous narcosis). While applying sutures in the area of the vaginal vestibule, the metal catheter is put into external aperture of the urethra.

**Vulvar and vaginal haematoma.** Vulvar haematoma is observed most often. However, the vaginal haematoma is more dangerous in consequence of difficulty of its revealing and treatment (Fig. 116). Haematoma can also develop in the area of episio- and perineotomy. Haematoma can even not be accompanied by mucous membrane lesion (when fetus or obstetrical forceps tear submucous tissues).

Haematoma of the vulva and vagina are characterized by acute pain, the feeling of pressure, thenesmus, anemization. Shock is possible during strong internal hemorrhage. A small vaginal haematoma is sewed (with opening or without it) and tightly plug with a tampon for 24 h.

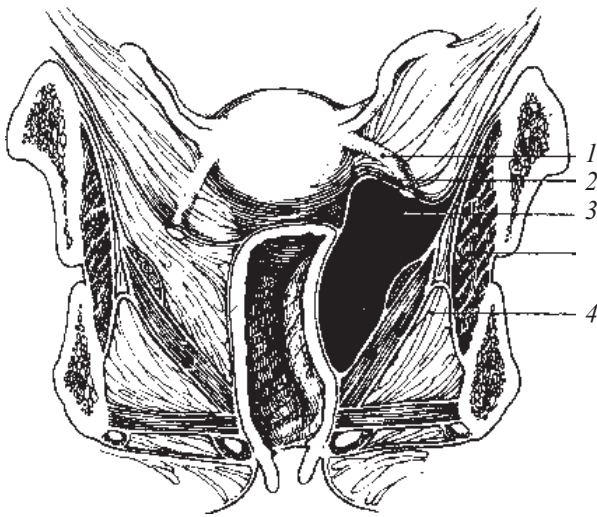


Fig. 116. Hematoma of vagina:  
 1 — round ligament of the uterus; 2 — margin  
 of the peritoneum; 3 — suprafascial hematoma;  
 4 — musculus levator ani

A bag with ice is put on the site of haematoma. A bigger vaginal haematoma (more than 5 cm) is dissected, dried, drained, the site of hemorrhage is revealed and hemostatic sutures are applied. Supervision for patient's hemodynamics and diuresis is realized. If haematoma is found out in the area of episiotomy, the sutures are undone, hemorrhage vessels are found out and tied up and all wound layers are taken in. To avoid the haematoma's relapses, the catchment and plugging of the vagina is made.

**Perineal rupture** as all maternal birth traumas can be *spontaneous* and *violent* or *traumatic*. By clinical course there are *threatened*, the *rupture beginning* and *completed rupture* of the perineum. The clinical symptoms of threatened perineal ruptures are cyanosis and tissue oedema at the beginning, then — pallor and glitter of the perineal skin. Bloody discharge are evidence of the rupture beginning.

By depth of lesion all perineal ruptures are divided into 3 degrees: I — rupture of posterior commissure, the part of posterior vagina's wall and perineum skin (perineum muscles stay intact); II — besides mentioned tissues, fascias and muscles of pelvic bottom tear additionally; III — rupture of anus' external sphincter (incomplete rupture) and sometimes — the anterior wall of the rectum (complete rupture) add to mentioned lesions.

During the central perineal rupture (today is not almost observed) the perineal centre is affected and the posterior commissure and sphincter of anus keep intact; delivery takes place through this artificially created canal.

Bleeding, infection, then — genital prolapse can be the complications of peritoneal rupture,

during ruptures of the III degree the gas and fecal incontinence occur. The treatment of women with perineal ruptures consists in immediate (after placenta delivery) recovery of anatomic relations in tissues by stitching and observance of all aseptic rules with using of adequate anaesthesia. During the rupture of the I degree, in series, catgut stitching is made on the vaginal mucosa downwards till posterior commissure (one floor of sutures) and then from the posterior commissure along the lines to the anus — silk (lavsan) suture and metal clamp on the perineal skin 1–2 cm from each other. The needle is put in such a way that slits are absent where the blood can accumulate, which prevents healing.

During peritoneal ruptures of the II degree, stitching on the wound's upper angle is also realized at the first time, then the torn peritoneal muscles are joined with some knotty catgut sutures (these sutures should size neither skin nor mucous membrane). After that, the vaginal mucous membrane is taken in to posterior commissure. The ends of ligatures are cut off, except stitch's ligatures which were put right on the commissure. Then the stitching on the lower wound's angle of the perineum is applied. The ends of this suture are not cut off. Having both stitches stretched (upper and lower), skin wound closure with silk or catgut sutures or put the second layer sutures.

If the perineal rupture is of the III degree, the rectum integrity is restored and then — the anus sphincter. Then the stitching is realized after the second surgical hand treatment just as during perineal rupture of the II degree. Postsurgical care consists in cleanliness maintenance of sutures' surface (dry suture toilet). When woman gets toilet, the suture area is not washed but only dried carefully with a sterile tampon, after that it is cleansed with potassium permanganate or 3–5% spirit iodine solution or brilliant green. A puerperal woman has an additional toilet of external genitalia and the suture area is dried after urination and defecation. The sutures are taken off on the 5th–6th day.

After sewing perineal rupture, a puerperal woman gets a special diet — liquid food (to detain defecation). The glyceric enema is recommended as soon as the desire to evacuation appears and then the sutures are taken off.

**Cervical rupture.** Women who give birth for the first time have little cervical lesions (lateral rupture) and they are evidence of former delivery later.

There are 3 stages of cervical ruptures: I — rupture's length under 2 cm; II — the rupture over 2 cm but doesn't reach the vaginal

fornix; III — the rupture reaches the vaginal fornix and pass to it.

The cervix is examined with the help of a speculum for rupture diagnosis in all puerperal women. In case of rupture revealing, the cervix is seized with fenestrated clips and take aside opposite to the rupture. The rupture is sewed with a knotty catgut sutures from the upper wound's angle (over the rupture site) till the rupture beginning (Fig. 117).

**Uterine rupture** can occur during pregnancy and delivery and observed with the rate of 1:1,500 labour; maternal mortality at this complication is 10–40%, perinatal — 50%. *Complete rupture* is characterized by lesion of all uterine layers, its serous layer is kept during *incomplete rupture* as a rule. Uterine rupture can be *spontaneous* or *traumatic*. By localization there are the ruptures of the bottom, body, lower uterine segment and uterine avulsion from the vaginal fornix. The complete uterine rupture may occur at late terms of pregnancy and labour in women with a uterine scar on the uterus after caesarean section or other big uterine operations; the haematoma formation in the broad uterine ligament is possible (Fig. 118). Mechanical obstacles can also be the reasons of the uterine rupture during delivery, including disparity between the maternal pelvis and fetal head (anatomically and clinically narrow pelvis), uterine hyperstimulation with oxytocin, operative delivery (fetus extraction at pelvic presentation, application of obstetrical forceps).

*Incomplete asymptomatic uterine rupture* can occur in consequence of suture's partial dehiscence on the uterus after caesarean section in the lower uterine segment, if there is the abdomen trauma in late terms of pregnancy. Instrumental uterine perforation is possible during the abortion operation. The uterine rupture can be accompanied by retroplacental hemorrhage but it is a late symptom.

*Clinical picture and diagnosis.* The classical symptoms of the uterine rupture are the following: 1) hemorrhage; 2) sensitivity or pain during uterine palpation, in the suprapubic area; 3) disturbance of fetal heart activity; 4) separation of the fetal presenting part or its placing (detected by palpation) in the abdominal cavity to the outside from the uterus. The abnormal fetus position and the presence of its extremities' extension are revealed with US.

The uterine rupture can be accompanied by the development of hemoperitoneum and hypovolemic shock. Uterine rupture should be under the suspicion if there is a massive obstetrical hemorrhage during the III delivery stage in the

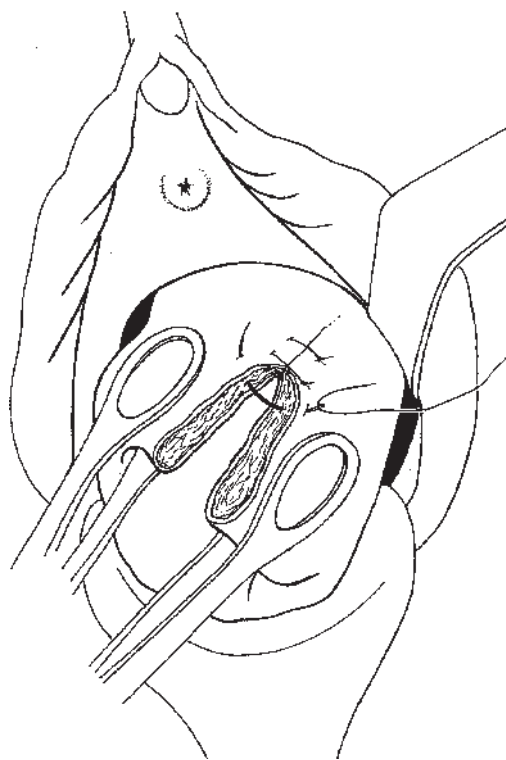


Fig. 117. Putting stitches of cervical rupture

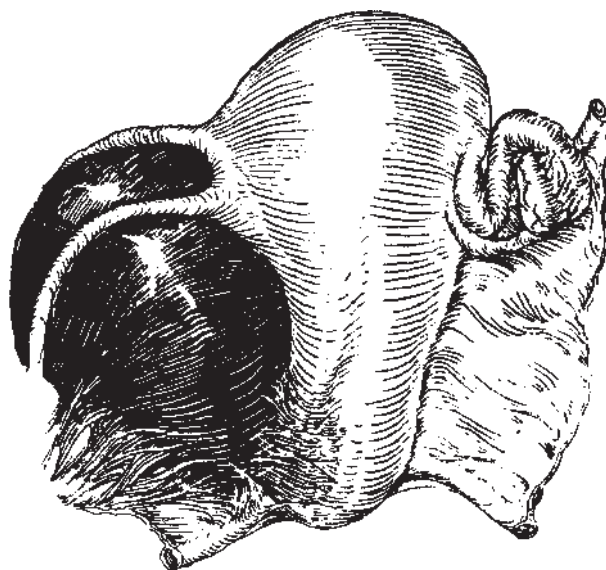


Fig. 118. Rupture of the lower uterine segment with hematoma in the broad uterine ligament

absence of other reasons. Manual examination of the uterine cavity is made for diagnosis.

The complications of uterine ruptures are hemorrhage, hypovolemic shock, infection, lesion of the urethra and the urinary bladder, thrombophlebitis, DIC-syndrom.

*The conduct of puerperal women* is in the immediate stoppage of birth activity and abdomi-



nal labour. The method of choice in case of uterine rupture is extirpation. The *a.a. uterina* or *a.a. hypogastrica* ligation, uterine tamponade can stop the uncontrolled hemorrhage. Thorough uterine rupture closure for saving reproductive function is possible in some cases.

*Prophylaxis* of uterine rupture consists in the rational labour management: 1) avoidance of hyperstimulation, complicated and long vaginal labour; 2) performing caesarean section in to lower uterine segment.

**Inversion of the uterus** is a very seldom complication which can cause profuse sudden blood loss. The treatment consists in the administration of anesthetics promoting uterine relaxation (halothane, phtorothane) and uterine reposition.

In case of inefficiency of applied drugs, the surgical treatment is realized including extirpation of the uterus. Strong traction of the umbilical cord should be avoided for prophylaxis of uterine inversion.

Separations and ruptures of the pubic symphysis, the formation of postnatal urinogenital and rectogenital fistulas belong to severe and seldom forms of maternal traumatism predominantly observed in consequence of unsuccessful labour operations (imposition of obstetrical forceps, fetus extraction by the pelvic end, embryotomy) as well as because of narrow pelvis, large fetus, long labour.

## COAGULATION DISTURBANCES

Any congenital or acquired coagulopathy (the delay of dead fetus in the uterus, embolism by the amniotic fluid, premature placental separation, uterine rupture, sepsis, massive blood transfusion, severe pre-eclampsia and eclampsia, extragenital pathology) can bring to profuse postnatal hemorrhage.

Long hemodilutive therapy (rheopolyglucin) with the use of anticoagulants can bring to the disturbances of hemostasis system in labour. The treatment includes the removal of coagulopathy reasons and restoration of coagulatory factors. During examination of puerperal women the presence of blood clots' formation should be taken into account. You should remember that profuse hemorrhage can bring to coagulopathy.

**Bleeding during the fetus intrauterine death.** If delivery do not occur just after the fetus death, a severe consumption coagulopathy by the thromboplastin release from the fetus substance may develop. 25% of women have considerable changes in coagulatory system in a month after the fetus death. Treatment consists in urgent delivery and correction of coagulatory distur-

bances. Labour stimulation is realized by intravenous injection with oxytocin or prostaglandins. Labour hyperstimulation especially after the 28th week of pregnancy with the possibility of uterine ruptures should be avoided.

**Bleeding as the result of embolism by the amniotic fluid.** The amniotic fluid penetration to the maternal blood flow can be fatal. The following mechanisms underlie this complication: 1) water penetration through the ruptures of the amnion and chorion; 2) trauma of the uterus (caesarean section, uterine rupture) or intracervical veins (cervical rupture); 3) increasing of intrauterine pressure (especially during the uterine hyperstimulation), bringing to fluid penetration into the venous circulation.

Edge placental separation, a uterine or cervical trauma promote the opening of maternal circulation. Impetuous delivery especially in consequence of stimulation with big oxytocin doses bring to the increasing of intrauterine pressure, accompanied by acute fetus hypoxia and meconium excretion into the amniotic fluid. During embolism the meconium presence increases the toxic influence of the amniotic fluid in the maternal circulation.

*Clinical picture and diagnosis.* As a rule, the embolism by the amniotic fluid takes place right after the child birth or after labour. The clinical picture is characterized by respiratory disturbances (depress-syndrom) of different degree (cyanosis, breathlessness, loud breath), circulatory collapse and sometimes by convulsions. Coagulopathic hemorrhage from the maternal passages develops very fast as the result of late treatment.

Mortality which occurs in the presence of embolism by the amniotic fluid depends on the volume and content of the amniotic fluid got into the blood flow and especially with meconium presence. Severe obstruction of pulmonary vessels by fetal substances (epidermal cells, hair, mucin and intravascular fibrin deposit) may bring to the development of acute cor pulmonary and severe hypoxia.

*Treatment* consists in the following: 1) providing adequate breathing (immediate pulmonary ventilation); 2) antishock therapy; 3) prevention of hemorrhagic and infectious complications and their treatment.

Urgent aid consists in intravenous administration of 1ml of 2% promedol solution, 2 ml of 1% benadryl solution and 2 ml of diazepam. At the same time the oxygen therapy with the help of nasal catheters or masks for narcosis is realized. Later on the tracheal intubation is made and artificial pulmonary ventilation is used. The infusive therapy is made simultaneously (rheopolyglucin, spasmolytics, cardiac glycosides,



corticosteroids), under the control of the arterial and central venous pressure, hourly diuresis, acid-base balance, hematocrit number, electrolytic balance, ECG data.

It is necessary to reveal women of high risk group for preventing postnatal hemorrhage and to take prophylactic measures: to avoid umbilical cord's strong traction, to reveal the integrity of removed placenta, to make uterine massage, to keep the patients under observation, to make examination of maternal passages with removal of blood clots from the uterus and the vagina, to realize thorough rupture closure.

**Post-shock hemorrhage** takes place in some minutes or hours after the patient's shock or collapse removal. This hemorrhage is connected with the development of DIC-syndrom, observed both at early terms and at the late postnatal or postoperative period. It may occur in consequence of embolism by the amniotic fluid, acid-aspirative Mendelson's syndrom, anaphylactic, infection-toxic or traumatic shock, poor anaesthesia of labour and especially of obstetrical operations as well as because of long stay of a dead fetus in the uterus.

*Clinical picture* is characterized by sudden beginning, massive blood loss and incapacity to fibrillation. Postshock hemorrhage is a local manifestation of the polyorgan and polysystem insufficiency syndrome. Not only promoted disturbance in hemostasis system but also severe myometrium lesion with the loss of contractile ability ("shock uterus") is observed.

Treatment consists in the elimination of hemorrhage source (uterine extirpation, ligation of internal iliac arteries) and correction of hemostasis disturbances by the way of intensive resuscitation.

## LATE POSTNATAL HEMORRHAGE

Late postnatal hemorrhage occurs in 2 h and more after delivery and can be conditioned by uterine hypotonia, delay of the placental parts (afterbirth), disturbances of fibrillation system, traumas of maternal passage's soft tissues, blood system diseases.

**Hypotonic hemorrhage** can occur during the first day of the postnatal period. Pathogenesis, clinical picture, diagnosis and treatment are similar to hemorrhages at the early postnatal period.

Within first days and even during the week after delivery, *hemorrhage* can be the cause of the placental part's or membrane's delay undi-

agnosed in time. Retained placental parts (afterbirth) prevent normal uterine involution, cause the endometrium development. If hemorrhage progresses, the diagnosis is specified on the basis of data given with US and vaginal examination. In this case the cervical duct passes 1–2 fingers, the uterus is big, soft. Sometimes placental tissues (afterbirth) are palpated behind the internal uterine os.

The *treatment* consists in immediate instrumental inspection of the uterine cavity under the intravenous anaesthesia with providing antibacterial and infusive therapy depending on the blood loss amount. The drugs stimulating uterine contractions are used additionally at the postoperative period.

Late postnatal hemorrhage can be determined *by soft tissue traumas of the reproductive tract* as the result of wrong stitching. In this situation the vaginal and perineal haematoma occurs. The sutures applied before are taken away under general anaesthesia, hemorrhage vessels are found out and legated and the wound's edges are connected.

In 0.2–0.3% of cases the hemorrhage is associated with the presence of thrombocytar or vascular diathesis (idiopathic, thrombocytopenic purpura or the Werlhof's, Willebrand's disease). The intensive treatment should be carried out (transfusion of fresh blood, thrombocytes suspension, antihaemophilic plasma; corticosteroid therapy; administration of dicinon, calcium chloride and oth.).

## PROPHYLAXIS OF OBSTETRICAL HEMORRHAGE

Only efficient measures' organization for prophylaxis of uterine hemorrhage during pregnancy, delivery and at the postnatal period can become a real basis for decreasing in maternal and perinatal mortality rate.

The beginning of prophylaxis of severe complications which can occur in future pregnancy and labour is the health protection of a girl and a woman. Revealing of pregnant women group of high risk of hemorrhage development, their examination and hospitalization in time, rational labour management, adequate anaesthesia, immediate obstetrical aid during complication play an important part.

### RECOMMENDED READING

3; 5; 14; 21; 22; 23; 39; 46; 56; 57; 61.

## Chapter 35

# HEMORRHAGIC SHOCK AND PRINCIPLES OF INFUSIVE-AND-TRANSFUSIVE THERAPY IN OBSTETRICS

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Hemorrhagic shock is a condition connected with acute and profuse bleeding during pregnancy, birth and postnatal period, which is expressed as a sharp decrease in blood volume (BV), cardiac emission and tissue perfusion due to the decompensation of protective mechanisms.

The BV in a pregnant woman is about 6.5% of the body weight. As a rule, obstetrical bleedings exceeding 1,000 ml, i.e. more than 20% of the BV (or 15 ml of blood for 1 kg of the body weight) results in the development of shock. Continued bleedings exceeding 1,500 ml (more than 30% of BV) are considered massive and threaten the woman's life.

*Etiology and pathogenesis.* Haemorrhagic shock can result in obstetrical bleeding, caused by premature separation of the placenta in its normal presentation and placenta previa, cervical pregnancy, uterine rupture of the uterus, and disorder in the separation of the placenta at the III stage of labour, retention of the lobes of the placenta, hypotony and atony of the uterus during the early postnatal period. The danger of obstetrical bleedings consists in its suddenness, massiveness, profuse character.

Irregardless of the reason of the bleeding, the disproportion between the reduction of BV and the capacity of the vascular canal, which first appears as a disorder in the macrocirculation (system circulation), then — microcirculation disorder and, at last, the development of metabolism and proteolysis progressing disorganization plays a leading part in the pathogenesis of hemorrhagic shock.

If blood loss does not exceed 500–700 ml, i.e. about 10% of the BV, compensation occurs due to an increase in the tone of the venous vessels, the receptors of which are most sensitive to oligemia. Thus, essential changes in the arterial tone, frequency of cardiac contractions, perfusion of tissue do not occur.

Blood loss exceeding 700 ml results in significant oligemia, which is a strong stressful factor. To maintain hemodynamics of vital organs (first of all, the brain and heart) powerful compensating mechanisms, resulting in the centralization of blood circulation, temporarily supporting cardiac output and ABP, are included. In connection with this the tone of the sympathetic nervous system increases; the emission of catecholamine, aldosterone, corticotrophin (ACTH), vasopressin (antidiuretic hormone), glycocorticoid increases, the renin-angiotensin system activates, causing the acceleration of the pulse, delay of liquid excretion from tissue and its entering to the blood circulation, as well as spasm of the peripheral vessels, opening of the arteriovenous shunts. However, centralization of blood circulation cannot provide a long-term ability of a woman's organism, because it is conducted due to the disorder of the peripheral blood circulation. Continued bleeding results in the exhaustion of the adaptative mechanisms and deepening of microcirculation disorder due to the exit of the liquid part of the blood into the interstitial space, blood coagulation, sharp delay of the blood circulation with the development of the sludge-syndrome, causing promoted hypoxia and acidosis of tissue. The latter disturbs the work of the "sodium pump", increases the osmotic pressure, as a result hydration develops resulting in the damage of cells. Reduction of perfusion of tissue, accumulation of vasoactive metabolites is caused by the stasis of blood in the microcirculatory canal, disorder in the coagulation process of the blood and thrombogenesis. Blood sequestration takes place, which again reduces the BV. A significant deficiency of BV results in the disorder of vital organs' blood supply; the coronary blood flow decreases, heart failure develops.

Intensity of compensatory mechanisms and the consequences of massive blood loss substan-

tially depend on the blood loss speed and the initial level of BV. Extragenital and obstetrical pathology (chronic blood loss in case of the placenta previa, chronic DIC-syndrome due to late gestosis, cardiovascular and renal diseases, etc.), inadequate anaesthesia create conditions for the development of shock.

*Clinical picture and diagnosis.* Three stages of hemorrhagic shock are distinguished in modern clinical practice: I — compensated shock; II — decompensated reversible shock; III — irreversible shock.

*The first stage* of hemorrhagic shock (the minor emission syndrome) develops with blood loss approximately 20% of the BV (15–25%, or 700–1200 ml). The compensation of the loss of BV is carried out due to an increase in the production of catecholamines. The clinical symptoms related to the functional changes of the activity of the cardiovascular system are observed: paleness of the skin, tachycardia up to 100 in 1 min, moderate oliguria and venous hypotension. Arterial hypotension is absent or poorly observed (100 mmHg). The level of hemoglobin — 90 g/l.

*The second stage* of hemorrhagic shock develops due to blood loss, which is 30–35% on average of the BV (25–40% or 1,200–2,000 ml). A deepening of the blood circulation disorder occurs during this stage. The systolic and pulse ABP (80–90 mmHg) is reduced, promoted tachycardia, shortness of breath, acrocyanosis develop; condition of anxiety, oliguria (less than 30 ml/h), decrease in the central venous pressure (CVP) are observed. The blood supply to the brain, heart, liver, kidneys, lungs, intestines, is disrupted and as a result, tissue hypoxia and a mixed form of acidosis develop.

*The third stage* of hemorrhagic shock occurs due to blood loss, which makes about 50% of the BV (40–60%, exceeds 2,000 ml), and is characterized by further disorders of the microcirculation: capillarostasis, loss of plasma, aggregation of cellular elements of the blood, excessive deterioration in the perfusion of organs, increase in metabolic acidosis. The systolic ABP is less than 60 mmHg; tachycardia — up to 140 beats/min and more. The disorder of external respiration increases, marble skin, and cold sweat appears; sharp cooling of the extremities, anuria, stupor, loss of consciousness occur.

The clinical picture of hemorrhagic shock in obstetrical practice, besides of the general laws, has certain features caused by the basic pathology caused by bleeding.

So, hemorrhagic shock with placenta previa is characterized by promoted oligemia, arterial hypotension, hypochromic anaemia; chronic DIC-syndrome develops in 25% of women.

If hemorrhagic shock developed due to hypotonic bleeding in the early postnatal period, after the short period of unstable compensation, the irreversible condition quickly approaches, which is characterized by expressed disorder in the hemodynamics, respiratory insufficiency and DIC-syndrome, profuse bleeding caused by the use of coagulation factors of the blood and sharp activation of fibrinolysis.

Premature separation of the placenta in its normal presentation, as a rule, develops against a background of prolonged late gestosis, accompanied by the chronic form of DIC-syndrome, oligemia and angiospasm. Haemorrhagic shock for this pathology is frequently complicated by anuria, hypostasis of the brain, reduction of fibrinolysis, respiratory disorders.

Diagnosis is based on a complex of the following parameters: 1) characteristic of colour and temperature of the skin, especially the extremities; 2) evaluation of the pulse, ABP, CVP, shock index, haematocrit number; 3) determining the volume of blood loss; 5) revealing of the hourly diuresis; 6) change in the acid-base condition (ABC) of the blood.

*Algovver's shock index* is the ratio between the pulse rate and the value of the systolic arterial pressure — is a simple and sufficient informative parameter of the volume of blood loss and extent of oligemia. Normally this index is less than 1; due to a decrease in the BV by 20–30% it increases to 1.0–1.2; in case of the loss of 30–50% of the BV it equals 1.5.

It is possible to use *Barashkov's method* (by the parameters of the relative density of the blood and haematocrit numbers). So, with blood loss of up to 1 l of blood, the haematocrit number is no less than 0.32; up to 1500 ml — from 0.32 to 0.2; if the blood loss is more than 1500 ml, the haematocrit number is less than 0.22. An increase in the haematocrit index for III stage of shock testifies to its irreversibility.

An important parameter describing the organ blood flow is the *hourly diuresis*. A decrease in the diuresis to 30 ml/h testifies of the insufficiency of the peripheral blood circulation, and down to 15 ml/h — of the approach of irreversible decompensated shock.

Normal parameters of CVP are 0.49–1.2 kPa (50–120 mmH<sub>2</sub>O). The levels of CVP lower than 50 mmH<sub>2</sub>O testify to expressed oligemia. If against a background of infusive therapy the BP remains low, then an increase in the CVP of more than 1.37 kPa (140 mmH<sub>2</sub>O) confirms the decompensation of the cardiac activity and an indication to adequate treatment. In such a situation with low values of CVP it is required to increase the volumetric speed of the infusion therapy.

Metabolic acidosis, which can be combined with gas (respiratory one), is characteristic for hemorrhagic shock, although in the final phase of metabolic disorders alkalosis can develop.

In modern reanimation practice, diagnosis and the control of the treatment are carried out under the monitor control of the cardiovascular function (parameters of macro- and microcirculation, osmolarity, colloid-oncotic pressure), respiratory and urinary systems, hemostasis and parameters of metabolism.

*Treatment.* In order to maintain effective treatment it is necessary to unite the efforts of the doctor — obstetrician, anaesthesiologist and an expert in resuscitation and if needed, haematologist-coagulologist. Treatment should be started as soon as possible, be complex, performed while taking into in view the reason of the bleeding and the woman's health condition.

Bringing the patient out of the condition of shock should be carried out simultaneously with actions for stopping the bleeding. The volume of operative intervention should provide reliable hemostasis. If the patient's condition is severe, operative intervention is performed in 3 stages: 1) laparotomy, bleeding stop (extirpation of the uterus, clamping the main vessels); 2) resuscitation actions; 3) continuation of the operation. The basic directions of treatment of hemorrhagic shock are: 1) infusion-transfusion therapy directed on the restoration of BV and liquidation of oligemia; 2) increase in the oxygen volume of the blood; 3) normalization of the rheological properties of the blood and liquidation of microcirculatory and coagulation disorders; 4) correction of biochemical and colloid-osmotic disorders.

For successful infusive-transfusive therapy it is important to take into account the quantitative ratio of entered blood components and preparations, volumetric speed and duration of transfusion. Considering the deposition of blood during shock, it is necessary to enter the volume of liquid which exceeds the volume of possible blood loss, namely: in case of blood loss of 1,000 ml — 1.5 times more; 1,500 ml of blood — 2 times, if the blood loss is more massive — 2.5 times. It is desirable that in the first 1–2 h about 70% of the lost BV would be restored.

A criterion of treatment efficiency is positive dynamics of the clinical symptoms of shock: colour of the skin, heart rate, ABP, shock index, CVP, hourly diuresis.

The choice of means of infusion therapy depends on the initial condition of the woman, the reasons for the bleeding, volume of blood loss and the patient's organism reactions to it (colloid, crystalloid solutions, conserved blood and its components and preparations).

Taking into account the huge factor of time for effective treatment in case of hemorrhagic shock, first it is necessary to use colloid solutions with a high enough osmotic and oncotic activity (polyglucin), which should always be ready, combining them with crystalloid blood substitutes. By detaining liquid in the vascular canal, these solutions promote the mobilization of compensatory possibilities of the organism which allows preparing for the subsequent blood transfusion, which is necessary to begin as soon as possible, but with obligatory observance of all rules and instructions.

Conserved blood components (erythrocytic mass, washed frozen erythrocytes) remain the most important infusion means for treatment of hemorrhagic shock, because only with their help it is possible to restore the functional disorder of transportation of oxygen in the organism. Transfusion of fresh conserved blood (period of storage no more than 3 days) is allowable. With massive bleeding, erythrocytic mass should be 0.5–0.8 of the volume of blood loss, however during continuous treatment it is not necessary to transfuse more than 3 l of blood in connection with the danger of develop of massive transfusive syndrome.

For observing the regime of *controlled hemodilution* blood transfusions are necessary to combine with the introduction of colloid and crystalloid solutions in a ratio of 1 : 1 or 2 : 1. Such a ratio is explained by the adaptable features of osmoregulation of a pregnant woman. For hydremia (haemodilution) it is possible to use any solutions which improve the rheological properties of the blood, reduce aggregation of cellular elements and by that return the deposited blood into active circulation, improve the peripheral blood circulation (polyglucin, rheopolyglucin). Solutions of starch — hydroxyethylamylum (rephortan) have found wider application. With the conduction of adequate treatment for hemorrhagic shock not only the amount but also the significant speed of introduction of solutions (volumetric speed) plays an important role. With the patient's severe condition the volumetric speed of infusion of a solution should be 250–500 ml/min; for II stage shock it is necessary to enter solutions at a speed of 100–200 ml/min. Such speed can be achieved by jet introduction of solutions in several peripheral veins, or with the help of catheterization of the central veins. In order to gain some time it is rational to begin infusion with the help of puncture to the ulnar veins and at once start the catheterization of the subclavial veins, which enables long-term infusive-transfusive therapy.

The rate of infusion of liquid, ratio of blood and entered blood substitutes, elimination of the



surplus of liquid should be conducted under the constant control of the patient's general condition, as well as on the basis of the evaluation of the haematocrit number, parameters of CVP, ABC, electrocardiogram. The duration of infusive therapy should be individual.

If there are doubts in determining the degree of hemorrhagic shock, the following ratio of components of infusive means are recommended: 1 (erythrocytes): 0.2 (albumen): 1 (dextran): 1 (crystalloid).

With the stabilization of the patient's condition, which is expressed by the restoration of the level of systolic ABP no lower than 90 mmHg, satisfactory filling of the pulse, disappearance of shortness of breath, hourly diuresis no less than 30–50 ml and an increase in the haematocrit numbers to 0.3, it is possible to transfer to drop introduction of blood and liquid at a ratio of 2 : 1, 3 : 1 till complete stabilization of the parameters of hemodynamics. Metabolic acidosis is corrected by drop intravenous introduction of 150–200 ml of a 4% solution of sodium bicarbonate. In order to improve the oxidation-reduction processes, 200–300 ml of a 10% solution of glucose with adequate amount of insulin, cocarboxylase, B group vitamins and ascorbic acid are recommended.

After the liquidation of oligemia against a background of improvement of the rheological properties of blood, an important component for the normalization of microcirculation is the use of preparations eliminating the spasm of the peripheral vessels — spasmolytics (papaverin, nospan, aminophylline) or ganglionic blockers (0.5–1 ml of a 0.5 % solution of pentamin by drops with an isotonic solution of sodium chloride), benzohexamethonium (1 ml of a 2.5% solution by drops). The introduction of glucosenovocainic mixes (150–200 ml of a 0.5% solution of novocain with a 20% solution of glucose, or in the ratio of 1 : 1 or 2 : 1) is effective. In order to improve renal blood circulations 150–200 ml of a 10% solution of the osmодиuretic preparation mannite is recommended. If necessary, in addition, saluretics (lasix) are prescribed.

The introduction of antihistamines (dimedrol, diprazin, suprastin) promotes the normalization of microcirculation, metabolism disorders. In order to improve the function of the myocardium, cardiac glycosides, corticosteroids (single dose hydrocortisone — 125–250 mg, daily — 1–1.5 g) are entered.

Disorder of the blood coagulation system, because of their significant variety should be corrected in correspondence with the coagulogramm. So, for I and II stage of hemorrhagic shock, an increase in the coagulant properties

of the blood is found. For III stage coagulopathy can develop, caused by sharp decrease in the contents of procoagulants and expressed activation of fibrinolysis. Inadequate use of infusive solutions results in the increasing loss of coagulation factors, the level of which is reduced due to bleeding. The restoration of coagulation properties of the blood should be conducted by introducing procoagulants absent in the blood (fresh citrate blood, frozen plasma, antihaemophilic plasma, preparations of fibrinogen or cryoprecipitate). In order to neutralize thrombin some authors recommend the use of anticoagulants of direct action — heparin, to reduce fibrinolysis — inhibitors of proteolytic enzymes (contrical, gordox).

When treating patients with hemorrhagic shock the time factor frequently is decisive. The earlier treatment begins the less effort and means necessary to bring the patient out of shock the better the nearest and remote prognosis. So, for patients with compensated shock it is enough to restore the volume of blood, prevent acute renal insufficiency, in some cases — normalize ABC. For treatment of patients with decompensated reversible shock it is necessary to use the whole arsenal of medical measures. If the patient is at the III stage shock, frequently all the doctor's efforts are unsuccessful.

Bringing the patient out of critical condition connected with hemorrhagic shock is the first stage of treatment. For the next few days therapy directed on the liquidation of the consequences of massive bleeding and prevention of new complications is conducted. The doctor's actions should be directed on supporting the functions of kidneys, liver and heart, on normalizing the hydroelectrolyte and albuminous exchange, prevention of anaemia and development of infections.

In order to decrease maternal death from obstetrical bleedings the organizational provision of all stages of emergency aid in the hospital has great value. Qualified medical aid will be effective under the conditions of performance of main principles of the organization of work: 1) constant readiness for rendering assistance to a patient with massive bleeding (blood bank, blood substitutes, systems for blood transfusion, vascular catheters); 2) the presence of action algorithm for the medical personnel in case of massive bleeding, constant readiness of the operational room; 3) round-the-clock possibility of carrying out laboratory express-diagnosis of the conditions of the basic vital functions of the organism.

#### RECOMMENDED READING

3; 5; 14; 21; 39; 46; 56.

## SYNDROME OF DISSEMINATED INTRAVASCULAR BLOOD COAGULATION IN OBSTETRICS

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The DIC-syndrome in obstetrical practice can develop as a result of severe forms of early and late gestosis, premature separation of the placenta in its normal presentation, embolism of the amniotic fluid, hemorrhagic shock, sepsis, severe extragenital pathology (diseases of the cardiovascular system, kidneys and liver), as well as as a result of Rh-factor — isoimmunization, transfusion of incompatible blood.

The starting mechanism for the development of the DIC-syndrome is the activation of blood or tissue thromboplastin due to hypoxia and metabolic acidosis, toxemia of any origin, trauma, toxins in the blood circulation and so forth. The formation of active thromboplastin is the long I phase of hemostasis in which many factors of blood coagulation take part; at the II phase the formation of thrombin occurs; at the III phase — fibrin.

Besides of the changes in the procoagulant part of hemostasis, there is the activation of the thrombocytic link, resulting in adhesion and aggregation of thrombocytes with the excretion of biologically active substances: kinin, prostaglandin, histamine, catecholamine, etc. These substances influence vascular permeability, cause angiospasm, result in the opening of the arteriovenous shunts, slow down blood circulation in the microcirculation system, become the reason for stasis, for the development of sludge-syndrome, deposition and redistribution of blood, formation of thrombi. As a result of these processes disorder of the blood supply to tissue and organs, including vital organs — the liver, kidneys, lungs, brain, develops.

As a response to the activation of the coagulation system the protective mechanisms, directed on the restoration of broken regional tissue perfusion (fibrinolytic system and system of mononuclear phagocytes) are turned on. Thus, against a background of disseminated intravascular coagulation of the blood due to the greater consumption of procoagulants and

an increase in fibrinolysis, increased bleeding develops (obstetrical thrombohaemorrhagic syndrome).

*Classification.* Four stages are distinguished by the course of obstetrical thrombohaemorrhagic syndrome (M. S. Matchabeli, 1982):

*I* — hypercoagulation connected with the appearance of a significant amount of active thromboplastin (time of blood coagulation according to Li—White less than 4 min);

*II* — consumption coagulopathy connected with a decrease in the amount of procoagulants and the activation of fibrinolysis (general bleeding is observed, time of blood coagulation — more than 10–12 min, the retraction of blood clot is absent);

*III* — decompensation phase of hemostasis and blood circulation, or pathological fibrinolysis (sharp decrease in the amount of all procoagulants in the blood, the development of afibrinogenemia against a background of expressed fibrinolysis; it is characterized by especially severe bleeding; if the patient does not die, the DIC-syndrome passes into the IV stage);

*IV* — regenerative, at which a gradual normalization of the conditions of the blood coagulation system occurs, however, during this period acute renal insufficiency, acute respiratory insufficiency and (or) disorders of blood circulation of the brain can also develop.

Classical forms of the DIC-syndrome are rarely observed in clinical practice. Depending on the factor causing its development, as well as on the duration of pathogenic influence, the woman's health condition, one of the stages can be longer and not pass into another one. In some cases mainly hypercoagulation against a background of not sharply expressed fibrinolysis is observed, in others — fibrinolysis is the basic part of the pathological process.

In clinical practice the staging of the DIC-syndrome offered by S. D. Fedorova (1985) is more often used:

*I* — hypercoagulation;

*II* — hypocoagulation without generalized activation of fibrinolysis;

*III* — hypocoagulation with generalized activation of fibrinolysis;

*IV* — complete loss of the ability of blood coagulation.

*First stage* — hypercoagulation is characterized by a decrease in the time for the blood coagulation, decrease in fibrinolytic and anticoagulating activity.

At the *II stage* the amount of thrombocytes decreases; the prothrombin index activity of the V, VII, VIII factors of blood coagulation are reduced. An increase in the contents of free heparin and the occurrence of products of fibrin degradation (PFD) testify to local activation of fibrinolysis. *The III stage* is characterized by a decrease in the amount of thrombocytes, decrease in the concentration of fibrinogen and an increase in the level of free heparin. *IV stage* — complete absence of blood coagulation — too high degree of hypocoagulation with excessively high fibrinolytic and anticoagulating activity.

*Clinical picture and diagnosis.* Clinical picture of **acute DIC-syndrome** is connected with such thrombotic and hemorrhagic disorders as:

1) hemorrhages in the skin, mucous membranes from the sites of injections, traumas, operation wounds, injured uterus;

2) local necrosis of the skin and mucous membranes;

3) changes in the functions of the CNS such as euphoria, disorientation, mental confusion;

4) acute insufficiency of the kidneys, liver, heart and respiratory insufficiency.

The degree of clinical displays depends on the stage of DIC-syndrome. Thus it is necessary to take into account, that the factors causing the development of DIC-syndrome significantly determine the character of disorders of the coagulation system. In case of premature separation of the placenta, the activation of fibrinolysis is insignificant, and sometimes is completely absent. Due to hypo- and atonic bleedings, the amount of thrombocytes sharply decreases the levels of fibrinogen, and other procoagulants are reduced; fibrinolytic activity considerably increases; the plasma tolerance to heparin is kept. With the placenta previa thrombocytopenia, hypofibrinogenemia against a background of increased fibrinolytic activity are observed. In case of uterine rupture the DIC-syndrome develops suddenly, characterized by an insignificant decrease in the contents of procoagulants and high fibrinolytic activity.

Clinical diagnosis of acute DIC-syndrome is difficult due to both nonspecificity and variety

of symptoms of basic diseases and conditions which can be the background for the development of obstetrical thrombohaemorrhagic syndrome. The leading method of diagnosis is laboratory tests of the hemostasis system.

The acute DIC-syndrome is accompanied by the following changes: increase in the time for blood coagulation (more than 10 min), decrease in the amount of thrombocytes and the level of fibrinogen, an increase in the time for recalcification of plasma, prothrombin and thrombin time, an increase in the concentration of products of fibrin degeneration and soluble complexes of fibrin/fibrinogen monomer.

Such tests are used for express-diagnosis of the phases of the DIC-syndrome course:

— time of blood coagulation;

— rate of spontaneous lysis of blood clots;

— determining the level of fibrinogen, the presence of products of fibrinogen degradation (PFD);

— determining the amount of thrombocytes;

— thrombin time;

— the erythrocytes fragmentation test;

— the ethanol test.

A decrease in the time of blood coagulation and thrombin time, positive ethanol test are typical for the I stage of the DIC-syndrome.

At the II stage of the DIC-syndrome there is a moderate decrease in the amount of thrombocytes ( $120 \cdot 10^9$  in 1 l), thrombin time increases to 60 s and more, PFD and damaged erythrocytes are found.

At the III stage of DIC-syndrome an increase in the time of blood coagulation, thrombin time, a decrease in the amount of thrombocytes to  $100 \cdot 10^9$  in 1 l, fast lysis of formed blood clots are observed.

The IV stage is characterized by the following parameters: blood clots are not formed, thrombin time — more than 60 s, the amount of thrombocytes — less than  $60 \cdot 10^9$  in 1 l.

*Treatment.* Diagnosis of patients with the DIC-syndrome and necessary treatment should be performed by an obstetrician together with an anaesthesiologist, the expert in resuscitation and, whenever possible, haematologist. Treatment for DIC-syndrome should be individual, directed on the elimination of its principal cause, normalization of hemodynamics and hemocoagulation.

The methods used for eliminating the reasons for DIC-syndrome come from the character of obstetrical pathology. The reason for the development of the acute DIC-syndrome in obstetrics practically is always connected to pathology of the uterus. The first stage of treatment is the elimination of the source of tissue thromboplastin — *extirpation of the uterus*.

The acute DIC-syndrome, as a rule, is combined with hemorrhagic shock, therefore in such cases fresh citrate blood and plasma are preferred for infusive-transfusive therapy. The regime controlled by hydremia (haemodilution) is carried out within the limits which do not exceed 15–25% BV, because of gelatinol, albumin, rephortan, Ringer's solution, lactasole.

With massive blood loss restoration of the hemodynamic system is recommended to begin with the introduction of solutions with high molecular mass — *hydroxyethyl starch* (6 and 10% HAES—Steril) in a dose of 10–20 mg/kg of body weight in 1 h, *volecam* (500–1000 ml), *dextran* solutions (no more than 400 ml). The mentioned above preparations have similarity with human glycogen. Its hemodynamic effect 2–3 times exceeds the effect of albumin solutions with duration of action of 4–6 h.

With the introduction of *synthetic colloid solutions* (polyglucin, etc.) quite often there is a complex interaction between the hemostasis system and molecules of the infused solutions. On one hand, there is a decrease in the intensity of intravascular blood coagulation and the consumption rate of procoagulants and thrombocytes, on the other hand — significant decrease in the activity of blood coagulation factors in the plasma and general hemostatic potential on the account of hydremia and inhibiting influences of molecules of dextran on the components of the hemostasis system (thrombocytes, the Willebrand factor, fibrinogen). In connection with this during infusive therapy for the restoration of procoagulant activity it is necessary to enter small doses of diuretics (10–20 mg).

A very big challenge during treatment of patients with the acute form of the DIC-syndrome is restoration of normal coagulating properties of the blood for which it is necessary to stop the process of its intravascular coagulation, decrease the fibrinolytic activity and restore the coagulation potential of the blood according to the coagulogramma.

To inhibit the utilization of fibrinogen as the initial part of development of the thrombohaemorrhagic syndrome, heparin is used, although the question about its use still remains debatable. Heparin is dosed depending on the stage of the DIC-syndrome: at the I stage it is allowable to enter up to 500 U (70 U/kg), at the II and III stages — 2,500–3,000 U (30–50 U/kg), at the IV stage — heparin is contraindicated. Heparin is not recommended in case of large wound surfaces.

V. I. Grishchenko, I. I. Gudivok (1996) believe that the heparin introduction is possible to recommend only at the I stage of the DIC-syn-

drome (hypercoagulation) at a dose of 2,500–5,000 U, under the control of the coagulogramma; at the II stages heparin should not be entered. V. M. Serov, A. M. Abubakirova (1997) suggested flatly refusing the use of heparin for interrupting intravascular blood coagulation even at the I stage of the DIC-syndrome in connection with the absence of its precise diagnosis and transition at the II stage of thrombohaemorrhagic syndrome.

With overdose of heparin *protamin sulfate* is applied: 100 U of heparin are neutralized by 0.1 ml of a 1 % solution of protamin sulfate.

Inhibiting fibrinolytic activity is carried out with the help of proteolysis inhibitors: *contrical*, *trasyol*, *gordox* — at a dose of no less than 10 mg/kg of the body weight in 1 h. Prescribing aminocaproic acid is inexpedient, because its influence results in the fixating of fibrin in the microcirculation, which threatens cortex necrosis of the kidneys, disorder of microcirculation in the liver, brain. It is necessary to take into account that a sharp decrease in fibrinolytic activity can cause an intensified intravascular deposition of fibrin in connection with this these preparations are recommended at the III and IV stage of the DIC-syndrome. Prescribing inhibitors of fibrinolysis for premature separation of the placenta in its normal presentation should be done with extra care.

The substitution therapy with infringements of hemocoagulation in the acute form of DIC-syndrome is following: *fresh donor erythrocytic mass* (no more than 3 days of storage), *native, fresh frozen and antihaemophilic plasma, cryoprecipitate and standard solutions of starch*. First 500 ml of blood are infused; after evaluation of the effect hemotransfusion is repeated.

Native, fresh frozen and (or) antihaemophilic plasma are used in amount of 250–500 ml. Early and fast introduction of fresh frozen donor plasma are applied against a background of injection of rheopolyglucin (no less than 15 ml/kg) as disaggregants, in case of the use of the large doses of plasma (more than 1.5–2 l). The basic purpose for the introduction of plasma is not to increase BV but to restore the hemostatic potential of the blood by normalizing the activity of protease and their inhibitors, factors of blood coagulation and anticoagulants, components of calicrein-kinin and fibrinolytic systems with their inhibitors. It is necessary to take into account that with the first stages of development of the DIC-syndrome in the beginning, activation of proteolytic systems of plasma occur, then — their depletion and secondary oppression by products of proteolysis (consumption coagulopathy). Significant changes resulting in the depletion of proteolytic systems of plas-



ma undergo physiological anticoagulants: inhibitors of the tissue factor and VIIa factor, anti-thrombin III, proteins C and S, tissue (endothelial) activator of fibrinolysis (TAF) — against a background of a significant increase in plasmin inhibitors ( $\alpha_2$ -antiplasmin) and TAF inhibitors. All these changes in the hemostasis system confirm the necessity of early use of fresh frozen plasma, which contains the majority of components of fermental systems of the plasma required for normalizing the hemostasis system during bleeding.

For the stimulation of the vascular-thrombocytic part of hemostasis, *dicynon*, *etamsylat* are recommended intravenously.

The use of *tranexamic acid* an antiplasmin preparation which is entered at a dose of 500–750 mg in an isotonic solution of sodium chloride, is the innovation in the treatment of patients with DIC-syndrome. Tranexamic suppresses the activity of plasmin, stabilizes factors of coagulation and fibrin, reduces vascular permeability and has an expressed hemostatic action, prevents the degeneration of fibrinogen.

At the same time due to the activation of fibrinolysis, the above-mentioned therapy is not always effective; in connection with this it is necessary to use additional methods to correct the disorders in the hemostasis system, especially if coagulopathy bleeding develops, connected with embolism of the amniotic fluid, premature separation of the placenta in its normal presentation. Thus, as a rule, excessive activation of the fibrinolytic part of the hemostasis system appears, consequently lysis not only of intravascular clots of fibrin, but also of circulating factors of blood coagulation, connected to an intensified generation of plasmin, occurs.

The introduction of fresh frozen plasma with inhibitors of fibrinolysis gives a temporary effect and promotes further activation of fibrinolysis in connection with this in such cases it is necessary to use preparations of tranexamic acid.

Restoration of the volume of erythrocytes by transfusion of erythrocytic mass stored no longer than 3 days, is recommended only when the levels of hemoglobin is below 80 g/l., and the hematocrit number less than 0.25. Such cautious use of blood is explained as in our country it is not identified by the HLA system, which is responsible for the development of nonhaemolytic reactions with the introduction of leukocytes and thrombocytes which are in conserved allogenic blood.

With the development of hypoglycaemia in connection with massive blood loss it is recommended to enter a 10–20% solution of concentrated carbohydrates which promote the restor-

ing of energy resources and exponentiate the hemodynamic effect.

With the presence of instable hemodynamics and continuing bleeding infusive-transfusive therapy is conducted against a background of glucocorticoids (prednisolone at a dose of no less than 10 mg/kg of the body weight in 1 h or hydrocortisone — no less than 100 mg/kg of the body weight in 1 day).

If the above-mentioned therapy appears to be inefficient, additional measures are taken: plasmapheresis, hemofiltration. There is an opinion (V. M. Serov, A. M. Abubakirova, 1997; I. I. Baranov, 1998) that with all forms of the DIC-syndrome the use of fibrinogen and dry plasma is absolutely contraindicated.

After eliminating the acute displays of the DIC-syndrome rehabilitation actions are conducted in order to prevent renal and liver insufficiency, infectious complications, correction of respiratory disorders, restoration of the albuminous and electrolytic homeostasis; the parameters of hemocoagulation and fibrinolysis are controlled.

**Chronic DIC-syndrome.** Even with the physiological course of pregnancy, conditions for the development of the chronic DIC-syndrome (increase in the concentration of fibrinogen and other factors of blood coagulation, decrease in fibrinolytic activity, increase in the aggregation and adhesive properties of thrombocytes) are created. The chronic DIC-syndrome is the basis for the pathogenetic mechanisms of development of the most severe complications of pregnancy (pre-eclampsia, placental insufficiency, antiphospholipid syndrome, diseases of the cardiovascular system, liver, kidneys, Rh-conflict, intrauterine death of the fetus). The transition of the chronic form of DIC-syndrome into the acute one occurs due to premature separation of the placenta in its normal presentation in pregnant women with hypertension disorders.

*Clinical picture and diagnosis.* Bleedings from the nose, gums, intradermal and hypodermic hemorrhages are possible. The diagnosis is based on the results from the exam of the hemostasis system (normal or decreased amount of thrombocytes; normal or increased amount of fibrinogen; normal or a little decreased parameter of the prothrombin time; decreased time for blood coagulation; increased amount of reticulocytes). The presence of products of fibrin degeneration and soluble complexes of fibrin / fibrinogen monomer represent special value in diagnosis of DIC-syndrome.

*Treatment.* With the chronic form of DIC-syndrome in pregnant women with late gestosis, the complex of medical actions includes the introduction of low- and medium-molecular blood

substitutes (rheopolyglucin, rephortan, polydes, gelatinol) in combination with spasmolytics and rheological active preparations (pentoxifyllin, persantin). Their application causes improvement in the rheological properties of the blood, prevents microthrombosis and promotes the optimization of tissue perfusion. For treatment of patients with the chronic DIC-syndrome heparin is used (anticoagulant of direct action), which reduces the adhesiveness of thrombocytes, possesses antithromboplastin and antithrombin activity, normalizes blood circulation in parenchymatous organs and uterine-placental complex. Heparin is entered hypodermically by 5,000–10,000 U every 12 h till the normalization of the amount of thrombocytes and level of fibrinogen. In case of progressing chronic DIC-syndrome in pregnant women with obstetrical pathologies (arterial hypertension, Rh-isoimmunization, intrauterine death of the fetus) the most important stage of treatment is delivery.

Prevention of DIC-syndrome consists in the following: 1) revealing the group of pregnant women with a high risk of disorders of the hemostasis system (patients with late gestosis, congenital defects of hemostasis, multiple myomatous nodes in the uterus, with antenatal fetal death, antiphospholipid syndrome, those who used antiaggregate and anticoagulant therapy for a long time); 2) duly diagnosis of extragenital and obstetrical pathologies; 3) correct conduction of infusive-transfusive therapy with the development of bleeding; 4) the use of autohaemodonor (preoperative preparation of blood and its components); 5) controlled hydremia (haemodilution); 6) application of repeated blood transfusion during an operation.

#### RECOMMENDED READING

3; 4; 5; 12; 14; 21; 23; 29; 39; 46; 56.

Postnatal infection is one of principal causes of mortality and death rate in obstetrical practice. An increase in the frequency of performing caesarean sections in modern obstetrics has led to an increase in the frequency of infectious complications. Thus, the incidence of postnatal infections can change within the limits of 2 to 10% of all births, and can reach 50% in groups of increased risk.

**The postnatal infection** is considered any rise in the puerpera's body temperature of more than 38°C occurring within any 2 days during the first 10 days after labour, excluding the first 24 hours.

*Etiology and pathogenesis.* Risk factors for postnatal infectious complications for puerpera can be: obesity, anaemia, pyelonephritis, low social and economic status of the woman; long period between the rupture of the fetal sac and delivery, lengthy labour; numerous vaginal examination and intrauterine manipulations; chorioamnionitis in labour; amount and size of traumas and damages during delivery; an increase in the time of performing caesarean sections; preventive use of antibiotics. Endogenous foci of infections in the nasal part of the pharynx, oral cavities, and appendages of the uterus also can be a source of inflammatory processes during the postnatal period.

The microorganisms occupying the area of the placental areola, places of ruptures and damages, usually belong to the microflora of the cervix uteri, vagina and perineum under their normal condition. The activators of postnatal pyo-septic diseases can be *aerobic microorganisms* (streptococci of groups A, B, D, enterococci, colon bacilli, klebsiella, proteus, golden staphylococci), *anaerobic* (peptococci, peptostreptococci, bacterioids, clostridium, fusobacteria) and their associations, as well as *chlamidia, mycoplasmas, bacterial vaginosis*, etc. The clinical course of the disease depends on the character of the infection. So, anaerobic gram-negative bacilli are to the greater extent

virulent than anaerobic gram-positive cocci. The most widespread activator of obstetrical hematosepsis is aerobic gram-negative colon bacilli (*E.coli*). Golden staphylococcus infects a wound more often and causes postnatal mastitis.

During the postnatal period the internal wall of the uterus represents a wound surface easily infected in the ascending way by pathogenic and conditionally pathogenic flora of the vagina. An important role is played thus by the puffiness of the tissue causing disorders in microcirculation, necrosis of the tissue, trauma to the labour canal. While performing operative interventions during delivery and caesarean section damage to tissue, disorder of local blood circulation as a result of trauma to the vascular system, formation of defective tissue occurs. This negatively influences the process of further healing and results in a deceleration in the rate of involution of the uterus after delivery. The majority of bacteria which are found during postnatal pyo-septic complications have low virulence and seldom are the reason for the occurrence of infection in healthy tissue. The occurrence of postnatal infection is connected also to the change of vaginal biocenosis and the development of transitional immunodeficiency during pregnancy.

*Classification.* Postnatal pyo-septic infectious diseases are classified by their *prevalence* (local, generalized forms); *locations of the infectious foci* (vagina, uterus, appendages, perimetrium, pelvic veins, breasts); *character of the infection* (aerobic, anaerobic, gram-positive, gram-negative, mycoplasmic, chlamidial, etc.).

According to the classification of postnatal pyo-septic diseases (PPSD) accepted in Ukraine C. V. Sazonov and A. V. Bartels the postnatal infectious disease is a uniform dynamical process consisting of several stages.

**First stage** — infection is limited to the area of the labour wound (postnatal ulcer on the perineum, vaginal wall, cervix uteri; infection in the

wound on the anterior abdominal wall, peritoneum after episiotomy; endomyometritis).

**Second stage** —infection is distributed beyond the limits of the labour wound, however, still is located (metritis, parametritis, thrombophlebitis of the uterine or pelvic veins, extremities; adnexitis, pelvioperitonitis).

**Third stage** — infection which is close to generalized (peritonitis, septic shock, anaerobic gas infection, progressing thrombophlebitis).

**Fourth stage** — generalized infection (sepsis without metastases — hematosepsis; sepsis with metastases — septicopyemia).

In modern obstetrical practice the most often infectious complications after labor and caesarean section are wound infections and endomyometritis.

The development of postnatal infections has a certain sequence. So, on the 1st day after performing a caesarean section the most often reason of fever is endomyometritis or complications on the part of the lungs; on the 2nd day — endomyometritis or infections of the urinary organs, on the 3rd day — wound infection, on the 4th day — affection of the veins of the extremities. The occurrence or relapse of thrombophlebitis of superficial veins of the leg, hip, forearm is connected with adynamia, compelled lying position of the puerpera, multiple puncture of the peripheral veins, injections and blood loss.

The terms of display and extent of severity of postnatal pyo-septic diseases substantially depend on the condition of the protective-compensatory mechanisms of the puerpera, interactions of micro- and macroorganism. Early forms of postnatal pyo-septic diseases as separate stages of a uniform dynamic septic process result in generalized affection of the basic parts of homeostasis and functional disorder of the organs and systems which provide desintoxication. This represents the principal cause of accumulation of secondary endotoxins in an organism and the formation of the *endogenous intoxication syndrome*, determining the course and outcome of the disease.

*The spread of postnatal infection* most frequently occurs by the ascending way, however, haematogenous, lymphogenous, perineural, and combined lymphohaematogenous spread are possible.

Duly diagnosis and effective treatment of a puerpera with local forms of PPSD, firstly, with endomyometritis, allow reducing the frequency of generalized forms of the disease.

*Treatment* of patients with PPSD should be early, etiotropic, complex, systematic, active; with the presence of the purulent foci its radical removal is conducted. The antimicrobial treat-

ment directed on the *microbic associations* (mixed flora), as a rule, is effective. If it is not possible to receive a culture of microorganisms, empirical antimicrobial treatment is applied.

The basic forms of postnatal pyo-septic diseases are examined below.

**The postnatal ulcer** occurs due to the infection of cracks and ruptures of the mucous membrane of the vagina, vulva, perineum, and cervix. The condition of the puerpera thus can remain satisfactory or be affected to some extent.

*Diagnosis* of the disease is not difficult. For a postnatal ulcer the following attributes are characteristic: pain in the area of the wound, hyperemia, hypostasis, necrotic or purulent cover, hardly separated from the adjoining tissue and easily bleeding. Local treatment is usually enough. With the presence of symptoms of intoxication (fever, tachycardia, leukocytosis, increase in ESR) general treatment is applied Hydrogen peroxide, hypertonic solution of sodium chloride, dimexid, dioxydin are locally used. After the normalization of the body temperature and wound's edges cleansing, the general treatment is stopped, and fatty tampons are used locally (Vishnevsky ointment), physical factors (ultrasound, helium-neon and infrared laser, magnetic-laser therapy).

**Infection of the wound.** Infection of the wounds of the perineum (including wounds due to perineo- and episiotomy), ruptures of the perineum occurs because of significant bacterial contamination during delivery. In case the infection is located in the areas of the wound of the perineum after episiotomy the sutures are removed; surgical processing of the wound is performed according to the principles of purulent surgery: washing, drainage. After cleansing the wound secondary sutures are imposed.

The risk of *infection of the wound occurring on the abdominal wall* after caesarean section (3–16% of cases) depends on many factors: duration of the operation; preventive application of antibiotics; quality of the suture material; technique of suturing; iatrogenic factor. Maternal factors causing the development of wound infection can be diabetes, asthma, anaemia, complications of the respiratory system, vomiting, extended treatment with corticosteroids, the presence of extragenital foci of infection.

The edges of the wound become red, swollen and painful. The sutures frequently separate, become covered with necrotic mass; the edges of the wound are opened, serous-bloody and serous-purulent discharge appear. Complete separation of the sutures can take place. For treatment the wound is drained; the sutures, purulent masses and necrotic tissue are removed, applying proteolytic enzymes, adsorbents. Meas-



ures for receiving a culture of the microorganisms from the wound are taken; adequate antimicrobial preparations are prescribed. After cleansing the wound secondary sutures are applied.

To reduce the risk of a wound infection the following actions are carried out: 1) cut (not shave) the hair in the area of the operational area before the operation; 2) careful disinfection of the operational area, especially in the naval and pubic area; 3) sterile instruments and technique are used; 4) scrupulous hemostasis in the wound; 5) selective use of preventive antibiotics; 6) minimal use of suture material in the wound; 7) for obese patients drainage of the wounds is necessary.

**Necrotic fasciitis** is a rare infection which can develop in the area of the wound of the perineum or anterior abdominal wall. This extremely virulent and frequently fatal infectious process involves the fascia, muscles and hypodermic tissue. It can be spread downwards — to the hips and upwards — to the stomach and thorax. The necrotic tissue is removed till the border of the healthy tissue. Antibacterial therapy is conducted; the activity of the cardiovascular system is supported. Further skin transplantation is performed. Under the condition of duly treatment about half of the patients with necrotic fasciitis survive.

**Metritis.** Postnatal infection of the uterus includes *endometritis*, *endomyometritis* and *endoparametritis (parametritis)*, *phlegmon of the broad uterine ligament*. If the infection is spread to the deciduous tissue, myometrium, parametrial tissue, the given condition is also called *metritis with pelvic cellulitis*. Bacteria will penetrate into the parametrial tissue between the leaves of the broad uterine ligament by ascending or lymphatic spread from the sites of traumas and damages of the uterus and cervix, including the area of the placenta, or cut after caesarean sections.

**Endomyometritis** is inflammation of the mucous membrane of the uterus and adjoining layers of the myometrium. It is the most common complication after caesarean operation. *The following kinds of endomyometritis* are distinguished: 1) *with necrosis of the decidual tissue*; 2) *against a background of remains of the placenta and membranes*. Without preventive application of antibiotics the incidence of endomyometritis after caesarean sections ranges from 5–10 to 70–85% and on average is 35–40%. More often the infection is observed in young women having a low social and economic standard of living which had a caesarean operation in connection with prolonged labour and early rupture of the fetal sac.

As a result of using modern broad-spectrum antibacterial means of action against aerobic and anaerobic microorganisms during the operation, the incidence of endomyometritis decreases to 4–5%. Such life-threatening complications as *pelvic abscess*, *septic shock* and *septic pelvic thrombophlebitis* thanks to the use of modern antibiotics occur only in 2% of cases.

Endomyometritis causes *polymicrobial associations* containing bacteria which in most cases are typical for the lower segments of the sexual tract.

*Clinical picture and diagnosis.* The acute form of endomyometritis develops on the 2nd–5th day of the postnatal period and is characterized by an increase in the body temperature, pain in the lower abdomen, fever. The discharge (lochia) becomes cloudy, with pus. The patient's general condition can be both satisfactory and severe and depend on the extent of intoxication of the organism. The advanced intoxication can stimulate postnatal psychosis.

*Clinical examination* of patients includes: vaginal examination; determining the parameters of hemoglobin, haematocrit number, amount of leukocytes; urine test; obtaining bacterial culture from the contents of the uterus, wound; examination of breast milk. The results from the blood test of such patients testify to anaemia, leukocytosis, left shift neutrocytosis, lymphocytopenia, aneosinophilia, increase in ESR and hypercoagulation shift in the hemostatic potential of the blood. Subinvolution of the uterus takes place. Involution of the uterus is supervised with the help of ultrasound. The length of the uterus with its physiological involution is 15 cm during the 1st day; 13.5 cm — at the 2nd day; 11 cm — at the 3rd day, and 10.5 cm at the 7th day. Echographic attributes of endomyometritis are the following: 1) decrease in the tone of the uterus; 2) expansion of its cavity and the presence of gas in it; 3) infiltration of the myometrium; 4) deposit of fibrin; 5) the presence of placental and decidual tissue.

The course of endomyometritis after a caesarean section is characterized by fever (the body temperature is more than 38°C), frequently — tachycardia, pain in the lower abdomen, tenderness of the uterus during palpation and (sometimes) symptoms of irritation of the peritoneum in the lower segments of the abdominal cavity. These symptoms, as a rule, can appear in 24 or 48 h after the caesarean operation, as well as at earlier terms if the group B streptococcus infection has taken place. The discharge (lochia) thus become cloudy, bloody-purulent, sometimes with an odour. Frequently the course of the disease is little symptomatic, and the diagnosis is established by the process of elimination after the dif-

ferentiation of endomyometritis with hypostasis of the mammary glands, mastitis, infectious diseases of the urinary organs and pulmonary atelectasis due to general anaesthesia.

*The obliterate form of endomyometritis* has no expressed clinical semiology and is quite often caused by mycoplasmic or chlamydial infection. The disease begins late: on the 7th–9th day of the postnatal period. Its basic attribute is subinvolution of the uterus.

*Treatment.* It is necessary to begin treatment as soon as possible and conduct it in complete volume. The patient is recommended to observe bed confinement and put ice on the lower abdomen. Further, correction of treatment methods is conducted on the basis of the results from bacteriological exam.

So, with the presence of remains of the fetal egg an obligatory component of treatment is their removal with the help of vacuum — aspiration, fenestrated forceps or a large curette.

With the establishment of endomyometritis it is necessary to begin the parenteral antibacterial therapy with the use of *semisynthetic penicillins, macrolids or cephalosporins and metronidazole*, taking into account thus the polyetiology of the diseases (clindamycin + aminoglycoside; broad spectrum cephalosporins; penicillin of broad spectrum of action; penicillin + aminoglycoside + metronidazole). In case of a severe form of the disease a combination of **clindamycin + gentamycin** (“gold” standard) is applied. If the puerpera had prevention treatment with cephalosporins, the method of choice should be treatment with penicillin, because enterococcus can be one of the predominant microorganisms in this case. Parenteral antibiotic therapy is carried out for no less than 24 h after the normalization of the patient’s body temperature and inverse development of the symptoms of the disease. Oral application of antibiotics is ineffective in this case.

The majority of puerperal women react to antibiotic therapy within 72 h. In case of inefficiency of such treatment, additional examination is conducted and the disease is differentiated with mastitis, remains of parts of the after-birth (placenta, sac), wound infection, pelvic abscess, septic pelvic thrombophlebitis, parametritis, appendicitis and peritonitis. However, after revealing a wound infection, antibiotic therapy is continued. With the resistance of microorganisms to antibiotics (aerobic gram-negative microbes, enterococci, bacteroids) a combination of clindamycin + penicillin + aminoglycoside is used. With the presence of anaerobic flora metronidazole is added. Infusive desintoxication, desensitized and supporting therapy is simultaneously carried out; stimulation of the

contractile activity of the uterus, heparin therapy to prevent the development of consumption coagulopathy and thrombophlebitis are conducted.

In Ukraine with the complex treatment of patients with PPSD, suction-washing drainage of the uterine cavity — intrauterine dialysis (lavage) with cooled solutions of antimicrobial preparations for 14–48 h are also used (the dosage for the solution of chlorine hexidine — 40–50 drops in 1 min). Ukrainian experts suggest *intrauterine immobilizing antibiotics* as well. In order to prevent the generalization of the septic process nonmedicamentous desintoxication means are used — quantum hemotherapy, hyperbaric oxygenation, hemosorption; immobilizing preparations are used.

With duly and adequate treatment improvement in the puerpera’s condition can come in 1–2 days (an abortive form of endomyometritis). Endomyometritis occurring after caesarean section quite often has a more severe course and a tendency to generalization of the septic process.

**Parametritis.** The process usually develops in connection with the presence of trauma or infection in the cervix. More often the lateral sections of the parametrium are affected, less often — posterior ones. Anterior parametritis (after vaginal delivery) occurs seldom. During vaginal examination parametritis is distinguished by the following attributes: the infiltrate spreads to the pelvic walls; the mucous membrane of the vaginal vault becomes motionless in the damaged area. Treatment is conducted the same as for inflammatory processes with other locations. If infection of the parametrium is marked (**pelvic abscess**), persistent fever arises; a resistance to antibiotic therapy appears; malaise continues to develop; functional disorders of the stomach and intestines occur; pain in the area of the abdominal cavity and tenderness during abdominal palpation takes place. Bimanual examination and ultrasound help establish the diagnosis. Conducting patients with a pelvic abscess includes drainage of the latter through the vaginal vault or transcutaneously — through the anterior abdominal wall. With the rupture of the pelvic abscess an urgent laparotomy with the wound drainage is required.

**Inflammation of the fallopian tubes and ovaries (salpingo-oophoritis)** during the postnatal period seldom occurs and more often is unilateral. The clinical picture is similar to that for endomyometritis, which results in salpingo-oophoritis. The patient’s condition worsens; the pain is located in the ileac areas. Fever appears, which in case of purulent process has a hectic character. There can be symptoms of irritation of the peritone-

um. Treatment consists in intensive antibacterial, detoxication therapy with the use of means stimulating nonspecific protective forces of an organism. If tubal-ovarian abscess develops, operative treatment is recommended.

With **thrombophlebitis of the uterine veins** subinvolution of the uterus, lengthy and abundant bloody discharge are observed. During the vaginal examination, an enlarged, painful, softened uterus is found; dense painful veins are palpated on the pelvic walls, on the surface of the uterus — characteristic twisted bands.

**Septic pelvic thrombophlebitis** is observed in 0.5–2% of patients with endomyometritis or wound infection, which takes place more often during caesarean section than during labour. The disease develops at the end of the 2nd week after delivery. The diagnosis is established mostly by the method of elimination. Pelvic thrombophlebitis more often develops on the right side, which is connected to an increased blood circulation in the right ovarian vein and venous stasis. Products of vital activity of bacteria promote the development of thromboplastin and cause thrombosis. Microembolism of the lungs and other organs in the system of the inferior vena cava may be subsequently observed.

The *clinical picture* of pelvic thrombophlebitis is characterized by fever, tachycardia for several days, despite the antibacterial therapy used for endomyometritis. Tenderness of the uterus and intestinal dysfunction frequently are not observed. Sometimes during vaginal examination it is possible to find an enlarged painful uterus, with thick twisting veins in different sections of the parametrial fat. Treatment includes anticoagulant therapy (heparin). Fast inverse development of the symptoms of the disease thanks to heparin therapy (as a rule, within 24 h) confirms the given diagnosis. The duration of anticoagulant therapy can be 7–30 days.

**Thrombophlebitis of the superficial veins of the crus.** Thrombophlebitis of the superficial veins of the lower extremities during the postnatal period is observed seldom; its development is connected with varix dilation. In case of thrombophlebitis of the superficial veins of the crus or hips, the general condition of the puerpera, as a rule, does not change. Local symptoms prevail: hyperemia, painful thickening along the dilated veins. The patient is appointed bed rest for a week; antibacterial, anticoagulant and antiagregant therapy (heparin, acetylsalicylic acid, troxevasin) are prescribed. Locally heparin or troxevasin ointment is applied.

**Thrombophlebitis of the profound veins of the lower extremities.** In connection with thrombophlebitis of the profound veins of the lower extremities in the blood against a background

of the general severe condition there is acute pain in the lower extremities. In 1–2 days hypostasis of the extremities appears; local temperature is reduced due to arterial spasm.

The process precedes severely, with a high body temperature, intoxication. If the profound veins of the hip are affected, the legs swell, their surface becomes pale; painfulness is felt in the area of large vessels. This variant of thrombophlebitis is threatened by severe complications — *pulmonary thrombembolism*. The patient should observe bed rest for 3 weeks with the affected extremity in a raised position. The duration of the disease is 4–6 weeks. Treatment includes bed rest; application of infusive therapy (rheopolyglucin, trental), salicylates, spasmolytics, nicotinic acid, antibacterial and anticoagulant means (heparin, then — indirect anticoagulants).

**Obstetrical peritonitis** is the most severe complication of the postnatal period. It can be the result of endomyometritis, perforation of the inflammatory tubal-ovarian mass or pyosalpingx (more often gonorrhoeal etiology), twisting of the ovarian tumour's pedicle, necrosis of the myoma's subserous node. However, most frequently, peritonitis occurs after caesarean section due to infection and separation of the sutures on the uterus (in 0.5–1% of cases).

*Etiology and pathogenesis.* Peritonitis is caused, as a rule, by microbic associations, colon bacilli is the leading one. Recently it has been considered that the basic role in the development of peritonitis is played by anaerobic asporous bacteria, aerobic-anaerobic associations.

Cellulitis in the area of uterine rupture can result in necrosis and separation with subsequent penetration of purulent substance into the abdominal cavity.

Obstetrical peritonitis is an extremely severe pathology which is characterized by the early occurrence of endogenous intoxication. Due to the influence of biologically active substances expressed generalized vascular disorders occur in patients, mainly at the level of microcirculation. Inadequate blood supply to organs and tissue becomes the reason for the development of general tissue hypoxia, disorder of the metabolic processes. Products of the disordered metabolism render pathological influence on the CNS, myocardium and other organs, causing subsequent oppression of the metabolic processes in tissue, functional disorders of vital organs and systems — cardiovascular, respiratory, hemostasis. All this results in the fast occurrence of destructive changes in the kidneys, pancreas, liver, intestines.

A special role in the pathogenesis of peritonitis is played by intestinal paresis. Liquid, pro-



teins and electrolytes accumulate in the openings of the small intestines. Overdistention and ischemia of the intestinal wall cause disorder of their barrier function leading to further intensification of intoxication.

*Clinical picture.* The first symptom of peritonitis is frequently *intestinal paresis*. The clinical picture of peritonitis is characterized by progressing intoxication, abdominal pain, nausea, vomiting, intensifying intestinal paresis, dryness of the tongue, high fever, tachycardia, decrease in ABP, resistance to antibacterial therapy. The abdomen, as a rule, is inflated, painful, weak peristalsis. Strain of the muscles of the anterior abdominal wall and symptoms of irritation of the peritoneum can be vaguely expressed.

Three variants of peritonitis occurring after caesarean section are distinguished: 1) due to chorioamnionitis in labour; 2) as a result of postoperative intestinal paresis; 3) due to separation of the sutures on the uterus.

In case of *the first variant* of peritonitis symptoms of the disease appear early, namely at the end of the first or in the beginning of the second day. High body temperature, tachycardia, swelling of the abdomen, vomiting testify to the severity of the patient's condition. The temporary reactive phase passes quickly into the toxic one. The patient's condition quickly and progressively worsens despite conservative therapy.

If *the second variant* of peritonitis develops, the infection of the peritoneum can be connected to the development of endometritis during the postoperative period (generalization of septic process). For women with the given variant of peritonitis pregnancy and labour quite often are complicated by pyelonephritis, lengthy waterless period. The patient's condition after caesarean section can remain satisfactory. Subfebrile body temperature and moderate tachycardia are observed. The leading clinical symptom is early intestinal paresis. Despite intensive treatment, its effect is unstable and in 3–4 days acute deterioration in the patient's condition occurs: the reactive phase of peritonitis pass into the toxic one.

*The third variant* of peritonitis develops due to the inferiority of the sutures on the uterus. Clinical symptoms, as a rule, appear on the first day: pain in the lower abdomen, tenderness during palpation of the uterus, as well as symptoms of irritation of the peritoneum, a small amount of discharge from the uterus. The specified symptoms are quickly joined by vomiting, frequent and rare stool, swelling of the abdomen, intoxication.

Vaginal examination, during which in the given case a decreased tone of the uterus, the obstetrician's fingers freely pass the cervical ca-

nal, inferiority of the sutures on the uterus are found, helps to specify the diagnosis.

*Diagnosis.* The obstetrical peritonitis differs from the surgical one by the indistinct clinical picture. Only by evaluating all the symptoms together and in dynamics, it is possible to correctly and in due time establish the diagnosis, without waiting for the classical displays of peritonitis (both general and local). As for local displays, pain in the abdomen, stable intestinal paresis, symptoms of irritation of the peritoneum (Shchotkin—Blumberg's) can be leading. From the general symptoms the most often are: severe fever; superficial frequent breath; vomiting; condition of anxiety or euphoria; tachycardia; cold sweat. In the blood expressed leukocytosis with sharp left shift and toxic granularity of neutrophilic granulocytes, increase in the leukocytic index of intoxication (normally — about 1); an increase in the level of alkaline phosphatase; thrombocytopenia; a significant reduction in the amount of thrombocytes.

*Treatment* of patients should be carried out with an obstetrician, surgeon, and experts in resuscitation under the conditions of intensive therapy and should occur in 3 stages: 1) preoperative preparations; 2) operative intervention; 3) intensive therapy during the postoperative period.

*Preoperative preparation* includes obligatory decompression of the stomach with the help of a nasogastric tube, infusive and antibacterial therapy for 2 h before the operation.

Immediate *surgical intervention* includes laparotomy, extirpation of the uterus with tubes, intubation of the intestines, drainage of the abdominal cavity, peritoneal dialysis.

During *the postoperative period* antibacterial, infusive, supporting therapy, stimulation of the intestinal function, and heparin therapy are performed. During this period for a long period of time intensive infusive-transfusive therapy is applied directed on the elimination of oligemia and metabolic acidosis, correction of rheological properties of the blood, hydro-electrolytic and albuminous balance, desintoxication of an organism; cardiac glycosides, diuretic means, antienzymes, anticoagulants, vitamin therapy, oxygenation are used. Broad-spectrum antibiotics are entered intravenously.

One of the primary goals of treatment is restoration of motor function of the stomach and intestines (cerucal, ganglionic blockers with neostigmine methylsulfate). Lengthy peridural anaesthesia is performed. The complex of treatment includes plasmapheresis, quantum hemotherapy, hemosorption, hyperbaric oxygenation, especially with the detection of anaerobic floras.

**Postnatal sepsis.** The generalization of infection, or sepsis, in obstetrical practice in 90% of



cases is connected to the infectious focus in the uterus and develops as a result of exhaustion of the antiinfectious immunity. An adverse background can be infectious and obstetrical complications, malnutrition of pregnant women, iron deficiency anaemia, complicated, long operative delivery, obstetrical bleeding, which reduces adaptable opportunities of an organism and creates conditions for the generalization of infection.

Any infection of the reproductive tract complicating labour can lead to the development of postnatal sepsis. The place for the first location of infection can be cellulitis during damages to the vagina and cervix during birth, as well as endometrium, especially in the area of the placental areola. Postnatal sepsis is one of the principal causes of death for mothers alongside with obstetrical bleeding and severe hypertension complications of pregnant women.

*Clinical picture.* Attributes of sepsis are:

- 1) the presence of the primary purulent focus;
- 2) high fever;
- 3) revealing the causative agent in the blood.

In the beginning of the development of the disease a puerpera may have general malaise, headache, anorexia, and increase in the body temperature and pulse rate, as a rule, on the 3rd–4th day after delivery, nausea, vomiting, and feeling of discomfort in the lower abdomen. Discharge from the uterus (lochia) become cloudy, has an unpleasant odour. Symptoms of intestinal paresis appear. Septic (bacteriemic) shock can develop. In the blood leukocytosis and increased ESR are found, anaemia is possible.

Ultrasonography helps conducting differential diagnosis to eliminate pelvic abscess, the remains of the placenta in the uterus and thrombophlebitis of the pelvic veins.

Sepsis proceeds as two forms: haematosepsis and septicopyemia — which are observed approximately with the same frequency. The discovered culture of microorganisms in the blood testifies to the presence of *septicemia*; the occurrence of purulent foci on internal organs is defined as *septicopyemia*.

*Septisemia* occurs in weakened puerperas 3–4 days after labor and is characterized by a rough course. Its causative agent is gram-negative flora: colon bacilli, proteus, pyocyanic bacilli, frequently in a combination with asporous anaerobic flora.

*Septicopyemia* has a wave-like course: the periods of deterioration of the patient's condition connected with the metastasis of infection and the formation of its new foci are replaced by relative improvement. The development of septicopyemia is caused by the presence of gram-

positive flora, more often — golden staphylococcus.

*Diagnosis.* The presence of the source of infection, severe fever, determining the causative agent in the blood (in 30% of patients) testify to sepsis. If the activator in the blood is not found, the diagnosis of sepsis should not be denied. Shortness of breath, cyanosis, paleness, greyish or yellowish skin, tachycardia, lability of pulse, tendency to arterial hypotension, hepatosplenomegaly, functional disorders of the CNS (euphoria or depression, sleeping disorders) are also characteristic for sepsis. Results from the blood test testify to reduction of the amount of hemoglobin and erythrocytes; leukocytosis or sharp left shift leukopenia appear; significant lymphocytopenia, aneosinophilia, toxic granularity in the neutrophilic granulocytes, hypo- and disproteinemia, hypoglycemia, oligemia, hyponatremia are determined.

*Treatment* includes eliminating the foci of infection and complex intensive therapy (antibacterial, desintoxication, immune correction, desensitization, roborant). Plasmapheresis, hemo- and lymphosorption are applied. Solutions of electrolytes are included in infusive therapy; oxytocin is entered to improve the contractile function of the uterus; sedative preparations are prescribed. Antibiotics are used in large doses: penicillin G — 5 mln U + aminoglycoside, then — penicillin G at a dose of 1.2 mln U + aminoglycoside 4 times a day. For anaerobic infections 600 mg of clindamycin and kanamycin are prescribed. After receiving the culture of microorganisms they continue treatment with the antibiotics of choice. If the course of the disease is severe, the patient is transported to the intensive therapy unit for the monitoring hemodynamics and supporting the activity of the cardiovascular, respiratory and other systems of an organism.

In connection with the development of coagulopathy, fresh erythrocytic mass, fresh frozen plasma, cryoprecipitate, other necessary blood preparations are transfused, taking into consideration the fact that an organism loses 5 g (12%) of protein for every 100 ml of pus. For the treatment of patients with a long fever, corticosteroids are used in short courses to block the intensive sympathomimetic effect of endotoxins, restoration of the vascular tone, assist in redistribution of liquid from the intravascular into the extracellular space. Corticosteroids also have an expressed desensitizing effect. In order to correct the severe arterial hypotension, dopamine is infused.

*Surgical treatment* includes laparotomy, drainage of the pelvic abscesses. Extirpation of the

uterus with the tubes is recommended during severe infection, which is resistant to active antibacterial therapy, conducted for 3 days. Treatment by antibiotics and heparin therapy are also conducted after the operation. Serotherapy (antistaphylococcal gamma-globulin, antistaphylococcal plasma), vaccinothrapy (staphylococcal anatoxin) and immunomodulating treatment are also used.

**Mastitis.** Parenchymatous inflammation of the mammary glands is a rare complication in the antenatal period, more often occur after delivery during lactation. Symptoms of mastitis seldom appear till the end of the 1st week of the postnatal period and after the 3rd–4th week. Inflammation of the breasts, as a rule, is preceded by their swelling (lactostasis).

*Swelling of the breasts* develops 24–48 h after the beginning of lactation. The breasts increase, become firm and nodulous. Their swelling is frequently accompanied by strong pain, transitory fever. This condition is connected to the expansion of the venous and lymphatic vessels in the breasts as a result of lactation, instead of being the result of the expansion of the milk ducts.

*Diagnosis.* It is recommended to take a culture of microorganisms from breast milk.

For treatment the puerperal women are recommended to use supporting bras to raise the breasts, to carry out expression of breast milk, to apply ice; if necessary anesthetics are appointed; temporarily limit the liquid consumption.

The most often causative agent of *mastitis* is golden staphylococcus, the direct source of which is, as a rule, the nasal and oral part of the newborn's pharynx. While breast feeding the microorganisms penetrate through the nipple of the breast into the sites where there are cracks and injures.

The first symptoms of this disease can be fever with further increase in the body temperature and tachycardia. The breast becomes red, swollen, and painful. One breast is more often affected.

Antibacterial treatment should begin no later than 48 h after the disease onset. Penicillinase-resistant antibiotics, for example *dicloxacillin*, are prescribed. The inverse development of the symptoms, as a rule, begins in 24–36 h; however to prevent the relapses of the disease, the patients should go through a complete course of antibiotic therapy.

With the development of *purulent mastitis* surgical treatment (section of the abscess cavity, drainage) in a combination with antibiotic therapy is required.

In order to prevent mastitis it is necessary to strictly observe sanitary-epidemiologic regimen in the hospital, to conduct prevention and treat-

ment of nipple cracks and to undertake measures in order to prevent galactostasia. During pregnancy to develop an active immunity to golden staphylococcus, inoculation with use of adsorbed staphylococcal anatoxin is recommended.

**Bacterial-toxic, or septic, shock** is one of the severest complications of pyo-septic processes of any localization. It is a special reaction of an organism expressed by the development of poly-organic disorders, connected to the penetration of microorganisms and their toxins into the blood flow, disorder of adequate perfusion of the tissue. Septic shock can be the complication of septic abortion and postnatal infection.

*Etiology and pathogenesis.* Bacterial-toxic shock more often complicates the course of pyoinfectious processes caused by gram-negative flora — colon bacilli, proteus, klebsiella, pyocyanic bacilli, less often — anaerobic asporous flora, etc. Reasons for the occurrence of shock, besides of the foci of the infection (more often — the uterus), also include a decrease in the general resistency of a patient's organism and an opportunity of massive penetration of the causative agent or its toxins into the blood circulation.

The microorganism's toxins entering the blood circulation destroy the cellular membranes of the system of mononucleosis phagocytes of the liver, lungs, as well as thrombocytes and leukocytes. Due to the destruction by lysosome, proteolytic enzymes, vasoactive substances are released (kinin, histamine, serotonin, catecholamin, prostaglandin, endorphin). Peripheral vascular resistance decreases. ABP falls, capillary perfusion decreases, hyperactivation of the thrombocytic and procoagulation parts of hemostasis with the development of DIC-syndrome takes place; metabolic processes are broken; unoxidized products accumulate.

Prolonged influence of bacterial exo- and endotoxins worsen the micro- and macrocirculation disorders. There is a reduction of blood volume, minute volume of the heart; oligemia, tachycardia develop; the coronary blood flow is reduced; the metabolism of the myocardium worsens. A steady decrease in ABP (hypodynamic phase of shock) develops; further decrease in tissue perfusion results in the intensification of tissue acidosis, the development of lactacidosis (anaerobic way of metabolism) against a background of promoted hypoxia. Necrotic changes in organs and tissue (the lungs, liver, kidneys, brain, digestive tract, skin) may appear 4–6 h after the beginning of functional disorders.

*Clinical course.* The bacterial-toxic shock has an acute onset, develops more often after an

operation or manipulation in the foci of infection, which creates conditions for the “burst” of microorganisms or their toxins into the blood flow.

Hyperthermia (up to 39–41°C), accompanied by a repeating fever lasts for 1–3 days, then critically decreases by 2–4°C, precedes the development of shock. The main attribute of bacterial-toxic shock is the decrease in ABP, which is not adequate to the blood loss. During the hyperdynamic, or “warm”, phase of shock, the decrease in ABP lasts from 15 min to 2 h. The hypodynamic, or “cold”, phase of the bacterial-toxic shock is characterized by a more acute and long decrease in ABP (from several hours to several days), tachycardia, increase in the shock index of more than 1.5, dyspnea, disorientation, hallucinations. Symptoms of renal failure, acute respiratory insufficiency join; bleeding occurs due to the progressing of the DIC-syndrome.

*Diagnosis.* The main role is played by the factor of time because irreversible changes in the organism occur in 4–6 h. The diagnosis is based on finding the septic foci in the organism, the presence of hectic fever, decrease in ABP inadequate to the extent of blood loss, as well as tachycardia, tachypnoe, pain syndrome, oliguria and the occurrence of petechia eruption and necrosis of the skin. By the data from the hemogramma the presence of thrombocytopenia and attributes of the DIC-syndrome are determined.

*Treatment.* Intensive therapy is carried out by the obstetrician-gynaecologist together with the expert in resuscitation, if necessary — nephrologist and hematologist-coagulologist. Urgent treatment begins with the injection of 2 l of Ringer’s solution, rhexopolyglucin (restoration of the general blood circulation in order to prevent the development of acute renal insufficiency), in-

troduction of corticosteroids, aminophylline, spasmolytics and saluretics (lasix). With a stable decrease in the systolic arterial pressure (< 80 mm), treatment with dopamin and digoxin is conducted. Oxygen therapy and the correction of the electrolyte disbalance, coagulopathy are conducted. Antibiotics are entered to bring the puerpera round.

Antibacterial treatment begins with intravenous introduction of large doses of broad-spectrum antibiotics and metranidazole. If the focus of the infection is the uterus, its extirpation is conducted.

In order to prevent and treat acute respiratory insufficiency the water balance, oncotic pressure of the blood are corrected; corticosteroids and cardiac glycosides, oxygen therapy, if necessary — artificial ventilation of the lungs are used. In case of the development of bleeding, treatment is performed depending on the parameters of the coagulogramma (fresh erythrocytic mass, native and fresh frozen plasma, cryoprecipitate, natural inhibitors of fibrinolysis — contrical, gordox, trasylol).

*Prevention* of postnatal pyo-septic diseases consists in observing sanitary-epidemiologic regime, duly sanitation of the foci of infection, revealing of the group of pregnant women of a high risk, treatment of patients with extragenital diseases and complications of pregnancy, rational conducting of birth, observance of technique and rules of performing obstetrical operations and manipulations, duly treatment of located forms of infection in order to prevent the generalization of the septic process.

#### RECOMMENDED READING

3; 4; 5; 12; 21; 23; 29; 39; 46; 56.

### GENERAL INFORMATION ABOUT OBSTETRICAL OPERATIONS

Obstetrical operations are performed to interrupt or preserve pregnancy, correct the position and presentation of the fetus, prepare the maternal passages for operative abdominal and vaginal delivery, as well as to reduce the size of the dead fetus, stop bleeding, restore the intactness of the maternal passages.

With the development of obstetrics the views concerning the indications and contraindications to performing obstetrical operations have changed. In modern obstetrics operative interventions having an adverse prognosis for the fetus are rarely applied. In connection with this the basic operation for delivery is caesarean section.

Obstetrical operations can be *elective* and *urgent*. The majority of operative interventions are carried out under urgent indications which require the presence in the obstetrical hospital of an *operational room*, working round the clock, *anaesthesiologic-reanimation service*, blood bank, stock of preparations to fight against shock, bleeding, as well as an *intensive care unit for newborns*.

**General conditions** for carrying out obstetrical operations are the following: 1) establishment of the optimum time for performing the operation; 2) patient's consent for the operation; 3) presence of a skilled surgeon, possessing the technique of obstetrical operations; 4) presence of opportunities for expanding the volume of the operation in the operating room.

Besides, each obstetrical operation requires its own *certain conditions* influencing its results and the absence of which is a contraindication to performance of the given surgical intervention. These conditions are connected to the gen-

eral condition of the woman and the fetus, character of the obstetrical and extragenital pathologies, condition and position of the fetus, readiness of the maternal passages.

Observing the rules of aseptics and antisepsics while performing obstetrical operations has exclusive value in reducing the risk of postoperative complications. Lengthy waterless period, numerous vaginal examinations create conditions for the development of ascending infection. Such factors as fatigue of a puerpera, anaemia, accompanying diseases and obstetrical pathology, operational trauma of tissue considerably weaken resistance of a woman's organism to infections.

The main rules for preoperative preparation, anaesthesia and postoperative supervision of obstetrical operations are presented below.

**Preoperative preparation.** While preparing a pregnant woman for an elective operation her examination is performed, which includes clinical blood and urine analysis; biochemical blood tests; the blood group and Rh-factor determination, Wassermann's reaction; blood test for AIDS; exam of the vaginal microflora; electrocardiography; consultation with the therapist. When preparing for an elective caesarean operation complex evaluation of the condition of the fetus is obligatory: ultrasound, cardiotachography, if necessary — dopplerometry, amnioscopy.

Before an elective operation sanitary processing of pregnant women (hygienic baths, cutting pubic hair, emptying the intestines) is conducted. Examination by the anaesthesiologist is obligatory. When preparing a pregnant woman for an urgent operation it is desirable to empty the intestines. If the operation will be performed under endotracheal narcosis, if necessary (the patient ate before the operation), the stomach is emptied to prevent the Mendelson's syndrome — regurgitation and aspiration of acidic gastric contents.



Before every obstetrical operation the urinary bladder is catheterized; if control of the diuresis is necessary, a constant catheter is put in. Sterile slippers are put on pregnant women's feet. In the operational room processing of the operational area limiting it with sterile material is conducted.

During the performance of vaginal obstetrical operations the patient should lay on a special operational table or Rakhmanov's bed in the position on her back, with her legs bent and pulled towards the abdomen. Every obstetrical operation should end with the catheterization of the bladder to be convinced of the absence of blood in the urine.

**Processing of the surgeon's hands** before an operation is carried out in various methods (processing with pervomur, degmicid, chlorhexidin, etc.). Most frequently 0.5% solution of chlorhexidin bigluconate in 70% ethyl alcohol is used to disinfect the surgeon's hands. The hands are washed with soap under running water with two brushes for 3–5 min, wiped dry, then the palms and back surfaces of the hands are processed with 5–8 ml of a solution of chlorhexidin, rubbing it into the skin for 2 min.

No agent used to process the hands guarantees absolute sterility, therefore all obstetrical operations should be performed in sterile surgical gloves.

**Anaesthesia during obstetrical operations** should correspond to the following principles: 1) availability and simplicity of the performance; 2) capability of managing the condition of narcosis, achieving retrograded anaesthesia; 3) absence of negative influences on respiration and blood circulation of the fetus; 4) absence or weak influence on the uterine contractile function, system of blood coagulation.

In modern obstetrics general anaesthesia (endotracheal, intravenous and mask narcosis) and local (regional, conduction, infiltrational) are used.

The basic method of general anaesthesia during caesarean operation in Ukraine is *endotracheal narcosis* with artificial pulmonary ventilation. The basic components of endotracheal narcosis are the following: 1) premedication (neuroleptics, tranquilizers, anesthetizing agents, antihistamines and cholinolytics); 2) entered narcosis (nitrogen oxide, barbiturates, viadril, sodium hydroxybutyrate, ketamin, etc.); 3) muscular relaxants; 4) artificial pulmonary ventilation; 5) basic (supporting) narcosis (nitrogen oxide, neuroleptanalgesia — fentanyl, droperidol).

*Intravenous narcosis* (ketamin, ketalar, kalip-sol, diprivan) is widely used when performing short-term operative interventions (artificial abortion, application of sutures on the cervix in

case of isthmic-cervical insufficiency; suturing ruptures of soft tissue of the maternal passages; manual separation of the placenta and removal of the afterbirth; manual examination of the uterine cavity, application of obstetrical forceps, curettage of the uterus during the postnatal period).

Mask inhalation narcosis with nitrogen oxide with oxygen (2 : 1 or 3 : 1) is used for short-term obstetrical operations. In order to intensify the effect premedication is used (promedol, seduxen, droperidol, pipolphen).

**Local anaesthesia.** Types of local anaesthesia applied in obstetrical practice include regional (conduction, spinal and epidural, which is frequently applied) and infiltrational.

*Epidural anaesthesia* — a form of regional anaesthesia, provided with a single introduction of a solution of local anaesthetics into the epidural space after a puncture in the corresponding part of the vertebrae (in obstetrics — more often in the lumbar or sacral). Advantages of this kind of anaesthesia have a minimal negative influence on the fetus, capability of applying during urgent operations in case of insufficient emptying of the intestines, with late gestation, diabetes, diseases of the liver, kidneys, and metabolism disorders.

*Infiltrational anaesthesia* (introduction into tissue of a 0.25% solution of novocaine) is widely applied in obstetrical practice for suturing ruptures of the soft delivery paths.

*Pudendal anaesthesia* is applied when conducting premature birth without protection of the perineum.

*Paracervical anaesthesia* in modern obstetrics is almost not conducted in connection with a possibility of fetal bradycardia developing; sometimes it is applied during an operation of artificial abortion and curettage of the uterus.

**Postoperative care.** Bringing of a patient out of narcosis is desirably performed in the conditions of the operational room. It is necessary to prevent aspiration of vomit masses. With the presence of severe obstetrical and extragenital pathologies artificial pulmonary ventilation is stopped after stabilization of the basic vital signs (respiration, hemodynamics, renal functions, normalization of consciousness) within 2 h.

After abdominal operation (caesarean section) a puerpera is transported in a wheelchair to the intensive therapy unit, where she stays for 2–3 days. Immediately after the operation ends she is appointed ice and loads (up to 1 kg) on the lower abdomen for 2 h. The colour of the skin and visible mucous membranes, breath rate, pulse, ABP, diuresis, intestinal function, blood loss, tone and involution of the uterus are observed closely.

Infusive-transfusive (up to 1–2.5 l) and antibacterial therapy are performed; tonomotor means are entered (oxytocin, methylergometrin). In order to prevent thromboembolic complications heparin is applied (2,500–5,000 U hypodermically in 4–6 h for 3–4 days), fraxiparin. If the amount of discharge from the uterus is insufficient, then 30 min before the oxytocin injection 2 ml of nospan intramuscularly are entered.

During the first 2–3 days after the operation anesthetizing means are used (promedol by 1 ml of a 2% solution every 4–6 h; tramadol, tramal).

In order to prevent complications on the part of the respiratory organs at the end of the first day after the operation circular cups or mustard plasters are appointed on the thorax; massage is carried out, expectorants are used. In order to stimulate the intestinal function on the 2nd day neostigmine methylsulfate, 10% solution of sodium chloride, hypertonic clyster are prescribed. On the 3rd day a cleansing clyster is performed. For paresis of the stomach and intestines intubation and washing out the stomach are performed; intravenously 30 ml of a 10% solution of sodium chloride are entered, in 30 min — hypertonic clyster; infusive therapy in order to correct the electrolyte balance and acid-base condition of the woman is conducted.

Within the first day the puerpera should not eat. On the 2nd day she can have unsweet tea, water with lemon. On the 3rd day — semiliquid diet (kissel, semi-boiled eggs, fish broth, liquid porridge, buttermilk).

Postoperative care of the sutures on the perineum consists of keeping the surface sutures clean, the patient's observing the diet, supervision of the functions of her bladder and intestines. In case of expressed hypostasis of the sutured area ice is put on it (for 20 min for 24–48 h). Toilet of the external genitalia is conducted after every urination and defecation. The suture area is drained; the wound is processed with brilliant green 2 times a day. On the 3rd–4th day laxatives, clyster are appointed; on the 5th–6th — the stitches are removed. The woman is allowed to sit after the suture area has healed (on the 8th–10th day).

The performance of operations to preserve pregnancy (application of sutures on the cervix), induction of abortion or birth, as well as operations performed to prepare delivery paths (amniotomy, episio- and perineotomy), correcting the wrong position and presentation of the fetus is described in the corresponding sections of this book.

## CAESAREAN SECTION

**Caesarean section** is a surgical method of extracting the fetus and afterbirth through a cut on the anterior abdominal wall (laparotomy) and uterus (hysterotomy).

The role of caesarean section in modern obstetrics is difficult to overestimate, because this method of delivery in many cases prevents the development of severe complications in the mother and fetus. However, the 10-folds increase in incidence of caesarean operations in Ukraine during last 20 years does not correspond to the rates of decrease in maternal and perinatal morbidity and death rate.

The desire to solve all obstetrical problems by expanding the indications to caesarean section is erroneous, because an increase in the incidence of this operation will cause an increase in pyo-septic complications, pathological blood loss, formation of defective scars on the uterus, adhesions and disorder of the adaptable capabilities of the newborn.

The incidence of caesarean delivery in advanced countries has increased within last decades as a result of expanding the indications to the operation on the part of fetus, and because of a decrease in contraindications to it. So, in the USA the rate of abdominal delivery has increased from 4.5% in 1965 to 22.7% in 1985; recently a tendency for its reasonable reduction to "ideal" has been shown, i.e. the frequency of performing the given operation should be 15–16% of cases. Deterrent factors concerning the growth in the frequency of caesarean operations are that the maternal death rate in connection with this operation is 10–25 times as much, and infectious morbidity and death rate is 80 times exceeding the corresponding parameters for delivery by the natural delivery paths. So, maternal death rate after caesarean section is about 1:1,000 operations; the principal causes are complications from narcosis (aspiration pneumonia), sepsis and thromboembolism. Maternal morbidity after caesarean section is connected to infectious complications, bleedings, and damage to the urinary organs.

The incidence of perinatal death rates due to caesarean section depends on the reason for the operation and the gestational age of the fetus. Birth trauma during the performance of caesarean section happens much less often than during vaginal delivery. However, abdominal delivery nevertheless cannot guarantee safety concerning damage to the fetus. A significant reduction in perinatal death rate was managed to be achieved due to the performance of caesarean section in connection with presentation of the placenta,

breech presentation, horizontal position of the fetus. In the USA, for example, the frequency of vaginal deliveries after previous caesarean section with a horizontal cut in the lower segment increases. As a rule, when performing this operation epidural anaesthesia is used.

**Indications to a caesarean section.** *Absolute* and *relative* indications are distinguished. In different countries of the world they have their own features and depend on the level of development of medical aid. *Absolute indications*, as a rule, include such obstetrical situations when other operative interventions connected to extraction of the fetus (even reduced sizes) through the natural delivery paths, are impossible as well as when other ways of delivery are more dangerous than a caesarean section.

In order to reduce the maternal and perinatal morbidity and death rates at the conference of the Association of Obstetrician-Gynaecologists of Ukraine (September, 1998) obstetrical situations — *relative indications*, were determined where delivery by caesarean section were recommended.

***Indications on the part of the mother:***

— anatomically contracted pelvis of III and IV degrees of narrowing (conjugata vera < 7 cm) and forms of narrow pelvis rarely seen (cross shifted, transverse narrowed, funnel, osteomalacic, narrowed as a result of exostosis and bone tumours);

— clinically narrow pelvis;

— central presentation of the placenta;

— partial presentation of the placenta with expressed bleeding and the absence of conditions for urgent delivery by the natural delivery path (per vias naturales);

— premature separation of a normally presented placenta and the absence of conditions for urgent delivery by natural delivery;

— threatening or already begun rupture of the uterus;

— two or more scars on the uterus; inferiority of the scar on the uterus; scar on the uterus after a corporal caesarean section;

— cicatricial changes of the cervix and vagina;

— anomalies of delivery activity unresponsive to medicamentous correction;

— expressed varix dilation of the veins of the cervix, vagina and vulva;

— developmental anomalies of the uterus and vagina;

— condition after III degree rupture of the perineum and plastic operations on the perineum;

— condition after surgical treatment of urogenital and enterogenital fistulas;

— tumours of the pelvic organs, prohibiting the birth of the child;

— cervical cancer;

— the absence of effect from treatment for severe forms of late gestosis and impossibility of urgent natural delivery;

— traumatic damages to the pelvis and spine;

— extragenital pathology with the presence of a record from the corresponding specialist about the necessity of eliminating the II stage of delivery;

— verified genital herpes.

***Indications on the part of the fetus:***

— hypoxia of the fetus, confirmed by objective methods of examination with the absence of conditions for urgent natural delivery;

— pelvic presentation of the fetus having the body weight of more than 3,700 g in combination with another obstetrical pathology and high degree of perinatal risk;

— prolapse of pulsating loops of the umbilical cord;

— wrong position of the fetus after the amniotic fluid discharge;

— straightening insertion of the fetus' head (frontal, forward view of the face); high direct standing of the sagittal suture;

— infertility which was treated with high risk of perinatal pathology, fertilization "*in vitro*";

— condition of agony or clinical death of the mother with the presence of an alive fetus;

— multiple pregnancy with pelvic presentation of one fetus.

The insufficient level of medical culture of certain groups of the population and professional mistakes made while supervising pregnant women in the female consultations and obstetrical hospitals create conditions for **contraindications** to delivery by caesarean operation. They include: extragenital and genital infections, duration of labour more than 12 h, duration of the waterless period more than 6 h, vaginal examinations (more than 3), intrauterine death of the fetus (except for life-saving indications on the part of the mother), as well as the absence of necessary equipment and a doctor with proper skills.

**Methods of caesarean section.** Depending on the access to the uterus **abdominal caesarean section** which is performed by laparotomy and used for delivery, and **vaginal** — for abortion through the natural sexual ways are distinguished.

Depending on the location of the cut on the uterine cavity caesarean section can be **corporal (classical)** and **located in the lower uterine segment**.

Corporal (classical) caesarean section is performed only under special indications.

The most widespread method of abdominal delivery is **caesarean section in the lower uterine segment**. Its advantages are smaller blood loss,

formation of stronger scars, and smaller probability of its rupture during subsequent births, smaller chances concerning the formation of intestinal fusion in the area of the scar.

**Extraperitoneal caesarean section** is a more complex variant of caesarean section in the lower uterine segment and is performed under the condition of a high risk of infection.

**Caesarean section in the lower uterine segment with temporary isolation of the abdominal cavity** is performed in the group of pregnant women with an increased risk of development of pyo-septic complications.

In case of urgent delivery in the interests of the mother, as well as with the presence of endometritis, intrauterine death of the fetus, the absence of conditions for delivery by natural delivery **caesarean section with subsequent amputation or extirpation of the uterus (Porro's operation)** is performed.

**Vaginal caesarean section** is not applied in modern obstetrics.

**Surgical principles.** In order to prevent infection and achieve efficiency at the operation such principles are kept: careful hemostasis, accurate connection of tissue, minimization of suture material, reduction in the time of the operation, prevention of necrosis of tissue and infection.

The conduction of elective procedures, performed simultaneously with caesarean section, is limited, because for this the time of the operation increases, transfusion is required. Besides, they are connected to the possibility of infection. **Tubal ligation** is the most often concomitant procedure, which has almost no contraindications.

**Technique of the operation.** The choice of the method of incision on the anterior abdominal wall (laparotomy) depends, as a rule, on the type of incision on the uterus, the obstetrician's experience, as well as on the necessity to access the upper half of the abdominal cavity (Fig. 119). When performing the caesarean section on the lower uterine segment, preference is given to the horizontal incision on the anterior abdominal wall (according to Pfannenstiel) or (less often) vertical. The horizontal incision has the best cosmetic results, heals better, represents smaller probability of the development of a postoperative hernia, causes less pain. Advantages of vertical incision (longitudinal median, below median laparotomy) are its simplicity and speed of the performance, greater access to the abdominal cavity.

*The horizontal Pfannenstiel's incision* (Fig. 119, 1) is performed symmetrically at a distance of 2 cm above the pubic symphysis, slightly rounding it laterally. In a similar way they separate the hypodermic basis under the control of he-

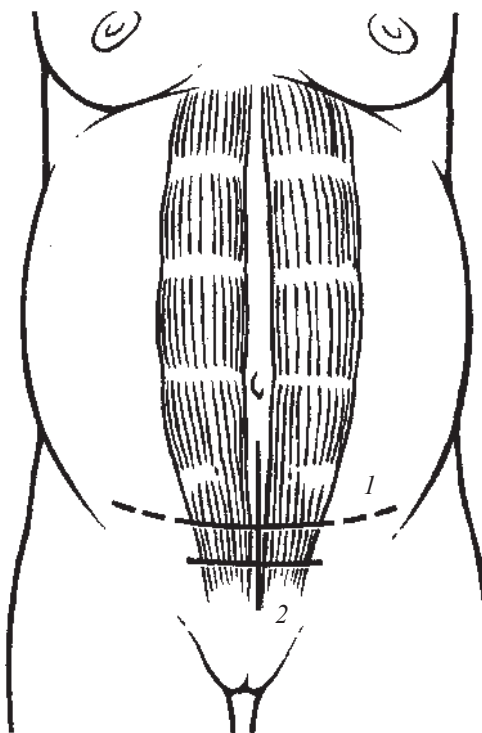


Fig. 119. Types of incisions on the anterior abdominal wall during caesarean section:

- 1 — Pfannenstiel's incision;
- 2 — vertical (median) incision

mostasis. Horizontally the fascia of m. rectus is cut, grasping the median line and anatomically separating the underlying tissue. The rectal and pyramidal muscles are pulled laterally; the posterior leaf of the fascia and the parietal peritoneum are opened with a cautious vertical or horizontal incision. When sewing up the abdominal cavity, the rectal muscles are brought to the medial line; the hypodermic basis is pulled together and accordingly sutured.

*Vertical (median) incision* (Fig. 119, 2), as a rule, is used during the classical caesarean section. It is performed on the median line in the direction from the naval to the pubic symphysis. After the incision of the hypodermic basis, they anatomically cut the median line and parietal peritoneum. When closing the abdominal cavity, all the tissues are carefully pulled together and sutured.

**Caesarean section in the lower uterine segment.** After entering the abdominal cavity, the visceral peritoneum is cut approximately at a distance of 1 cm higher than the urinary bladder. They bluntly separate the bladder from the lower uterine segment for 3–4 cm and it is pulled towards the pubic symphysis, opening thus the lower uterine segment. The latter exists as an anatomic area only in the late terms of pregnancy and in birth. So, in pregnant women without labour activity it is located in the depth of the pelvis, while with complete opening of the cervix it can



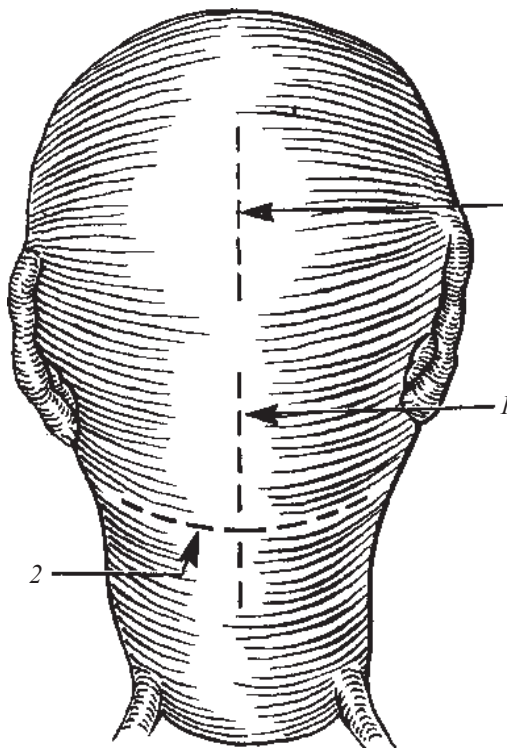


Fig. 120. Types of incisions on the uterus during caesarean section:  
1 — vertical; 2 — horizontal

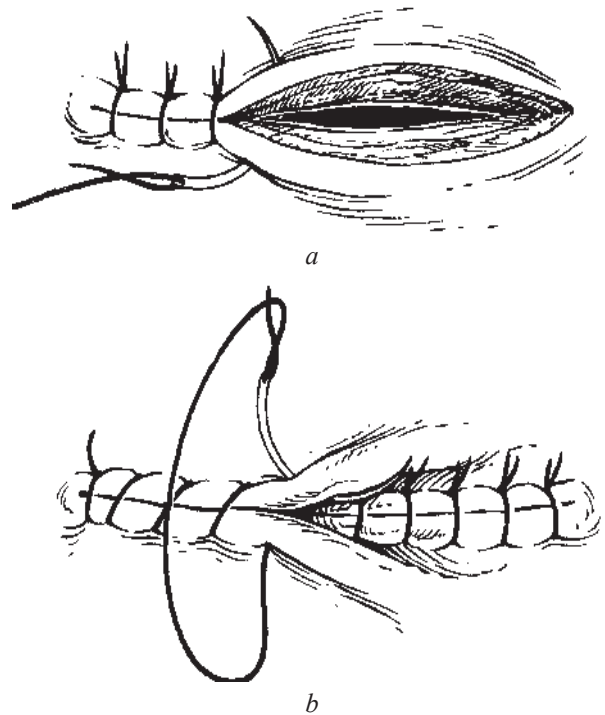


Fig. 121. Application of stitches on the uterus:  
a — first layer; b — second layer

be at 1/3 of the distance to the naval. The doctor should approach responsibly the choice of location of the incision on the uterus. When performing the given operation they cautiously carry out a small *horizontal incision* (Fig. 120, 2), cut the lower uterine segment, then according to the greatest diameter of the fetal head the *incision is extended with scissors laterally*, rounding off the ends (Fig. 120). The uterine vessels are visualized and left outside the incision.

*Vertical incision on the lower uterine segment on the median line* (Fig. 121, a) is used to increase access to the uterus. The basic problem while performing such an incision is its continuation onto the myometrium of the corpus uteri. In case of *premature birth* the type of incision on the uterus is chosen after opening the abdominal cavity. Frequently there is a necessity of a classical incision or low vertical incision in connection with insufficient expansion of the lower uterine segment. With the *pelvic presentation* of the fetus and insufficient expansion of the lower uterine segment (long, closed cervix), as well as horizontal position of the fetus, a vertical incision is performed. Then the hand is entered into the uterine cavity to raise and remove the fetal head through the incision on the uterus. The success of this moment always depends on the adequacy of the incision made on the uterus. If the fetal head is located deeply in the pelvis, the assistant directs it cautiously pushing through the

vagina upwards. Sometimes to birth the fetal head the spoon of Simpson's forceps are used.

The head of a prematurely born fetus with a breech presentation can appear trapped because of an incision not wide enough. The actions of the surgeon should follow the natural biomechanism of delivery characteristic for the breech presentation to minimize the compression of its organs and excessive extension of the head. With the occurrence of difficulties the incision on the abdominal wall and uterus is extended, sometimes a *T- or J-shaped incision* is made on the uterus, as they are more safe concerning the possibility of rupture of the uterus during subsequent pregnancies.

After the birth of the head the contents from the nasal and oral part of the fetal pharynx are immediately evacuated. Having conducted complete sanitation of the upper respiratory tract of the fetus, by means of moderate pushing on the lower uterus, the baby's body is removed, the umbilical cord is cut.

After the childbirth at the site of the incision on the uterus the bleeding vessels are revealed and grasped with clamps. In order to stimulate the contraction of the uterus and limit blood loss after the birth of the fetal shoulders, infusion of oxytocin is begun. The placenta immediately is born independently (cautious traction by the umbilical cord is allowed) or it is removed by the obstetrician; the integrity of all the coty-

ledons are checked. If there are doubts concerning the presence of remains of the placenta, manual examination of the uterine cavity is performed.

Suturing the uterus is facilitated due to moving it in the wound on the anterior abdominal wall.

The uterus is sutured with one or two layers of continuous (or interrupted) catgut sutures, the distance between the stitches should be about 1 cm (Fig. 121). Application of the first stitch is done laterally from the end of the horizontal incision and below the edges of the vertical incision. The edges of the wound carefully pulled together. The stitches should penetrate the whole thickness of the myometrium. The basic decidual membrane, whenever possible, is not grasped with the stitch (to prevent the development of endometriosis). It is considered that the application of interrupted stitches on the uterus is accompanied by the greater probability of the occurrence of ischemia and bad healing. The urinary bladder is above the site of incision. The application of continuous catgut stitches (third layer) is made on the visceral peritoneum. It is better to use synthetic material (vicryl, monocryl, etc.). The uterus is examined, its tone is observed, cautious massage is performed, the ovaries and fallopian tubes are examined, if necessary sterilization is carried out.

The abdominal napkins are removed; hemostasis is controlled, the amount of tools are checked. The parietal peritoneum and rectal muscles of the abdomen are sewed with continuous catgut stitches. The fascia of the rectal muscles (anterior leaf) is accurately sutured, mainly with continuous stitches. The needle is stuck in and pulled out at a distance of 1 cm from the edges of the wound (collagenolysis zone), between the stitches there should be a distance of approximately 1 cm.

With expressed hypodermic basis the latter is sutured and stitches are imposed on the skin (interrupted or continuous hypodermic stitches).

*Classical (corporal) caesarean section* is performed more often in case of the presentation of the placenta, horizontal or diagonal position of the fetus, necessity of accelerated delivery, as well as unopened lower segment of the uterus due to premature labour.

The technique of performing the classical caesarean sections is simple. The corpus uteri is shifted to the left in connection with its physiological rotation to the right to avoid rupture near the left uterine rib and injury to the vascular bunch. A reference point of the median position of the uterus is the round ligaments. A vertical incision is made with a length of no less than 12 cm in the

lower part of the corpus uteri above the vesicouterine fold through the visceral peritoneum and myometrium. The uterine cavity is cut; with the scalpel a small incision is made, which is extended downwards and upwards with the scissors. In case of the placenta previa it is shifted to one side, or cut with a scalpel, or teared with the fingers. The fetus is removed; the bleeding vessels at the site of the incision are clamped; the birth of the placenta and membrane is assisted. Infusion of a solution of oxytocin 10 U/l to achieve the contraction of the uterus is necessary. The myometrium (depending on its thickness) is sutured in two-three layers of interrupted or continuous stitches (Fig. 122). The first layer of stitches should grasp half of the thickness of the myometrium. Correct connection of the edges of the wound to each other has crucial importance in the healing and formation of a firm cicatrix. Peritonization is performed with the help of the visceral peritoneum. The anterior abdominal wall is sutured diligently, promoting the anatomic connection of the edges of the wound that helps to avoid the development of a postoperative hernia.

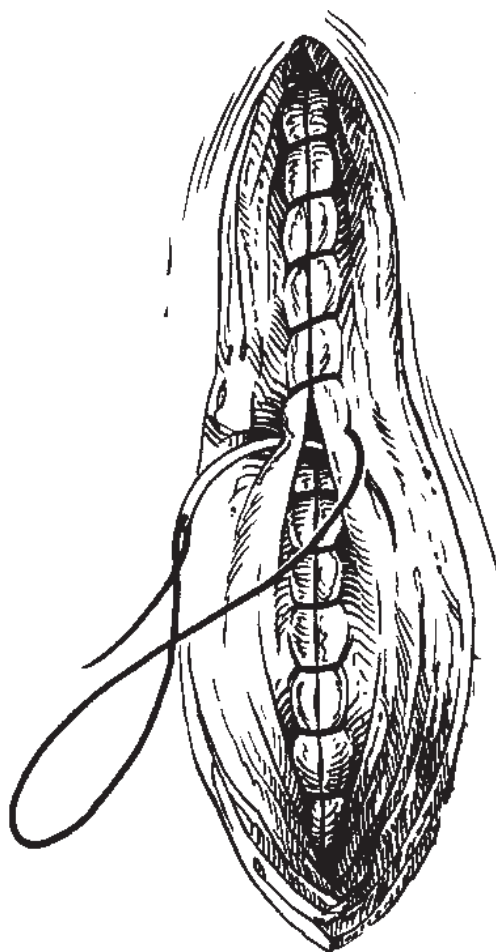


Fig. 122. Suturing the incision on the uterus after the classical caesarean section

*Extraperitoneal caesarean section and caesarean section with temporary isolation of the abdominal cavity* was offered in the pre-antibiotic era to reduce postoperative infectious complications with their increased risk. In connection with a possibility of using modern antibacterial means these operations are seldom carried out. Intraoperational prevention of pyo-septic complications by intravenous introduction of cephalosporins, as well as intraoperational peritoneal and intramuscular lavage solutions of antimicrobial preparations are performed, as a rule, in women of the group of risk. Antibacterial therapy is continued even in the postoperative period.

**Total hysterectomy after caesarean section** is recommended during the following complications: 1) uncontrollable bleeding (with atony of the uterus, bleeding from the place of the placenta); 2) rupture of the uterus (when it is impossible to suture it); 3) adherent placenta (placenta accreta); 4) severe infection or necrosis of the uterus; 5) tumours of the uterus and cervix (multiple myomatous nodes, cervical cancer).

**Subtotal hysterectomy** (supravaginal amputation of the uterus without removing the cervix), as a rule, is performed in connection with a necessity of reducing the time of the operation and life-saving risk of total hysterectomy.

**Intraoperational complications** of abdominal delivery are observed approximately in 11% of cases (atony of the uterus, bleeding; adherent placenta; damage to the corpus uteri, its cervix, vagina, broad ligament, uterine arteries; trauma to the fetus; damage to the urinary bladder, urethra and intestines; anaesthesiological and hemotransfusion complications; massive venous air embolism; intraoperational infection).

**Blood loss** during an uncomplicated caesarean section is about 600 ml. Haemodynamics and haematocrit number start to stabilize usually on the 3rd day after the operation (increase in the haematocrit number more than 0.3). A reduction in the intraoperational blood loss is achieved by scrupulous surgical hemostasis, exteriorisation of the uterus (removing through the abdominal incision), fast removal of the placenta and membranes of the fetus, anatomic suturing of the wound, introduction of oxytocin immediately after the birth of the placenta. In order to reduce the possibility of massive venous air embolism it is necessary to carry out an adequate infusive therapy, avoid extreme Trendelenburg's position.

Risk factors for *intraoperational complications* after an urgent caesarean section can be the following: 1) very high or too low position of the presented parts of the fetus; 2) small gestational age of the fetus; 3) long labour; 4) long waterless period; 5) previous caesarean section; 6) inexperience of the surgeon.

**Postoperative complications.** Morbidity after a caesarean operation is about 15%, from which 90% — *infections* (endomyometritis, wound infection, inflammation of the urinary tract, sepsis). After an operation 2% of patients can suffer from life-threatening infections (septic shock, pelvic abscess, septic pelvic thrombophlebitis). Complications occur more often after urgent (25%) operations rather than after elective ones (5%).

*Noninfectious postoperative complications* (less than 10% of the total) include intestinal paresis, intraabdominal bleeding, paresis of the urinary bladder, thrombosis and pneumonia.

Factors causing *postoperative mortality* include: 1) long period after break of the fetal membrane (more than 8 h); 2) long labour before the operation (more than 12 h) with the opening of the cervix more than 4 cm; 3) multiple vaginal examinations (more than 3–7); 4) anaemia; 5) obesity; 6) system diseases and other extragenital pathologies; 7) low social and economic status of the woman, absence of antenatal supervision; bad nutrition, very young age of the mother; 8) small gestational age of the fetus; 9) long stay of the parturient woman in the hospital before the operation.

Iatrogenic reasons for perinatal morbidity and death rates after caesarean section can be inaccurate determination of the fetal gestational age with the performance of elective repeated caesarean sections, traumatic extraction of the fetus from the uterus especially prematurely born.

**Repeated caesarean section.** The probability of uterine rupture at the area of the horizontal scar after a caesarean section in the lower uterine segment, if modern suture material (vicryl) was used, is low. However, after classical (corporal) caesarean section uterine rupture can occur at the area of the scar during labour and even before labour (approximately in 12% of cases).

During the preparation to an elective repeated caesarean section an important point in the prevention of perinatal morbidity and death rates is to determine the exact gestational age of the fetus. It is established on the basis of such parameters: the data of the last menstrual period; the ultrasound data at the I or at the beginning of the II trimester of pregnancy; results from a series of examination of the height of the uterine fundus above the pubis during pregnancy; date for establishing the fetal heart beats (with the height of the uterine fundus at 18–20 cm); size of the fetus (no less than 3,000 g).

Delivery is performed after 38 full weeks of the gestational age. If there are doubts concerning the maturity of the fetus, delivery is postponed with the absence of other complications

(vertical incision on the uterus, severe delay in intrauterine development of the fetus).

If the gestational age of the fetus cannot be precisely established, amniocentesis is performed to determine the lecithin/sphingomyelin ratio or wait for spontaneous labour to occur.

#### **Birth per vias naturales after caesarean section.**

Within last years vaginal delivery after caesarean section has become very much widespread in advanced countries in connection with its proven safety. According to the recommendations of the ACOG (USA, 1988), one and even two previous caesarean operations with the performance of horizontal incision on the lower uterine segment with the absence of complications are not contraindications for performing vaginal delivery, as well as prescribing oxytocin during labour to those parturient women. The contraindication to spontaneous labour is a previous classical caesarean section.

When conducting labour in patients with scars on the uterus, it is necessary to have a stock of blood, to monitor constantly the fetal heart activity and the contractile function of the uterus. Labour is conducted under the conditions of a possibility to organize an operational room if necessary within 30 min.

*Preoperative conducting.* Before carrying out an elective caesarean section, a pregnant woman is hospitalized; laboratory blood and urine tests are carried out. 1,000 ml of compatible blood are prepared. The surgeon and anaesthesiologist examine the pregnant woman. The night before the operation sedative preparations are given. The parturient woman should stop taking food and any preparations per os 8 h before the operation. In order to minimize the risk of development of the Mendelson's syndrome due to aspiration of acidic contents of the stomach before inducing general anaesthesia antacids are prescribed. Such prevention is taken even in case of the application of regional anaesthesia (possibility of accompanying inhalation anaesthesia).

During the performance of caesarean section intravenous introduction of solutions is necessary. A woman with an average constitution, having a haematocrit number more than 0.33 and sufficient volume of blood and extracellular liquid, as a rule, is tolerant to blood loss of about 1,500 ml. The exact establishment of true volume of blood loss is important in avoiding both its underestimation and overestimation. The volume of blood loss during the caesarean sections is about 1 l, however, it can vary.

During the operation, as well as directly after it, intravenously 1–2 l (up to 3 l) balanced solutions of electrolytes (Ringer's solution or similar solutions) are introduced; 5% solution of dextrose (glucose). After the birth of the fetal should

20 U/l of oxytocin (10 ml/min) are entered to induce uterine contractions.

After the operation in the intensive care unit monitoring of the amount of bloody discharge from the vagina, tone and size of the uterus is conducted. The puerpera is recommended to breath deeply and cough. If the woman completely wakes up after the operation and bleeding is minimal, ABP and pulse — satisfactory, and diuresis — more than 30 ml/h, she is transferred to the postnatal room.

*Postoperative care.* After the operation, if it is necessary, for the purpose of anaesthesia, 10 mg of morphine hydrochloride or a similar dose of another narcotic analgesic are entered intramuscularly. Also antiemetic preparations are prescribed. Within the first days, every 4 h the ABP, pulse, body temperature, height of the uterine fundus are measured, the amount of blood loss is determined.

*Infusive therapy.* The postnatal period is characterized by excretion of liquids which "was kept" during pregnancy and became "extra" after delivery (with the absence of its pathological reduction). Moreover, with the typical caesarean section or uncomplicated hysterectomy a significant delay of extracellular liquid in the wall and opening of the intestines does not occur, under the condition that it's railing in from the operational field or peritonitis did not develop. Therefore, it is not necessary to increase the volume of intravenous infusion more than 3 l during the operation and 24 h after it. If diuresis is less than 30 ml/h a patient needs careful additional examination. The reason for oliguria can be the underestimation of blood loss or anti-diuretic effect caused by the introduction of oxytocin. If extensive intraabdominal manipulations were not performed and there is no sepsis, a puerpera can take liquid per os the day after the operation. If peroral use of liquid is impossible, intravenous infusion is continued. Tolerance to the usual diet is restored when the intestines begin to function.

*Function of the urinary bladder and intestines.* The catheter from the bladder is removed as a rule 12 h after the operation or the next morning. The restoration of independent evacuation of urine from the bladder is observed before its overfilling the same as after vaginal delivery. Peristalsis of the intestines is usually absent the first day after the operation, weakened for 2 day and starts being more active on the 3rd day. Pain connected to the accumulation of gases in the intestines can disturb on the 2nd–3rd day after the operation. In order to stimulate defecation, a cleansing or glyceric clyster is applied.

*Getting out of bed and walking* is allowed starting the 2nd day after the operation (first with



the help of an assistant), gradually, but no less than 2 times a day. Before getting out of bed to minimize her discomfort analgesics are prescribed. Early getting up and walking are necessary to prevent venous thrombosis and pulmonary embolism.

**Care for the wound.** The postoperative wound is examined every day. A light bandage is put on the wound. The stitches are removed on the 4th–5th day after the operation. It is possible to take a shower on the 3rd day after delivery.

**Laboratory tests** include determining the haematocrit number, hemoglobin level the next morning after the operation or earlier, if an increase in blood loss, oliguria is observed or there is suspicion of oligemia. With significant decrease in the haematocrit number in comparison with that one before the operation, repeated tests are conducted and the reason for this phenomenon is found. In the case when the haematocrit number remains stable (does not decrease), blood transfusion is not preferred, rather treatment with peroral preparations of iron.

**Prevention with antibiotics.** Endomyometritis' causative agents after caesarean section are mostly group B streptococci, gram-negative aerobes (*E. coli*), anaerobic gram-positive and gram-negative microorganisms. The used antibiotic should be clinically effective and non-toxic, act both on aerobes and anaerobes (cephalosporins of I and II generation). Antibiotics of the III generation (reserve) are not used to prevent endomyometritis.

It is established that without antibacterial treatment infectious complications developed in 85% of women who gave birth for the first time and were operated on as a result of nonconformity between the size of the fetal head and the maternal pelvis. In this case antibiotics are appointed not to prevent but to treat. It is also established that the introduction of one dose of penicillin with gentamycin or cephalosporin simultaneously with cutting the umbilical cord and subsequent introduction of two of the same doses with a 6-hour interval considerably reduces the probability of infection development. Other techniques of treatment consist of the application of one dose of cephalosporin or preparations from the group of penicillin with a wide spectrum of action.

Patients with clinically diagnosed *chorioamnionitis* are given a regular antimicrobial treatment till normalization of the body temperature.

In the recommendations developed on the basis of materials from the conference of the Association of Obstetricians-Gynaecologists of Ukraine (September, 1998), in order to reduce the risk of postoperative complications it is marked that the performance of an elective cae-

sarean section should begin with the approach of labour activity. The caesarean section is considered to be elective if the birth history contains a record of the obstetrician-gynaecologist consultation about a necessity in it in view of indications, contraindications and the conditions of its performance. If there is a corresponding record about a necessity in abdominal delivery, with the approach of labour activity or with the rupture of the amniotic fluid, it does not matter if it is day or night, the given operation is performed.

For performing elective caesarean operations, antenatal preparation, which includes full examination of pregnant women with the evaluation of her condition and the condition of the fetus, sanitation of the maternal passages should be conducted, whenever possible prostaglandins are prescribed.

A repeated caesarean section should be performed by high skilled doctors, mainly in the elective order.

With the presence of a full-value scar on the uterus, as well as with the absence of a large fetus, narrowed pelvis, indications to delivery by caesarean section with the given pregnancy and an interval between pregnancies of 3 years and more, it is preferred to perform delivery through natural maternal passages with dynamic evaluation of the condition of the scar during pregnancy and labour.

When performing an elective caesarean operation, it is better to use autohaemotransfusion, which reduces the risk of developing pyo-septic and post-transfusive complications, eliminates the possibility of transferring the HIV-infection, syphilis and hepatitis B. Conditions for autohaemotransfusion are following: the absence of extragenital pathologies in pregnant women, level of hemoglobin no lower than 100 g/l, haematocrit number — no less than 0.33, amount of erythrocytes — no less than  $2.8 \cdot 10^{12}$  in 1 l, general protein — no lower than 65 g/l.

It is necessary to constantly improve the technique of the operation, to suture the wound on the uterus it is better to use such material as dextran, vicryl, PDS.

A caesarean section with severely preterm pregnancy should be carried out in view of the health interests of the mother even if there are proven data of the threatening conditions of the fetus and its viability. It is expedient to perform caesarean section on pregnant women with habitual preterm pregnancy.

A decrease in the perinatal losses in case of performing caesarean section with preterm pregnancy and small fetal weight is possible only if pregnant women with the threat of premature labour are in specialized delivery rooms having

sufficient material care and the possibility to carry out a proper care for the newborns born with a small body weight.

## APPLICATION OF OBSTETRICAL FORCEPS AND VACUUM-EXTRACTION OF THE FETUS

Obstetrical forceps were invented in the XVII century. They are intended for the extraction of the fetal head and can be different in size and form, but always consist of two parts — branches (Fig. 123) which are entered into the vagina. Each branch is entered in the necessary direction according to the position of the fetal head, and then they are closed together with the help of a lock.

Each branch contains three parts: the upper, or *blade*, middle, or *lock*, and lower, or *handle*. In practical application frequently each branch is called the blade. On one end of the branch there is an oval aperture — a window, on the other one — a handle. The window is framed with ribs, rounding upwards. The forceps should not be heavy; their usual weight is no more than 500 g. The general length of the instrument — 35 cm from which the length of the handle with the lock is 15 cm, spoons — 20 cm.

Each spoon is bent in two directions. One curve corresponds to the curve of the wire axis of the genital canal and is referred to as *pelvic*; the other one — is intended for grasping the fetal

head, so that it does not slide off, and is referred to as *head*. In the Simpson—Fenomenov's forceps (Fig. 123, *c*) the distance between the most remote points of the head curvature is 8 cm, and between the tops of the forceps — 2.5 cm. In the Lasarevitch, Kjelland's forceps (Fig. 123, *a*) there is only one curve — head (direct forceps).

On the second end of the spoon there is a handle; one its edge (internal) — flat smooth; the second (external) — has prongs. The internal edges of the handles with the clamping of the spoons touch each other, and the prongs on the external edges are support for the surgeon's fingers.

Both spoons have an inside lock with the help of which they clamp. The lock is made in such a manner that on one (left) spoon there is a special deepening into which the second (right) spoon freely enters.

Between the lock and handle on the lateral sides of the forceps there are lateral ledges — Bush's hooks. When the forceps are clamped, Bush's hooks are a reliable point of support for traction; they also help determining the correctness of spoon application.

The forceps's branches are distinguished by such attributes: 1) on the left branch the lock is located above, on the right one — below; 2) if the forceps are lying on the table, Bush's hooks and the ridge surface of the handle on the left branch are inverted to the left, on the right — to the right; 3) the handle of the left branch is inverted to the left hand, right — to the right (if the forceps laying on the table, are inverted by the handles to the surgeon).

With correct application any model of forceps is effective. Piper's forceps (Fig. 123, *b*) are used for rendering assistance in birth of the fetal head in the breech presentation. In this country Simpson—Fenomenov's forceps (head presentation of the fetus) are used.

*Classification.* The forceps are intended for rendering assistance during birth of the fetus (extraction, or traction) with its occipital presentation (or posterior type of face presentation) and are classified depending on the level of the fetal head's position in the birth canal with application of the spoons.

*The exit forceps* are used when the fetal head is in the exit of the pelvis. *The cavitory forceps* are used if the fetal head is in the pelvic cavity (its narrow part).

The higher the presenting part of the fetus is located in the pelvis the harder to impose the forceps and remove the fetus and the greater risk for the health of the mother and fetus.

*Indications* on the mother and fetus's part for a non-traumatic completion of birth by means of forceps are the following:

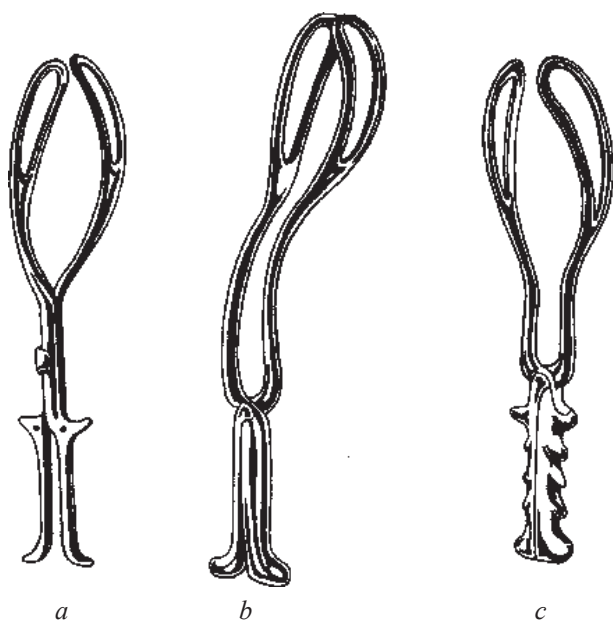


Fig. 123. Types of obstetrical forceps:  
*a* — Kjelland's; *b* — Piper's;  
*c* — Simpson—Fenomenov's

1) secondary uterine inertia with conservative treatment failure because of the long-term standing of the fetal head in one of the pelvic planes;

2) severe forms of late gestosis (severe nephropathy, pre-eclampsia, eclampsia);

3) bleeding at the II stage of labour caused by premature separation of the placenta, rupture in the vessels of the umbilical cord in case of its membrane affixion;

4) severe somatic diseases of the women, which require the elimination of the II stage of labour; high degree myopia;

5) intoxications, infections, poisoning with the severe condition of the woman;

6) acute intrauterine hypoxia of the fetus;

7) birth of the fetal head is impossible during a caesarean operation (more often during extraperitoneal).

The introduction of epidural anaesthesia into obstetrical practice during labour and as a result a reduction in maternal expulsive forces has led to some increase in cases of obstetrical forceps usage in advanced countries.

#### **Conditions for application of obstetrical forceps.**

Application of forceps is conducted under such circumstances: 1) an alive fetus; 2) complete opening of the uterine aperture; 3) absence of the amniotic bubble; 4) location of the fetal head in the exit or in the pelvic cavity; 5) average fetal head sizes; 6) sufficient size of the maternal pelvis (conjugata vera more than 8 cm).

It is necessary to precisely determine the position and presentation of the fetal head (occipital, posterior type of face), the absence of disproportion between the maternal pelvis and the fetal head. The operation should be performed by a skilled surgeon with the use of adequate anaesthesia.

*Technique.* When starting the operation of obstetrical forceps application, it is necessary to have precise representation of the biomechanism of birth.

For application of the forceps, the parturient woman is laid on the Rakhmanov's bed (operational table) on her back, thus her legs should be bent in the knees and coxofemoral joints. First it is necessary to clean out pregnant women's intestines and bladder; the external genitalia and internal surface of the hips should be processed with disinfectant solutions. When applying the forceps, intravenous or inhalation narcosis is used.

The operation consists of four basic moments: *first* — introduction and accommodation of the spoons, *second* — clamp the forceps; *third* — trial traction and extraction of the head, *fourth* — removal of the forceps.

The forceps are made in such a manner that their head curve is adapted to the lateral sur-

faces of the fetal head. The biparietal size of the fetal head corresponds with the greatest distance between the spoons of the forceps. Application of the spoons should be done biparietally, parallel to the long axis of the head, i.e. its big diagonal size.

Before application of the forceps, the surgeon should do a trial, "phantom", application, having arranged the forceps in front of the perineum to correct their position with the last application.

**Application of exit (typical) forceps.** With the *left hand* they take for the handle of the *left* spoon, put the handle parallel to the right inguinal fold and, lowering it downwards, enter the spoon into the *left* side of the pelvis, controlling with the fingers of the right hand entered into the vagina. The spoon should be entered so that it easily slides on the lateral surface of the middle finger of the obstetrician's right hand, thus with the removed big finger direct the movements of the spoon. The spoon should lie on the parietal area of the head. The entered spoon is transferred to the assistant to hold or left. Further with the *right* hand they take the *right* spoon and, supervising with the left hand, enter it in the *right* side of the vagina, application of the spoon on the other parietal area of the head (Fig. 124).

With the introduction of the spoons it is necessary to check with the fingers that the top edge of the spoon was entered under the cervix, instead of lying on it. The spoons of the forceps have a special window for checking this moment. If the spoon is entered under the cervix, the latter is visible on the window (outside) as a hard tense membrane.

Correctly applied spoons are easily closed. Having checked once again the correctness of applying the forceps, a *trial traction* is done to be convinced whether the forceps slide off. After that extraction of the head is begun with the help of traction. Traction should lead the head in the same directions in which it would pass during natural birth. Traction should be smooth, not choppy, with a gradual increase in the applied force (imitation of contractions). The duration of one traction should correspond to the duration of the pushing; the interval between tractions is 30–60 s. After 4–5 tractions the forceps are unclamped to reduce squeezing the head. The doctor carries out traction standing or sitting; the elbows should be pressed to the trunk in order to prevent application of excessive force during traction.

So, pulling out the head in the pelvic outlet with the anterior kind of occipital presentation, irregular, very cautious, gentle traction are done, first in the direction *towards yourself and a little upwards* (horizontal traction; Fig. 125) while the

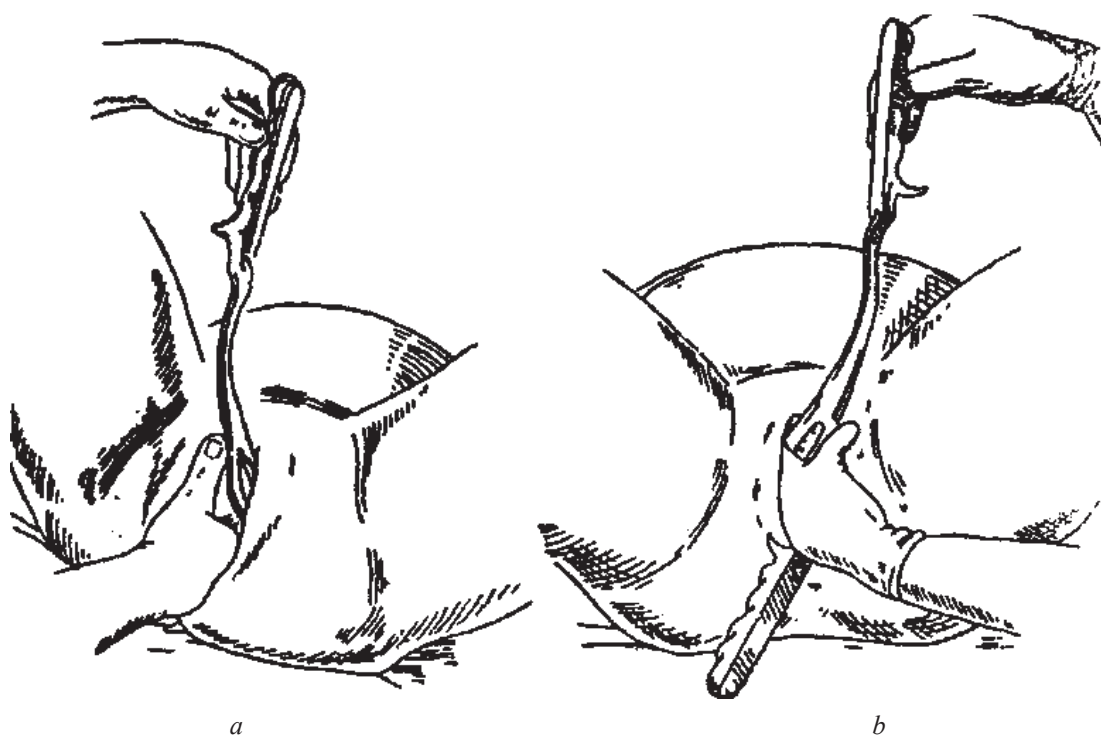


Fig. 124. Application of the left (a) and right (b) spoons of the Simpson—Fenomenov's forceps

occipital area of the fetus does not go under the pubic angle and the head does not start to pouch the perineum out. Traction is carried out during uterine contractions. At this time, as a rule, episiotomy is done. After that the direction of traction should be **abruptly upwards**. When the occipital tubera are out, it is possible to remove the forceps and pull the head manually. The forceps are removed in the reversed manner, namely: first — the right, and then — the left spoon, with movements parallel to the opposite groin.

**Application of the cavity (atypical) forceps** is performed, when the fetal head is in the narrow part of the plane of the lesser pelvis and still it is necessary to perform its internal turn and extension (with the anterior kind of occipital presentation). The sagittal suture is placed in one of the diagonal diameters of the pelvis. The application of the cavity forceps is performed opposite to the diagonal size to grasp the head in the area of the parietal tuberculum. The application of cavity forceps is connected with significant technical difficulties and danger of damaging the fetus and the maternal passages.

With the anterior kind of the I position of occipital presentation of the fetus application of cavity forceps is done in the left oblique diameter. The order of spoons introduction is the same as used for the exit forceps. The left spoon is entered under the control of the right hand in the posterior lateral section of the pelvis and is placed in the area of the left parietal tuberculum; the handle of the forceps is transferred to

the assistant. The application of the right spoon should be done from the opposite side, in the anterior lateral pelvic area, however, this is interfered by the pubic arch. The given obstacle is overcome with the help of the "wandering" of the spoon. First the right spoon is entered in the right half of the pelvis as usual. Then under the control of the left hand, entered into the vagina, the spoon is moved until it is not placed in the area of the right parietal tuberculum. Advancing the spoon is done by cautious pressing with the II finger of the left hand on its bottom rib, the handle is moved a little backwards, clockwise. The forceps are clamped when they are lying on both sides (biparietal) of the fetal head and are in the left oblique diameter of the pelvis. A trial traction is done the same as for the exit forceps. Traction for the imitation of the biomechanism of birth is first of all carried out *downwards and a little backwards*. With the advancement of the head together with the forceps a rotation counter-clockwise will be made, until it reaches the pelvic fundus. Hence only traction should be active; the rotation of the forceps is carried out due to the spontaneous rotation of the head when advancing through the maternal passages. When the head reaches the pelvic fundus, the subsequent traction is performed the same as for the exit forceps: first — *horizontal (and a little upwards)*, till the appearance of the occipital tuberculum from under the pubic arch; then — *forward and abruptly upward* for the extension of the head. The unclamping



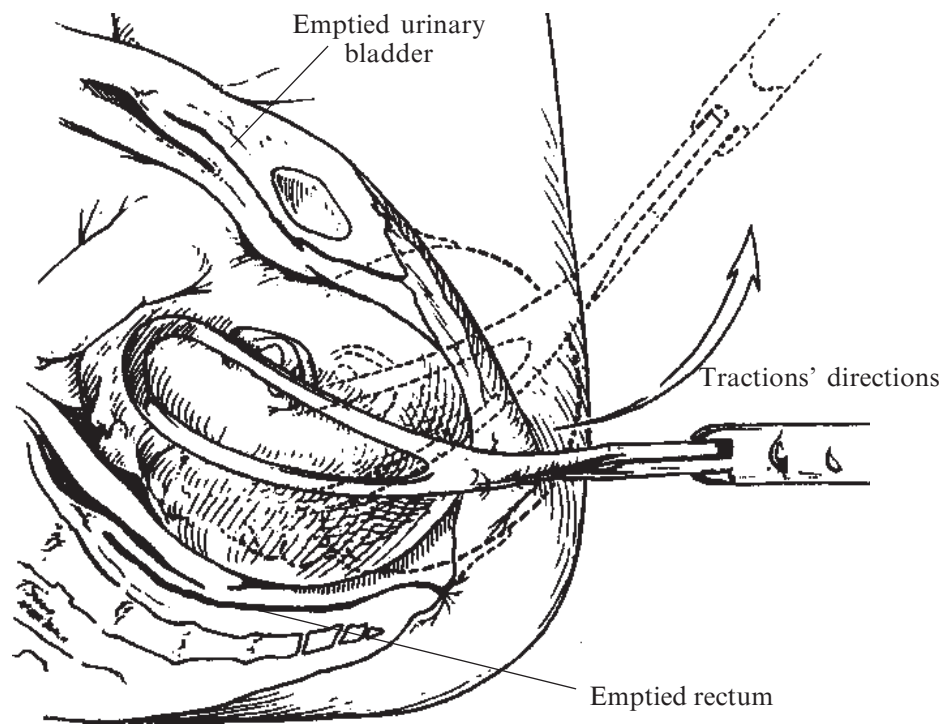


Fig. 125. Traction of the head with the Simpson's forceps with the anterior kind of occipital presentation of the fetus

and removal of the forceps is done according to the usual rules.

*Difficulties* when applying forceps can be connected to the resistance of the pelvic fundus, narrow vagina, introduction of the spoons into the fold or vaginal vault. Difficulties connected to unclamping the forceps occur if the spoons are located not in one plane, or the forceps are applied not in the transversal but in the oblique or even the frontooccipital direction (due to the doctor's wrong orientation concerning the position of the head, large birth tumour). If the handles of the forceps when attempted to clamp separate, it could testify to the insufficient depth of applied spoons and a possibility of severe damage to the fetus (even skull fracture). The absence of advancement of the head can be caused by the wrong direction of traction. With incorrect application of the forceps, they can slip, representing the danger of birth trauma to the mother and fetus.

*Complications* due to application of obstetrical forceps (especially cavitory) can be damage to the maternal passages (rupture of the cervix, vagina, even the lower segment of the uterus), pelvic organs (urinary bladder and rectum), especially in case of the wrong technique of applying forceps, rarely — rupture of the pubic symphysis and damage to the sacrococcygeal joints.

For the fetus the application of obstetrical forceps can cause hypostasis of tissue, cyanosis, hematoma, cephalhematoma, paresis of the face

nerve, damage to the bones of the skull, brain hemorrhage.

**Vacuum-extraction of the fetus** was offered in 1954 by Malmstrom to reduce the traumatic effects due to the use of forceps and was widely used in Europe. With the vacuum-extraction the fetal head rotates without threatening to damage the maternal tissue; a significant decrease in the intracranial pressure is observed with traction. The classical vacuum-extractor consists of a disk-like cup, which is intended for putting on the skin of the fetal head and in which vacuum (Fig. 126) is created. The Malmstrom's vacuum-extractor consists of a set of 4 metal cups



Fig. 126. Vacuum-extraction of the fetus

with a diameter of 5–8 cm, having rounded edges and concave internal surfaces.

Indications and conditions for applying the vacuum-extractor are the same as for obstetrical forceps (except for cases when it is necessary to remove “rough” labour activity — decompensated heart diseases, severe forms of late toxicosis of pregnant women, high degree myopia).

Applying of the vacuum-extractor can be done without the use of anaesthesia. Preparation for the operation is the same as for other vaginal interventions.

The lateral surface of the vacuum-extractor’s cup is entered into the vagina in the direct pelvic diameter with the right hand. Then the cup is returned to the transverse diameter, pressed to the fetal head, closer to the posterior (small) fontanelle, and traction is started synchronously with the contractions in the direction corresponding to the biomechanism of birth. With the cutting of the parietal tubera the vacuum is liquidated, the cup is separated from the head, which is further removed manually. With one hand traction is carried out, and the second hand supports the fetal head in the bent position.

Traction is performed only during uterine contractions. Vacuum-extraction should not proceed more than 30 min.

In Ukraine vacuum-extraction of the fetus is rarely used. It is believed that as a result of its application the risk of intracranial bleeding, cephalhematoma, damages to the skin of the head and even death of the fetus increases.

## FETUS-DESTROYING OPERATIONS

Fetus-destroying operations include *craniotomy*, *cleidotomy*, *embryotomy*.

**Craniotomy.** Before craniotomy was frequently used in case of death of the fetus and it was impossible to remove it with the help of obstetrical forceps, as well as with the threat of the uterine rupture as means of the safest operation for the mother. In modern practice in Ukraine the given operation is carried out mainly to simplify the birth of the head of the fetus with hydrocephaly (reducing the volume of the head and extracting the fetus).

The operation consists of perforating the head of the fetus (*perforatio capitis*) with the Fenomenov’s perforator with its subsequent compression with the Brown’s cranioclast (*cranioclasia*) and extraction of the fetus by traction of the cranioclast.

*Technique.* First the lower vaginal speculum is entered into the vagina, then — the upper; it is possible to enter the lateral specula so as to carrying out the operation under the control of the eye. Such control is very important in preventing wounds to the cervix and vaginal walls, especially when the head of the fetus is high in the pelvis or if it is necessary to start the operation in conditions of incomplete opening of the uterine os.

The nearest fontanelle or suture, if possible, is felt for with the finger; an incision is made in the skin and along the finger the perforator is entered into the vagina, which is stuck in the area of the fontanelle with the sharp end, penetrating through the brain membranes into the skull cavity. If the head appears mobile, it is necessary to first of all grasp and fixate it with two-pronged forceps (Muso).

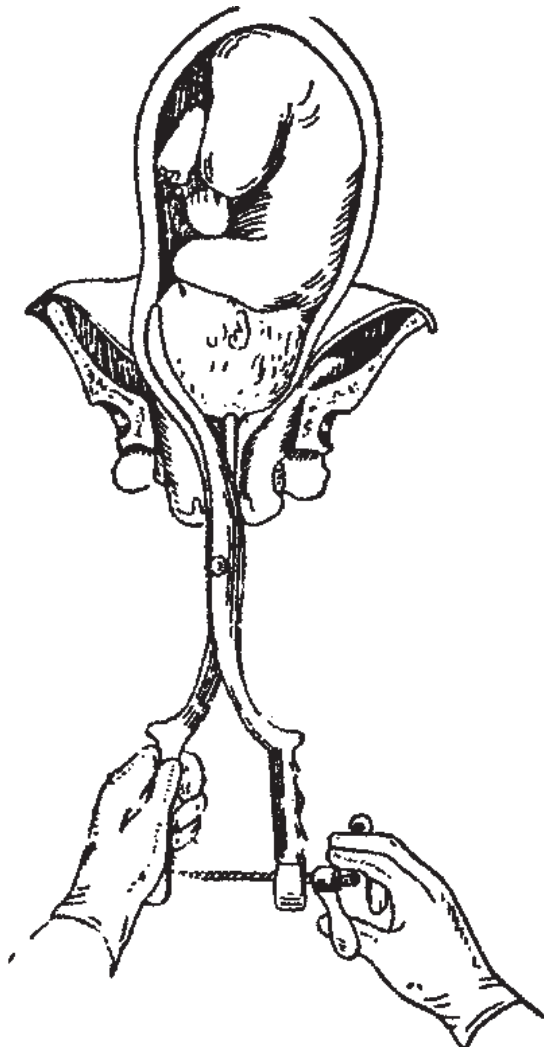
Between the applied forceps, the skin is cut with scissors and the perforator is entered through the incision in the skull. By pressing the handle of the perforator, with rotary movements, the aperture made in the skull is expanded. After that the perforator is taken out, and after this the brain substance is removed. Through the perforated aperture inside the skull, a spoon or a large curette is entered; the brain is destroyed and removed (*excerebratio*). Sometimes for the removal of the brain substance, the washing of the skull with a sterile liquid is applied. Having removed the brain, the application of the cranioclast is performed. For this purpose, first, the integral spoon with a stamp-like branch is entered inside the skull. Further on the external surface of the head, as a rule, on the face, the second, final, spoon is imposed, which is entered the same as for the spoons of the forceps. Thus, it is necessary to be convinced that the second spoon is directly on the face of the fetus, instead of the cervix.

The applied cranioclast is closed with screws (Fig. 127). The cranioclast’s lock is screwed strongly and if the os is entirely opened, then the fetus is removed.

**Cleidotomy.** When removing the fetus, it is possible to have difficulties when removing the shoulders, especially if the fetus is large and the maternal pelvis is narrow. In such cases the clavicle is cut, i.e. *cleidotomy* is done for which special scissors (Fenomenov’s) are used.

When carrying out the operation, it is necessary to remember that the fetus is dead, and it is necessary to prevent damage to the tissue of the maternal passages.

**Embryotomy.** In modern obstetrics a necessity for such an operation rarely occurs. Embryotomy (cutting the fetus into pieces) was carried out in case of the neglected transversal position



*Fig. 127.* Application of the cranioclast

of the dead fetus. The purpose of the operation is reducing the size of the fetal body as soon as possible, so that to remove it from the uterus in pieces.

Conditions for carrying out this operation are the following:

- full opening of the uterine aperture;
- absence of absolute narrowing of the pelvis (conjugata vera no less than 7 cm);
- the operation is performed under general anaesthesia (narcosis).

Depending on the character of the position of the fetus, several variants of embryotomy are used: decapitation (*decapitatio*), breaking of the spinal column (*spondilotomia*), removing of the internal parts (*evisceratio*). All of them are carried out with the purpose of reducing the volume of the fetus.

After cutting the fetus and reducing its sizes, it is necessary to be very cautious so that not to injure the wall of the uterus and vagina, remove the fetus in pieces. The head thus is grasped (fixed) with the Muso's forceps, perforated and removed.

In modern obstetrics fetus destroying operations are used seldom. It is connected to an increase in the possibility of prenatal diagnosis concerning the revealing of developmental anomalies of the fetus (ultrasonography, amniocentesis, exam of the level of  $\alpha$ -fetoprotein) and duly abortion at early terms. This is also promoted by the perfection of technique of conducting birth and research of the condition of the fetus (heart rate monitoring, biophysical structure, dopplerometria), duly performance of caesarean section or application of obstetrical forceps in the interests of the mother and fetus. Besides, in advanced countries for the safety of the mother, as well as from the position of humanity even with the presence of fetal developmental anomalies, caesarean section is performed.

#### RECOMMENDED READING

3; 5; 7; 21; 22; 25; 29; 46; 56; 57; 61.

**PART I. PHYSIOLOGICAL  
OBSTETRICS**

*Chapter 1*

**PRINCIPLES OF OBSTETRICAL  
AND GYNAECOLOGIC AID  
ORGANIZATION IN UKRAINE**

1. An ambulance delivers a parturient woman with a full-term pregnancy which complaints of periodic pains in the lower abdomen, till 30–40 s through 4–5 min, the amniotic fluid discharged 12 h ago. The body temperature is 38.5°C. There are vaginal discharge with an odour. The fetal heartbeats are dull, rhythmical, 160 beats/min. Which department of the maternity hospital should the patient be hospitalized in?

- A. Admission department.
- B. Physiological department.
- C. Pathological pregnancy department.
- D. Intensive care department.
- E. She does not need hospitalization.

2. A primipara, 20 years old, arrived to the maternal hospital. Labour at term. The heartbeats of the fetus are rhythmical, 140 beats/min. She complaints of rhinitis, body temperature is subfebrile. What department of the maternity hospital must the patient be hospitalized at?

- A. Admission department.
- B. Physiological delivery department.
- C. Gynaecological department.
- D. Pathological pregnancy department.
- E. Intensive care department.

3. The body temperature in a puerperal patient increased up to 38°C on the 5th day after labour. Complaints of pain in the lower abdo-

men. At examination abundant purulent lochia are revealed. What department must the patient be treated at?

- A. Septic department.
- B. Observational delivery department.
- C. Physiological delivery department.
- D. Gynaecological department.
- E. Polyclinic.

4. The  $\beta$ -haemolytic staphylococcus of the A group was revealed at bacteriological examination of nasal smear of a delivery room' midwife. All the listed measures should be conducted for prophylaxis of zymotic diseases **except**:

- A. Antibiotic prophylaxis.
- B. Physiotherapy of nasal mucous.
- C. Local antiseptics.
- D. Vitamin therapy.
- E. Bacteriological re-examination after treatment.

5. Acute respiratory infection was diagnosed in a parturient woman at the physiological delivery department. All the listed measures should be conducted for prophylaxis of zymotic diseases **except**:

- A. Antibiotic therapy.
- B. Isolation of parturient woman.
- C. "Immunal" prescription.
- D. Vitamin therapy.
- E. Symptomatic therapy.

6. A parturient woman has arrived with complaints of the amniotic fluid outflow 14 h ago. What department should she be delivered to?

- A. Observational delivery department.
- B. Physiological delivery department.
- C. Does not matter.
- D. Septic department.
- E. Isolation room.

7. Delivery in a primipara has finished "per vias naturales", total duration 9 h 25 min with an alive mature boy, 3,750, 54 cm, 8–8 pp. accord-



ing to the Apgar's score. The perineotomy and perineorrhaphy was conducted (3 silk suture were applied). Waterless period comprised 3 h 10 min. The course of pregnancy was physiological. Total bloodloss was 250 ml. Point the contraindications for *rooming-in* (for mother and newborn).

- A. Perineotomy.
- B. Fast delivery.
- C. Prolonged waterless period.
- D. Premature birth.
- E. Physiological bloodloss.

8. A primigravida, 33 years old, addressed for consultation to the legal office; works as an aid-woman in the hospital. The pregnancy course is physiological, the gestational term is 16 weeks, no somatic pathology revealed. Determine the term of pregnancy when she may not work in the night time:

- A. 20 weeks.
- B. 16 weeks.
- C. 24 weeks.
- D. 30 weeks.
- E. 12 weeks.

9. In a just opened maternity hospital there are 130 beds. How many beds should contain the department of pathological pregnancy?

- A. 50.
- B. 40.
- C. 30.
- D. 20.
- E. 10.

10. The committee for maternity leave solves the term of its ending for a puerperal patient. Ten days ago she delivered an alive mature girl, 3,200 g, 50 cm, 8–9 pp. at the Apgar's score. Pregnancy and labour are physiological. She was discharged from the hospital on the 5th day of the puerperal period. The condition of the puerpera and newborn is satisfactory. How long is the maternity leave supposed to last?

- A. 56.
- B. 26.
- C. 36.
- D. 96.
- E. 76.

11. Deputy of principal doctor has to demonstrate the index of early neonatal death. It is necessary to do the following: "total quantity of newborns that died during 0–1 day of life" multiply on:

- A. 1,000 alive newborns.
- B. 1,000 delivery with alive and dead newborns.
- C. 100,000 alive newborns.
- D. 1,000 pregnancies.
- E. 10,000 female population.

## Chapter 2

### DEONTOLOGIC AND PSYCHOSOMATIC ASPECTS OF OBSTETRICS AND GYNAECOLOGY

1. A primipara, 35 years old, delivered an alive newborn, 4,000 g. In 30 min the hemorrhage began without placental separation. Manual detachment and removing of the placenta was done. The uterus did not contract despite all the conservative treatment, hemorrhage proceeded. Total bloodloss comprised 1,500 ml. The laparotomy and total hysterectomy was conducted according to vital-saving indications. The woman was discharged from the hospital in a satisfactory condition with an alive baby on the 13th day. What doctor must not tell the patient's husband about conducted operation?

- A. Extent of operation.
- B. Inform about operation.
- C. Indications for operation.
- D. Patient's consent for operation.
- E. Haemorrhage was the indication for the operation.

2. A primigravida, 16 years old, was treated in the department of pathological pregnancy because of gestosis of the second half of pregnancy. As the result of conducted treatment the edema disappeared, ABP decreased from 150/100 up to 120/90 mm, but proteinuria was still on. The patient insisted on discharging from the hospital. The doctor informed the patient about possible complications in the case of termination of treatment. Still the patient considered herself healthy and left the hospital without permission. Point the illegal act of the medical staff:

- A. Refusal in medical care in this maternity hospital.
- B. A senior midwife informs the maternity hospital.
- C. Holding conversation with the patient and her husband about necessity of continuation of in-hospital treatment
- D. The patient reports her official deny from treatment in individual case history.
- E. Holding of house patronage.

3. Acute intrauterine fetal hypoxia was revealed at the II stage of labour. The head of the fetus is on the pelvic floor, complete disclosure of the uterine cervix are determined. The doctor has informed a patient about necessity of obstetrical forceps applying. The woman shows her flat refusal. In 30 min the patient delivered

a dead mature fetus with twice cord entanglement around the fetal neck. What treatment measures must the doctor undertake?

- A. Proceed conservative treatment, conduct perineotomy.
- B. Apply obstetrical forceps forcibly.
- C. Conduct caesarean section.
- D. Conduct a fetus destroying operation.
- E. Conduct ultrasound examination.

4. The organization of medical service of the delivery department are being discussed at the medical conference, particularly concerning early applying of newborns to maternal mammary gland. One of young doctors was asked about contraindication. Which of them should be listed?

- A. All listed below.
- B. Premature birth.
- C. Operative delivery.
- D. Patrimonial traumatism of a fetus.
- E. Haemolytic disease of a newborn.

5. A primigravida, 16 years old, addressed to a gynaecologist for consultation concerning long-term anaemia on the background of antianemic treatment. The doctor cancelled a conducted treatment immediately explaining the uselessness of medicines. Then the doctor sent the patient for additional examination and promised to help by means of modern treatment. What was wrong in the doctor's consultation?

- A. Criticizing the prescribed treatment.
- B. Revealing the conducted treatment.
- C. Sending for additional examination.
- D. Explaining of existence of modern methods of treatment.
- E. Consulting a patient who was treated by another doctor.

6. A secundipara, primigravida has severe hemorrhage in premature labour. The patient was informed about a necessity in operative treatment and possible complications. The woman gave her consent for operation. During operation preterm separation of a normally presented placenta complicated by the Couvelaire uterus was diagnosed. Total hysterectomy was conducted. The baby was born dead. The patient asked not to inform anybody about the operation extent. The doctor did not indicate the extent of operation in the medical certificate, but in the inquiry to the polyclinic wrote the correct diagnosis. In personal conversation with the patient's husband the doctor informed him about impossibility of restoration of menstrual and reproductive function in the patient. What was wrong in the doctor's activity?

- A. Informing husband about impossibility of restoration of menstrual and reproductive function.
- B. Nonindication of the extent of operation in a sick-list.
- C. Indication of the extent of operation in inquiry to polyclinic.
- D. Requiring of the patient's consent for operation.
- E. Informing the patient about possible complications.

7. A patient of 21 years old, with complaints of acute pain in the lower abdomen, sudden loss of consciousness arrived to the hospital without an attendant. After a special gynaecological, laboratory and ultrasound examination the doctor established the diagnosis: ectopic pregnancy, rupture of the fallopian tube, intraabdominal hemorrhage. The doctor informed the patient about the diagnosis, possible complications and necessity in the operative treatment. The unmarried patient did not give her consent for operation. What must the doctor do?

- A. Conduct the operation by life-saving indications.
- B. Conduct hemotransfusion.
- C. Conduct antianemic treatment.
- D. Not to provide medical care in this hospital.
- E. Conduct psychological rehabilitation.

### *Chapter 3*

## **CLINICAL ANATOMY OF THE FEMALE GENITAL TRACT AND THE GYNECOID PELVIS**

1. At external examination of pregnant women it was revealed that longitudinal size of Michaelis' rhomboid is 8 cm, transversal — 10 cm. What is the size of external conjugate?

- A. 18 cm.
- B. 20 cm.
- C. 14 cm.
- D. 16 cm.
- E. 2 cm.

2. The pelvic sizes of a primigravida are: 25–28–31–20 cm. The diagonal conjugate is 12.5 cm. Determine the type of a pelvic form:

- A. Normal pelvis.
- B. Flat rachitic.
- C. Justo minor pelvis.
- D. Transversally contracted.
- E. Simply flat.

3. The signs of perineal rupture appeared during labour are observed in a primipara, 30 years old. The preineotomy was conducted with the aim of prophylaxis of trauma. It is necessary to suture following for perineum reconstruction:

- A. Skin and centrum tendineum perinei.
- B. Skin and musculus levatoris ani.
- C. Skin and musculus gluteus major.
- D. Skin and musculus superficialis perinea.
- E. Skin and musculus cocigei.

4. After delivery of a big fetus the increasing hematoma of the lower third part of the left vaginal wall was revealed at survey of maternal passages. What vessels should be ligated:

- A. Arteria pudenda interna.
- B. Arteria recta medialis.
- C. Arteria uterine.
- D. Arteria vesica superior.
- E. Arteria vesica inferior.

5. It is necessary to ligate uterine arterias while conducting caesarean section, complicated by hypotonic bleeding. What region should be involved?

- A. The region of the internal os of the uterine cervix.
- B. The region of plica vesico uterina.
- C. The region of the external os of the uterine cervix.
- D. The region of the uterine fundus.
- E. The region of the uterine angles.

6. One of the planes of the pelvis is limited from behind promontorium of sacrum, at the front — by spina iliaca, from the sides — by linea terminalis. Name this plane:

- A. Plane of inlet.
- B. Plane of wide part.
- C. Plane of narrow part.
- D. Plane of outlet.
- E. Axis of pelvis.

7. What does the value of obstetrical conjugate (conjugata vera) equals to if the external conjugate = 20 cm, and the circumference of the radiocarpal joint = 14.5 cm:

- A. 11 cm.
- B. 9 cm.
- C. 10 cm.
- D. 12 cm.
- E. 13 cm.

8. What suture can be determined on the presenting part at internal obstetric examination, if in the region of pubic symphysis it joins the triangle ventricle and the rhomboid ventricle at the sacrum region?

- A. Saggital.
- B. Coronal.
- C. Lambdoid.
- D. Frontal.
- E. Direct.

9. A multipara is in labour during 9 h. Complete dilation of the uterine os. The amniotic membrane is absent. The head of the fetus is in the plane of the outlet, saggital suture is placed closer to symphysis pubis. By what size of the fetal head will the fetus be born in this presentation?

- A. Small oblique.
- B. Direct.
- C. Vertical.
- D. Big transversal.
- E. Small transversal.

10. A parturient woman had admitted to the hospital at the II stage of labour. The penetration of the fetal head is taking place during one hour. The skin of the perineum is thinned. Episiotomia was held. It is necessary to suture the following formations:

- A. Skin of labia majora pudendi.
- B. Skin and musculus levatoris ani.
- C. Skin and musculus gluteus major.
- D. Skin and musculus superficialis perinea.
- E. Skin and musculus cocigei.

#### Chapter 4

### PHYSIOLOGY OF THE FEMALE GENITAL SYSTEM

1. A woman, 23 years old, addressed the gynaecologist for consultation. After a special gynaecological examination it was revealed that mucus from the uterine cervix is transparent, its extension reaches 10 cm, the fern symptom is positive, diameter of the external os of the uterine cervix — 2 cm. What phase of the menstrual cycle does it correspond to:

- A. Periovulatory.
- B. Lutein.
- C. Follicular.
- D. Desquamation.
- E. Regeneration.

2. A 24-year old woman, who had never been pregnant before, stopped receiving oral contraceptives. She had one menses since the last drug intake, and then within 6 months amenorrhea had been observed. Choose the most suitable investigation.

- A. Determination of the gonadotrophins level.
- B. US of the pelvic organs.
- C. Progesterone test.
- D. Computer tomography of the head.
- E. Determination of the contents of testosterone-depot in the blood serum.

3. In a woman of 24 years old which had a normal menstrual function before, the cycles became irregular, according to tests of function diagnosis — anovulatory. The prolactin level in the blood is elevated. Choose the most suitable investigation.

- A. Determination of the gonadotrophins level.
- B. US of the pelvic organs.
- C. Progesterone test.
- D. Computer tomography of the head.
- E. Determination of the testosterone-depot contents in the blood serum.

4. Which of the following changes in the endometrium do not occur during the menstrual cycle?

- A. Plasma cell infiltration.
- B. Vascular growth.
- C. Stromal edema.
- D. Decidual reaction.
- E. Proliferation of the glandular cells.

5. A woman of 31 years old with a nonregular menstrual cycle addresses the gynaecologist with complaints of infertility. Last menstruation finished 7 days ago. The hormonal, ultrasonic examination in combination with the tests of functional diagnosis were recommended. Which of the following data is not characteristic of the described phase of the physiological menstrual cycle:

- A. Basal body temperature over 37°C.
- B. Variable length.
- C. Growth and development of the ovarian follicles.
- D. Vascular growth of the endometrium.
- E. Estrogen ovarian secretion.

6. A young girl of 13 years old addressed the gynaecologist with complains of absence of menarche. During examination no genital and extragenital pathology is revealed. The establishment and maintenance of the menstrual cycle depend on:

- A. Pulsatile secretion of the gonadotrophin-releasing hormone.
- B. Prolactin release by anterior pituitary.
- C. The follicular phase of variable length.
- D. Progesterone synthesis by corpus luteum.
- E. Estrogen ovarian secretion.

7. A patient complains of infertility. The anovulatory cycle is revealed after complex examination. The stimulation of ovulation is prescribed. The best predictor of ovulation is:

- A. The onset of the luteinizing hormone production.
- B. Estrogen peak.
- C. Follicle stimulating hormone.
- D. LH peak.
- E. Preovulatory progesterone rise.

8. A woman of 35 years old has visited the gynaecologist with complaints of irregular painful menstruations. Which of the following is fundamental in the etiology of dysmenorrhea:

- A. Ovulation.
- B. Secretory endometrium.
- C. Progesterone fall.
- D. Corpus luteum.
- E. Prostaglandin release.

9. A woman of 28 years old visited the gynaecologist with complaints of infertility. The menstrual cycle became irregular after a cranial trauma. Hormonal examination revealed a decrease in gonadotrophin-releasing hormone (GnRH) secretion. Synthesis and secretion of which of the following substances are under GnRH control:

- A. Follicle-stimulating hormone, luteinizing hormone.
- B. Dopamine.
- C. Prolactin.
- D. Norepinephrine.
- E. Thyrotrophin-releasing hormone.

## Chapter 5

### FERTILIZATION AND EMBRYOGENESIS

1. Lysis of the zygote's membrane takes place in the uterine tube during the first critical period. What complication of pregnancy is suspected?

- A. Implantation of the embryo into the tubal wall.
- B. Death of the embryo.
- C. Invagination of the blastocyst's wall.
- D. Returning of the blastocyst to the ampular part of the tube.
- E. Formation of two blastocysts.

2. The follicular cells participate in formation of zona pellucida around the cytolemma of the oocyte. What is their function?



- A. Trophic.  
B. Enzymatic.  
C. Excretory.  
D. Respiratory.  
E. Transport.
3. While interviewing a pregnant woman the obstetrician found out that she suffered from acute infective disease at the gestational term of 3–4 weeks. What stage of embryogenesis might be affected?  
A. Formation of intestinal tube.  
B. Implantation.  
C. Placentation.  
D. Development of the brain.  
E. Formation of the genital system.
4. During gastrulation the differentiation of nucleating layers and formation of axial germs of the organs happens. All listed below is correct **except**:  
A. The neural tube originates from ventral ectoderma.  
B. The epithelium of the thin intestine originates from entoderma.  
C. The dermatome originates from the mesoderma.  
D. The sclerotome is a part of somite.
5. The implantation and further development of embryo are promoted by transformation of stroma of the endometrium. What is the result of this transformation?  
A. Formation of decidual membrane.  
B. Desquamation of the functional layer.  
C. Hypertrophy of the myometrium.  
D. Formation of the placenta.  
E. Proliferation of the basal layer.
6. During gastrulation the abnormality of formation of primary stria happened. What malformation of development should be expected?  
A. Malformation of the placenta.  
B. Malformation of the neural tube.  
C. Malformation of the amnion.  
D. Malformation of the horde.
7. At examination of a newborn with dysfunction of kidney excretion, the pathology of development of epithelium of renal tubules was found. What germ did the abnormality happen during embryogenesis in?  
A. Mesoderma.  
B. Alantois.  
C. Entoderma.  
D. Ectoderma.  
E. Pechordal plate.
8. On 6th–7th day after fertilization embryo reaches the uterine cavity. The stage of splitting is over. What form does the zygote obtain by this time?  
A. Blastocyst.  
B. Embryonal faceplate.  
C. Embryonal layers.  
D. Extraembryonal organs.  
E. Epiblast.
9. The embryogenesis lasts for 280 days, which are divided into the subperiods. What terms does the embryonal period correspond to?  
A. 3–8 weeks.  
B. 1–5 weeks.  
C. 3–6 weeks.  
D. 1 month.  
E. 8–12 weeks.
10. During the embryo development the yolk sac forms that does not contain yolk. What is the function of this organ?  
A. Haemopoietic.  
B. Secretory.  
C. Endocrine.  
D. Trophic.  
E. Excretory.
11. For histologic examination the microscopic specimens of fetal and maternal parts of the placenta were given. What structures do not belong to the fetal part?  
A. Smooth chorion.  
B. Villous chorion.  
C. Cytotrophoblast.  
D. Sympathotrophoblast.  
E. Langhans' fibrinoid.
12. The main organ that provides connection between maternal and fetal organism is the placenta. To what type of the placentas does it belong?  
A. Haemochorial.  
B. Desmochorial.  
C. Endoteliochorial.  
D. Epitheliochorial.  
E. Myochorial.

## Chapter 6

### ADAPTIVE CHANGES IN A FEMALE ORGANISM DURING PREGNANCY

1. A 19-year old primigravida, height is 168 cm, weight is 45 kg is in the gestational term of 10–11 weeks. During consultation with the ther-

therapist she complains of palpitation, irritability, tearfulness, decrease in the body weight. Objective: the skin and visible mucous have usual color. ABP is 115/70 mmHg, pulse is 108 beats/min, does not vary during her sleeping, functional systolic murmur is auscultated. Borders of the heart are not modified, in ECG there is a vertical position of electrical axis of heart, sinus tachycardia, slight hypertrophy of the myocardium of the left ventricle. Clinical analysis of the blood and urine are without pathological variations. What is the most probable cause of the condition of pregnant women?

- A. Acquired heart disease.
- B. Active phase of the rheumatic process.
- C. Congenital heart disease.
- D. Disease of the thyroid gland.
- E. Adaptation to pregnancy.

2. A 20-year old primigravida, height is 166 cm, weight is 56 kg in term of 13–14 weeks. During consultation with the therapist she complains of palpitation, irritability, tearfulness, decrease in the body weight. Objective: the skin and seen mucous have usual colour. ABP is 115/70 mm, pulse — 98 beats/min, does not vary during her sleeping, functional systolic murmur is auscultated. Which of the following statements concerning maternal physiology during pregnancy is not correct?

- A. Functional residual capacity of the lungs is increased.
- B. Cardiac output is increased.
- C. Oxygen consumption is increased.
- D. Inspiratory capacity of the lungs is increased.
- E. Pulmonary ventilation is increased.

3. A woman states that her last menstrual period was 7 weeks ago. She has had a positive home pregnancy test. Measurement of which of the following hormone levels would be appropriate at this time?

- A. Human chorionic gonadotrophin.
- B. Human chorionic somatotrophin.
- C. Progesterone.
- D. Prolactin.
- E. Estrinol.

4. At examination of a primigravida at 33 weeks of pregnancy the clinical blood analysis shows: Hgb 109 g/l, erythrocytes 3.4 T/l, leucocytes  $8 \cdot 10^9$ , ESR 30 mm/h. Level of serum iron, and iron-binding ability is in the norm. Coagulatory system is not violated. A patient shows no complaints. No complication of pregnancy was revealed. What is the most probable origin of the condition:

- A. Physiological anaemia of pregnancy.
- B. Haemolytic anaemia.

- C. Aplastic anaemia.
- D. Congenital anaemia induced by red blood cells hypoplasia.
- E. Chronic post-haemorrhagic anaemia.

5. At examination of vaginal smear of a 25 years old pregnant woman at 28 weeks of gestation it was found out that leucocytes quantity comprised: in the urethra 2–4 in the field of view, in the cervical channel — 4–6, in the vaginal wall — 6–10; no pathogenic microorganisms, no pathology of epithelium cells is revealed; vaginal content pH = 6. What is the origin of increased acidity of vagina content?

- A. Elevated level of lactic acid.
- B. Vaginitis.
- C. Bacterial vaginosis.
- D. Age peculiarities.
- E. Migration of cylindrical epithelium.

6. A primigravida, 23 years old, is on dispensary observation in the maternity hospital. Term of gestation is 26 weeks. No complication of pregnancy is observed, no extragenital pathology is revealed. The routine biochemical examination of blood revealed significant increasing of the lipid level (up to 30%). Biochemical liver tests are normal. At the lipidogram: shift to the side of triglycerides (increasing up to 2.5 times) and low density lipids (up to 20%). What is the most probable reason of tests violations?

- A. Supplying of demands of a developing pregnancy.
- B. Congenital hyperlipidemia.
- C. Cardiovascular pathology.
- D. Presence of a malignant neoplasm.
- E. Antiphospholipid syndrome.

7. A primigravida of 32 years old complains of sense dyspnea, fatigue at 22 weeks of pregnancy. Before direction for physical preparation for labour. At objective examination: the skin and visible mucous have usual color. The ABP is 110/70 mm, pulse is 88 beats/min. Clinical blood analyses revealed no pathology. The tests of functional condition of the respiratory system revealed that respiratory volume is increased up to 42%, alveoli ventilation increased up to 56%, functional capacity of residual and reserve volume of expiration decreased up to 18%. Inspiration volume increased up to 10%, respiration rate increased up to 50%. What is the most probable reason of respiratory tests violations?

- A. Influence of progesterone on the respiratory center.
- B. Bronchial asthma.
- C. Obstructive pulmonary disease.
- D. Surfactant insufficiency.
- E. Pneumonia.

## Chapter 7

### DIET AND HYGIENE OF PREGNANT WOMEN

1. A woman, 32 weeks of pregnancy at her visit to the maternity hospital revealed that weekly gaining weight comprised 600 g. What is normal weekly gaining weight?
  - A. 300–400.
  - B. 200–300.
  - C. 400–500.
  - D. 500–600.
  - E. 600–700.
2. A primipara, 26 years old, is at the dispensary observation in the maternity hospital. The term of pregnancy is 9–10 weeks. From anamnesis it was revealed that during last two years is vegetarian. What deficiency is the most probable in this woman?
  - A. Vitamin B<sub>12</sub>.
  - B. Calcium.
  - C. Folic acid.
  - D. Iron.
  - E. Iodine.
3. In a primipara, 25 years old, at 34 weeks of pregnancy it was revealed: an excessive gaining weight, edematous feet, positive ring symptom. What correction of nutrition should be done?
  - A. Limitation of liquid and salt.
  - B. Limitation of dairy products.
  - C. Limitation of protein and carbohydrates.
  - D. Limitation of fat.
  - E. Increasing of meat, liver, fruit.
4. A pregnant woman at the term of 32 weeks complaints of general weakness, dizziness. The clinical blood analysis: erythrocytes  $2.8 \cdot 10^{12}/l$ ; hemoglobin 92 g/l. What is the correct way of diet exchanging?
  - A. Increasing of meat, liver, fruit.
  - B. Increasing of dairy products.
  - C. Increasing of protein and carbohydrates.
  - D. Limitation of fat.
  - E. Limitation of liquid and salt.
5. The increasing of hemoglobin in blood of a pregnant woman up to 1 U on Sahli will take place due to administration of iron (mg):
  - A. 25.
  - B. 10.
  - C. 15.
  - D. 40.
  - E. 50.
6. A multipara at 32 weeks of pregnancy anaemia of pregnancy of a moderate degree has. The coming labour is fourth. At examination of microelements of hair the deficiency of folates is revealed. Prescribe the treatment:
  - A. Folic acid, vitamin B<sub>12</sub>.
  - B. Methionin.
  - C. Glutamine acid.
  - D. Vitamin B<sub>1</sub>, vitamin B<sub>6</sub>.
  - E. Panangin, potassium orotate.
7. A multipara at 35 weeks of pregnancy is administered iron-containing medicines with the aim of treatment of anaemia of pregnancy. What treatment should be recommended additionally?
  - A. Sour green apples.
  - B. Acid milk diet.
  - C. Calcium and phosphorus.
  - D. Tea or coffee restriction.
  - E. Porridge and nuts.
8. A primipara at 7–8 weeks complains of vomiting 3–4 times a day. In the anamnesis — viral hepatitis 3 years ago. General condition is normal. What recommendation for nutrition should be given?
  - A. Using of fluid meal with low temperature 5–6 times a day.
  - B. Boiled meat, liver.
  - C. Raisin, baked potato.
  - D. Limitation of liquid up to 800 ml per day.
  - E. Sparing diet (apple-cheese once a week).
9. With the aim of revealing latent diabetes mellitus in a primigravida the screening test for glucose tolerance is prescribed. Recommendation for preparation for test include all **except**:
  - A. Exclude floury products, sweets.
  - B. Usual physical loading.
  - C. 10–16 h night starvation.
  - D. 3 days without carbohydrates limitation.
  - E. Examination on an empty stomach.

## Chapter 8

### THE PROBLEMS OF TERATOLOGY AND MEDICAL GENETICS

1. A pregnant woman of 18 years old visited the maternity hospital at the term of 11–12 weeks. From the anamnesis it is known that one month ago the woman suffered from rubella. What influence on the fetus is probable?
  - A. Birth defects of the fetus.
  - B. Haemolytic disease of the newborn.
  - C. A birth trauma to the newborn.
  - D. Illness of hyaline membranes.
  - E. Chromosomal anomalies of the fetus.

2. A multigravida, 27 years old, was hospitalized with a term pregnancy and labour contractions that began 5 h ago. Circumference of the abdomen is 109 cm, height of the standing of the uterine fundus is 38 cm. Position of the fetus is longitudinal, head presentation. The head is movable above the pelvic inlet, of big size. Palpitation of the fetus is clear, rhythmical, 126 b/min. Internal obstetrical examination: cervix is flattened, disclosure — 5 cm. Sagittal suture is in the right oblique size, width of the suture is 1 cm, fluctuating small fontanelle is on the left. Point the additional method of examination, confirming the hydrocephaly of the fetus.

- A. Ultrasound examination.
- B. Auscultation.
- C. Cardiotocography.
- D. Laparoscopy.
- E. Culdoscopy.

3. A primigravida, 32 years old, has visited the maternity hospital with complaints of absence of fetal movements during 48 h. The term of gestation is 28 weeks. Three days ago was ill with influenza. The body temperature is 39°C. At examination antenatal death of the fetus is established. What is happening with the level of estriol in the urine?

- A. Decreases significantly.
- B. Decreases insignificantly.
- C. Increases significantly.
- D. Increases insignificantly.
- E. Does not vary.

4. At a multigravida with the 4th pregnancy the gestational term is 32 weeks. Hydrocephaly of the fetus is established at ultrasound examination. In anamnesis — two miscarriages and antenatal death of the fetus in 28 weeks. Point the obligatory additional method of examination:

- A. TORCH-group infection examination.
- B. Clinical blood analysis.
- C. Clinical urine analysis.
- D. Examination of vaginal smears.
- E. Biochemical blood tests.

5. In a pregnant woman during the dispensary observation it was revealed that in first labour there was born a girl with genetic pathology. At what pregnancy term is it necessary to conduct amniocentesis for diagnosing probable genetic anomalies of the fetus?

- A. 15–16 weeks.
- B. 6–7 weeks.
- C. 12–14 weeks.
- D. 17–18 weeks.
- E. 20 weeks.

6. A primigravida, 37 years old, is taken for dispensary observation at the maternity hospital. The term of gestation is 7–8 weeks. The course of pregnancy is physiological. What complication of pregnancy must be predicated first of all?

- A. Birth defects.
- B. Pre-eclampsia.
- C. Miscarriage.
- D. Early gestosis.
- E. Placental insufficiency.

7. Which of the following procedures allows the earliest taking of DNA for prenatal diagnosis in pregnancy?

- A. Chorionic villus sampling.
- B. Amniocentesis.
- C. Fetal biopsy.
- D. Fetoscopy.
- E. Percutaneous umbilical cord sampling.

8. Which of the following procedures requires the least technical skills and poses the lowest risk for fetal loss?

- A. Amniocentesis.
- B. Fetoscopy.
- C. Chorionic villus sampling.
- D. Fetal biopsy.
- E. Percutaneous umbilical cord sampling.

9. Which of the following disorders can not be diagnosed prenatally with DNA technology?

- A. Neural tube defects.
- B. Phenylketonuria.
- C.  $\beta$ -Thalassemia.
- D. Duchenne's muscular dystrophy.
- E. Cystic fibrosis.

10. Genetic counseling is advisable in each of the following clinical situations **except**:

- A. A pregnant woman of 21-year old with no family history of genetic disease.
- B. A 35-year old woman who plans to acquire a family.
- C. A pregnant woman who is a carrier of Tay-Sachs gene.
- D. A 39-year old woman who has one child with a neural tube defect and would like to have more children.
- E. A couple who has two children with unbalanced translocations.

## Chapter 9

### DIAGNOSIS OF PREGNANCY

1. A woman of 26 years old has visited a doctor of the maternity hospital with complaints of nausea, vomiting once a day, sleepiness, delay



of menses for 2 months. Bimanual examination revealed: cyanosis of the cervical and vaginal mucous. The uterus is enlarged till the sizes of a female fist, softened, is especial in the isthmical area, however, during inspection became denser, painless. Appendages are not palpated. Allocation mucous. Establish the most correct diagnosis.

- A. Pregnancy of 8 weeks.
- B. Uterine fibromyoma.
- C. Salpingocycosis.
- D. Infringement of a menstrual cycle.
- E. Gastritis.

2. A primigravida. Last menses on May, 29, the first movement — on October, 20. At the first visit to the maternity hospital the pregnancy term is 7 weeks (on July, 24) has been determined. It is expected that labour can begin:

- A. On March, 5.
- B. On April, 17.
- C. On March, 15.
- D. On March, 29.
- E. On February, 17

3. A woman of 26 years, parous 7 months ago, within last 2 weeks suffers from nausea, vomiting in the mornings disturb, sleepiness. Menses was not observed after labour. The patient didn't use the birth control methods. What method is expedient for specification of the diagnosis?

- A. Ultrasound.
- B. Pelvic organs roentgen.
- C. Palpation of the mammary glands and colostrum exam.
- D. Bimanual vaginal examination.
- E. Exam with specula.

4. While examining a pregnant woman at the maternity hospital, the doctor found out that the uterus enlarged till 5–6 weeks of pregnancy, azygomorphous, in the left angle of the uterus the diverticulum is palpated. The uterus of soft consistence, but during exam was reduced and condensed. After the termination of irritation the uterus became soft again. What signs of pregnancy were found out by the doctor?

- A. Piskacek and Snegiryov's.
- B. Gorvits—Hegar's.
- C. Genter and Piskacek's.
- D. Gubarev and Gauss'.
- E. Snegiryov and Genter's.

5. The patient of 22 years old complains of a delay of menses during 2 months. Gustatory changed. Deliveries — 0, abortions — 0. Vaginal examination: the vaginal and cervical mucous is cyanotic, the uterus of the sacciform

form, enlarged till 7–8 weeks of pregnancy, a soft consistence. Appendages without features. The isthmus of the uterus is softened. Vaults of the vagina are free. What diagnosis is the most reliable?

- A. Uterine pregnancy.
- B. Hysteromyoma.
- C. Infringement of the menstrual cycle.
- D. Vesical drift.
- E. Chorionepithelioma.

6. A 32-year old woman with gestation of 28 weeks is referred to define the position of the fetus. Which method of examination should be used in this case?

- A. Ultrasound.
- B. Roentgenoscopic.
- C. Radionuclide.
- D. Thermal.
- E. Radiographic.

7. A woman has a regular 28-day menstrual cycle. Last menses were from April, 8 till April, 12, 1998. Prospective term of delivery?

- A. On January, 15, 1999.
- B. On January, 01, 1999.
- C. On January, 8, 1999.
- D. On January, 22, 1999.
- E. On January, 29, 1999.

8. A woman of 22 years old complains of nausea, vomiting ones a day, sleepiness, delay of menses for 2 months. At bimanual exam: the uterus enlarged till the sizes of the female fist, softened, especially in the isthmical area, painless. Appendages are not palpated. Discharge are mucous. What is the most probable diagnosis?

- A. Pregnancy of 8 weeks.
- B. Hysteromyoma.
- C. Salpingocycosis.
- D. Infringements of the menstrual cycle.
- E. Uterine endometriosis.

9. A pregnant woman, 36 weeks of gestation, in a dorsal decubitus complains of weakness, difficulty of respiration. During exam in the position on her back in 5 min respiration up to 24 per minute, decrease in the ABP to 70/50 mmHg; in a lateral position the RR 20 per min, the ABP is 115/65 mmHg. Specify the reason of the given condition?

- A. Syndrome of prelums of the bottom vena cava.
- B. Neurocirculatory dystonia by the hypotonic type.
- C. Oligemia.
- D. Pre-eclampsia.
- E. Eclampsia.

10. A patient, 22 years old, has visited the maternity hospital with complaints of a delay of menses for 1.5 months, nausea, fatigability, sleepiness, irritability. At survey on the trunk and papillae pigmentation is expressed. No pathology is revealed on the part of internal organs. At exam in specula the cyanosis of vaginal and cervical mucous is determined; at bimanual exam — augmentation of the uterus, its hyperantestraightening, asymmetry. What are the listed complaints and the data of bimanual exam most likely connected to?

- A. Uterine pregnancy.
- B. Infringement of the menstrual cycle.
- C. Disease of the gastrointestinal tract.
- D. Ectopic pregnancy.
- E. A tumour of the uterus.

11. A patient, 22 years old, has visited the maternity hospital with complaints of delay of menses for 2 months, the appeared indication to a spicy food, nausea, sleepiness, aversion for a tobacco smoke. At bimanual exam: the uterus in hyperantestraightening, enlarged till a goose egg sizes, in the area of the left angle — asymmetry. What probable attributes specify the presence of pregnancy?

- A. Absence of menses, hyperanteflexion and asymmetry of the uterus.
- B. Indication to a spicy food.
- C. Vausea.
- D. Sleepiness.
- E. Aversion for tobacco smoke.

## Chapter 10

### OBSTETRICAL EXAMINATION

1. A primigravida is in the delivery room. Her body weight is 62 kg. A longitudinal position of the fetus, the head of the fetus is pressed to the pelvic inlet. A circumference of the abdomen is 100 cm. The height of standing of the uterine fundus is 35 cm. What is an approximate weight of the fetus?

- A. 3,500 g.
- B. 4,000 g.
- C. 2,500 g.
- D. 3,000 g.
- E. 4,500 g.

2. A multipara, 40 weeks of gestation is examined. A spherical, mobile formation is determined to the left from the umbilicus, the fetal heartbeats about 140 beats/min is auscultated closer to the umbilicus. What position of the fetus is supposed in this case?

- A. Transversal position of the fetus, 1 position.

- B. Transversal position of the fetus, 2 position.
- C. Logitudinal position of the fetus, head presentation.
- D. Pevic presentation.
- E. Slanting position of the fetus.

3. The external obstetrical examination of the pregnant woman revealed: the form of the uterus is extended in a transversal direction. At the left lateral wall of the uterus there is the head; at the right — the pelvic end of the fetus is palpated, above the pelvic inlet the presenting part is absent. The fetal heartbeats are precisely auscultated at the umbilical level. The gestational term is 40 weeks. What is position of the fetus?

- A. Transversal position, 1 position.
- B. Longitudinal position, 2 position, head presentation.
- C. Transversal position, 2 position.
- D. Slanting position, 2 position.
- E. Longitudinal position, 1 position, pelvic presentation.

4. At external obstetrical exam the abdomen has an oval form, at the left lateral part of the uterus there is a round, dense, mobile part of the fetus, at the right — a voluminous soft, not mobile part of the fetus. The fetal heartbeats are auscultated at the umbilical level. What is the position of the fetus?

- A. Transversal position, 1 position, a presenting part is absent.
- B. Longitudinal position, 1 position, head presentation.
- C. Longitudinal position, 2 position, pelvic presentation.
- D. Slanting position, 1 position, a presenting part is absent.
- E. Transversal position, 2 position, a presenting part is absent.

5. A primigravida, 38 weeks of gestation. At external obstetrical examination: the form of the uterus is extended in a transversal direction, at the right lateral part of the uterus there is the fetal head, at the left one — the pelvic end of the fetus is palpated, above the pelvic inlet the presenting part is absent. The fetal heartbeats are most expressively auscultated at the umbilical level. What position of the fetus?

- A. Transversal position, 2 position.
- B. Longitudinal position, 1 position.
- C. Transversal position, 1 position.
- D. Slanting position, 2 position.
- E. Longitudinal position, 2 position.

6. A multipara, 40 weeks of gestation is examined. A spherical, mobile formation is de-

terminated to the left of the umbilicus. The fetal heartbeats about 140 beats/min are auscultated closer to the umbilicus. What position of the fetus is probable in this case?

- A. Transversal position, 1 position.
- B. Transversal position of the fetus, 2 position.
- C. Longitudinal position of the fetus, head presentation.
- D. Pelvic presentation.
- E. Slanting position of the fetus.

7. A primigravida, 24 years. Gestation is 3 weeks. The uterus is in the normal tone. In the uterine fundus the dense, mobile, round part of the fetus is determined. Above the pelvic inlet there is a soft part of the fetus. Clear, rhythmic heartbeats, 142 beats/min are auscultated above the umbilicus to the left. Medical policy:

- A. Gymnastics by Grishchenko—Shuleshov.
- B. Urgent delivery.
- C. Continuing observation.
- D. External preventive version on the head.
- E. Vitamin therapy.

8. At internal obstetrical exam both legs of the fetus are determined, breeches are not reached. Define the presentation.

- A. Complete foot.
- B. Complete cluneal.
- C. Mixed cluneal.
- D. Incomplete foot.
- E. Knee.

9. Pregnancy is 38 weeks. External obstetrical inspection revealed: the uterus is extended in a transversal direction, at the right lateral part of the uterus the head, at left one — the pelvic end of the fetus are palpated, above the pelvic inlet the presenting part is absent. The fetal heartbeats are most expressively auscultated at the umbilical level. What is the position of the fetus?

- A. Transversal position, 2 position.
- B. Longitudinal position, 1 position.
- C. Transversal position, 1 position.
- D. Slanting position, 2 position.
- E. Longitudinal position, 2 position.

10. A 23-year old pregnant woman is in the delivery room. The uterine fundus is 3–4 fingers higher than the umbilicus. In the area of the uterine fundus a large, ball-shaped, mobile part of the fetus is palpated. A presenting part of the fetus is volumetric, soft, motionless. Cardiac sounds of the fetus are clear, rhythmical, 136 beats/min, which are determined on the right above the umbilical level. Your diagnosis.

- A. Pelvic presentation.

- B. Head presentation.
- C. Slanting presentation.
- D. Transversal position of the fetus.
- E. It is impossible to establish the diagnosis.

## Chapter 11

### METHODS OF ANTE- AND INTRANATAL EXAMINATION OF THE FETUS CONDITION

1. A multigravida was admitted to the maternity hospital with complaints of absence of fetal movements during 24 h. The term of gestation is 37–38 weeks. What method of examination is the most informative?

- A. Cardiotocography of the fetus.
- B. Auscultation of the fetus.
- C.  $\alpha$ -Fetoprotein level.
- D. Sphingomyelin level.
- E. Alkaline phosphatase level.

2. At cardiotocogram of a pregnant woman of 32 years old the monotonous basal rhythm is determined. Basal frequency is 135 beats/min. The term of pregnancy is 34 weeks. The woman is an active smoker (1 pack of cigarettes per day). The given cardiotocogram indicates:

- A. Chronic fetal hypoxia.
- B. Maturity of the fetus.
- C. Normal reaction of the fetus.
- D. Intrauterine retardation.
- E. Acute hypoxia.

3. A pregnant woman visited the maternity hospital with complaints of weakening of fetal movements during last three days. Term of pregnancy is 34 weeks. Haemoglobin decrease up to 90 g/l is revealed. Point the most informative method of diagnosing the fetal condition.

- A. Biophysical profile of the fetus.
- B. Cardiotocography.
- C. Amnioscopy.
- D.  $\alpha$ -Fetoprotein in the amniotic fluid.
- E. Ultrasound fetometry.

4. At cardiotocogram basal frequency ranges from 100 to 190 beats/min, refractory monotonous rhythm, long-term, late decelerations with amplitude of 50 beats/min. Establish the diagnosis.

- A. Promoted intrauterine hypoxia of the fetus.
- B. Suspected intrauterine hypoxia of the fetus.
- C. Physiological condition of the fetus.

- D. Intranatal death of the fetus.
- E. Intrauterine hypoxia of the fetus in progress.

5. Acute abdominal pain and vaginal bleeding appeared in a 25-year old pregnant woman. Cardiotocography of fetal heartbeats shows bradycardia and late decelerations. Which of the following characteristics would not be present in the fetus?

- A. Respiratory alkalosis.
- B. Increased partial pressure of carbon dioxide.
- C. Drop in fetal pH.
- D. Accumulation of lactic acid.
- E. Metabolic acidosis.

6. Which of the following analysis is not a routine screening test during an early uncomplicated pregnancy?

- A. Repeated chorionic gonadotrophin levels.
- B. Haemoglobin.
- C. Serology.
- D. Cervical cytology.
- E. Blood type and Rh-factor.

7. A primipara when admitting to the maternity hospital has the 41–42 weeks of gestation. Biophysical profile of the fetus is 4 points. The optimal management:

- A. Urgent labour.
- B. Fetoscopy.
- C. Stress test.
- D. Amniocentesis.
- E. Dopplerometry.

8. A sharp fall of the fetal heartbeats are detected at intranatal cardiotocogram. The pH of the blood taken from the skin of the newborn is 7.14. The optimal management:

- A. Caesarean section.
- B. Fetoscopy.
- C. Oxygen therapy.
- D. Cordocentesis.
- E. Labour induction.

### Chapter 13

## CLINICAL COURSE OF LABOUR

1. The longitudinal position of the fetus, head presentation are diagnosed in a parturient woman with a full pregnancy at external obstetrical exam. At vaginal exam: the cervix is flattened, opening is 8 cm, a sagittal suture in the left slanting size, the big fontanelle on the right near the symphysis. Define the position, kind, presentation.

- A. 1 position, posterior kind, occipital presentation.
- B. 1 position, posterior kind, sincipital presentation.
- C. 2 position, forward kind, occipital presentation.
- D. 1 position, posterior kind, frontal presentation.
- E. 1 position, posterior kind, face presentation.

2. At the vaginal examination in 6 h after the beginning of patrimonial activity it is determined: cervical opening up to 5 cm, head presentation, adpressed to the pelvic inlet. A sagittal suture is in the transversal size of the pelvic inlet, the small fontanelle at the left. What moment of the labour biomechanism is described?

- A. Straightening of the head.
- B. Extension of the head.
- C. Internal head rotation.
- D. Additional straightening of the head.
- E. Internal version of the shoulders.

3. A primigravida 24 years old. 4 h passed from the beginning of regular contraction. The ABP is 120/80 mmHg. The position of the fetus is longitudinal, head presentation, the heartbeats of the fetus are 130 beats/min. Vaginal examination: the cervix is opened up to 1.5 cm. The fetal bladder is intact, intense. The head of the fetus is fitted to the pelvic inlet. What stage of labour is the parturient woman at?

- A. 1st stage.
- B. Precursors of labour.
- C. Preliminary period.
- D. 3rd stage.
- E. The beginning of the 2nd stage of labour.

4. Internal obstetrical exam of a parturient woman revealed the sacral cavity completely filled with the fetal head, ischiums are not determined. The sagittal suture in the direct size, the small fontanelle is inverted to the symphysis. What plane of the pelvis is occupied by the presenting part of the fetus?

- A. Pelvic outlet plane.
- B. The plane of the wide part of the pelvic cavity.
- C. The plane of the narrow part of the pelvic cavity.
- D. Pelvic inlet plane.
- E. Above the pelvic inlet.

5. Vaginal exam of a parturient woman revealed: opening of the uterine os up to 2 cm, the fetal bladder is intact. The sacral cavity is free, only a bent finger reaches the promontory of the sacrum, an internal surface of the joint ac-



cessible to exam. The head of the fetus presents. The sagittal suture is in the transversal size, the small fontanelle is at the left. What is the period of labour?

- A. The period of cervical opening.
- B. The preliminary period.
- C. Precursors of labour.
- D. The period of fetal expulsion.
- E. The afterbirth period.

6. The vaginal examination detects the head of the fetus which is carrying out a back surface of a pubic joint and the sacral cavity, palpations are accessible to the bottom edge of the pubic joint, ischium, the joint is sacral-coccegeal. What plane of the pelvis is the head of the fetus located at?

- A. In the plane of the narrow part of the pelvic cavity.
- B. In the plane of the wide part of the pelvic cavity.
- C. Above the pelvic inlet.
- D. In the plane of the pelvic inlet.
- E. In the plane of the pelvic outlet.

7. An external exam didnot reveal the head of the fetus. The amniotic fluid discharged. At internal exam: the cervix is extended, the head of the fetus is fit below the bottom edge of the symphysis, the coccyx and sciatic hillocks. The os opening is complete, the sagittal suture is in the direct size, the small fontanelle is under the symphysis. The head is fit below the bottom edge of the symphysis, the coccyx and sciatic hillocks, at attempts appears from the pudendal fissure. What plane of the pelvis is occupied with the head of the fetus?

- A. The plane of the pelvic outlet.
- B. Fit to the pelvic inlet.
- C. The plane of the pelvic inlet.
- D. The plane of the wide part of the pelvic cavity.
- E. The plane of the narrow part of the pelvic cavity.

8. The position of the fetus is longitudinal, the head a small segment is in the pelvic inlet. The fetal heartbeats are clear, rhythmical, 140 beats/min, at the left lower than the umbilicus. The head of the fetus by the small segment is in the pelvic inlet. The sagittal suture in the right slanting size, the small fontanelle at the left is closer to the symphysis. Specify the position and the kind of fetal presentation?

- A. The 1 position, anterior kind.
- B. The 1 position, posterior kind.
- C. The 2 position, anterior kind.
- D. The 2 position, posterior kind.
- E. High direct standing of the sagittal suture.

9. The head of a newborn has a dolichocephalic form, is extended to the anterior-posterior direction. At exam on the occipital part of the head the labour tumour is in the middle between the big and small fontanelle. What kind of the head presentation takes place?

- A. Posterior kind of occipital presentation.
- B. Anterior kind of occipital presentation.
- C. Anterior-parietal presentation.
- D. Anterior presentation.
- E. Face presentation.

10. At the occipital part of the newborn's head having a dolichocephalic form, a labour tumour with the center in the small fontanelle area is determined. During which presentation of the fetal head did the labour take place?

- A. Anterior kind of occipital presentation.
- B. Anteparietal presentation.
- C. Posterior kind of occipital presentation.
- D. Face presentation.
- E. Anterior presentation.

11. A parturient woman has an ovoid abdomen, enlarged with a pregnant uterus. The fetal head is not determined above the pelvic inlet. Through the lower uterine segment a wide, flat surface of the fetal trunk is determined, the head of the fetus is faced anteriorly to the right lateral uterine wall. The contracrive ring is set 18 cm higher than the symphysis. The fetal heartbeats are rhythmical, 150 beats/min on the right higher the symphysis. Labour contractions are strong, in 2–3 cm. The height of standing of the contractile ring allows to suppose:

- A. Presenting part.
- B. Labour activity.
- C. Localization of the placenta.
- D. Extent of cervical opening.
- E. Movement of the presenting part through the maternal passages.

12. A primipara is at the 2nd stage of labour, which lasts for 45 min. The patient urges to defecate. Labour contractions are 35–40 s in 2–3 min of good strength. At internal obstetrical examination the cervix is extended, complete dilation. The head of the fetus is in the narrow part of the pelvic cavity. The saggital suture is in the right oblique size, the small fontanelle is at the left, near the symphysis. The component of labour contractions is:

- A. Cervical dilation.
- B. Complete cervical dilation.
- C. Contraction of abdominal muscles.
- D. Amniotic fluid discharge.
- E. Movement of the fetus through the maternal passages.

13. A multigravida in 15 min after a child birth has vaginal discharge, pain in the lower abdomen and loin. The total bloodloss comprises 100 ml is still on. The uterine fundus moved to the left subcostal area. Cord ligation is elongated by 10 cm. At pressing with the edge of the palm on the lower abdomen the cord doesn't come into the vagina. The vessels of the umbilical cord are not filled with blood. Name the author of the mechanism of the placental separation.

- A. Schultze.
- B. Duncan.
- C. Abuladze.
- D. Genter.
- E. Crede—Lasarevitch.

14. A primipara, total duration of labour is 10 h 15 min. Labour is physiological. The placenta is on the table, maternal surface is visible, the surface is flat, grey and blue. Amniotic membranes are intact. Weight of the placenta is 540 g, sizes 18×16×3×1.5 cm. What was revealed during the placental exam?

- A. Infected placenta.
- B. Placenta with intact lobules and membranes.
- C. Additional missing lobules.
- D. Fetoplacental insufficiency.
- E. Premature separation of the placenta.

## Chapter 14

### LABOUR MANAGEMENT

1. The internal exam of a parturient woman revealed: the cervix dilated, opening is 8 cm, the fetal bladder is absent. The sagittal suture in the left slanting size, the small fontanelle at the left is closer to the sacrum. The bottom pole of the head is in the wide part of the pelvis. Specify the position and kind of the fetus.

- A. The 1 position, posterior kind.
- B. The 1 position, anterior kind.
- C. The 2 position, anterior kind.
- D. The 2 position posterior kind.
- E. High direct standing of the sagittal suture.

2. A parturient woman of 25 years old is in the 2nd stage of labour. At internal obstetrical exam: complete cervical dilation. The fetal bladder is absent. The head which completely fills the sacral cavity presents. Ischiums are not determined. At attempts the perineum pouches out. Where is the head?

- A. In the plane of the pelvic outlet.
- B. In the small segment of the pelvic inlet plane.
- C. In the big segment of the pelvic inlet plane.

- D. In the plane of the wide part of the small pelvis.
- E. In the plane of the narrow part of the lesser pelvis.

3. After a childbirth, in the 3rd stage of labour, the doctor by pressing by a palm's rib above the symphysis marks retraction of the umbilical cord in the vagina. What feature was used by the doctor for definition of the placenta discharge?

- A. Kustner—Chukalov's.
- B. Alfeld's.
- C. Shroeder's.
- D. Crede—Lazarevitch's.
- E. Genter's.

4. A primipara of 20 years old with hydramnios is 3 h in labour. Labour activity is strong. A single fetus, the head presentation. The fetal heartbeats are absent. Cervical dilation is 4 cm. The fetal bladder is intense. Define policy of labour?

- A. Amniotomy.
- B. Expectant policy.
- C. Caesarian section.
- D. Sleep-rest.
- E. Prostaglandins administration.

5. The data of the functional condition of a child after the birth: the heartbeats are 136 beats/min; respiration is independent, but without the first cry; the skin of the trunk is pink, extremities — dark blue; movements are active, the cry is loud. The newborn's condition according to the Apgar's score:

- A. 8 points.
- B. 5 points.
- C. 10 points.
- D. 6 points.
- E. 9 points.

6. A primigravida is at the term of 35–36 weeks. Regular contractions. The position of the fetus is longitudinal, presented with the head, is fitted to the pelvic inlet. Prospective mass of the fetus is 3,500 (±200). The fetal heartbeats are clear, rhythmical, 136 beats/min. Glucose in the blood is 11 mmole/l. At vaginal examination: the cervix is short up to 1 cm, the cervical canal passes 1 finger (2 cm). The fetal bladder is intact. What is the policy of labour?

- A. Through the maternal passages.
- B. Tocolytic therapy.
- C. Amniotomy.
- D. Caesarian section.
- E. Augmentation of labour activity.

7. A parturient woman with the 3rd in-term labour. Weight of the woman is 80 kg. The boy

with the weight of 4,200, length of 50 cm was born. The total bloodloss is 450 ml. The physiological volume of hemorrhage for the given parturient woman makes up:

- A. 400 ml.
- B. 500 ml.
- C. 600 ml.
- D. 700 ml.
- E. 800 ml.

8. At the puerpera of 22 years with the weight of 80 kg, in 10 min after the birth of the fetus with the weight of 4,100 g and the length of 53 cm afterbirth and 100 ml of blood discharged independently. The uterus reduced, in 10 min the bleeding renewed, hemorrhage made 300 ml. What hemorrhage is allowable in the given situation?

- A. 400 ml.
- B. 1000 ml.
- C. 500 ml.
- D. 650 ml.
- E. 300 ml.

9. A primipara, 20 years old, 4 h of in-term labour. The light amniotic fluid discharged. Position of the fetus is longitudinal, head presentation, fitted to pelvic inlet. Prospective fetus weight is 4,000 g ( $\pm 200$  g). Fetus heartbeats are clear, rhythmic, 140 beats/min, at the left, lower than the umbilicus. Internal obstetrical exam: the uterine cervix is dilated, cervical dilation is 2 cm, amniotic membrane is absent. What complication might appear?

- A. Falling out of the umbilical cord.
- B. Septic disease.
- C. Superactive labour activity.
- D. Breech presentation.
- E. Uterine inertia.

10. A primipara, pelvic measurements: 25×28×31. Labour activity is normal. The head of the fetus is fit into the pelvic cavity by its small segment. Cervical dilation is 10 cm. Diagonal conjugate is 10 cm. Supposable weight of the fetus is 3,000 g ( $\pm 200$  g). Determine the policy of the doctor:

- A. Labour stimulation.
- B. Caesarean section.
- C. Fetus destroying operation.
- D. Expectant policy.
- E. Obstetrical forceps.

11. A parturient woman is in the 3rd stage of labour. An alive newborn, 4,000 g was delivered 10 min ago. Bloody discharge appeared. What must be done?

- A. Press on the abdomen.
- B. Checking the signs of placental separation.

- C. Administration of uterotonics.
- D. Manual separation of the placenta.
- E. Surgical arrest of bleeding.

12. A primipara delivered an alive girl in 12 h 25 min after the beginning of regular labour activity. The newborn's weight is 3,100 g, length — 50 cm. In 10 min bloody vaginal discharge and spasmodic abdominal pain appeared. The signs of Alfred, Schroeder, Kustner—Chukalov are positive. The placenta with all the lobules and membranes has separated and departed, 570 g, 19×17×3×1.5 cm. In 2 h the puerpera was transferred into the puerperal department in a satisfactory condition. Determine the total duration of labour.

- A. 12 h 25 min.
- B. 12 h 35 min.
- C. 14 h 25 min.
- D. 14 h 35 min.
- E. 2 h.

## Chapter 15

### ANAESTHESIA AND ANALGESIA OF LABOUR

1. A primipara is in the latent phase of the first stage of normal labour. Sizes of the pelvis are 25×28×31×20 cm, diagonal conjugate is 13 cm, supposable weight of the fetus is 3,200 g, labour activity is normal. What method of analgesia is adequate?

- A. Psycho-prophylactic anaesthesia.
- B. Pudendal anaesthesia.
- C. Neuroleptic analgesics.
- D. Inhalation narcosis.
- E. Epidural anaesthesia.

2. Episiotomy was conducted in a primipara at the 2nd stage of labour because of threatening rupture of the perineum and a short perineum (3 cm). Before perineorrhaphy the obstetrician is conducting anaesthesia by means of:

- A. Local infiltrative anaesthesia.
- B. Psycho-prophylactic anaesthesia.
- C. Pudendal anaesthesia.
- D. Neuroleptic analgesics.
- E. General anaesthesia.

3. A patient has just delivered her fifth child without any analgesia. After labour of the placenta the physician notices that the uterus has inversed and is protruding through the vagina. Which of the following agents would be appropriate anaesthesia for repositioning the uterus?

- A. Ketamine.
- B. Cyclopropane.
- C. Bupivacaine.

- D. Nitric oxide.
- E. Lidocaine.

4. A physician is called to see a patient the morning after her labour. She states that her headache is so bad that she can not rise head off the pillow. It is noted that she had an epidural anaesthesia during labour. Which of the following is not a possible explanation for her headache?

- A. Diminished intravascular volume.
- B. Leakage of cerebrospinal fluid at the puncture site.
- C. Irritation of the pia-arachnoid.
- D. Diminished cerebrospinal fluid volume.
- E. Collapse of the maternal vertebral venous plexus.

5. A woman is at the end of the 1st stage of premature labour. She had no analgesia or anaesthesia up to this point. The vertex is on the perineum; the infant's head is visible at the perineum with each contraction. Which method of analgesia will be the most appropriate?

- A. Pudendal block.
- B. Intravenous ketamine.
- C. Spinal anaesthesia.
- D. Intramuscular morphine.
- E. Epidural anaesthesia.

6. A woman complains of painful uterine contractions that occur every 5–6 min. She is in the 1st stage of labour during 5 h. The head of the fetus is fit to the pelvic inlet. Heart beats of the fetus are clear, rhythmic. The sizes of the pelvis are 25×28×31×20 cm, supposable weight of the fetus is 3,400 (±200 g). On examination: the dilation of the uterine cervix is 4 cm and it is effaced. Which method of analgesia will be the most appropriate?

- A. Pudendal block.
- B. Intravenous ketamine.
- C. Spinal anaesthesia.
- D. Promedole, benadryl, no-spa.
- E. Psycho-prophylactic anaesthesia.

7. A woman is in the active phase of normal labour having contractions every 5–6 min. Heart beats of the fetus are clear, rhythmical. On examination: the dilation of the cervix is 5–6 cm, the head of the fetus is with its small segment in the pelvic inlet. The woman requires a pain relief. Which method of analgesia will be the most appropriate?

- A. Epidural anaesthesia.
- B. Pudendal block.
- C. Intravenous ketamine.

- D. Spinal anaesthesia.
- E. Promedol, benadryl, no-spa.

8. A multigravida is suffering from bronchial asthma of medium severity. She is in the first stage of in-time labour. The secondary uterine inertia has appeared. Heartbeats of the fetus are dull, irregular, 200 beats/min. An urgent caesarean section is indicated. Which method of analgesia will be the most appropriate?

- A. Epidural anaesthesia.
- B. General anaesthesia.
- C. Intravenous ketamine.
- D. Spinal anaesthesia.
- E. Promedol, benadryl, no-spa.

9. A patient had general anaesthesia for an urgent caesarean section because fetal distress. After the surgery the anaesthesiologist notes tachypnea and no breath sounds in both lower lobes of the lungs. All of the following would be appropriate actions in this case **except**:

- A. Antacid administration.
- B. Suction.
- C. Corticosteroid administration.
- D. Ventilation.
- E. Antibiotics administration.

10. A primipara of 20 years old has visited the gynaecologist to get an advise concerning the method of analgesia in labour. The term of pregnancy is 18 weeks, no complication of pregnancy is revealed, no extra-genital pathology is found. What should the doctor advise?

- A. Psychic and physical prophylactic preparation for labour since 20 weeks.
- B. Prophylactic preparation for labour since 36 weeks
- C. Physical prophylactic preparation for labour since 20 weeks
- D. Epidural anaesthesia in labour
- E. No anaesthesia because of physiologic level of pain.

## Chapter 16

### PHYSIOLOGY OF POSTNATAL PERIOD

1. A puerpera of 22 years old. The 2nd day after normal labour. The common condition is satisfactory, the body temperature is 36.5°C, the pulse rate is 80 beats/min, satisfactory properties. Mammary glands are enlarged, papillae are intact. The uterus is dense, painless, the bottom is 8 cm above the symphysis. The lochia are bloody, in the small amount. Physiological func-



tions are normal. For determination of dynamics of reduction of the uterus in the puerperal period it is enough:

- A. Conduct US.
- B. Conduct X-ray exam.
- C. Define by palpation the level of standing of the uterine fundus.
- D. Define by palpation the level of standing of contractile rings of the uterus.
- E. Measure the circumference of the abdomen.

2. A 24-year old puerpera is on the 2nd day after labour. The common state is satisfactory, the body temperature is 36.6°C, the pulse rate is 82 beats/min, satisfactory properties. There is no pathology from internal organs. The mammary glands are enlarged in dimensions, mild, papillae are intact. The uterus is dense, painless, the bottom of it is by 5 cm above the symphysis. The lochia are serous-bloody, in the small amount. Physiological functions are normal. What is enough for determination of the character of lochia?

- A. Observation.
- B. Microscopy of the lochia.
- C. Luminescent microscopy of the lochia.
- D. Bacteriological investigation of the lochia.
- E. Vaginoscopy.

3. A 25-year old puerpera is on the 7th day after labour. The common state is satisfactory, there are no complaints. The body temperature is 36.6°C, pulse rate is 76 beats/min, satisfactory properties. The ABP is 120/80 mmHg on both humeral arteries. The mammary glands are mild, painless, papillae are safe. The uterus is dense, painless, the bottom of it is defined at the symphysis. The lochia are serous-mucous, scanty. Physiological functions are normal. What hormone secreted by the pituitary gland stimulates reduction of the uterus at the puerperal period?

- A. Prolactin.
- B. Folliculin.
- C. Progesterone.
- D. Chorionic gonadotrophin.
- E. Oxytocin.

4. A 24-year old puerpera is on the 4-th day after the normal labour. The common state is satisfactory, there are no complaints. The body temperature is 36.5°C; pulse rate is 80 beats/min, satisfactory properties, rhythmical; ABP is 120/80 mmHg on both humeral arteries. The mammary glands are mild, painless, papillae are intact. The uterus is dense, painless, its bottom is 6–8 cm higher than the bosom. The lochia are serous-bloody. The diagnosis “subinvolution of

the uterus” is made. It is necessary to conduct the following measures:

- A. A tool revision of the uterine cavity.
- B. Endometrial instillation of antiseptic solutions.
- C. Supravaginal ablation of the uterus.
- D. To appoint the agents stimulating reduction of the uterus.
- E. Hyperbaric oxygenation.

5. A 26-year old puerpera on the 4-th day after labour has a persistent bleeding. The hemorrhage made 400 ml. The common state is getting worse — the body temperature is 36.7°C, the pulse rate is 94 beats/min, ABP is 90/70 mm. The uterus is intense, tender, its bottom is at the umbilical level. The diagnosis is labour in time. The bleeding on the 4th day of the puerperal term. It is necessary:

- A. Manual exam of the cavity of the uterus and removing of the delayed parts of the placenta.
- B. A tool revision of the cavity of the uterus.
- C. To introduce drugs reducing the uterus.
- D. Supravaginal ablation of the uterus.
- E. External massage of the uterus after the catheterization of the bladder.

6. At the puerperal period after physiological labour the lochia are bloody. At microscopic examination the lochia mostly consists of erythrocytes. What day after physiological labour do such lochia correspond to?

- A. 2nd.
- B. 4th.
- C. 6th.
- D. 8th.
- E. 10th.

7. In a primipara during the first day after labour the body temperature is 37.3°C. The most probable reason:

- A. Reaction to labour stress.
- B. Endometritis.
- C. Acute respiratory infection.
- D. Exacerbation of chronic pyelonephritis.
- E. Vaginitis.

8. On the 3rd day after labour a puerpera complains of moderate pain in the mammary glands. The most probable reason is:

- A. Lactation onset.
- B. Mastitis.
- C. Mastopathy.
- D. Trauma.
- E. Myositis of the pectoral muscles.

9. A puerperal woman has addressed the maternity hospital 2 months after the labour.

The condition is satisfactory. No genital and extragenital pathology. Pregnancy and labour proceeded without complications. The menstrual cycle didn't restore. What method of contraception can be recommended?

- A. Depot-provera.
- B. Intrauterine device.
- C. Barrier method.
- D. Exlutone.
- E. All listed above.

### Chapter 17

## PHYSIOLOGY OF NEONATAL PERIOD

1. In primipara general duration of labour comprised 10 h 15 min. She delivered an alive mature girl, 3,200 g, 51 cm. The newborn's skin is pink, arms and feet are cyanotic, crying aloud, adequate respiration, active reflexes, movements are active. The heartbeats are 130 beats/min, rhythmical. In 5 min the skin of extremities became pink, sucking movements appeared, the baby was applied to the mammary gland. Conduct the evaluation of the newborn according to the Apgar's score together with the neonatologist:

- A. 9–10 points.
- B. 9–9 points.
- C. 8–9 points.
- D. 7–8 points.
- E. 6–7 points.

2. Data of functional state of a newborn at the moment of labour: the heartbeats are clear, 136 beats/min, respiration is independent, without first cry, the skin of the face and body is pink, extremities are cyanotic, movements are active, at irritation of the foot the baby draws it back, the grimace appeared on the face and he began to cry aloud. Conduct the evaluation of the newborn according to the Apgar's score:

- A. 8 points.
- B. 5 points.
- C. 10 points.
- D. 6 points.
- E. 9 points.

3. Bloody discharge appeared from the genital organs in a newborn girl. The most probable reason is:

- A. Hormonal crisis.
- B. Birth defects.
- C. Inflammatory process.
- D. Physiologic reaction.
- E. Trauma to the vulva.

4. In first day after labour the mother paid attention to the color of her newborn's feces — dark-green. What is it caused with?

- A. Discharge of meconium.
- B. Transitional feces.
- C. Toxic infection.
- D. Birth defects of the intestines.
- E. Acute colitis.

5. A puerpera asks for recommendations about optimal regimen of breast feeding. What will you recommend?

- A. According to the requirements of the newborn.
- B. 3 times a day.
- C. 4 times a day.
- D. 6 times a day.
- E. 8 times a day.

6. Jaundice is marked in a mature newborn from 3rd to 10th day of his life. Maximal level of bilirubin in the blood is 102  $\mu\text{mol/l}$ , 8.2  $\mu\text{mol/l}$  of it is conjugated. What state is in progress?

- A. Physiological jaundice.
- B. Atresia of bile-excreting tract.
- C. Haemolytic disease of a newborn.
- D. Congenital hemolytic anaemia.
- E. Fetal hepatitis.

7. Speed of growth of a newborn is provided by:

- A. Growth hormone.
- B. Hormone of the thyroid gland.
- C. Insulin.
- D. Sex hormones.
- E. All listed above.

8. What type of respiration is typical for a newborn?

- A. Diaphragmatic.
- B. Chain—Stokes'.
- C. Superficial
- D. Abdominal.
- E. All listed above.

9. To the states that indicate the adaptation of a newborn to new conditions the following ones belong:

- A. Skin catarrh.
- B. Physiological jaundice.
- C. 5–8 % weight loss.
- D. Uric acid infarct.
- E. All listed above.

10. The prophylactic measures against septic complications in a newborn:

- A. Toilet of the umbilical wound.
- B. Daily hygienic bathing
- C. Breast feeding.

- D. Clean clothes and bed sheet
- E. All listed above.

11. Heartbeats of the newborn comprise:
- A. 130 beats/min.
  - B. 170 beats/min.
  - C. 100 beats/min.
  - D. 80 beats/min.
  - E. 200 beats/min

## **PART II. PATHOLOGICAL OBSTETRICS**

### *Chapter 18*

### **DISTURBANCES OF LABOUR ACTIVITY**

1. A multipara, 26 years old, was admitted to the maternity hospital with a term pregnancy and complaints of the amniotic fluid discharge 1 h ago. There is no labour activity. Circumference of the abdomen is 100 cm, height of standing of the uterine fundus is 35 cm. Position of the fetus is longitudinal, head presentation. The fetal heartbeats are rhythmical, 140 beats/min, on the left lower umbilicus. The uterine cervix is 1.5 cm long, along the leading axes of the pelvis. Cervical dilation is 2 cm. The fetal bladder is absent, the head is fit to the pelvic inlet. The sagittal suture is in the right oblique size. Choose the optimum labour management.

- A. Labour induction.
- B. Caesarean section.
- C. Obstetrical forceps.
- D. Expectant policy for 5 h.
- E. Prolongation of pregnancy.

2. A multipara, 32 years old, is at the I stage of labour for 5 h. Light amniotic fluid discharged an hour ago. Signs of clinical disproportion are absent. At internal obstetrical examination the head of the fetus is set to the pelvic inlet, the fetal bladder is absent. Cervical dilation is 2 cm. Choose the optimum labour management.

- A. Treatment of uterine inertia.
- B. Labour induction.
- C. Caesarean section.
- D. Obstetrical forceps.
- E. Medication sleep.

3. A multipara was admitted to the maternal hospital with painful contractions every 2 min. Cervical dilation is 2 cm. 2 h after administration of spasmolytics the puerperant complains of painful contractions again. Cervical dilation is the same. Establish the diagnosis:

- A. Discoordination of labour activity.
- B. Preliminary period.
- C. Uterine inertia.
- D. Active stage of labour.
- E. Latent phase of labour.

4. A primigravida is at the 1st stage of labour for 9 h. The head of the fetus is fit to the pelvic inlet. Contractions are weak, irregular. The fetal heartbeats are clear, rhythmical, 136 beats/min. At vaginal examination the uterine cervix is dilated, thickened, cervical dilation is 4 cm. The fetal bladder is intact. Data of internal examination conducted at 4 h are the same. Establish the diagnosis.

- A. Uterine inertia.
- B. Intrauterine hypoxia of fetus.
- C. Premature separation of a normally presented placenta.
- D. Pre-eclampsia of a mild degree.
- E. Discoordinated labour activity.

5. In a primipara, 30 years old, with a term pregnancy against a background of pathological preliminary period, the amniotic fluid had discharged 6 h ago. There is no labour activity. The head is fit to the pelvic inlet. The fetal heartbeats are clear, rhythmical, 142 beats/min. Internal obstetrical examination reveals an "immature" uterine cervix. Choose the optimum labour management.

- A. Caesarean section.
- B. Prolongation of pregnancy and antibiotic therapy.
- C. Prostaglandins administration.
- D. Labour stimulation.
- E. Expectant policy.

6. A primipara, 37 years old is at the I stage of labour for 10 h. Contractions during 20–25 s in 6–7 min. Position of the fetus is longitudinal, the head is fit to the pelvic inlet. At internal obstetrical examination: the cervix is 1 cm long, dilation is 4 cm. The fetal bladder is absent. Establish the diagnosis.

- A. Primary uterine inertia.
- B. Secondary uterine inertia.
- C. Physiological preliminary period.
- D. Discoordination of labour activity.
- E. Pathological preliminary period.

7. A multipara, 37 years old, is admitted to the maternity hospital one hour after labour onset. Contractions are during 60–80 s every 1.5 min. The head of the fetus is in the pelvic cavity. The heartbeats of the fetus are 150 beats/min. At internal examination: the cervix is dilated by 7 cm. Choose the optimum labour management.

- A. Administration of  $\beta$ -adrenomimetics.
- B. Dynamic observation.
- C. Caesarean section.
- D. Medication sleep.
- E. Labour stimulation.

8. A primipara is at the I stage of labour for 6 h. Contractions during 25 s, in 4–6 min, accompanied by pain, that spreads from lower segment upwards. The fetal heartbeats are clear, rhythmical, 156 beats/min. At internal obstetrical examination: the cervix is 1 cm long, dilation is 3 cm. The head of the fetus is above the pelvic inlet. What pathology has the complicated labour?

- A. Discoordination of labour activity.
- B. Uterine inertia.
- C. Threat of hysterorrhesis.
- D. Augmented labour activity.
- E. Cervical distocia.

9. A primipara is at the 2nd stage of labour during one hour, contractions in 5 min during 30 s. Pelvic sizes — 25×28×31×21 cm. Supposable weight of the fetus is 3,600 g. At internal obstetrical examination: complete cervical dilation, the fetal bladder is absent, the head is on the pelvic floor, the saggital suture is in the direct size of the plane of outlet, small fontanelle is near the symphysis. The heartbeats of the fetus are 100 beats/min. Choose the optimum labour management.

- A. Obstetrical forceps.
- B. Caesarean section.
- C. Labour stimulation.
- D. Treatment of intrauterine hypoxia of fetus.
- E. Fetus destroying operation.

10. A primipara, 24 years old, with a term pregnancy and normal sizes of the pelvis is at the 1st stage of labour. The contractions became weaker, ineffective. Internal obstetrical examination: complete cervical dilation, the head of the fetus is with its big segment in the plane of the pelvic inlet. The fetal bladder is absent. The fetal heartbeats are clear, rhythmical, 130 beats/min. Choose the optimum labour management.

- A. Labour stimulation.
- B. Obstetrical forceps.
- C. Administration of spasmolytics.
- D. Medication sleep.
- E. Caesarean section.

## Chapter 19

### MULTIPLE PREGNANCY

1. A multipara was admitted to the maternity hospital with diagnosis: multiple pregnancy. What is the most probable complication of pregnancy and labour?

- A. Premature labour.
- B. Premature separation of a normally presented placenta.
- C. Occipital posterior presentation.
- D. Acute hypoxia of the fetus.
- E. Hydramnios.

2. After birth of the first fetus it has been revealed that the second fetus is in the transversal position. The fetal heartbeats is clear, 136 beats/minute. The fetal bladder of the second fetus is intact. What should be done?

- A. External-internal obstetrical turn and extraction of the fetus.
- B. Vaginal examination.
- C. Amniotomy.
- D. Caesarean section.
- E. Fetus-destroying operation.

3. During the 2nd stage of labour of twins after labour of the first fetus, 2,800 g, the amniotic fluid of the second fetus had discharged. At internal obstetrical examination the pulsatile umbilical cord is determined in the vagina. The head of the fetus is mobile under the pelvic inlet, easily pushes away after pressing. The umbilical cord replacement failed. The heartbeats of the fetus are 160 beats/min, rhythmical. Supposable weight of the fetus is 2,500 g. What is the optimum labour management?

- A. Combined external-internal rotation of the fetus on leg with subsequent extraction of the fetus.
- B. Caesarean section.
- C. Vacuum-extraction of the fetus.
- D. Obstetrical forceps.
- E. Treatment of fetal hypoxia.

4. At a primigravida in 15–16 weeks of pregnancy the level of  $\alpha$ -fetoprotein is significantly increased. Pregnancy took place against a background of stimulation of ovulation. At ultrasound examination multiple pregnancy is revealed. What means the increased level of  $\alpha$ -fetoprotein in this case?

- A. Multiple pregnancy symptom.
- B. Neural tube defect.
- C. Misappropriate term of pregnancy.
- D. Necrosis of the fetal liver.
- E. Disturbances of fetal osteogenesis.



5. A primigravida was admitted to the maternity hospital with complaints of aching pain in the lower abdomen. She is one of twins. The term of pregnancy is 33 weeks. Circumference of the abdomen is 107 cm. The height of standing of the uterine fundus is 37 cm. The uterine tonus is increased. Position of the fetus is longitudinal, the presenting part is round-shape, dense, mobile. The fetal heartbeats are listened on the right, lower umbilicus, 136 beats/min and on the left on the level of the umbilicus, 138 beats/min. What is the most probable reason of pregnancy complication?

- A. Multiple pregnancy.
- B. Gestosis.
- C. Big fetus.
- D. Hydramnios.
- E. Breech presentation.

6. A multipara, 26 years old, was hospitalized 4 h after beginning of normal labour activity with a term pregnancy, the 3rd one. Sizes of the pelvis are normal. At external obstetrical examination: the head is defined above the pelvic inlet, in the uterine fundus — two big parts of the fetus are precisely determined, one of them is the head. The fetal heartbeats are auscultated at the left lower umbilicus, 150 beats/min, and on the right — 136 beats/min. Circumference of the abdomen is 119 cm, the height of standing of the uterine fundus is 42 cm. What is the most probable component of diagnosis?

- A. Multiple pregnancy.
- B. Birth defects.
- C. Intrauterine retardation syndrome.
- D. Olygohydramnios.
- E. Macrosomia.

7. A primigravida with a term pregnancy is hospitalized. Multiple pregnancy is diagnosed. Presentation of the first fetus is footling, second — transversal. Determine labour management:

- A. Elective caesarean section.
- B. Urgent caesarean section.
- C. Conservative labour.
- D. External rotation of the fetus.
- E. Modificating gymnastics.

8. A primigravida is at the 2nd stage of term labour. One alive boy has delivered, 2,400 g, 48 cm. After external examination it was revealed that another alive newborn is present in the uterus. Position of the second fetus is longitudinal, head presentation. The fetal heartbeats are 140 beats/min. At internal obstetrical examination: cervical dilation is complete, the fetal bladder is intact. The head of the fetus is in the pelvic cavity. Determine labour management:

- A. Amniotomy, conservative labour.
- B. Caesarean section.
- C. Amniotomy, fetus destroying operation.
- D. Amniotomy, obstetrical forceps.
- E. Amniotomy, labour stimulation.

9. A parturient woman is at the 1st stage of term labour that lasts for 10 h, multiple pregnancy. Position of the fetuses is longitudinal, head presentation of both fetuses. The fetal heartbeats are 140–160 beats/min. What must be done for prophylaxis of bleeding at the 2nd stage of labour?

- A. Oxytocin injection.
- B. Applying suture on the cervix.
- C. Introduction of ether tampon.
- D. Massage of the uterus.
- E. Applying clamps on the cervix.

## Chapter 20

### PREGNANCY AND LABOUR AT PELVIC PRESENTATION

1. A multigravida, 38 years old, visited the maternity hospital. Pregnancy 31–32 weeks, longitudinal position, breech presentation. The fetal heartbeats are clear, rhythmical, 132 beats/min, on the right, above the umbilicus. Tonus of the uterus is normal. What is the policy of pregnancy management?

- A. Corrigent gymnastics.
- B. Medical observation.
- C. Caesarean section at 38 weeks.
- D. External rotation of the fetus.
- E. Physiological and psychological preparation.

2. A primipara, 20 years old, 2nd stage of labour lasts during 1 h. Buttocks of the fetus fill up the sacral cavity. Sizes of the pelvis are normal. Supposable weight of the fetus is 3,000 g. The heartbeats of the fetus are 100 beats/min, clear, arrhythmical. What is the policy of labour management?

- A. Extraction of the fetus by the pelvic end.
- B. Caesarean section.
- C. Fetus destroying operation.
- D. Expectant management.
- E. Obstetrical forceps.

3. A multigravida is 12 h of labour activity. Waterless period is 4 h. Incomplete footling presentation. One foot is delivered up to popliteal space. Cervical dilation is complete. The fetal heartbeats are clear, rhythmical, 170 beats/min. What is the policy of labour management?

- A. Extraction of the fetus by one foot.
- B. Caesarean section.
- C. Expectant management.
- D. Fetus destroying operation.
- E. Vacuum-extraction of the fetus.

4. A primipara, 26 years old, is at the 1st stage of labour, breech presentation of the fetus. Supposable weight of the fetus is 3,800 g. The fetal heartbeats are dull, 100 beats/min. Cervical dilation is 8–9 cm. The fetal bladder is intact. Diagonal conjugate is 13 cm. What is the policy of labour management?

- A. Caesarean section.
- B. Amniotomy.
- C. Obstetrical forceps.
- D. Extraction of the fetus by pelvic end.
- E. Labour stimulation.

5. A multipara is delivered to the maternity hospital. Pregnancy is the 3rd. The 1st — normal labor, 2nd — induced abortion. Position of the fetus is longitudinal, breech presentation. Normal labour activity. During obstetrical examination the amniotic fluid discharged, after which bradypnea of the fetus till 100 beats/min is determined. Cervical dilation is complete, the fetal bladder is absent, the umbilical cord is determined in the vagina. Buttocks of the fetus are in the plane of narrow part of the pelvis. What is the policy of labour management?

- A. Extraction of the fetus by the pelvic end.
- B. Caesarean section.
- C. Umbilical cord replacement.
- D. Treatment of the acute hypoxia of the fetus.
- E. Episiotomy, Tsovyanov's assistance.

6. Breech presentation is determined in a multipara at 32 weeks of pregnancy. The course of pregnancy is physiological. What is the policy of pregnancy management?

- A. Corrigent gymnastics.
- B. Ultrasound examination for evaluation of the fetus condition.
- C. Caesarean section at 38 weeks.
- D. External rotation of the fetus.
- E. Physiological and psychological preparation.

7. At a parturient woman at the 2nd labour stage after buttocks birth the secondary uterine inertia came. What is the policy of labour management?

- A. Extraction of the fetus by the pelvic end.
- B. Caesarean section.
- C. Conservative labour.
- D. Treatment of the acute hypoxia of the fetus.
- E. Labour induction.

8. External examination of a multigravida, 23 years old revealed the uterine fundus 3–4 fingers higher than the umbilicus. In the uterine fundus a dense rounshape, mobile part of the fetus is determined. The plain, wide surface of the fetus is determined on the right, on the left — small parts of the fetus are determined by the second manoeuvre of external examination. Presenting part is volumable, soft, immobile. The fetal heartbeats are rhythmical, 136 beats/min, auscultated under the umbilicus. Point the component of diagnosis.

- A. Breech presentation.
- B. Head presentation.
- C. Oblique presentation.
- D. Hypoxia of the fetus.
- E. Transversal position.

9. A primipara is in the first stage of labour. At internal obstetrical examination: the cervix is absent. The buttocks and feet of the fetus present. What is the presentation of the fetus?

- A. Flexed breech presentation.
- B. Complete footling presentation.
- C. Incomplete footling presentation.
- D. Breech presentation.
- E. Knee presentation.

## Chapter 21

### TRANSVERSE AND OBLIQUE LIE OF THE FETUS

1. A primipara with a regular labour activity during 9 h with a term pregnancy. Sizes of the pelvis are 25×29×31×21 cm. Contractions in 2–3 min, for 45 s, of a good strength. Circumference of the abdomen is 100 cm. The height of standing of the uterine fundus is 28 cm. The presenting part is not determined. On the left there is the head, on the right — pelvic end of the fetus. The fetal heartbeats are 142 beats/min. Internal obstetrical examination: the cervix is dilated by 8 cm, the fetal bladder is intact, tense. What is the policy of labour management?

- A. Podalic version.
- B. Conservative labour.
- C. Caesarean section.
- D. Obstetrical forceps.
- E. Braxton—Hicks' operation.

2. A multigravida, 30 years old, is in the maternity room with a term pregnancy and transverse position of the fetus. 3 l of the amniotic fluid has discharged. Sizes of the pelvis are 26×29×31×21. Circumference of the abdomen is 108 cm. The height of standing of the uterine fundus — 32 cm. The head of the fetus is on the

left. The fetal heartbeats are 136 beats/min. Internal obstetrical examination: the cervix is shortened, dilation is 5 cm, no fetal bubble, presenting part is not determined. The promontory is inaccessible. What is the policy of labour management?

- A. Caesarean section.
- B. Podalic version.
- C. Conservative labour.
- D. Obstetrical forceps.
- E. Braxton—Hicks' operation.

3. A multigravida is in labour in the hospital for 6 h of regular labour activity. She has never visited maternal consultation. Waterless period is 10 h. Prospective date of labour — in 3 weeks (as to woman's information). Supposable weight of the fetus is 2,900 ( $\pm 200$ ). The head of the fetus is palpated on the left. The fetal heartbeats are not auscultated. Internal obstetrical examination: the cervix is dilated by 9 cm, the edematous arm of the fetus is palpated in the vagina. What is the policy of labour management?

- A. Embryotomy.
- B. Trying to put an arm inside the uterus.
- C. Ivanov's forceps.
- D. Podalic version.
- E. Caesarean section.

4. A multigravida, 35–36 weeks of pregnancy. In anamnesis two physiologic labours. Denies any gynaecologic pathology in the past. Position of the fetus is oblique, fetus is mobile. Abdominal wall is rather compliant. Supposable weight of the fetus — 3,000 g. Condition of the pregnant woman and fetus is satisfactory. What is the policy of pregnancy management?

- A. Direct to hospital for external version.
- B. External rotation in the maternity polyclinics.
- C. Prescribe bandage.
- D. Observation in the maternity polyclinics.
- E. Podalic version.

5. A multipara is delivered to the maternity hospital with a normal labour activity. Labour is fourth, in-term. She has never visited the maternity hospital. The amniotic fluid discharged 10 h ago. The fetus is tightly embraced with the uterine walls and is immobile between contractions. The fetal heartbeats are not auscultated. The arm of the fetus is fallen out from the pudendal fissure, the shoulder of the fetus is determined in the pelvic cavity. What is the policy of labour management?

- A. Fetus destroying operation.
- B. Arm replacement.
- C. Caesarean section.
- D. Podalic version.
- E. Classic obstetrical care.

6. In the maternity hospital a multigravida is under observation. The term of gestation is 30–31 weeks. Pregnancy is the 4th, 2 medical abortions in anamnesis. Position of the fetus is oblique, the head is palpated on the left in the ileac region, breeches in the left hypochondrium. Tonus of the fetus is normal. The fetal heartbeats are rhythmical, 130 beats/min, on the left, under the umbilicus. What is the policy of pregnancy management?

- A. Corrigit gymnastics.
- B. Medical supervision.
- C. Bandage using.
- D. External version.
- E. Physiological and psychological preparation.

7. A multigravida was admitted to the maternity hospital with a term labour, 8 h after its onset. The seventh pregnancy. The abdomen is roundshape, the head of the fetus is determined on the level of the umbilicus. Heartbeats are clear, rhythmical, 136 beats/min. Sizes of the pelvis are 26×28×31×21 cm. A supposable weight of the fetus is 3,300 g. Internal obstetrical examination: cervical dilation is complete. The fetal bladder is intact. A presenting part is not determined. What is the policy of labour management?

- A. Podalic version.
- B. External version.
- C. Caesarean section.
- D. Corrigit gymnastics.
- E. Amniotomy, conservative labour.

7. A multipara, 21 years old is examined: a round-shape mobile mass is determined on the left from the umbilicus, the fetal heartbeats are determined, 140 beats/min at the same place. What position of the fetus is described?

- A. Left transverse position.
- B. Right transverse position.
- C. Longitudinal position, head presentation.
- D. Breech presentation.
- E. Oblique position.

## Chapter 22

### LABOUR OF THE STRAIGHTENING PRESENTATION OF THE FETAL HEAD

1. A primipara is in the 2nd stage of in-time labour. Labour lasts for 22 h. Sizes of the pelvis are normal. Labour contractions are of good strength. Supposable weight of the fetus is 4000 g. Internal obstetrical examination: complete cervical dilation. The head of the fetus is with its

big segment in the plane of the pelvic inlet. Sagittal suture is in the right oblique diameter. One can palpate a small (on the right) and big (on the left) fontanelles, which are on the same level. Point the straightening of the head:

- A. Anterior parietal.
- B. Asynclitic.
- C. Occipital.
- D. Anterior.
- E. Face.

2. A multipara is in the I stage of in-time labour that lasts for 6 h. Labour activity is normal, position of the fetus is longitudinal, head presentation. Height of standing of the uterine fundus is 40 cm. The fetal heartbeats are clear, rhythmical, 146 beats/min. Data of internal obstetrical exam: cervical dilation is 8 cm. The amniotic membrane is intact. Through the membrane one can palpate superciliary archs, root of the nose, on the back — anterior angle of the big fontanelle. Point the head straightening:

- A. Anterior.
- B. Asynclitic.
- C. Occipital.
- D. Anterior parietal.
- E. Face.

3. A multipara is delivered to the maternity hospital with amniotic fluid discharge 6 h ago and normal labour activity. Position of the fetus is longitudinal, head presentation, posterior type. The head of the fetus with its small segment is in the pelvic inlet. Heartbeats of the fetus are clear, rhythmical, 150 beats/min. Sizes of the pelvis are 24×26×27×18 cm. Internal obstetric examination: cervical dilation 7 cm, amniotic membrane is absent. One can palpate nose, mouth, and chin of the fetus faced to symphysis. Point the head straightening:

- A. Face.
- B. Asynclitic.
- C. Occipital.
- D. Anterior parietal.
- E. Anterior.

4. A primipara, waterless period — 12 h, normal labour activity. Sizes of the pelvis 25×28×32×18 cm. Circumference of the radio-carpal joint is 15 cm. Sizes of the outlet of the pelvis are 8.5 cm, transverse — 11 cm. The fetal heartbeats are clear, rhythmical, 150 beats/min. Internal obstetrical examination: the uterine cervix is dilated, dilation is 7–8 cm. The head of the fetus with its big segment is in the pelvic inlet. The sagittal suture is in transverse lie. The big fontanelle is on the right, both are on the same level. What complication has arisen?

- A. Extensional straightening.
- B. Justo minor pelvis I grade.
- C. Preterm discharge of the amniotic fluid.
- D. Asynclitic straightening.
- E. No complication.

5. A primipara, 27 years old, admitted with active labour contractions. In-time labour, 13 h. Pelvic sizes are 26×28×30×20 cm. Supposable weight of the fetus is 4,300 g. Internal obstetrical examination: the cervix is dilated, the head is in the plane of the inlet, sagittal suture is in the direct size of the inlet, the big fontanelle is faced to the symphysis. The small one — to the promontory and higher than the big one. Expressed configuration of the fetal head is marked. Point the component of diagnosis?

- A. High direct standing of the sagittal suture.
- B. Low transverse standing of the sagittal suture.
- C. Preterm fluid discharge.
- D. Posterior asynclitism.
- E. Anterior asynclitism.

6. Data of internal obstetric examination after discharge of the amniotic fluid: complete cervical dilation, amniotic membrane is absent, the sagittal suture is in the transverse diameter of the pelvic outlet, the big fontanelle on the right, the small one — on the left. Diagonal conjugate is 10 cm. Sizes of plane of the pelvic outlet: direct — 8.5 cm, transverse — 11.5 cm. Point the component of diagnosis?

- A. Low transverse standing of the sagittal suture.
- B. High direct standing of the sagittal suture.
- C. Preterm amniotic fluid discharge.
- D. Posterior asynclitism.
- E. Anterior asynclitism.

7. A multipara is 6 h in labour. Sizes of the pelvis are 25×28×30×20 cm. Position of the fetus is longitudinal, head presentation, anterior type. The head by its small segment is in the pelvic inlet. The fetal heartbeats are clear, rhythmical, 134 beats/min. Internal obstetric examination: dilation of the internal os is 8 cm, amniotic membrane is intact, cupola-shaped; superciliary archs, root of the nose faced backwards can be palpated through it. What is the policy of labour management?

- A. Caesarean section.
- B. Expectant management.
- C. Applying obstetrical forceps.
- D. Classic version of the fetus.
- E. Fetus destroying operation.



## Chapter 23

### CONTRACTED PELVIS AND LABOUR

8. A primipara is at the 1st stage of labour with normal labour activity. Sizes of the pelvis are normal. Supposable weight of the fetus is 4,200 g. Position of the fetus is longitudinal, the back of the fetus is faced backwards, the head of the fetus is with the small segment in the pelvic inlet. The fetal heartbeats are clear, rhythmical, 133 beats/min. Internal obstetrical examination: cervical dilation — by 7 cm, amniotic membrane is absent. One can palpate nose, mouth and chin of the fetus faced to the symphysis. What is the policy of labour management?

- A. Caesarean section.
- B. Expectant management.
- C. Applying obstetrical forceps.
- D. Classic version of the fetus.
- E. Fetus destroying operation.

9. A primipara is in the in-time labour, labour contractions in 3–4 min during 40–45 s, of a good force. Sizes of the pelvis are 26×28×30×21 cm. Supposable weight of the fetus is 3,800 g. The fetal heartbeats are clear, rhythmical, 146 beats/min. Internal obstetrical examination: cervical dilation is 7 cm, the head is with small segment in the pelvic inlet. The fetal bladder is absent. The saggital suture is in the direct size of the inlet, the big fontanelle is near by the symphysis, the small one — the promontory, higher than the big one. What is the policy of labour management?

- A. Caesarean section.
- B. Fetus destroying operation.
- C. Conservative labour.
- D. Obstetrical forceps of Lasarevitch.
- E. Obstetrical forceps of Simpson—Phenomenov.

10. A parturient woman, 24 years old, is at the 1st stage of in-time labour during 14 h with normal labour activity. Sizes of the pelvis are 26×28×30×18 cm. The fetal heartbeats are dull, rhythmical, 90 beats/min. Supposable weight of the fetus is 3,200 g ( $\pm 200$  g). Internal obstetrical examination: cervical dilation is complete, the head of the fetus is on the pelvic floor. The saggital suture is in transversal diameter of the outlet. The big fontanelle is on the right, the small one — on the left at the same level. What is the policy of labour management?

- A. Applying obstetrical forceps.
- B. Conservative labour.
- C. Caesarean section.
- D. Classical manual care.
- E. Fetus destroying operation.

1. A primipara, 24 years old, arrived to the maternity hospital with labour pains during 2 h. The amniotic fluid did not discharge. The sizes of the pelvis: 26×26×31×17. Diagonal conjugate is 10 cm. Determine pathology of the pelvis:

- A. Generally contracted pelvis.
- B. Transversally contracted pelvis.
- C. Simple flat pelvis.
- D. Flat rachitic pelvis.
- E. Normal pelvis.

2. A primipara of 20 years old who arrived to the maternity hospital has the following sizes of the pelvis: 23×26×28×18. The diagonal conjugate is 11 cm. Determine the form of the pelvis:

- A. Generally contracted pelvis.
- B. Transversally contracted pelvis.
- C. Simple flat pelvis.
- D. Flat rachitic pelvis.
- E. Normal pelvis.

3. A 30-year old primipara has a caesarean section concerning a clinically contracted pelvis in anamnesis. The present pregnancy proceeded without complications. US examination revealed a uterine scar. The sizes of the pelvis are 24×25×28×20. The diagonal conjugate is 12.5 cm. Determine pathology of the pelvis:

- A. Generally contracted pelvis.
- B. Transversally contracted pelvis.
- C. Simple flat pelvis.
- D. Flat rachitic pelvis.
- E. Normal pelvis.

4. A 24-year old pregnant woman had two abortions in term of 11–12 weeks in anamnesis. The sizes of the pelvis: 26×29×30×18. The diagonal conjugate is 11 cm. Determine etiology of the pelvis:

- A. Tuberculosis.
- B. Spondilolisthesis.
- C. Osteomalacia.
- D. Rachitis.
- E. Hypophysial nanism.

5. A primipara, the sizes of the pelvis: 25×28×31×20 cm. Labour activity is good. The small segment of the head of the fetus is in the pelvic inlet. The cervical dilation is 5 cm. The fetal bladder is intact. The diagonal conjugate is 10 cm. Weight of the fetus is 3,000 g. Determine policy of labour management.

- A. Augmentation of labour.
- B. Caesarean section.

- C. Fetus destroying operation.
- D. Expectant management.
- E. Obstetrical forceps.

6. A primipara, the sizes of the pelvis: 25×28×31×20 cm. Labour activity is normal. Amniotic fluid is clear. Weight of the fetus is 4,500 g. The head of the fetus is fit to the pelvic inlet. The Vasten's sign is positive. The opening of the cervix is complete. The fetal bladder is absent. The promontory is inaccessible. The fetal heartbeats are clear, rhythmical, 136 beats/min. Determine policy of labour management.

- A. Augmentation of labour.
- B. Caesarean section.
- C. Fetal destroying operation.
- D. Expectant management.
- E. Obstetrical forceps.

7. Labour is in time, continues for 6 h. The sizes of the pelvis: 26×27×30×18. Labour pains are active. The head is fit to the pelvic inlet. Supposable weight of the fetus is 3,500 g. The amniotic fluid discharged 2 h ago. During the internal obstetrical examination: the cervical dilation is 8 cm, the sagittal suture is in the direct size of the pelvic inlet, it is leaned back (to the promontory). Determine policy of labour management.

- A. Labour augmentation.
- B. Caesarean section.
- C. Fetal destroying operation.
- D. Expectant management.
- E. Obstetrical forceps.

8. At multigravida with a flat rachitic pelvis, the intrauterine death of the fetus is diagnosed in the end of the 1st stage of labour. Determine policy of labour management.

- A. Craniotomy.
- B. Extraperitoneal caesarean section.
- C. Classical version.
- D. Urgent caesarean section.
- E. Decapitation.

9. A secundipara is in labour for 6 h. In the past — early child death associated with craniocerebral trauma of the fetus. Pregnancy is post-mature (for 3 weeks). The sizes of the pelvis: 25×27×30×18 cm, the head is fit to the pelvic inlet. Weight of the fetus is 3,500 g. The cervical dilation is 8 cm. The amniotic fluid has just discharged. The diagonal conjugate is 10 cm. Determine policy of labour management.

- A. Augmentation of labour.
- B. Caesarean section.
- C. Fetus destroying operation.
- D. Expectant management.
- E. Obstetrical forceps.

10. A primigravida, 20 years old, is taken to dispensary observation at 11–12 weeks of pregnancy. From anamnesis: grew up and developed in poor financial and housing conditions. In childhood was often ill with infection diseases, suffered from rachitis. Sizes of the pelvis are 26×27×30×17.5 cm. Weight of the woman is 56 kg. The ABP is 72 beats/min, Hgb is 100 g/l. Which factor of listed below can influence the method of labour?

- A. Contracted pelvis.
- B. Anaemia.
- C. Age.
- D. Asthenic syndrome.
- E. Anamnesis.

## Chapter 24

### LABOUR WITH A BIG FETUS

1. A multigravida is at the 1st stage of labour. Supposable weight of the fetus is 4,200 g. The fetal heartbeats are rhythmical, 160 beats/min. Labour contractions are in 3 min, 35–40 s. Sizes of the pelvis are 25×28×31×20 cm. At internal obstetrical examination: complete cervical dilation, head of the fetus is pushed away from the pelvic inlet. Bones of the skull are dense, sutures and fontanelles are badly expressed. The promontory is inaccessible. Determine policy of labour management:

- A. Caesarean section.
- B. Conservative labour, treatment of intrauterine hypoxia of fetus.
- C. Conservative labour, functional evaluation of the pelvis.
- D. Medicamental sleep.
- E. Labour augmentation with oxytocin.

2. In a multipara bleeding from genitalia appeared in the maternity room. The ABP is 120/65 mmHg, contractions in 2–3 min for 50–55 s. The uterus relaxes badly between contractions, painful at palpation in the lower segment. Sizes of the pelvis are 26×27×33×18 cm. The fetal heartbeats are dull. Catheterization of the urine bladder failed because of mechanical obstruction. Cervical dilation is complete, the fetal head is set to the pelvic inlet, there is a big labour tumor on the head. The sagittal suture is shifted forwards, the big and small fontanelles are on the same level. The most probable diagnosis?

- A. Clinically contracted pelvis, hysterorrhesis.
- B. Clinically contracted pelvis, preterm separation of the placenta.

- C. Flat rachitic pelvis, II degree, acute intrauterine hypoxia of the fetus.
- D. Hysterorrhesis.
- E. Preterm separation of the placenta.

3. A secundipara is admitted to maternity hospital with a term pregnancy and regular labour activity. Position of the fetus is longitudinal, head presentation. Sizes of the pelvis are 23×26×28×18 cm, circumference of radio-carpal joint is 17 cm. Supposable weight of the fetus — 400 g. A parturient woman is uneasy, contractions are painful, the contractile ring is on the level of the umbilicus. The lower segment of the uterus is painful. What is the optimum labour management?

- A. Urgent caesarean section.
- B. Labour augmentation.
- C. Obstetrical forceps.
- D. Conservative labour.
- E. Administration of spasmolytics.

4. A multipara was admitted for labour with normal labour activity. Sizes of the pelvis: 26×29×30×18 cm. Supposable weight of the fetus is 4,100 g. At internal obstetrical examination: cervical dilation is complete, the head is set to the pelvic inlet. The amniotic fluid discharged. The Vasten' sign is positive. What is the optimum labour management?

- A. Caesarean section.
- B. Vacuum extraction of the fetus.
- C. Uterotonics administration.
- D. Obstetrical forceps.
- E. Medicamental sleep.

5. A mutigravida is in the end of the 2nd stage of term labour. Supposable weight of the fetus is 4,300 g ( $\pm 200$  g). What labour management prophylaxis is aimed in this case at?

- A. Bleeding in the 2nd stage.
- B. Infection complication.
- C. Extragenital pathology.
- D. Anaemia.
- E. Eclampsia.

6. A multipara is taken for dispensary observation to the maternity hospital in 12 weeks of pregnancy. From anamnesis it is known that she had two labour and delivered children with weight of 4,100 g and 4,300 g. No extragenital pathology is revealed. What is the optimum method of prophylaxis of big fetus?

- A. Rational diet.
- B. Salt intake reduction.
- C. Water intake reduction.
- D. Vegetarian nutrition.
- E. Medicines decreasing appetite.

## Chapter 25

### GENITAL TRACT DISEASES AND LABOUR

1. Primiry examination of a parturient woman revealed an incomplete vaginal septum. Labour are first, in-time, supposable weight of the fetus is 3,800 g ( $\pm 200$  g). The presenting head is in the pelvic cavity during 4 h, progredient movement of the head is disturbed. What is the optimal management of labour?

- A. Section of the septum.
- B. Caesarean section.
- C. Cavitary forceps operation.
- D. Vacuum aspiration.
- E. Fetal destroying operation.

2. A primigravida visited to the maternity hospital with complaints of 2 months menstruation delay. After clinical and instrumental examination the obstetrician had set the diagnosis: 12 weeks of pregnancy, uterus duplex. What complication of pregnancy is most probable?

- A. Threatened abortion.
- B. Immune conflict.
- C. Genetic disorders.
- D. Multiple pregnancy.
- E. Anaemia.

3. A primigravida, 32 years old, arrived to the hospital with complaints of acute local pain in the abdomen. The pains arised suddenly and gradually increased, localization is in the anterior uterine wall, the fundus region. The term of pregnancy is 34 weeks. The fetal heartbeats are clear, rhythmical, 136 beats/min. At manual external examination a round-shaped mass is determined in the fundus region of the uterus, 9 cm in diameter, painful at palpation. Ultrasonic examination revealed a fibromatous node in the uterine wall. The central part of the node is characterized by a structural abnormality. What is the optimal management?

- A. Conservative treatment of the node blood-supplying violation, tocolytics.
- B. Operative parturition.
- C. Labour induction, analgetics administration.
- D. Intibiotics administration.
- E. Conservative myomectomy.

4. A primiry examination of a pregnant woman showed a high position of the presenting head. The labour activity starts, contractions are weak, short. The term of pregnancy is 37 weeks. The position of the fetus is longitudinal, breech presentation. The fetal heartbeats are clear, rhythmical, 142 beats/min. At external obstetri-

cal examination the cervix is 1cm long, displaced to the right, the cervical channel passes 1 finger, the internal os is closed. At the region of the internal os a round-shaped dense mass 8 cm in diameter is revealed — a myomatous node. During internal examination the discharge of the amniotic fluid happened. What is the optimal management of labour?

- A. Caesarean section.
- B. Expectant policy.
- C. Labour inducing.
- D. Caesarean section in the case of fetal distress.
- E. Medicamental sleep.

6. A primigravida, 35 years old, arrived to the maternity hospital with complaints of bloody discharge from genitalia. The term of pregnancy is 33 weeks. Position of the fetus is longitudinal, head presentation, the fetal heartbeats are clear, rhythmical, 134 beats/min. The tonus of the uterus is not increased, the uterus is painless at palpation. At specula examination the cauliflower growth of the cervix is revealed with necrotic foci and bloody discharge. What is the optimal management?

- A. Caesarean section, treatment of cervical cancer.
- B. Treatment of cervical cancer, caesarean section.
- C. Treatment of cervical cancer, conservative parturition.
- D. Conservative operation on the cervix.
- E. Supervision, operative treatment in the case of tumor progression.

7. A primigravida, 27 years old, visited the maternity hospital with complaints of constant pain in the lower abdomen. The term of pregnancy is 13 weeks. At bimanual examination: the cervix is 2 cm long, uterine channel is closed; the uterus is round-shape, is enlarged according to the 13 weeks of pregnancy, its tonus increases at examination, painless at palpation. In the region of right appendages a round, elastic, painless mass is present, diameter 8 cm, left appendages are unchanged. Discharge are mucous, insignificant. At ultrasonic examination: unilocular ovarian tumor, with homogenous content; wall of the cyst is thin, flat. What is the optimal management?

- A. Operative treatment of the ovarian tumor at 16 weeks of pregnancy.
- B. Treatment of threatened abortion.
- C. Prophylaxis of the placental deficiency.
- D. Immediate operative treatment of the ovarian tumor.
- E. Puncture of the ovarian tumor.

8. A primigravida, 36 years old, was admitted to the maternity hospital with diagnosis: 1st pregnancy, 32 weeks, longitudinal position, left anterior occipital presentation, chronic placental deficiency, chronic fetal hypoxia, fetal hypotrophy. Cancer of the left ovary. The patient presents no complaints. The tonus of the uterus is normal, palpation is painless. The fetal heartbeats are clear, rhythmical, 138 beats/min. At internal obstetrical examination: the cervix is 2.5 cm long, cervical channel is closed, discharge are mucous. What is the optimal management?

- A. Caesarean section, total hysterectomy with appendages and greater omentum.
- B. Treatment of fetal hypoxia
- C. Resection of the ovarian tumor, treatment of fetal hypoxia
- D. Conservative labour, operative treatment of the ovarian tumor
- E. Operative treatment in case of fetal distress.

## Chapter 26

### INCOMPETENT PREGNANCY

1. A pregnant woman of 25 years old, has arrived in a hospital with complaints of pains in the lower abdomen and vaginal bloody discharge. Bimanual exam: the uterus is soft, enlarged till 9 weeks of pregnancy, the cervical canal easily passes a finger. The parts of embryonal tissue are palpated in the external os. From the vagina — moderate bleeding. What treatment should be carried out?

- A. Instrumental erosion of embryonal tissue.
- B. Observation over the patient.
- C. Hormonal treatment.
- D. Haemostatic and antianemic therapy.
- E. Pregnancy preserving therapy.

2. A pregnant woman of 27 years old, in the term of 17 weeks has arrived to the hospital for treatment. In anamnesis — 2 misbirths. At bimanual exam: the uterus enlarged till 17 weeks of pregnancy, the cervix is short, the os passes the end of the finger. The diagnosis is cervical failure. Establish the most rational policy of the doctor

- A. Cervical suturing.
- B. Tocolytic therapy.
- C. Abortion.
- D. Hormonal treatment.
- E. Amniocentesis.

3. A pregnant woman of 24 years in the term of 18–19 weeks in connection with the cervical



failure diagnosed during ultrasound is hospitalized to the gynaecologic department. At exam: the cervix is short up to 0.5 cm, its epithelium is without pathological changes. The cervical canal passes a finger, the fetal bladder is intact. The uterus enlarged up to 18–19 weeks of pregnancy. The normal tone. Further policy of the doctor?

- A. Cervical suturing.
- B. Tocolytic therapy.
- C. Abortion.
- D. Prophylaxis of fetal distress.
- E. Sedative therapy.

4. A pregnant woman of 25 years old complains of colic pains in the bottom part of the abdomen at the term of 31–32 weeks. The position of the fetus is longitudinal, head presentation. The heartbeats — 146 beats/min, rhythmical. Vaginal examination: the cervix is dilated by 5–6 cm. the fetal bladder is intact. The head is mobile above the pelvic inlet. What policy of the doctor?

- A. Labour management as premature.
- B. Medicamental tocolysis.
- C. Amniotomy.
- D. Using 2% promedol solution for anaesthesia.
- E. Augmentation of labour activity.

5. A primigravida 28 years old visited the maternity hospital with complaints of whining pains in the lower abdomen and loin. Duration of gestation is 15–16 weeks. In anamnesis: one labour and two induced abortions. At vaginal examination: the cervical length is 2.5 cm, the external os passes the end of the finger. The uterus is enlarged according to duration of gestation. Vaginal discharge are mucous, moderate. What diagnosis is the most authentic?

- A. Threatened abortion.
- B. Misbirth in progress.
- C. Still pregnancy.
- D. Hydatidiform mole.
- E. Placenta previa.

6. A pregnant woman, 25 years old, with complaints of whining pains in the lower abdomen and in the loin. Duration of gestation is 9–10 weeks. In anamnesis — 2 induced abortions. At vaginal examination: cervical length is 3 cm, the cervical canal is closed, the uterus is enlarged according to the gestation term, discharge are mucous, scanty. What diagnosis is most probable?

- A. Threatened abortion.
- B. Spontaneous abortion in progress.
- C. Still pregnancy.
- D. Hydatidiform mole.
- E. Abortion in progress.

7. In the delivery room there is a twice pregnant woman, 24 years old, at the term of 18–19 weeks in connection with the cervical failure diagnosed during ultrasound. In anamnesis 2 misbirths in the term of 12 and 17 weeks. At vaginal examination: the cervix is short up to 1.5 cm, the cervical canal passes 1 finger (2 cm). The fetal bladder is intact. The uterus is enlarged accordingly 18–19-week pregnancy, in the normal tone. At exam in specula the cervix is without pathological changes. What's further policy?

- A. Applying a circular suture on the cervix with a subsequent therapy by tocolytics.
- B. Observation.
- C. Prophylaxis of a respiratory distress.
- D. Acupuncture.
- E. Electrophoresis with magnesium.

8. A pregnant woman, gestation is 32 weeks, complains of a nagging pain in the lower abdomen. The head of the fetus is fit to the pelvic inlet. The fetal heartbeats are clear, rhythmical, 136 beats/min. Vaginal examination: the cervix is generated, the external os is closed. The amniotic fluid did not discharge. What should be conducted?

- A. Pregnancy preserving therapy.
- B. Labour induction.
- C. Amniotomy.
- D. Caesarian section
- E. Observation.

9. A multipara was hospitalized to the maternal hospital with the diagnosis of multiple pregnancy. What features of the course of pregnancy and labour should be anticipated?

- A. Premature labour.
- B. Premature separation of a normally presented placenta.
- C. Occipital posterior presentation.
- D. Acute hypoxia of the fetus.
- E. Polyhydramnios.

10. In a 23-year old pregnant woman at the term of 32 weeks of pregnancy abundant watery discharge from the vagina appeared. The present pregnancy is the first, proceeds without complications. Labour pains and bleeding are not present. In contents of the vagina the elements of the amniotic fluid are found out. Further policy:

- A. Augmentation of the labour activity after preparation.
- B. Caesarian section.
- C. Prolongation of pregnancy.
- D. Application of hyperbaric oxygenation.
- E. Observation in the woman's consultation clinic.

**PROLONGED GESTATION**

1. A primigravida, 39 years old, had been treating concerning infertility. Pregnancy is 41–42 weeks, position of the fetus is longitudinal, head presentation. The placenta near the uterine fundus, the third degree of maturity, presence of ossification, petrificates. A biophysical profile of the fetus is 5–6 points. Supposable weight of the fetus is 3,900 g ( $\pm 200$  g). At vaginal exam: the cervix is long, dense, the external os is closed. The head of the fetus is fit to the pelvic inlet. The amniotic fluid did not discharge.

What policy is the most expedient?

- A. Caesarian section according to the plan.
- B. Caesarian section with the beginning of labour activity.
- C. Intravenous introduction to oxytocin.
- D. Amniotomy with the subsequent labour augmentation.
- E. Conservative labour with the beginning of labour activity.

2. A primipara is 38 years old, 41–42 weeks of gestation, complains of weakening of movements of the fetus. The clinical and laboratory data specify postmature pregnancy. Supposable weight of the fetus is 4,200 g. The fetal heartbeats are dull, 160 beats/min. Amnioscopy revealed green amniotic fluid. What policy of labour management?

- A. Caesarian section.
- B. Expecting for independent labour activity.
- C. Octocine test.
- D. Oxytocin labour induction.
- E. Prostaglandines labour induction.

3. A pregnant woman, 28 years old, at the term of 42–43 weeks has arrived with complaints of discharge of the amniotic fluid, without labour activity. In anamnesis — infringement of the menstrual cycle, infertility within 2 years. The fetal heartbeats are dull, 170 beats/min. At vaginal examination the cervix is short up to 1.5 cm, softened, the uterine os is dilated by 2 cm, the head is fit to the pelvic inlet, the bones of the skull are dense, suture and fontanelles narrow, hardly defined. Amniotic fluid painted by meconium. What prophylaxis of the arisen complication is necessary?

- A. Hospitalization of the pregnant woman 2 weeks prior to the supposable term of labour.
- B. Psychoprophylactic preparation for labour.
- C. Hospitalization at the term of 32–34 weeks of pregnancy.

- D. Consultation of the endocrinologist.
- E. Establishing the biophysical profile of the fetus before labour.

4. A primipara, 31 years old parturates at the gestational term of 43 weeks. The amniotic fluid discharged 4 h ago. Drop introduction of 5 U of oxytocin is on for 2 h. Contractions are weak, irregular. The pelvic sizes are  $25 \times 28 \times 30 \times 20$  cm. A position of the fetus is longitudinal, head presentation, the head is fit to the pelvic inlet. The fetal heartbeats are dull, rhythmical — 140 beats/min. The circumference of the abdomen is 110 cm, height of standing of the uterine fundus is 40 cm. At vaginal examination: the cervix is short, dilated by 2 cm. What diagnosis is the most reliable and what is policy of the doctor?

- A. Postmature pregnancy. Caesarian section.
- B. Postmature pregnancy. Conservative conducting labour.
- C. Prolonged pregnancy. Conservative conducting labour.
- D. Prolonged pregnancy. Caesarian section.
- E. Births in time. Conservative conducting labour.

5. In the delivery room there is a parturient woman of 42 years old, 40–41 weeks of pregnancy. Duration of the water-free period is 28 h. Labour activity is not present. The body temperature is normal. In anamnesis infertility within 20 years. At vaginal examination: the cervix is short up to 1.5 cm, softened; cervical dilation is 2 cm, the fetal bladder is absent. The head of the fetus is above the pelvic inlet. The fetal heartbeats are clear, rhythmical, 146 beats/min. What method of labour is more expedient in the given situation?

- A. Caesarian delivery with restriction of the abdominal cavity.
- B. To administrate a glucoso-vitamin-calcium-hormonal background with the subsequent oxytocin labour induction.
- C. Caesarian section with supravaginal ablation of the uterus.
- D. To give medicamental rest with the subsequent prostaglandins labour induction.
- E. Observing the parturient woman.

6. A primipara, 41–42 weeks of pregnancy, is parturating for 6 h, contractions for 25 s in 5–6 min. The fetal heartbeats are arrhythmic 100–160 beats/min, green amniotic fluid leaks. At vaginal examination: the cervix is dilated, opening is 4 cm, the sagittal suture in the transversal size of the plane of the pelvic inlet. What further policy of conducting labour?

- A. Caesarian section.
- B. Augmentation of labour.
- C. Applying obstetrical forceps.
- D. Vacuum extraction of the fetus.
- E. Conservative conducting labour.

### Chapter 28

## PATHOLOGICAL CHANGES OF AMNIOTIC FLUID

1. A 34-year old woman has consulted the doctor of maternity hospital on the 10th week of gestation (the second pregnancy) with the purpose to get registered. In previous pregnancy the hydramnios took place, the child was born with weight of the body of 4,086 g. What method of investigation is it necessary first of all?

- A. Bacteriological investigation of vaginal discharge.
- B. Determination of the contents of fetoprotein.
- C. The glucose tolerance test.
- D. Cardiophonography of the fetus.
- E. US of the fetus.

2. A primigravida of 38 years old is directed for the ultrasonic investigation with gestation of 31–32 weeks. The circumference of the abdomen is 110 cm, height of standing of the uterine fundus is 34 cm, the woman's weight is 70 kg. What is the purpose of examination?

- A. To exclude developmental anomalies of the fetus.
- B. To exclude multiple pregnancy.
- C. To exclude presence of hysteromyoma.
- D. To determine quantity of the amniotic fluid.
- E. All listed above.

3. A primipara, 20 years old, is transferred into the maternity hospital with in-time pregnancy from the pathological pregnancy department where she was treated for chronic pyelonephritis, polyhydramnios. Labour activity is in progress, labour pains began 3 h ago. The fetus is single, head presentation, the heartbeats are clear, rhythmical, 142 beats/min. Supposable weight of the fetus is 3,000 g. The pelvis is normal. Cervical dilation is 3 cm, edges are thin. The amniotic bladder is intact, tense out of labour pains. Determine policy of the doctor:

- A. Stimulation by enzaprost.
- B. Stimulation by oxytocin.
- C. Caesarean section.
- D. Amniotomy.
- E. Expectant management.

4. Uterine bleeding began in a 31-year old multipara in early puerperal period. The woman had delivered twins against a background of hydramnios through the natural maternal passages. What is the most probable reason of bleeding?

- A. Atony of the uterus.
- B. Hysterorrhesis.
- C. Delay of the placenta.
- D. Thrombocytopenia.
- E. Cervical rupture.

5. In a pregnant woman at the pregnancy term of 24 weeks hydramnios was diagnosed. In anamnesis — one miscarriage and one induced abortion, chronic adnexitis during 5 years. Point the method of examination that can reveal the origin of hydramnios.

- A. TORCH infection detetmination.
- B. Clinical blood analysis.
- C. Clinical urine analysis.
- D. Bacterioscopic examination of vaginal smear.
- E. Coagulogram.

6. A pregnant woman was admitted to the maternal hospital for prelabour preparation with a term pregnancy and expressed hydramnios. The circumference of the abdomen is 114 cm, height of standing of the uterine fundus is 31 cm. The uterus is tense, the symptom of fluctuation is marked. The head is fit to the pelvic inlet. The fetal heartbeats are dull, rhythmical, 140 beats/min. What is the optimum labour management?

- A. Early amniotomy, slow amniotic fluid discharge.
- B. Caesarean section.
- C. Conservative labour.
- D. Labour induction.
- E. Medicamental sleep.

7. A secundigravida, 25 years old, was under dispensary observation. She had been suffering from chronic pyelonephritis since 20 years old, three times the exacerbation was marked during this pregnancy. At examination: hydramnios, intrauterine retardation, leucocytosis. What methods of examination are most informative for diagnosis of intrauterine fetus infection?

- A. US, clinical blood and urine analysis, bacteriologic examination of urine and amniotic fluid.
- B. Biochemical blood test, Zimnitsky test.
- C. Clinical blood and urine analysis.
- D. External examination of the pregnant woman, clinical blood and urine analysis.
- E. Biochemical blood test, clinical urine analysis.

8. A multigravida, 31 years old, was admitted with complaints of involuntary position of the body in bed, rapid increase in abdomen circumference. Term of pregnancy is 29-30 weeks, circumference of the abdomen — 120 cm, height of standing of the uterine fundus — 38 cm. The uterus is tense, parts of the fetus can not be palpated. Palpitation of the fetus is dull, 140 beats/min. What is the most probable component of diagnosis?

- A. Hydramnios.
- B. Preterm separation of a normally presented placenta.
- C. Big fetus.
- D. Multiple pregnancy.
- E. Hysterorrhesis.

## Chapter 29

### EXTRAGENITAL PATHOLOGY AND PREGNANCY

1. A primigravida was admitted to the delivery room at the term of 32 weeks with complaints of the general weakness, giddiness, fatigue. Objectively: general condition is satisfactory, integuments and seen mucous are acyanotic. The ABP is 110/70 mmHg, the pulse rate is 100 beats/min. Internal organs are without pathology. Labour activity is not present. The fetal heartbeats are clear, rhythmical, 140 beats/min. In the analysis of a blood: Hgb — 93 g/L, erythrocytes —  $3.0 \cdot 10^{12}/l$ , color index of blood. — 0.7, ESR — 18 mm/h, serum iron — 8.6 mmol/l. What pathology can be suspected in the pregnant woman?

- A. Iron deficiency anaemia of I degree.
- B. A hypoplastic anaemia of III degree.
- C. Megaloblastic anaemia of pregnancy.
- D. Posthaemorrhagic anaemia of I degree.
- E. Avitaminosis of pregnancy.

2. A multipara, 11 weeks of gestation, thirst, polyuria, appreciable weight loss, general weakness, dry mouth. In anamnesis dead childbirth with weight of 4,600 g. Glucose in the blood — 10.8 mmol/l. The diagnosis of the oculist — retinopathy. Policy of the further conducting pregnancy?

- A. An urgent abortion under medical indications.
- B. Prolongation of pregnancy with insulin therapy.
- C. Metabolic therapy.
- D. Treatment in conditions of the endocrinological clinic.
- E. Abortion after improvement of health condition.

3. 27. A primigravida of 25 years old suffering from mitral stenosis at 32 weeks of pregnan-

cy has signs of heart failure. After a course of therapy in the hospital no obvious improvement of health condition was marked. What is the further policy?

- A. Premature labour.
- B. An operative treatment of heart disease.
- C. Rheumatic disease examination.
- D. Preservation of pregnancy and cardiac therapy.
- E. Prelabour preparation.

4. A primigravida has visited the maternity hospital concerning pregnancy of 10 weeks with complaints of short wind, palpitation, fast fatigue. She is registered at the cardiologist with the diagnosis: rheumatic disease, an active phase, rheumatic carditis. The combined mitral defect with prevalence of stenosis. Cardiac insufficiency, II A stage. The plan of management?

- A. Abortion under medical indications.
- B. Hospitalization in terms till 12 weeks, 26–28 weeks, 36–37 weeks.
- C. An induced abortion in the late term under medical indications.
- D. Antenatal hospitalization in the term of 38 weeks.
- E. An out-patient treatment.

5. In pregnant woman, 28 weeks of gestation, in 2 weeks after angina headache, pains in loins, oedemas, rising of the body temperature up to  $37.8^{\circ}\text{C}$ , insignificant dyspnea appeared. Objectively: oedemas of legs and trunk are more promoted in the morning; the ABP is 140/90 mmHg, the Pasternatskiy's sign is positive on both sides; the analysis of urine: leukocytes — 2–3 in the field of view, erythrocytes — 10–15 in the field of view, protein — 4 g/L, hyaline cylinders. The most probable diagnosis?

- A. Glomerulonephritis of pregnancy.
- B. Pyelonephritis of pregnancy.
- C. Pre-eclampsia.
- D. Idiopathic hypertension.
- E. Urolithiasis.

6. A primigravida, 18 years old, visited the maternity hospital concerning pregnancy of 8 weeks. At exam of the therapist the diagnosis is rheumatic disease in the inactive phase, failure of the mitral valve is established. What is the further plan of conducting the pregnant woman?

- A. Pregnancy can be prolonged.
- B. It is necessary to interrupt pregnancy.
- C. Exam in the specialized department.
- D. Immediate hospitalization to the pathological pregnancy department.
- E. Pregnant woman does not require observation.



7. A primipara, 37 weeks of gestation, arrived to the maternity hospital with complaints of dyspnea, palpitation, fast fatigue. In the childhood suffered from anginas, since 15 years — rheumatic disease, an inactive phase, mitral stenosis, the II stage, cardiac insufficiency, II A stage. What policy of conducting the pregnant woman in this case?

- A. Conservative treatment, labour with exception of contractions in the 2nd stage.
- B. Prolongation of pregnancy in conditions of cardiological department.
- C. Conducting labour with augmentation of labour activity.
- D. Embryotomy.
- E. Exception of the 2nd labour stage by way of vacuum extraction of the fetus.

8. A primipara, 19 years old, is in the beginning of the first stage of physiological labour. In anamnesis mitral heart disease (failure of the mitral valve). The condition of the fetus is satisfactory. The fetal bladder is intact. What policy of conducting labour?

- A. Actively expectant, in the presence of the therapist, with the maximal anaesthesia.
- B. Caesarian section.
- C. Obstetrical forceps.
- D. Vacuum extraction of the fetus.
- E. Augmentation of labour activity.

9. A multipara of 32 years old suffers from idiopathic hypertension of I degree. The second stage of labour began. The head of the fetus is in the pelvic cavity. Contractions are in 2 min for 30 s. The fetal heart rate is 104 beats/min. The premature placental separation is suspected. Policy of the doctor?

- A. Cavitory obstetrical forceps.
- B. Augmentation of labour.
- C. Caesarian section.
- D. Treatment of intrauterine hypoxia of the fetus.
- E. Vacuum extraction of the fetus.

10. A pregnant woman is delivered to the observation department at the term of 24–25 weeks with complaints of acute pain in the lumbar area on the right, rise in the body temperature up to 38.6°C. Fever, often urodynia are observed. First pregnancy. Since 16 weeks of gestation pain in lumbar area more often on the right periodically appeared. The general condition is of moderate severity. The ABP is 120/80 mmHg, the heart rate is 106 beats/min, rhythmical. The abdomen is soft, enlarged by a pregnant uterus, the latter is in a normal tone. The Pasternatskiy's sign is sharply positive on the

right. The analysis of urine — leucocytes are in the whole field of view. What most probable pathology causes such a picture?

- A. Acute right-hand pyelonephritis.
- B. Acute glomerulonephritis.
- C. Hydronephrosis.
- D. Threatened abortion.
- E. Urolithiasis.

### Chapter 30

## GESTOSIS (TOXICOSIS OF PREGNANCY)

1. A woman, 8 weeks of gestation, suffers from nausea and vomiting 4–7 times a day. Weight loss is 5 kg. What preliminary diagnosis is the most authentic?

- A. Toxicosis of the first half of pregnancy.
- B. Toxinfection.
- C. Exacerbation of gastritis.
- D. Infringement of function of the stomach.
- E. Threatened abortion.

2. A pregnant woman is delivered by an ambulance car. Pregnancy is the third, the term is 8 weeks. Two previous pregnancies have been interrupted in connection with early gestosis. Pregnancy is desired. The pregnant woman is exhausted. Integuments are dry, acetone odour from the mouth. Vomiting is up to 20 times a day. Treatment was not provided. What diagnosis is the most authentic?

- A. Severe vomiting of pregnancy.
- B. Alimentary intoxication.
- C. Moderate vomiting of pregnancy.
- D. Exacerbation of chronic cholecystitis.
- E. Exacerbation of chronic gastritis.

3. A pregnant woman was admitted to the hospital concerning gestosis of first half of pregnancy. She had been receiving a full-volume treatment within 2 weeks. Now she complains of vomiting up to 20 times a day. The pregnant woman is exhausted, integuments are dry, acetone odour from the mouth. During treatment in the hospital the acetone in urine increased, hypoproteinemia gradually increased. What is necessary to undertake in the arisen situation?

- A. Urgent abortion.
- B. To continue the treatment within a week.
- C. Vitaminous therapy.
- D. Physio-therapeutic treatment.
- E. Acupuncture.

4. A pregnant woman is 21 years old, 8–9 weeks of gestation, complains of nausea, vomiting up to 20 times a day, the nutrition is disturbed. Within 10 days she lost up to 4 kg. The

condition of the patient is severe, from the mouth — acetone odour. The body temperature is subfebrile, the skin is dry, icteric. The pulse rate is 110 beats/min. The carried out treatment is not effective. What is further policy?

- A. Abortion.
- B. Tocolytic therapy.
- C. Antiemetic and sedative therapy.
- D. Parenteral nutrition.
- E. To continue infusion and detoxicational therapy.

5. A primipara has oedemas on the legs and complains of headache, pain in the epigastric area. The ABP is 180/120. Circumference of the abdomen is 90 cm, height of standing of the uterine fundus is 38 cm, the position of the fetus is longitudinal, head presentation, fetal heartbeats are 130 beats/min, rhythmic. In the analysis of the urine protein is 3.3 g/L. What complication of pregnancy has arisen?

- A. Pre-eclampsia of severe degree.
- B. Pre-eclampsia of moderate degree.
- C. Hypertonic crisis.
- D. Eclampsia.
- E. Oedemas of pregnancy.

5. A parturient woman is delivered to the delivery room in the second stage of labour. Pregnancy is full-term. At home there was an attack of eclampsia. Oedemas, hypertension and proteinuria since 32 weeks of pregnancy. The ABP is 150/100 mmHg, 160/110 mmHg. The head of the fetus on the pelvic floor. The fetal heartbeats are 160 beats/min. What is the policy of the doctor?

- A. Obstetrical forceps under general anaesthesia.
- B. Caesarian section.
- C. Vacuum extraction of the fetus.
- D. Embryotomy.
- E. Expectant policy.

6. A primigravida, 28 years old, was admitted with intensive labour activity, complains of headache, infringement of vision. The ABP is 180/110 mmHg. Promoted oedemas of legs, anterior abdominal wall. The head of the fetus is in the pelvic cavity. The fetal heartbeats are clear, rhythmical, 148 beats/min. At internal exam: cervical dilation is complete, the head of the fetus is in the pelvic cavity. Choose policy of labour management.

- A. Obstetrical forceps application.
- B. Caesarian section.
- C. Embryotomy.
- D. Conservative labour management with episiotomy.
- E. Augmentation of labour activity.

7. A pregnant woman, 25 years old, was delivered to the maternity hospital. From the words of her relatives she had three attacks of cramps at home. The pregnant woman has never suffered from epilepsy. At exam: the pregnant woman is unconscious, the ABP on the right and left hands is 190/120 mm, there are oedemas on the upper and lower extremities. Duration of gestation is 35 weeks. The diagnosis?

- A. Eclampsia.
- B. Epilepsy.
- C. Diabetic coma.
- D. Acute renal failure.
- E. Hepatic coma.

8. A primipara, 23 years old, 37–38 weeks of gestation, the condition is severe. At home there was an attack of eclampsia. The ABP is 180/100 mmHg. The pulse rate is 98 beats/min. Generalized oedemas. Consciousness is confused. Define policy of conducting the pregnant woman.

- A. Urgent caesarian delivery against a background of intensive care.
- B. Prolongation of pregnancy against a background of intensive care.
- C. An intensive care during 2–3 h with a subsequent labour.
- D. Obstetrical forceps application.
- E. Early amniotomy.

9. A woman, 36 weeks of pregnancy, complains of headache, nausea, vomiting, pain in the right hypochondrium. At exam: paleness of integuments, yellow mucosa, the ABP is 160/100 mmHg on both hands, oedemas of the lower extremities and anterior abdominal wall, hemorrhage in places of injections. An acute pain in the epigastric area and enlargement of the liver is determined by palpation. Parameters of the blood: augmentation ALT, AST, thrombocytopenia, hemoglobin is 85 g/l, hyperbilirubinemia. What is diagnosis?

- A. HELLP-syndrome.
- B. Eclamptic status.
- C. A set of symptoms of disseminated intravascular coagulation of blood.
- D. The liver failure.
- E. Eclampsia.

10. A pregnant woman is delivered to the delivery room with complaints of a headache, flashing of “spots” before eyes, in the analysis of urine taken during admission protein is 2 g/l. Pregnancy is full-term. Since 32 weeks of pregnancy oedemas, hypertension and proteinuria have been observed. The ABP at admission is 170/110, 160/100 mmHg. Labour activity is absent. The position of the fetus is longitudinal, head presentation, above the pelvic inlet. The

fetal heartbeats are 150 beats/min, rhythmical. What should be prophylaxis of the arisen complication?

- A. Early revealing and treatment of pretoxicosis.
- B. Psycho-prophylactic preparation for labour.
- C. Consultation of the nephrologist.
- D. Carrying out oxygenotherapy.
- E. Usage of tranquilizers.

### Chapter 31

## PLACENTAL INSUFFICIENCY AND INTRAUTERINE GROWTH RESTRICTION OF THE FETUS

1. In a primigravida, 25 years old, during the admission to the maternity hospital a mild form of late gestosis — oedemas of pregnancy is established. A gravida is directed to the obstetrical hospital where chronic fetoplacental insufficiency (FPI) and hypoxia of the fetus of moderate degree are found. The term of gestation is 34 weeks of pregnancy. Which of the listed drugs is the most expedient for appointing for treatment of FPI in this patient?

- A. Ampicillin hydrochloride — 4 g.
- B. Curantyl — 2.0 ml.
- C. 40% glucose — 20.0 ml.
- D. 1% dibazol — 1.0 ml.
- E. Ascorutin — 1 tablet 2 times per day.

2. A secundigravida, 27 years old is registered in the maternity hospital at the term of 11–12 weeks. There are frequent anginae, chronic pyelonephritis in anamnesis. The first pregnancy was complicated by the syndrome of retardation of the fetus development. Which of the pointed out examinations is necessary to carry out first of all?

- A. Pelvic US.
- B. Examination of the TORCH-infection contamination.
- C. Determination of the level of estrogens.
- D. Bacteriological examination of the urine.
- E. Determination of the contents of ferrous serum.

3. A multigravida, 27 years old, was hospitalized with diagnosis: 2nd pregnancy, 35 weeks. Retardation of intrauterine development of the fetus of the 1st stage. The patient has been smoking since 16 years old, 2 packages of cigarettes per day, smokes even at night. Position of the fetus is longitudinal, head presentation. The fetal heartbeats are rhythmical, 140 beats/min.

Circumference of the abdomen is 88 cm, height of standing of the uterine fundus is 32 cm. Point the examination that can confirm the diagnosis and establish the stage of intrauterine retardation:

- A. Ultrasound examination.
- B. Colposcopy.
- C. Laparoscopy.
- D. Culdoscopy.
- E. Hysteroscopy.

4. A multigravida, 34 years old, was hospitalized with diagnosis: 2nd pregnancy, 34 weeks. Hypotrophy of the fetus. She has been suffering from hypertonic disease since 27 years old. Blood pressure is 140/90–150/90 mmHg during pregnancy. Circumference of the abdomen is 88 cm, height of standing of the uterine fundus is 28 cm. The fetal heartbeats are clear, rhythmical, 140 beats/min. Point the examination that can confirm the hypotrophy of the fetus:

- A. Ultrasound examination.
- B. Cardiotocography.
- C. Chorionic gonadotrophin level.
- D. Estriol level.
- E.  $\alpha$ -fetoprotein level.

5. There is a disproportion between fetometry sizes of the fetus and term of pregnancy in a pregnant woman at 32 weeks of pregnancy. The only risk factor is smoking (1 package during 12 h). The woman feels more frequent fetal movements. What hormone level must be examined for determination of the condition of the fetoplacental complex?

- A. Estriol.
- B. Progesterone.
- C. 17-KS.
- D. Somatomammotrophin.
- E.  $T_3$ ,  $T_4$ .

6. At the III trimester of pregnancy the height of standing of the uterine fundus is retarded for two weeks. A threatened abortion and premature birth were marked during pregnancy. Labour is mature, weight of the newborn is 2,500 g, length is 53 cm, evaluation by the Apgar's score is 5–6 points. The origin of the state of the newborn:

- A. Chronic fetoplacental insufficiency.
- B. Intrauterine infection.
- C. Birth defects.
- D. Separation of the placenta.
- E. Immaturity.

7. A primigravida was admitted at 38 weeks of pregnancy. Sizes of the pelvis are 23×26×18 cm, diagonal conjugate is 11 cm. Data of echo-

graphy: head presentation, supposable weight of the fetus is 3,200 g, placenta of the third degree of maturity in the uterine fundus. At dopplerometry the violation of uteroplacental circulation is revealed, 2nd stage, oligohydramnios. Plan of management?

- A. Treatment of fetoplacental insufficiency, caesarean section.
- B. Treatment of fetoplacental insufficiency, conservative labour.
- C. Treatment of fetoplacental insufficiency, amniotomy and labour augmentation with oxytocin.
- D. Conservative labour, taking into account the fetus' weight.
- E. Urgent caesarean section.

8. A multigravida was admitted to the maternity hospital with complaints of edema of lower extremities, the ABP risen up to 170/90 mmHg. Term of gestation is 32 weeks. Chronic placental insufficiency was revealed at exam. What plan of management is optimal?

- A. Treatment of main pathology that provoked chronic placental insufficiency.
- B. Improvement of fetoplacental circulation.
- C. Normalization of metabolic processes in the mother.
- D. Normalization of metabolic processes in the fetoplacental complex.
- E. Improvement of the gas metabolism between mother and fetus.

## Chapter 32

### FETAL HYPOXIA, ASPHYXIA AND BIRTH INJURY OF A NEWBORN INFANT

1. A 24-year old primipara suffers from congenital heart disease. Duration of the first stage of labour — 4 h. At auscultation of fetal heartbeats — correct rhythm, tachycardia up to 160 per min. Heart sounds are heard sometimes clear, sometimes dull. There is meconium in the amniotic fluid. Estimate intrauterine condition of the fetus.

- A. Chronic fetal hypoxia at a compensated stage.
- B. Chronic fetal hypoxia at decompensated stage.
- C. Acute fetal hypoxia.
- D. Condition of the fetus is satisfactory.
- E. Antenatal destruction of the fetus.

2. A primigravida, 20 years old, suffers from a severe form of diabetes. The gestational term is 37 weeks. Fetal movements disappeared. Estimate the intrauterine condition of the fetus.

- A. Chronic fetal hypoxia at the compensated stage.
- B. Acute fetal hypoxia.
- C. Antenatal death of the fetus.
- D. Intranatal death of the fetus.
- E. Chronic fetal hypoxia at the decompensated stage.

3. First labour takes place at 32 weeks of gestation. A male newborn weighs 1,200 g, height is 40 cm. Breathing is superficial, at the inhalation chest retraction is observed, the nose wings participate in the act of breathing. How is the newborn respiratory insufficiency estimated?

- A. Apgar's score.
- B. Silverman's score.
- C. Vittlinger's score.
- D. Schiller's test.
- E. Is not estimated.

4. The first urgent labour. General duration of labour is 12 h. A mature alive boy weighs 3,500 g, height is 52 cm. How is the condition of his first minute of life estimated?

- A. Apgar's score.
- B. Vittlinger's score.
- C. Silverman's score.
- D. Is not estimated.
- E. Schiller's test.

5. A secundiravida was brought to the maternity hospital at the gestational term of 38 weeks with complaints of bloody discharge from the vagina. According to the data of previous ultrasound exam: the placenta blocks the os of the uterus, the head is presented highly above the pelvic inlet. Fetal heartbeats are rhythmic, 180 per min. The uterine tonus is increased at palpation. Estimate intrauterine condition of the fetus.

- A. Chronic fetal hypoxia at the stage of compensation.
- B. Chronic fetal hypoxia at the stage of decompensation.
- C. Acute fetal hypoxia.
- D. Antenatal destruction of the fetus.
- E. Intranatal destruction of the fetus.

6. A pregnant woman, 8 weeks of gestation, is admitted in the maternity hospital concerning gestosis of moderate severity. Generalized oedemas, increase in the body weight more than by 15 kg, proteinuria up to 1 g per day are observed. The ABP is 150/100 mmHg. Presented head is set to the pelvic inlet. Fetal heartbeats are rhythmic.



mical, dull, 160 per min. The estimation of fetal condition by the Fisher's score is 7 points. Estimate intrauterine condition of the fetus.

- A. Chronic fetal hypoxia at the stage of compensation.
- B. Chronic fetal hypoxia at the stage of decompensation.
- C. Acute fetal hypoxia.
- D. The condition of the fetus is satisfactory.
- E. Antenatal destruction of the fetus.

7. A 17-year old parturient woman arrived at the maternity hospital with a term pregnancy. She has been in labour for 2 h. The presented head is set to the pelvic inlet. Fetal heart sounds are clear, rhythmical, 140 beats/min on the left and lower from the navel. The amniotic fluid didn't discharge. Estimate intrauterine condition of the fetus.

- A. Chronic fetal hypoxia at the stage of compensation.
- B. Chronic fetal hypoxia at the stage of decompensation.
- C. Acute fetal hypoxia.
- D. Condition of the fetus is satisfactory.
- E. Intranatal destruction of the fetus.

8. A 22-year old primipara arrived at the maternity hospital with regular labour activity. Two hours ago the amniotic fluid discharged. Presented buttocks are fit to the pelvic inlet. Fetal heart sounds are dull, 100 beats/min. Internal obstetrical examination data: cervix is smooth, dilated by 4 cm. A pulsating loop of the umbilical cord is detected in the vagina. Estimate intrauterine condition of the fetus:

- A. Chronic fetal hypoxia at the stage of compensation.
- B. Chronic fetal hypoxia at the stage of decompensation.
- C. Acute fetal hypoxia.
- D. The condition of the fetus is satisfactory.
- E. Intranatal destruction of the fetus.

9. First urgent labour, premature discharge of the amniotic fluid. Initial uterine inertia. Duration of labour is 16 h. Labour augmentation is with enzoprost. A male newborn was born, the baby does not breathe, fetal heartbeats are 30 per min, heart sounds are dull. Physiological reflexes are absent. Skin is pale, muscle tone is flaccid. Estimate intrauterine condition of the newborn fetus:

- A. 0–3 points.
- B. 4–5 points.
- C. 5–6 points.
- D. 7–8 points.
- E. 8–10 points.

10. A parturient woman has been in labour for 4 h. The amniotic fluid discharged 2 h ago. The uterus is tense at the period between pains. There is tenderness and protuberance on the uterine fundus (on ultrasound: the placenta is located at the uterine fundus). Heart sounds are dull, 100 beats/min. Internal obstetrical exam: the cervix is smoothed. Opening of the uterine os is 4 cm. The presented head is set to the pelvic inlet. Abundant bloody discharge. Estimate intrauterine condition of the fetus:

- A. Chronic fetal hypoxia at the stage of decompensation.
- B. Chronic fetal hypoxia at the stage of decompensation.
- C. Acute fetal hypoxia.
- D. The condition of the fetus is satisfactory.
- E. Intranatal destruction of the fetus.

### *Chapter 33*

## **ISOIMMUNIZATION AND HEMOLYTIC DISEASE OF A FETUS AND NEWBORN INFANT**

1. A patient with Rh-negative blood has the 6th pregnancy. During 4th and 5th pregnancies there was a necessity of triple antenatal hemotransfusion of blood to fetus. Choose the titer of antibodies that is characteristic for this case.

- A. Indirect Cumbs' test is 1:2048.
- B. Indirect Cumbs' test is negative.
- C. Indirect Cumbs' test is 1:64.
- D. Indirect Cumbs' test is 1:128.
- E. Indirect Cumbs' test is 1:8.

2. A multigravida, 24 years old, with Rh-negative blood is taken for dispensary observation to the maternity hospital at 9–10 weeks of pregnancy. Pregnancy is the third, the first finished by normal birth 6 years ago, baby is healthy, second one — spontaneous abortion at the term of 16–17 weeks. After labour diabetes mellitus was revealed, class "B". Titer of antibodies 1:16–1:32. What is the policy of pregnancy management?

- A. Induced abortion according to medical indications.
- B. Prolongation of pregnancy with correction of insulin dosage.
- C. Prolongation of pregnancy with rational diet.
- D. Prolongation of pregnancy with regular detection of glucose level in blood.
- E. Prolongation of pregnancy with lymphocyte suspension injection.

3. Immune sensitizing by Rh-system was revealed in a secundipara, 21 years old during registering. The woman has been suffering from chronic pyelonephritis since childhood. In anamnesis: hemotransfusion, two miscarriages in 6–7-week terms. The most probable reason of sensitizing by Rh-system?

- A. Haemotransfusion without taking into account Rh-factor.
- B. Miscarriages.
- C. Extragenital pathology and haemotransfusion.
- D. Haemotransfusions.
- E. Chronic pyelonephritis.

4. In a multigravida with Rh-sensitizing the reducing of titer of Rh-antibodies from 1:16 to 1:8 at the term of 34–35 weeks. At ultrasound examination a double contour of the fetal head, increasing of the fetal liver, thickness of the placenta were revealed. What is the policy of pregnancy management?

- A. Urgent parturition.
- B. Desensitizing therapy.
- C. Plasmapheresis.
- D. Repeated detection of antibodies titer.
- E. Repeated ultrasound examination.

5. A multigravida, 26 years old, is admitted to the maternity hospital at the term of 32–33 weeks. The blood group is A (II), Rh-negative. In anamnesis — two deliveries with Rh-positive mature babies. Titer of antibodies at present — 1:32, does not increase. What is the policy of pregnancy management?

- A. Labour at 37–38 weeks.
- B. Immediate labour.
- C. Labour at 40 weeks.
- D. Labour at 34–35 weeks.
- E. Expecting for spontaneous labour.

6. An induced abortion was conducted in a primigravida with Rh-negative blood at 10–11 weeks. What is necessary to conduct for prophylaxis?

- A. Injection of anti-Rh  $\gamma$ -globulin.
- B. Injection of lymphocytes suspension.
- C. Desensitizing therapy.
- D. Plasmapheresis.
- E. Transplantation of the skin flap.

7. A multipara with blood group A (I), Rh-positive at 36–37 weeks is hospitalized. Titer of natural antibodies 1:256, immune antibodies, hemolysines 1:2. What is the policy of pregnancy management?

- A. Urgent labour.
- B. Labour at 37–38 weeks.
- C. Labour by arising of hemolytic disease signs.

D. Labour at 40 weeks.

E. Expecting for spontaneous labour.

8. A newborn with A (II), Rh-negative blood (mother 0 (I), Rh-negative; father A(II), Rh-positive) became ill with hemolytic jaundice. What is the origin of disease?

- A. ABO-system conflict.
- B. Rh-factor conflict.
- C. Immaturity.
- D. Intrauterine infection.
- E. Allergy.

9. In a multipara, 30 weeks of pregnancy, Rh-sensitization is revealed. Titer of antibodies is 1:32. From anamnesis: first pregnancy finished by intranatal fetus death at 37–38 weeks owing to hemolytic fetus disease. At exam: the abdomen is increased up to the sizes of a pregnant uterus, the position of the fetus is longitudinal, head presentation, the fetal heartbeats are 146 beats/min, rhythmical. Data of US: sizes of the fetus correspond to the term of pregnancy, internal fetus' organs — without peculiarities. Quantity of the amniotic fluid is a little increased. The placenta is 4 cm, with signs of premature aging. What is the optimal policy of pregnancy management?

- A. Amniocentesis with detection of optic density of the amniotic fluid.
- B. Caesarean section.
- C. Cordocentesis with infusion of washed erythrocytes into the umbilical vein.
- D. Observation of anti-Rh-antibodies' titer.
- E. Injection of anti-Rh  $\gamma$ -globin.

10. In a multipara, A(II), Rh-negative blood at 34 weeks of pregnancy the Rh-antibodies titer 1:64 is revealed. The data of ultrasound examination of the fetus: hepatosplenomegaly, ascitis, thickening of the placenta up to 6 cm. Optic density of the amniotic fluid is 0.42. What is the optimal policy of pregnancy management?

- A. Immediate labour.
- B. Cordocentesis with infusion of washed erythrocytes into the umbilical vein.
- C. To conduct the transplantation of the skin flap.
- D. Plasmapheresis with subsequent determination of anti-Rh-antibodies' titer.
- E. Desensitizing therapy.

## Chapter 34

### OBSTETRICAL HEMORRHAGE

1. A pregnant woman of 22 years old, gestation is 37 weeks; in anamnesis — late misbirth.

At night bleeding began suddenly up to 200 ml. The position of the fetus is longitudinal, the head above the pelvic inlet. The fetal heartbeats are clear, rhythmical, 140 beats/min. At vaginal exam: the cervical canal passes one transversal finger, in the external os spongiform tissue is palpated. What is the reason of bleeding?

- A. Placenta previa.
- B. Threat of premature births.
- C. A premature separation of a normally presented placenta.
- D. A low implantation of the placenta.
- E. Anabrosis of the cervix of the uterus.

2. A pregnant woman with complaints of aching back pain and spreading bloody vaginal discharge was admitted to the maternity hospital. The term of gestation is 36–37 weeks. At exam: the sizes of the pelvis are in the norm, abdominal circumference is 102 cm, height of standing of the uterine fundus is 38 cm. Above the pelvic inlet there is a big soft part of the fetus, in the uterine fundus — more dense of a round form. The fetal heartbeats are 160 beats/min, higher than the umbilicus at the left. Bemanual exam: the cervix is dense, open by 5 cm, the amniotic bladder, edge of the placenta is determined, the pelvic end presents. What obstetrical policy is applicable when further conducting pregnant woman?

- A. Caesarian section.
- B. Labour through maternal passages.
- C. Extraction of the fetus by the pelvic end.
- D. A prolongation of pregnancy.
- E. Applying obstetrical forceps.

3. A primigravida in the term of 37 weeks of pregnancy. The fetus is alive. The pelvic sizes are 26×28×31×20. Three days ago at absence of labour activity 50–60 ml of bloody vaginal discharge appeared. In two days bleeding repeated. At vaginal examination: the cervix is short, the canal passes a finger. Behind internal os a spongiform tissue is determined. The head of the fetus is mobile above the pelvic inlet. After exam the bleeding went stronger. The diagnosis?

- A. Placenta previa.
- B. Cervical cancer.
- C. Hypotonic uterine bleeding.
- D. Separation of a normally presented placenta.
- E. Threatened hysterorrhesis.

4. A pregnant woman showing complaints of headache and pains in the epigastric area was delivered to the maternity hospital. Pulse is 100 beats/min, the ABP is 170/100 mmHg, oedemas of the trunk, abdomen, legs. The sizes of the uterus correspond to the term of a full pregnancy, it is tense and morbid at palpation, the fetal

heartbeats are dull, discharge from the vagina are bloody. What is it necessary to undertake?

- A. Urgent caesarian section.
- B. Treatment of acute hypoxia.
- C. Complex treatment of gestosis.
- D. To open the fetal bladder and conduct delivery through the maternal passages.
- E. Complex pathogenetic therapy of gestosis, in case of its failure to perform caesarian delivery.

5. A pregnant 25-year old woman is delivered to the maternity hospital with pregnancy of 34 weeks and complaints of bright bloody discharge with clots which appeared after the act of defecation. The head of the fetus is at the uterine fundus. The fetal heartbeats are 140 beats/min. Labour activity is absent. Vaginal examination: the cervix in length is 3 mm, the os passes the end of the finger, through the vagina a great mass of soft consistence, discharge are bloody and bright. What diagnosis is the most authentic?

- A. Placenta previa.
- B. Hysterorrhesis.
- C. Separation of a normally presented placenta.
- D. Low implantation of the placenta.
- E. Threatened premature birth.

6. A secundigravida concerning a massive vaginal bleeding was delivered to the delivery room. At vaginal examination: the cervix is short, opening of the uterine os is up to 3 cm, a spongiform tissue is palpated higher than the internal os, the membranes are determined nearby. At exam in specula the walls of the vagina and cervix are not pathologically changed. What pathology is described?

- A. Partial placenta previa.
- B. Premature separation of a normally presented placenta.
- C. Complete placenta previa.
- D. Rupture of the regional suture.
- E. Embolism of the amniotic fluid.

7. A pregnant woman of 24 years old in the term of 36 weeks complains of abdominal pains, bloody vaginal discharge. Objectively: the general condition is of mild severity, the pulse rate is 90 beats/min, the ABP is 150/90 mmHg. The uterus is tense, the fetal heartbeats are 179 beats/min, dull. Vaginal examination: the cervix in length is 2.5 cm, the external os passes one finger. Through the vaginal vaults the head of the fetus is determined. From the uterus moderate bloody discharge. What diagnosis is the most authentic?

- A. Premature separation of a normally presented placenta.

- B. Threatened premature labour.
- C. Placenta previa.
- D. Hysterorrhesis.
- E. Pre-eclampsia.

8. A secundipara, 25 years old, the gestational term is 32 weeks, has a serious form of diabetes mellitus, complete premature separation of a normally presented placenta. At caesarian operation there is with massive ecchymoses, the uterus is of a mottled kind, cyanotic-crimson, in the abdominal cavity up to 200 ml of hemorrhagic liquid. What complication has arisen owing to a premature placental separation?

- A. Couvelaire's uterus.
- B. DIC-syndrome.
- C. Haemorrhagic shock.
- D. Embolism of the amniotic fluid.
- E. Hypotonia of the uterus.

9. In a puerpera of 24 years old the exam of the maternal passages in the early postnatal period revealed: intact cervix, damages to the posterior wall of the vagina, the skin and muscles of the perineum. The anal muscle, and rectal mucosa are not injured. What birth trauma is concerned?

- A. Perineal rupture, II degree.
- B. Perineal rupture, I degree.
- C. Perineal rupture, III degree.
- D. Rupture of the posterior commissure.
- E. Colporrhesis.

10. A 20-year old puerpera of after a child birth with the weight of 4,000 g has vaginal bleeding. Placental parts are absent. The uterus is with clear contours, normal tone. Manual separation of the placenta is carried out in connection with suspicion at close implantation of the placenta, oxytocin is entered i/v. The uterus was well reduced, but vaginal bleeding proceeded. At exam of the maternal passages with the help of specula a deep rupture of the left lateral wall of the vagina is revealed. What should be the policy of the doctor with the purpose of bleeding stop?

- A. Rupture suturing.
- B. Intravenous introduction of uterotonics.
- C. Manual exam of the uterine cavity.
- D. Vaginal tamponade.
- E. Supravaginal ablation of the uterus without appendages.

11. At exam of the separated placenta the defect in the size of 2×3 cm is fixed. Bleeding is not present. What policy is most justified?

- A. Manual inspection of the uterine cavity.
- B. Uterotonic agents prescription.
- C. External massage of the uterus.

- D. Observation over the puerpera.
- E. Tool inspection of the uterine cavity.

12. A secundigravida is 25 years old. In the third stage of labour the bleeding without signs of separation of the placenta appeared. At manual placental separation it is revealed that the placenta is evolved into the myometrium. Policy of the doctor?

- A. Laparotomy, hysterectomy.
- B. Tool inspection of the afterbirth.
- C. Application of uterotonics.
- D. Haemotransfusion.
- E. Prophylaxis of postnatal inflammation of the uterus.

13. A puerpera has a profuse bleeding after twins birth through the natural maternal passages. The children's place and maternal passages are intact. The uterine fundus is higher than the umbilicus, the uterus is soft at palpation, does not react to introduction of agents reducing the uterus. What is the most authentic reason for bleeding?

- A. Uterine atony.
- B. Damage to the cervix.
- C. Hysterorrhesis.
- D. Delay of the placental parts.
- E. Uterine hypotonia.

14. Delivery began in a parturient woman with a serious form of pre-eclampsia right after the bleeding. The afterbirth, maternal passages are intact. The uterine fundus is lower than the umbilicus by 2 cm, dense. At external massage of the uterus the bleeding has amplified, the blood is liquid and without clots. What diagnosis can be assumed?

- A. Coagulopathic bleeding, DIC-syndrome.
- B. Hypotonic bleeding.
- C. Delay of the fetal parts in the uterus.
- D. Hysterorrhesis.
- E. Embolism of the amniotic fluid.

15. While performing the caesarian delivery in connection with a complete placenta previa, after placental separation an appreciable bleeding arose at the site of the placental platform. Cannot be removed from the placental platform. The rests of the placental tissue can not be removed from the placental platform. The diagnosis of a true partial placenta increta is established. Specify the most rational policy to stop bleeding.

- A. Hysterectomy without appendages.
- B. Removal of the rests of the placental tissue.
- C. Sewing together the sites of bleeding.
- D. Ligation of the main vessels.
- E. Intravenous uterotonics prescription.



Chapter 35

**HAEMORRHAGIC SHOCK AND PRINCIPLES OF INFUSIVE-AND-TRANSFUSIVE THERAPY IN OBSTETRICS**

1. A primipara, 22 years old, after labour of a newborn, 4,000 g, has hemorrhage from the maternal passages. Bloodloss is 20 % of BV, the ABP is 100/60 mmHg, shock index — 1. Diagnosis:

- A. Haemorrhagic shock of II degree.
- B. Haemorrhagic shock of I degree.
- C. Haemorrhagic shock of III degree.
- D. Thrombus-haemorrhagic shock.
- E. Septic shock.

2. In a puerperal woman in the early puerperal period hemorrhage appeared. Bloodloss is 1,500 ml (1.8 %). General condition is severe, the consciousness is confused, anergic stupor, anxiety, body temperature is 35.7°C, pale skin, acrocyanosis. Tachycardia is 130–140 beats/min, central venous pressure is 20 mm, respiration rate is 40 per min, diuresis per hour is 15–20 ml/h, Htc — 0.25, shock index — 1.4, Hgb — 70 g/l. What should be the doctor's policy?

- A. Laparotomy. Total hysterectomy without appendages.
- B. Manual revision of the uterine cavity and massage of the uterus.
- C. Applying ligating clamps on the parametrium.
- D. Introduction of ether tampon.
- E. Cold on the lower abdomen.

3. In a multipara with placenta previa the uterine hemorrhage have appeared. Total bloodloss is 500 ml, ABP — 100/60 mm, the pulse rate is 100 beats/min, pale skin. Determine the shock index.

- A. 1.5.
- B. 0.5.
- C. 1.0.
- D. 0.8.
- E. 2.0.

4. At a puerperal woman in the early puerperal period hemorrhage appeared from the maternal passages. Total bloodloss is 1,000 ml, the ABP is 90/70 mm, the pulse rate is 120 beats/min, pale skin, cold sweat, oliguria. Determine the grade of hemorrhagic shock.

- A. 0.
- B. I.
- C. II.
- D. III.
- E. IV.

5. In a puerperal woman in the early puerperal period hemorrhage appeared from the maternal passages. Total bloodloss is 1,000 ml, the ABP is 90/70 mm, pulse rate is 120 beats/min, pale skin, cold sweat, oliguria. Determine the total volume of infusive therapy in connection with total bloodloss.

- A. 1.5.
- B. 2.
- C. 2.5.
- D. 1.
- E. 3.

6. A multipara with preterm placental separation has uterine hemorrhage. Total bloodloss is 1,200 ml, the ABP 90/60 mm, pulse rate is 120 beats/min, pale skin. Determine the volume of BV restoration during first two hours.

- A. 840 ml.
- B. 1,800 ml.
- C. 1,000 ml.
- D. 1,300 ml.
- E. 1,200 ml.

7. A puerperal woman in the early puerperal period has hemorrhage from the maternal passages. Total bloodloss is 1,000 ml, the ABP is 90/70 mm, pulse rate is 120 beats/min, pale skin, cold sweat. The speed of infusive therapy introduction:

- A. 100–200 ml/min.
- B. 250–500 ml/min.
- C. 50–60 ml/min.
- D. 250–300 ml/min.
- E. 10–20 ml/min.

8. At a puerperal woman in the early puerperal period hemorrhage from maternal passages appeared. Total bloodloss is 1,000 ml, the ABP is 90/70 mm, pulse rate is 120 beats/min, pale skin, cold sweat, oliguria. Determine the colloid solution ratio for infusive therapy:

- A. 1:1–1:2.
- B. 2:1–3:1.
- C. 2:1.
- D. 3:1.
- E. 3:1–4:1.

9. A puerpera in the early puerperal period has severe hemorrhage from the maternal passages. Consciousness is absent, the ABP is 60/40 mm, pulse rate is 140 beats/min, Htc — 0.2, pale skin, cold sweat, cold extremities, anuria. Determine the bloodloss volume:

- A. 1,500 g and more.
- B. 100 g.
- C. No more than 1,500 g.
- D. 1,200 g.
- E. 1,300 g.

10. In a puerpera in the early puerperal period hemorrhage appeared. Bloodloss is 1,500 ml (1.8 %). General condition is severe, consciousness is confused, anergic stupor, anxiety, body temperature is 35.7°C, pale skin, acrocyanosis. Tachycardia is 130–140 beats/min, central venous pressure is 20 mm, respiratory rate is 40 per min, diuresis per hour is 15 ml/h, Htc — 0.22, shock index is 1.4, Hgb — 70 g/l. What is the stage of shock?

- A. Decompensated irreversible.
- B. Compensated.
- C. Mild.
- D. Severe.
- E. Moderate.

### Chapter 36

## **SYNDROME OF DISSEMINATED INTRAVASCULAR BLOOD COAGULATION IN OBSTETRICS**

1. In a puerpera with severe pre-eclampsia the hemorrhage have appeared right after the child birth. The placenta exam revealed no defects, uterine fundus is 2 cm lower than the umbilicus, the uterus is dense. After external massage of the uterus hemorrhage increased. The blood is watery without clots. Preliminary diagnosis:

- A. Coagulopathic bleeding, DIC-syndrome.
- B. Trophoblastic disease.
- C. Hypotonic bleeding.
- D. Amniotic fluid embolism.
- E. Hysterorrhesis.

2. After the third in time birth of a child with the weight of 4,300 g uterine bleeding arose. The external massage of the uterus, introduction of uterotonics, manual exam of the cavity of the uterus and massage of the uterus on the fist, a tampon with an ether to the posterior arch were carried out. No effect, the bleeding was on. Total bloodloss is 1,200 ml. Thrombocytes —  $55 \cdot 10^9$  in 1 l, thrombin time — 70 s, FDP (fibrinogen degradation products) — positive, the clots of blood does not form. What is the stage of DIC-syndrome?

- A. IV stage.
- B. I stage.
- C. II stage.
- D. III stage.
- E. V stage.

3. A multipara, in-time labour, has delivered an alive boy, 4,500 g. In 10 min after the birth of the child uterine bleeding began. The placenta is separated by the hand, massage of the uterus on the fist was carried out, the solution of oxytocin is intravenously entered. In 10 min the bleeding renewed and increased. Conservative methods of restoring the contractile activity of the uterus failed. The total bloodloss made more than 1,200 ml. Thrombocytes —  $100 \text{ g} \cdot 10^9$  in 1 l, thrombin time — 65 s, FDP — positive. What is further policy?

- A. Ligation of arteria iliaca interna, total hysterectomy.
- B. Subtotal hysterectomy, ligation of arteria iliaca interna.
- C. Total hysterectomy, ligation of arteria iliaca interna.
- D. Conservative treatment.
- E. Ligating clamps on the parametrium.

4. A multigravida, primipara of 25 years arrived to the maternity hospital with labour activity. In anamnesis — 2 induced abortions. There are oedemas, the ABP — 180\100 mmHg. At the height of one labour pain the parturient woman turned pale, pulse rate is 100 beats/min. The uterus is in hypertone, asymmetric, tense, tender at palpation. The fetal heartbeats are absent. At vaginal exam: the cervix dilated by 4 cm. The amniotic membrane is intact. Moderate bloody discharge. Time of blood clotting — 3 min, clots forming is absent. Thrombocytes —  $175 \cdot 10^9$  in 1 l, thrombin time — 24 s, FDP — positive. What is the diagnosis?

- A. Preterm separation of a normally presented placenta, DIC-syndrome, I stage.
- B. Hysterorrhesis. DIC-syndrome, II stage.
- C. Preterm separation of a normally presented placenta, DIC-syndrome, II stage.
- D. Amniotic fluid embolism, DIC-syndrome, I stage.
- E. Coagulopathy.

5. In a parturient woman in the early puerperal period hemorrhage appeared. Bloodloss is 1,000 ml (1.8 %). General condition is severe, consciousness is confused, anergic stupor, anxiety, the body temperature — 35.7°C, pale skin, acrocyanosis. Thrombocytes —  $100 \text{ g} \cdot 10^9$ , thrombin time — 65 s, FDP — positive. What is the stage of DIC-syndrome?

- A. II stage.
- B. I stage.
- C. IV stage.
- D. III stage.
- E. V stage.

6. In a puerperal woman in the early puerperal period hemorrhage appeared. Thrombocytes —  $100 \text{ g} \cdot 10^9$ , thrombin time — 60 s, FDP — positive. What medicines are obligatory:

- A. Contrical.
- B. Heparin.
- C. Aminocaproic acid.
- D. Lasix.
- E. Calcium gluconate.

7. A multipara, 34 years old, with severe gestosis against a background of chronic pyelonephritis. Intensive therapy failed. During cesarian section uterine hemorrhage appeared, blood is fluid without clots. What will be the first step:

- A. Total hysterectomy.
- B. Subtotal hysterectomy.
- C. Haemotransfusion.
- D. Plasma transfusion.
- E. Albumine transfusion.

8. A multipara, 24 years old, 37 weeks of gestation, was admitted to the maternal hospital on 12.05.04 with complaints of profuse bloody discharge. An hour ago some bloody discharge from genitalia, no pain, no labour activity. While cesarian section operation: Hgb — 70 g/l, thrombocytes  $110 \cdot 10^9$  in 1 l, Htc — 0.22. It was recommended to infuse packed red blood cells in complex treatment. Deadline term of storage of packed red blood cells to be used:

- A. 9.05.04.
- B. 8.05.04.
- C. 7.05.04.
- D. 6.05.04.
- E. 5.05.04.

9. A primipara, 28 weeks of pregnancy, pre-eclampsia of a mild extent against a background of chronic pyelonephritis in the stage of remission and placental insufficiency were diagnosed. She complains of nasal and gingival hemorrhages. At objective examination — no peculiarities. Laboratory examination: Hgb — 90 g/l, thrombocytes  $130 \cdot 10^9$  in 1 l, thrombin time — 55 s, FDP — positive, ethanol test — positive. The diagnosis:

- A. Chronic DIC-syndrome.
- B. Iron deficiency anaemia.
- C. B<sub>12</sub>-folic acid deficiency anaemia.
- D. Posthaemorrhage anaemia.
- E. Thrombocytopenic purpura.

10. A multipara, 32 weeks of pregnancy, 0 (I), Rh-negative blood, antyphospholipid syndrome; has no complaints. Objective examination revealed no peculiarities. At laboratory examination: Hgb — 94 g/l, thrombocytes  $130 \cdot 10^9$  in 1 l, thrombin time — 50 s, FDP — positive,

ethanol test is positive. What is the obligatory component of treatment and prophylaxis of DIC-syndrome:

- A. Fraxyparin.
- B. Contrical.
- C. Aminocaproic acid.
- D. Lasix.
- E. Calcium gluconate.

## Chapter 37

### POSTNATAL INFECTION

1. A puerpera on the 3rd day of the postnatal period complains of body temperature rise up to 38.2°C, pain in the lower abdomen, purulent discharge from the vagina, weakness. Objectively: pulse rate — 98 beats/min, the ABP — 120/80 mmHg, the skin is acyanotic. The abdomen is soft, painless. The uterine fundus is a finger lower than the umbilicus, soft consistence, tender. At vaginal exam: the cervix is dilated by 3 cm, discharge from the uterus are purulent, in moderate quantity, the uterus is enlarged till 17 weeks of pregnancy. Appendages of the uterus and vaults of the vagina without features. Blood analysis: leukocytosis is  $13.5 \cdot 10^9$ /l, ESR — 32 mm/. Establish the preliminary diagnosis.

- A. Postnatal acute endometritis.
- B. Postnatal thrombophlebitis.
- C. Postnatal adnexitis.
- D. Postnatal parametritis.
- E. Postnatal pelvioperitonitis.

2. For the 2nd day after caesarian delivery the condition of a patient sharply worsened. Acute abdominal pain, nausea, vomiting, diarrhea, rise in the body temperature up to 39–40°C, tachycardia, dryness of mucosae, tachypnea, the promoted intestinal paresis, positive signs of peritoneal irritation appeared. Analysis of blood: leukocytosis, relating to stable neutrophile left shift. What pathology is possible in this situation?

- A. Peritonitis.
- B. Postnatal endometritis.
- C. Postnatal panmetritis.
- D. Tubo-ovarian abscess of the pelvis.
- E. Infectious-toxic shock.

3. A puerpera of 23 years old is transferred to the observation department on the 4th day after labour in connection with the rise in the body temperature up to 38.8°C. Labour have become complicated by uterine inertia, long water-free period, postnatal hypotonic bleeding,

manual exam of the uterine cavity. Objectively: the body temperature is 38.8°C, fever, heart rate — 100 beats/min. The abdomen is tender in the area of the hypogastrium. The uterine fundus is 4 cm lower than the umbilicus. Vaginal exam: the uterus is enlarged up to 18 weeks of pregnancy, soft, tender. Discharge are brown with unpleasant odor. What is the most probable diagnosis?

- A. Postnatal endometritis.
- B. Subinvolution of the uterus.
- C. Postnatal pelvioperitonitis.
- D. Sepsis.
- E. Lochia serosa.

4. For the 4th day after caesarian delivery a woman suffers from fever, abdominal pain, the temperature has risen up to 39°C. Pulse rate is 104 beats/min. Vomiting was marked twice. The patient is weak, the tongue is dry, imposed with gray spots, the abdomen is inflated. The signs of peritoneal irritation are positive in all abdominal departments. Percussion — an obtusion in flat places of the abdomen. The peristalsis is not auscultated. Flatus disturbs. The uterine fundus at the umbilical level. The uterus is painful at palpation. Discharge are bloody, moderate. What diagnosis the most authentic?

- A. Diffuse peritonitis.
- B. Metroendometritis.
- C. Progressing thrombophlebitis.
- D. Pelvioperitonitis.
- E. Parametritis.

5. At the 5th day after delivery which was accompanied by initial uterine inertia, the temperature rise up to 38.5°C, the pulse rate — 104 beats/min, fever appeared in a puerpera. The uterus is soft and painful at palpation. The uterine fundus is 2 fingers lower than the umbilicus, lochia in a small amount, bloody, with unpleasant odour. At vaginal examination: the cervix is open up to 3 cm, the uterus is enlarged till 14–15 weeks of pregnancy, soft and painful at palpation. There are clots in a small amount behind the internal os. The uterine appendages and vaults are without features. What diagnosis is the most authentic?

- A. Metroendometritis.
- B. Lochia serosa.
- C. Hematometer.
- D. Parametritis.
- E. Thrombophlebitis of the uterine vessels.

6. A puerperal woman at the 3rd day after labour complains of weakness, bad sleep, absence of appetite, pain in the lower abdomen. Rise in the temperature up to 39°C, acceleration of pulse rate was observed. During exam

the tender uterus which bottom is 1 cm lower than the umbilicus is defined. Lochia are bloody, with admixture of pus and unpleasant odour. What pathology is possible in this case?

- A. Postnatal endometritis.
- B. Thrombophlebitis of the uterine veins.
- C. Peritonitis.
- D. Parametritis.
- E. Subinvolution of the uterus.

7. In a puerpera of 29 years old at the 2nd day after caesarian section vomiting, a strong abdominal pain, which spreads to the stomach, stool and gas retention appeared. Integuments are acyanotic, labia and tongue are dry. The body temperature is 39°C. The abdomen is inflated, painful. Peristalsis of the intestine is sharply weakened, the uterus is enlarged, painful. What pathology is possible in this case?

- A. Diffuse peritonitis.
- B. Dynamic intestinal obstruction.
- C. Pelvioperitonitis.
- D. Purulent parametritis.
- E. Panmetritis.

8. A puerpera of 26 years old is transferred to the observation obstetrical department at the 3rd day. Labour is the second, normal. Having perineal rupture of 2 degree, sutured up by a catgut and silk sutures. At the 3rd day the body temperature is up to 37.5°C, general weakness, pain in the area of the vagina and perineum. The uterus is 3 fingers lower than the umbilicus. Lochia are in a small amount, serous-bloody. Sutures on the perineum are covered with the purulent covering, around tissues are inflamed, swollen. What preliminary diagnosis is the most authentic?

- A. Postnatal septic ulcer. The 1st stage.
- B. Endometritis, a postnatal septic ulcer.
- C. Endometritis, 2nd stage.
- D. Metroendometritis, 2nd stage.
- E. Metroendometritis, postnatal septic ulcer, 2nd stage.

9. A parturient woman is in the second labour stage with complaints of headache, fever, rise in the body temperature is up to 38.9°C, black amniotic fluid discharged 30 h ago. The amniotic fluid is muddy, with unpleasant odour. A child was born in a condition of asphyxia in 10 min. After erosion of the placenta by the Abuladze's method the condition of the woman worsened: the body temperature — 40°C, the ABP — 60/00 mm, pulse is thready, consciousness is absent. What complication of the postnatal period does she have?

- A. Metroendometritis. Septic shock.
- B. Chorioamnionitis. DIC-syndrome.



- C. An attack of eclampsia.
- D. Hemorrhagic shock.
- E. Amniotic fluid embolism.

10. A puerpera at the 11th day after labour complained of acute pain in the left mammary gland, the temperature rise up to 39°C. The internal genitalia are without pathology. The left mammary gland is hot, painful at touch. In the supralateral quadrant the skin is inflamed, cyanotic, swollen. At palpation the infiltrate is 6×8 cm with fluctuation in the middle is determined. Your policy?

- A. Surgical treatment of mastitis.
- B. Antibiotics.
- C. Milk expression is recommended.
- D. Observing the condition of the parturient woman.
- E. To stop lactation.

11. A 25-year old puerpera is transferred to the observational department on the 4th day of the puerperal period. Labour was the first, urgent, a large fetus. During labour perineotomy and perineorrhaphy were carried out. Complaints of malaise, burning sensation in the area of the perineum. The body temperature is 37.4°C, pulse rate is 88 beats/min. The mammary glands are able-bodied. The uterus is dense, its bottom is at a middle distance between the symphysis and umbilicus. The lochia are abundant. Junctionures are coated with pus, inflamed. Determine the stage of development of the postnatal pyo-septic process:

- A. I stage.
- B. II stage.
- C. III stage.
- D. IV stage.
- E. There are no septic complications.

12. A 29-year old puerpera is transferred to the observational department on the 5th day of the puerperal period. During labour rupture of the posterior wall of the vagina and the perineum of II degree occurred. Complaints of malaise, pains in the area of the perineum. The body temperature is 37.2°C, pulse rate is 88 beats/min. The mammary glands are able-bodied. The uterus is dense, its bottom is higher than the symphysis. Lochia are bloody, abundant. In removal of sutures from the perineum their incompetence is revealed. Edges of the wound are coated with pus, inflamed. The secondary sutures may be imposed:

- A. If the body temperature does not exceed normal.
- B. If parameters of blood are within normal limits.
- C. After purification of the wound and

disappearing of hyperemia.

- D. At once after taking out of initial sutures.
- E. Secondary sutures are not obligatory.

13. In a 30-year old puerpera on the 10th day of the puerperal period the acute deterioration of the common state has developed. The body temperature is 38.3°C, pulse rate is 98 beats/min, fever, complaints of throbbing pains in the area of the left mammary gland. Integuments are inflamed. The left mammary gland is tense, a mass of 30×45 mm with a marked fluctuation is palpated in the top of the lateral quadrant. The uterus is dense, painless, behind the symphysis. Discharge are serous, scanty. It is necessary to perform:

- A. Mammary gland massage and expression of milk.
- B. Puncture of the abscess of the mammary gland.
- C. To appoint ultrasound.
- D. To open and drain the abscess of the mammary gland.
- E. To appoint UV of the mammary gland.

## Chapter 38

### SURGICAL OBSTETRICS

1. A primipara, 36 years old, labour activity lasts for 5 h. Labour — in time. Labour pains for 35–40 s in 5 min. The amniotic fluid painted by meconium discharged. The fetal heartbeats — 90 beats/min. At vaginal exam: cervical dilation is 6 cm. What action is the most expedient?

- A. Caesarian section.
- B. Obstetrical forceps.
- C. Medicamental sleep.
- D. Introduction of uterotonics.
- E. Introduction of spasmolytics.

2. In a primipara at 41–42 weeks of pregnancy labour last 6 h, contractions for 25 s, in 5–6 min. The fetal heartbeats of arrhythmic 100–160 beats/min, green amniotic fluid. At vaginal examination: the cervix is dilated by 4 cm, the sagittal suture is in the transversal size of the plane of the pelvic inlet. What further policy of labour management?

- A. Caesarian section.
- B. Introduction of uterotonics.
- C. Applying obstetrical forceps.
- D. Vacuum extraction of the fetus.
- E. Conservative management of labour.

3. A pregnant woman is 37 years old, primigravida. Pregnancy is 40 weeks, head presentation, 1st stage of labour. Labour activity lasts for 10 h, labour pains every 5–6 min for 45–50 s. The amniotic fluid

painted by meconium discharged. The fetal heartbeats are 90 beats/min, evaluation by the Fisher's score is 5 points. At vaginal examination: the cervix is dilated by 6 cm. What is the policy of conducting labour?

- A. Caesarian section.
- B. Obstetrical forceps.
- C. Introduction of uterotonics.
- D. Introduction of spasmolytics.
- E. Vacuum-extraction of the fetus.

4. A pregnant woman at 38 weeks of gestation was admitted to the pregnancy pathology department. Twins are diagnosed. The first fetus is in the foot presentation, the second one — in the transversal presentation. Define the plan of labour.

- A. Elective caesarian section.
- B. Vaginal birth.
- C. Extraction of the 1st fetus by the leg, with the 2nd fetus — internal version.
- D. External version by Arkhangelskiy.
- E. To appoint corrigent gymnastics.

5. A primipara, 30 years old. The head is in the pelvic cavity. The fetal heartbeats began to slow down, arrhythmia appeared. What should be done?

- A. Cavitory obstetrical forceps.
- B. Target obstetrical forceps.
- C. Caesarian section.
- D. Perineotomy.
- E. Head-skin forceps.

6. A multipara, 34 years old was delivered to the maternity hospital in gestation of 39–40 weeks. The amniotic fluid discharged 10 h ago. Labour pains have begun. The fetal heartbeats are not auscultated. At vaginal exam: cervical dilation by 8 cm, edges are thin, the fetal bladder is not present, the brachium of the fetus, in the vagina — the hand. How to finish labour?

- A. Perform decapitation.
- B. Caesarian section.
- C. Carry out a version on the leg with the further extraction by the pelvic end.
- D. Finish labour conservatively.
- E. Perform cleidotomy.

7. A parturient woman of 25 years old is in labour during 16 h. Attempts are ineffective, proceed 1.5 h. The head of the fetus is in the pelvic cavity. The fetal heartbeats suddenly became dull, arrhythmic, 100 beats/min. At vaginal examination: complete uterine dilation, the fetal bladder is absent, the head is in the pelvic cavity. Which is the further obstetrical policy?

- A. Applying obstetrical forceps.
- B. The further conservative management of labour.
- C. Caesarian section.
- D. Vacuum extraction of the fetus.
- E. Oxytocin augmentation of labour.

8. A parturient woman of 30 years, somatically is healthy. II stage of labour. Supposable weight of the fetus is 3,100 g. The fetal heartbeats are deaf, 90 beats/min, rhythmical, the head in the pelvic cavity, the sagittal suture is in the direct size of the plane of the pelvic outlet, anterior kind. What policy of the doctor is the most expedient in this case?

- A. Target obstetrical forceps.
- B. Caesarian section.
- C. Cavitory obstetrical forceps.
- D. Augmentation of labour.
- E. Treatment of intrauterine hypoxia of the fetus.

9. A parturient woman which was delivered to the clinic, behaves restlessly. Labour pains follow one by another without interruption. The abdomen is acutely painful, especially in the lower part. The contractile ring is one and a half finger lower than the umbilicus, is slanting. The fetal heartbeats are not auscultated. Internal obstetrical exam: opening of the cervix is complete, the head is fit to the pelvic inlet, there is a big labour tumour. The doctor has established the diagnosis: threat of hysterorrhesis, intrauterine destruction of the fetus. What method of labour is correct?

- A. Narcosis, embryotomy.
- B. Narcosis in order to provide labour activity.
- C. Labour augmentation.
- D. Caesarian section.
- E. Narcosis and applying obstetrical forceps.

10. In a primipara, 30 years old, intensive labour pains with an interval of 1–2 min and duration of 50 s have begun. The head of the fetus appeared. The perineum, which height is 4 cm, became white. What is it necessary to make?

- A. Episiotomy.
- B. Protection of the perineum.
- C. Perineotomy.
- D. Vacuum extraction of the fetus.
- E. Expectant policy.

11. A pregnant woman of 31 years old was delivered to the maternity hospital. The 4th pregnancy, the second labour, the second stage. The amniotic fluid discharged 2 h after the beginning of labour activity. During exam the neglected transversal position and an arm proclivata are fixed. The fetal heartbeats are not auscultated. What further policy of the doctor?

- A. Decapitation of the fetus.
- B. Craniotomy.
- C. Classical version with extraction of the fetus by the leg.
- D. Caesarian section.
- E. The further conservative labour management.

12. Repeated labour at the woman of 30 years old. Duration of labour is 14 h. The fetal heartbeats

are dull, arrhythmic, 100 beats/min. Vaginal examination: opening of the cervix is complete, the head of the fetus is in the cavity of the pelvic inlet. The sagittal suture is in the direct size, the small fontanelle near the symphysis. Define further policy of labour conducting.

- A. Application of target obstetrical forceps.
- B. Augmentation of labour activity with oxytocin.
- C. Caesarian section.
- D. The head-skin forceps by Ivanov.
- E. Application of cavitary obstetrical forceps.

13. A parturient woman of 25 years old is in labour during 16 h, the second stage of labour. Contractions are ineffective, proceed 1.5 h. The head of the fetus is in the pelvic cavity. The fetal heartbeats are indistinct, arrhythmic, 100 beats/min at vaginal examination: opening of the cervix is complete, the fetal bladder is absent. The head is in the pelvic cavity. Further policy of the doctor?

- A. Applying obstetrical forceps.
- B. Conservative management of labour.
- C. Caesarian section.
- D. Vacuum extraction of the fetus.
- E. Oxytocin augmentation of labour.

14. A pregnant woman, 39 weeks of gestation, complains of colic pains in the lower abdomen and absence of movements of the fetus. Pregnancy developed against a background of gestosis of mild de-

gree. The position of the fetus is longitudinal, the head is in the small segment in the pelvic inlet. The fetal heartbeats are not auscultated. Vaginal examination: the cervix is dilated, opened by 6–7 cm, the fetal bladder is intact, the head at the level of the interspinal line. What is the policy of labour management?

- A. Embryotomy.
- B. Conservative labour conducting without protection of the perineum.
- C. Conservative labour conducting with protection of the perineum.
- D. Caesarian section.
- E. Conservative labour conducting with episiotomy.

15. A parturient woman is delivered to the delivery room with strong labour pains and the fetus' hand prolapse out of the vagina. The uterus is painful in the bottom segment. The fetal heartbeats are not auscultated. At vaginal examination: the cervix is dilated, the uterine os are open up to 10 cm, the impacted brachium and the hand of the fetus are palpated. What should be done?

- A. Embryotomy.
- B. Caesarian section.
- C. Version on the leg.
- D. Episiotomy.
- E. Obstetrical forceps.

## ANSWERS

- Chapter 1:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A; 10 A; 11 A  
*Chapter 2:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A  
*Chapter 3:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A; 10 A  
*Chapter 4:* 1 A; 2 B; 3 D; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A  
*Chapter 5:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A; 10 A; 11 A; 12 A  
*Chapter 6:* 1 E; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A  
*Chapter 7:* 1 B; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A  
*Chapter 8:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A; 10 A  
*Chapter 9:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A; 10 A; 11 A  
*Chapter 10:* 1 E; 2 A; 3 A; 4 D; 5 A; 6 A; 7 A; 8 A; 9 A; 10 A  
*Chapter 11:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A  
*Chapter 13:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A; 10 A; 11 D; 12 C; 13 B; 14 B  
*Chapter 14:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 E; 10 D; 11 B; 12 A  
*Chapter 15:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 E; 7 A; 8 A; 9 A; 10 A  
*Chapter 16:* 1 D; 2 A; 3 E; 4 D; 5 B; 6 A; 7 A; 8 A; 9 E  
*Chapter 17:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 E; 8 A; 9 A; 10 E; 11 A  
*Chapter 18:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 E; 7 A; 8 A; 9 A; 10 A  
*Chapter 19:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 E; 7 A; 8 A; 9 A  
*Chapter 20:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A  
*Chapter 21:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A  
*Chapter 22:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A; 10 A  
*Chapter 23:* 1 D; 2 A; 3 B; 4 D; 5 D; 6 B; 7 B; 8 A; 9 B; 10 A  
*Chapter 24:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A  
*Chapter 25:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A  
*Chapter 26:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A; 10 C  
*Chapter 27:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A  
*Chapter 28:* 1 C; 2 E; 3 D; 4 A; 5 A; 6 A; 7 A; 8 A  
*Chapter 29:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A; 10 A  
*Chapter 30:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A; 10 A  
*Chapter 31:* 1 B; 2 B; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A  
*Chapter 32:* 1 A; 2 B; 3 B; 4 A; 5 C; 6 A; 7 D; 8 C; 9 A; 10 C  
*Chapter 33:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A; 10 A  
*Chapter 34:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A; 10 A; 11 A; 12 A; 13 A; 14 A; 15 A  
*Chapter 35:* 1 A; 2 A; 3 C; 4 C; 5 A; 6 A; 7 A; 8 A; 9 A; 10 A  
*Chapter 36:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 A; 9 A; 10 A  
*Chapter 37:* 1 A; 2 A; 3 A; 4 D; 5 A; 6 A; 7 A; 8 C; 9 A; 10 A; 11 A; 12 C; 13 D  
*Chapter 38:* 1 A; 2 A; 3 A; 4 A; 5 A; 6 A; 7 A; 8 D; 9 A; 10 A; 11 A; 12 A; 13 A; 14 A; 15 A



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