

Conclusion

According to this study, Hadlock method was the most accurate for estimating fetal weight. Between the clinical methods, Yakubova has proven to be the most accurate one and Dobrovolskiy the less accurate one.

We must take into account that the Hadlock method requires ultrasonographic devices, which may not be present in all regions and facilities. Therefore, even with a smaller accuracy, the clinical methods are still of great importance.

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THE EFFICACY OF HIGH-FREQUENCY CHEST WALL OSCILLATION IN CHILDREN WITH COMMUNITY-ACQUIRED PNEUMONIA

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ЕФЕКТИВНІСТЬ ВИСОКОЧАСТОТНОГО КОЛИВАННЯ СТІНКИ ГРУДНОЇ КЛІТКИ У ДІТЕЙ З НАБУТОЮ ПНЕВМОНІЄЮ

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Abstract

Modern management of acute community-acquired pneumonia (CAP) should consider various components of pathogenesis, in particular the disturbance of the pulmonary function (PF) and changes of the mucociliary transport system (MCTS). The impairment of MCTS in CAP leads to disorder of the airway clearance, which causes changes of PF in the respiratory system. New opportunities for improving MCTS are related to the use of the modern, high-tech method of drainage of the bronchial tree - a high-frequency chest wall oscillation (HFCWO), which allows to restore the drainage function of the bronchi and improve PF.

The objective of this study was to estimate the efficacy and safety of using HFCWO in the complex therapy (CT) of CAP in children.

Methods: We enrolled and examined 56 children aged 6-16 with CAP confirmed by X-ray. The main group (MG) (n=36 children) received CT with the inclusion of HFCWO. The control group (CG) (n=20) was given only baseline therapy. Changes in respiratory clinical symptoms and indices of PF in children with CAP using HFCWO were studied.

Results: The improvement of the respiratory clinical symptoms was noted in children of MG manifested by reduction of dyspnea at rest in 91.7% of children and in physical activity in 86.1% of children, reducing the intensity of productive cough in 75.0% of children; the disappearance of moist râles in the lungs - in 77.8% of children. Changes of PF indices in children with CAP were accompanied by a significant improvement of VC, FVC, FEV₁, MEF₇₅, PEF.

Conclusions: The data obtained give evidence of the favorable influence of HFCWO on the respiratory clinical symptoms and indices of PF in children with CAP. The advantages of this method are effectiveness, safety and combination with other methods of bronchial drainage.

Keywords: community-acquired pneumonia, mucociliary transport system, drainage function of the bronchi, high-frequency chest wall oscillation, children.

Diseases of the respiratory tract are a topical problem in modern pediatrics, the most common of them is pneumonia. Community-acquired pneumonia (CAP)

occupies an important place in childhood morbidity and mortality worldwide. Each year, more than 2 million children younger than 5 years die from pneumonia,

making approximately 20% of all deaths in children within this age group [4]. This is more than AIDS, malaria and measles taken together according to the data of the World Health Organization (WHO) [1]. Within Intermountain Healthcare, pneumonia is the fourth most common cause for a pediatric admission and is the pediatric condition with the fourth highest cost [9].

The index of mortality from pneumonia among the children's population of our country averages 13.1 per 10 thousand, and its incidence in the CIS countries, including Ukraine, is from 4 to 20 cases per 1000 children from 1 month to 15 years [13]. In Ukraine, CAP takes third place in the structure of childhood mortality after perinatal pathology and congenital malformations [15].

Complex effective protection of the respiratory tract is carried out using natural mechanisms: aerodynamic filtration, mucociliary transport system, and cough. The coordinated functioning mechanisms of protection allow to provide drainage function of the respiratory tract, restoration of damaged structures and functions of the respiratory system [12].

The mucociliary transport system (MCTS) is the most important mechanism of airway clearance and a necessary potential of the protective and immune function of the respiratory tract [12, 16]. Mucociliary clearance (MCC) is a natural process of the airway mucus clearance, by removing rhinobronchial secretion due to oscillatory movements of the cilia of a single-layered multi-rowed ciliary epithelium of the mucous membrane [12].

Changes in MCC are one of the causes of exacerbations in patients with a pulmonary disease, including acute CAP [3, 17]. Disturbances of MCC are due to the accumulation of mucus in the respiratory tract. The accumulation of pathological secretions in the respiratory

tract leads to the development of infection and inflammation, since mucus serves as a predisposing environment for the growth of microbes. To eliminate cough and dyspnea, the main symptoms of MCC disturbance, the drainage of the bronchial tree should be adjusted [5].

At present, there are a large number of different methods of drainage of the bronchial tree, including mechanical devices that can effectively remove sputum. Device-based methods for bronchial drainage, especially in young children and in patients in a severe condition, unable to take an active part in the drainage of sputum and respiratory gymnastics, play an important role in restoring the pulmonary function of the lungs [14].

Particular attention is drawn to the method of drainage of the bronchial tree – a high-frequency chest wall oscillation (HFCWO). Among modern and high-tech devices of mechanical influence there is "The Vest Airway Clearance System", Hill-Rom Inc. (USA) (Figure 1). "The Vest system" consists of an inflatable vest, which is worn over the chest, and the air pulse generator that produces and delivers the oscillating air pulses at a frequency up to 20 Hz to the vest via a connecting air hose regulated depending on the tasks of the therapy and the patient's condition [1, 2, 6, 8, 14, 22].

According to the literature, the most widespread method has been obtained in the treatment of patients with cystic fibrosis (CF). Many authors note the beneficial effect of HFCWO on the functional state of the respiratory organs in such patients [10, 20]. Improved airway clearance in patients with CF was established in a number of studies [10].



Fig.1 The Vest Airway Clearance System, Model 105

Positive results of the influence of HFCWO on the mobilization of sputum, functional changes in the lungs and safety of this method in patients with respiratory failure were obtained in the conducted international studies. [1, 7, 10].

The pathogenetic substantiation of the HFCWO use in pediatrics remains incomplete, and the mechanism of therapeutic effect, optimal parameters of oscillations including the clinical features and age of children require additional investigations [11].

Despite the significant number of publications in foreign literature on the study of the effectiveness of

airway clearance by the method of HFCWO, using "The Vest Airway Clearance System" for various diseases, the possibility of applying the method in acute respiratory infections in children in the complex therapy of acute CAP remains insufficiently studied [6, 8, 11, 22].

Therefore, the inclusion of the method of HFCWO in the therapeutic complex of management of children hospitalized with acute CAP based on the study of clinical and functional indices determine the relevance of the chosen topic.

The aim of the study was to evaluate the effectiveness and safety of the method of HFCWO in the complex therapy of CAP in children.

Methods

There were 56 children aged 6 to 16 (10.3 ± 2.3 years) with a confirmed diagnosis of CAP who were examined and treated at the pulmonologic department of Odessa Regional Children's Clinical Hospital. The study was carried out according to the rules of Helsinki declaration and approved by Ethics committee of Odessa Regional Children's Clinical Hospital. All patients gave written informed consent before beginning the study. Among the examined children there were 32 boys (57.1%) and 24 girls (42.9%). All children were divided into 2 groups: the main group - 36 children (20 boys and 16 girls) (9.5 ± 1.7 years) and controls - 20 children (12 boys and 8 girls) (10.7 ± 2.2 years).

The main group (MG) received complex therapy with the inclusion of the method of HFCWO using "The Vest Airway Clearance System", Model 105. The procedures were carried out in a sitting position using a special inflatable vest connected to the air pulse compressor, the area of influence was the chest. The therapeutic effect was achieved at the expense of non-invasive effects, which contributed to the occurrence of high-frequency and low-amplitude vibrations of the walls of the bronchi. Procedures of HFCWO in children aged 6-11 were performed at a frequency of 8 Hz at a pressure of 1 bar for 10 minutes, for children aged 12-16 - at a frequency of 10 Hz at a pressure of 2 bar for 10 minutes by a "step-by-step" principle with an increased above-mentioned oscillation parameters.

The control group (CG) received baseline therapy (BT) in accordance with the Protocol for the Treatment of Children with Pneumonia, the Order of the Ministry of Health of Ukraine dated January 13, 2005 No. 18 without the use of HFCWO.

Primary outcome measures included dyspnea at rest and on physical exertion, productivity of cough (sputum) and auscultatory signs (moist râles). Secondary outcome measures included pulmonary function testing (PFT). All children were performed a comprehensive examination, which included anamnesis study, a general examination, spirometry testing of the pulmonary function (PF) according to the combined recommendations of the American Thoracic and European Respiratory Society (ATS /ERS). Statistical processing of the data was performed using the Excel program, the STATISTICA 7.0 packages and the Simple Interactive Statistical Analysis calculator (SISA).

Results and discussion

CAP of moderate severity with uncomplicated course was diagnosed in all patients. Manifestations of first-degree respiratory failure were observed in 91.0% of children who were included in the study. Clinical characteristics of the first degree respiratory failure included: shortness of breath on physical exertion, oral cyanosis, which increased during anxiety, the ratio of heart rate to respiratory rate of 2.5 to 1, tachycardia.

All children complained of cough, of which 37.5% of children had dry cough and 62.5% of children had nonproductive cough with viscous sputum. In most

cases (89.6%) the sputum production was in a small amount.

Almost all children (92.9%) had a dull pulmonary sound on percussion. The auscultation picture was variable: harsh breathing was heard over both lungs in all children, and 90.7% of patients were noted to have weakened breathing, mainly in the lower lung. In 39.3% of children, crepitation was heard, while in the rest (60.7%) there were local small-bubble râles.

Analyzing the data of the spirometry test of the "flow-volume" curve, we concluded that the majority of children (85.7%) had a restrictive type of pulmonary function of the mild degree at the beginning of treatment, while in 14.3% of children a restrictive type of moderate severity was recorded.

The results of the clinical-functional studies revealed marked changes in the broncho-pulmonary system, the disturbances of RF in children with acute CAP, which determined the expediency of corrective therapy with the use of vibration-compression effects of HFCWO using "The Vest Airway Clearance System".

After the complex therapy with the inclusion of the HFCWO method using the "The Vest Airway Clearance System", dyspnea at rest in the MG children decreased sooner and faster. Dyspnea at rest was in 8.3% of the MG children. This symptom was preserved in 25.0% of MG children.

Under the influence of complex therapy with the use of HFCWO, shortness of breath on physical exertion decreased in a larger number of children (86.1%) of the MG. In the control group, dyspnea on physical exertion decreased in 65.0% of children.

At same time, there was an improvement in the drainage function of the bronchi: there was a more pronounced dilution and reduced viscosity of sputum, a significant improvement in its evacuation. Already after the 4th procedure, an increase in the regression of the productive cough was observed, the sputum disappeared more easily, an increase in the volume of the expectorated sputum, and a decrease in its viscosity was registered.

By the 6th procedure, there was a favorable dynamics of the nature of the pathological secretion - the sputum became lighter, more transparent, took a mucous character, and decreased its number in all children.

After the 8th procedure, the intensity of productive cough decreased in half of the children (50.0%) of MG. In CG 65.0% of children had a rare cough after vibration-compression effects on the chest.

In 75.0% of the children of MG, the intensity of productive cough was reduced by the 10th complex treatment procedure with the inclusion of the HFCWO. In 40.0% of the CG children, the regression of this symptom was less pronounced and was noted later.

The course of vibration-compression influence on the chest using "The Vest Airway Clearance System" contributed to reduction of the number and prevalence of râles: the number of children with moist râles decreased almost 2 times by the 7th day of therapy.

The auscultative picture in the lungs was characterized by the disappearance of small-bubble râles in 77.8% of children in MG, indicating a reduction of the inflammatory activity and improved VF. By the end of

the course, changes in the form of single moist râles in forced respiration remained only in 22.2% of children, mainly in the presence of respiratory failure.

In CG the moist râles decreased 1.5 times for the relevant period, medium bubbling râles in the lungs remained in a larger number of children (55.0%) by the end of the course.

The reduction of clinical symptoms was accompanied by the improvement in RF. Under the influence of complex therapy with the inclusion of vibration-compression effects on the chest with "The Vest" device, the degree of severity of ventilation disorders has decreased.

The analysis of the data of PFT using a spirometry test after 10 procedures on the «The Vest» device showed improvement in the pulmonary ventilation system due to significant growth in vital capacity (VC), forced vital capacity (FVC) and forced expiratory volume in the first second (FEV₁) ($p < 0.05$) in MG.

In the majority of children of MG there was an increase in the high-speed marker of the forced expiratory flow at the level of 75% of forced vital capacity (FEF₇₅).

In the CG children who received standard basic therapy without the inclusion of HFCWO using the system «The Vest», dynamics of indices of PF was characteristic of significant growth in VC.

Among high-speed markers of PFT in the CG children, there was a significant increase of the forced expiratory flow at the expiration level of 25% of FVC (FEF₂₅).

Improvement of PF against the background of complex therapy with the inclusion of vibration-compression influence of the airway clearance system "The Vest Airway Clearance System" was confirmed by a significant increase in the peak expiratory flow (PEF) in the children of MG by the end of the treatment (Table 1).

Table 1 Dynamics of indices of the pulmonary function in children with CAP

Indices of PF	Main group (n=36)		Control group (n=20)	
	Before treatment	After treatment	Before treatment	After treatment
	M±sd	M±sd	M±sd	M±sd
VC	82.9±4.9	102.6±8.9*	88.1±3.1	95.6±3.5*
FVC	68.9± 4.5	80.0±3.9*	75.7±4.2	76.5±4.8
FEV ₁	71.9± 4.6	85.4±3.9*	77.1±12.1	77.6±13.6
FEV ₁ /FVC	104.8±3.1	106.9±2.4	102.0±13.6	102.3±8.3
MEF ₂₅	72.4±8.7	88.7±8.2	74.8±5.8	87.7±5.6*
MEF ₅₀	65.5±7.1	78.1±6.4	61.5±11.2	63.3±13.0
MEF ₇₅	63.2±7.5	77.4±6.6*	59.0±10.0	58.3±11.8
PEF	49.6±5.0	60.9±4.8*	43.0±11.2	46.3±7.8

Notes: Data is presented in % of the appropriate level. *Relative difference between the data of the children of the main and control groups before and after treatment, $p < 0.05$.

Conclusions

On the basis of the studies made, the data of the beneficial effects of the HFCWO method on clinical symptoms have been obtained by reducing dyspnea at rest and on physical exertion, reducing the intensity of productive cough.

At the same time, the restoration of pathophysiological mechanisms of MCC was observed, as a result of which improvement of the drainage function of the bronchi was observed due to improvement of the rheological properties of sputum, increase of quantity and improvement of its evacuation. The disappearance of moist râles in the lungs indicated a positive dynamics of the inflammatory process.

Improvement of the indices of the pulmonary function in the children of MG with CAP was accompanied by a significant improvement in VC, FVC, FEV₁, MEF₇₅, PEF.

The safety of HFCWO is confirmed by the absence of local skin reactions, itching, unpleasant sensations in the chest, and side effects of the vestibular apparatus (dizziness, nausea).

Abbreviations. HFCWO: High frequency chest wall oscillation; CAP: Community-acquired pneumonia; MCTS: Mucociliary transport system; CT: Complex therapy; MG: Main group; CG: Control group; AIDS: Acquired immune deficiency syndrome; WHO:

World Health Organization; MCC: Mucociliary clearance; USA: The United States of America; CIS: Commonwealth of Independent States; CF: Cystic fibrosis; BT: Baseline therapy; CPT: Chest physiotherapy; RF: Respiratory function; PF: Pulmonary function; PFT: pulmonary function test; ATS: American Thoracic Society; ERS: European Respiratory Society; SISA: Simple Interactive Statistical Analysis calculator; VC: Vital capacity; FVC: Forced vital capacity; FEV₁: Forced expiratory volume in the first second; FEF₂₅: Forced expiratory flow at the level of 25% of forced vital capacity; FEF₅₀: Forced expiratory flow at the level of 50% of forced vital capacity; FEF₇₅: Forced expiratory flow at the level of 75% of forced vital capacity; PEF: Peak expiratory flow.

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ОСОБЛИВОСТІ ПЕРЕБІГУ ТА КЛІНІЧНОГО ОФОРМЛЕННЯ ШИЗОФРЕНІЇ У ОСІБ З ОЖИРІННЯМ

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PECULIARITIES OF CURRENT AND CLINICAL DESIGN OF SCHIZOPHRENIA IN PERSONS WITH OBESITY

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Abstract

The paper presents the results of a comparative clinical-psychopathological study of the features of the course and clinical manifestations of schizophrenia, comorbid with obesity in comparison with schizophrenia, not burdened by somatic comorbidity. It was found that schizophrenia patients obesity are characterized by a low level of social realization, a significant duration of schizophrenia (more than 15 years), a significant predominance of negative symptoms over the productive psychopathological manifestation in the clinical structure, a reduction in the general energetic potential, social isolation, depressive autistic experiences in the clinical structure.