

DISEASES OF THE RESPIRATORY SYSTEM WITH THE SUBSEQUENT FORMATION OF CARDIOVASCULAR PATHOLOGY IN CHILDREN

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Diseases of the respiratory system are one of the most frequent causes of the treatment of children in hospital facilities. The younger the child, the more often these diseases occur and the more severe it can be. Cardiovascular disorders with bronchopulmonary pathology develop slowly, potentially reversible in childhood, which requires a correct assessment of the risk of their development for a particular patient and timely correction of therapy. The presence of dyspnea, prolonged exhalation, pale skin, cyanosis of the nasolabial triangle and acrocyanosis, swelling of the nose (symptoms common to cardiac and respiratory failure) indicate the reaction of the cardiovascular system in diseases of the respiratory system. We examined 14 children: among them 7 boys and 7 girls. Ten children were diagnosed with acute obstructive bronchitis, and 4 with pneumonia. In the course of the study, the parameters were assessed, reflecting the linear dimensions of the heart cavity and the main vessels, followed by the calculation of central hemodynamics, diastolic transmittal blood flow by the method of L.K. Hattle, B. Angelsen.

Key words: *bronchopulmonary pathology, children, electrocardiography, doppler echocardiography of the heart.*

Introduction. Respiratory diseases are one of the most common causes for the treatment of children in hospitals. The younger the child, the higher the incidence of these diseases and the more severe it may develop [1, 2]. Cardiovascular disorders in broncho-pulmonary pathology develop slowly, are potentially reversible in childhood, requiring a proper assessment of the risk of their development for a particular patient and timely correction of therapy tactics [3].

Toxicosis, as well as frequent concomitant diseases and oxygen deficiency cause profound changes in tissue metabolism, decrease in the processes of energy formation, disturbance of the regulatory function of central and autonomic nervous systems. All these factors affect the activity of the heart and the circulatory system as a whole, developing both compensatory, adaptive and pathological reactions [4].

The reaction of the cardiovascular system in diseases of the respiratory system is characterized by dyspnea, prolonged vision, pallor of the skin, cyanosis of the nasolabial triangle and acrocyanosis, inflammation of the nasal wings, a decrease in the ratio of respiratory and pulse rates [5], tachycardia that does not correspond to body temperature, accent of tone 2 over the pulmonary artery, muffling of the tone of the heart, systolic murmur of soft tone (general symptoms of cardiac and respiratory failure) [6].

Assessment of literature data showed that bronchopulmonary diseases, which begin their pathological path in early childhood, may lead to irreversible changes in adults with the development of complications and early mortality [7, 8]. Thus, children with frequent respiratory diseases may potentially replenish the population of adults with chronic obstructive pulmonary diseases, which is a very significant problem, requiring a combination of efforts of different specialists [9, 10].

2. Purposes, subjects and methods:

2.1. Purpose – to study the development of cardiovascular disorders in children from 1 month to 3 years with bronchopulmonary disorders.

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2.2. Subjects & Methods. The research was carried out at the Department of Pediatrics No.1 and Neonatology of KhNMU, at the Department of Infectious Diseases of Kharkiv Regional Children's Clinical Hospital. The study implied the assessment of histories, clinical and instrumental data. The features of bioelectric activity of the heart in the examined children were assessed by the results of electrocardiography. In the course of the study, we evaluated the indices reflecting the linear dimensions of the cardiac cavity and major vessels with subsequent calculation of central hemodynamics, diastolic transdermal blood flow by the method of L.K. Hattle and B. Angelsen following Doppler echocardiography of the heart ("AU 3 Partner" by "Esaote Biomedica" (Italy).

Conflict of interests. There is no conflict of interests.

3. Results and discussion. We examined 78 children aged from 1 month to 3 years, who were divided into 3 groups: Group 1 included 28 (35.8 %) children with acute obstructive bronchitis and pneumonia, Group 2 comprised 27 children (34.6 %) with acute simple bronchitis, Group 3 was the control group of 23 children (29.6 % of healthy children). The average age of children was 1.5 ± 1.6 years. The groups were representative and comparable by gender and age.

Assessment of family histories showed that most children (75 %) were the first child in the family. First-degree relatives of 28.6 % children had cardiovascular disorders, namely arterial hypertension. Mothers of 37.5 % children had pains or discomfort in the area of the heart on exertion and stress, which resolved spontaneously or after taking sedative.

Parents of 62.5 % children were overweight, due to insufficient motor and sedentary lifestyles. During pregnancy mothers of 87.5 % children were examined for TORCH infections, of whom 50 % were infected with herpes virus or rubella. Parents of 62.5 % children often drank alcohol or low-alcohol beverages; fathers of 87.5 % smoked, and both parents of 25 % smoked. Mothers of 12.5 % children have focal points of chronic infection (chronic tonsillitis).

Assessment of children and their relatives' complaints on admission showed the following data. Cough and dyspnea were observed in all children. In this case, 75 % of mothers described the cough as dry or non-productive. Elevated body temperature was observed in 87.5 % of children. Besides, 62.5 % of children had nasal congestion or mucous discharge from the nose, and 50 %

had distant wheezing. Features of bioelectric activity of the heart in the examined children were determined by ECG.

There were 8 (12 %) patients with no ECG changes.

In other 88 %, morphological and functional features were registered. The violation of ventricular myocardial repolarization was prevalent in 73.8 %, and nomotonic rhythm disturbances in the form of sinus tachycardia in 40.5 %. Also, overload and hypertrophy of the right chambers of the heart were observed in 18 % and a decrease in bioelectric activity of the heart (voltage) in 14.3 %.

The control group children were also found to have a significant difference in numbers. Thus, violation of ventricular myocardial repolarization and nomotonic rhythm disturbances in the form of sinus tachycardia occurred much less commonly, in 14 and 19 % respectively. And such changes as overload and hypertrophy of the right chambers of the heart and a decrease in bioelectric activity of the heart were not recorded at all.

The study of morphology of the heart, functional state of the myocardium and indices of central hemodynamics implied an assessment of Doppler echocardiography findings. Doppler echocardiography (DopECHO) of the heart showed an increase in mean pressure on the pulmonary artery (PA) to 20 mmHg (63 %), which significantly exceeded the norm ($p < 0.05$) in comparison with the control group, 1st degree regurgitation of the tricuspid valve (14 %) and 1st-2nd degree of the PA valve (23 %), which was significantly increased in comparison with the control group ($\delta < 0.05$); an increase in the diameter of the right atrium and right ventricle (30%), which significantly differed in patients of the control group ($p < 0.05$). Mild structural anomalies of the heart were recorded with the same frequency and the rates did not exceed the average incidence in the population.

A comprehensive cardiac examination using ECG, Doppler echocardiography of the heart made it possible to detect early changes in the cardiovascular system in the form of sinus tachycardia, an increase in average pressure on the airway, an increase in the diameter of the right atrium and right ventricle, etc. Acute inflammatory process in the respiratory tract is accompanied by disturbances of microcirculation, which in turn can lead to systemic disruption of the functioning of the whole organism. But most often it affects the cardiovascular system.

4. Conclusions. In order to prevent the development of cardiovascular complications in the cardiovascular system in young children, it's necessary to provide:

– timely detection and appropriate treatment for children with acute broncho-pulmonary pathology;

– dynamic monitoring with ECG and DopECHO CG.

These data should be taken into account when monitoring children to identify the risk group for the development of cardiovascular complications with possible administration of antihypoxic agents.

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