CLINICAL ASPECTS OF COMMUNITY-ACQUIRED PNEUMONIA AGAINST THE BACKGROUND OF CONGENITAL HEART DEFECTS IN YOUNG CHILDREN

Aliev A.L
Komiljonova N.A
Tashkent State Medical University

Abstract: Among respiratory diseases, pneumonia occupies an important place in the overall structure of pathology in young children. An unfavorable course of pneumonia is associated with concomitant diseases: rickets, protein-energy malnutrition, congenital heart defects (CHD), and others. Diagnosis is often difficult, since the statistical pattern of such a disease combination is clinically close to its manifestations. Objective of the study: to examine the clinical and laboratory features of community-acquired pneumonia against the background of CHD and to develop diagnostic and prognostic criteria for the development of a severe course of pneumonia in young children with CHD.

Relevance: Respiratory diseases occupy an important place in the overall structure of pathology in young children.

In recent years, data have been accumulated that allow a new approach to the prevention and treatment of pneumonia in young children; at the same time, many problems still remain unresolved and warrant further study.

One of the many reasons accounting for the low effectiveness of therapy is the systemic involvement in the bodies of sick children, as well as the increased resistance of hospital strains to modern antibiotics.

Another issue requiring priority resolution is diagnosis at the early clinical stages.

It is known that there are more than 90 variants of congenital heart defects (CHD) and numerous combinations of them. More than 50–60% are defects with increased blood flow to the pulmonary circulation. The natural course of such defects is accompanied by the development of pulmonary hypertension, heart failure, and other complications.

Diagnosis is often difficult, since the symptomatology of such a disease combination is clinically close to manifestations of cardiovascular syndrome.

In this regard, one of the important problems is the study of the clinical and laboratory features of community-acquired pneumonia against the background of CHD under modern conditions, as well as the development of new diagnostic criteria.

Objective of the study: to examine the clinical and laboratory features of

community-acquired pneumonia against the background of CHD and to develop diagnostic and prognostic criteria for the development of a severe course of pneumonia in young children with CHD.

Methods and Materials

Under our observation were 40 young children with community-acquired pneumonia against the background of CHD and 30 children who had pneumonia without CHD; for the control group, a group of 30 healthy children was selected. The subject of the study was venous blood for general clinical and biochemical examinations in the sick children, nasopharyngeal swab material and tracheobronchial aspirate, and the main clinical and radiological data.

Results

At the first stage of our study, we analyzed the features of the course of pregnancy in the observation groups and found anemia in the majority of mothers of newborns with community-acquired pneumonia and CHD (63.5%); anemia was registered significantly less often in the group of children with community-acquired pneumonia without CHD (54.2% of mothers). Among mothers whose children fell ill with CHD in the main group, cases of TORCH infection and threatened miscarriage were twice as frequent as among mothers whose children fell ill with pneumonia without CHD (36.3% and 11.8%, respectively). In addition, among mothers whose children were born with CHD and pneumonia, pyelonephritis was observed in 28.7%. The data obtained indicate that children with pneumonia in the main group significantly more often had preeclampsia (41.2%) and chorioamnionitis (31.4%) compared with pneumonia in the comparison group.

An unsatisfactory obstetric and gynecological history was most often characteristic of mothers of Group I children compared with mothers of Group II, including threatened miscarriage, polyhydramnios, premature birth, and rupture of the fetal membranes. The presence of these data points to the aggravating role of these factors, especially in pneumonia with CHD.

The mean age at the time of inclusion and study was 11.9 ± 3.6 months in the main group and 8.0 ± 2.5 months in the comparison group.

In analyzing the types of defects in the study groups, the predominant ones were ventricular septal defect (VSD) in 63.7%, atrial septal defect (ASD) in 23.7%, and patent ductus arteriosus in 12.9%.

In analyzing the hemodynamic disturbances in CHD, patients with hypervolemia of the pulmonary circulation predominated. At the in-hospital stage, after the diagnosis was established, a physical examination was performed, paying attention to the condition of the skin and visible mucous membranes, tissue turgor, and the presence of edema, taking into account the type of CHD, with an assessment of physical development and the presence of protein-energy malnutrition (PEM). The severity of the children's condition

was determined by the degree of respiratory failure.

Among the general clinical symptoms in the children of the observation groups, the main groups showed decreased appetite (93.1% and 80.4%), lethargy (84.5% and 34.7%), restlessness (23.5% and 54.3%), pallor of the skin (70.1% and 48.4%), mottling of the skin (88.6% and 62.3%), muscular dystonia (79.1% and 61.4%), and elevated body temperature (60.1% and 55.8%).

A comparative description of the respiratory disturbances observed in the newborns showed that in children admitted to the hospital with community-acquired pneumonia against the background of CHD, the following were mainly noted: shortness of breath (93.7%), cyanosis of the nasolabial triangle (88.2%), acrocyanosis (82.4%), flaring of the nostrils (93.1%), participation of accessory muscles in the act of breathing — intercostal retraction (90.1%), sternal retraction (86.5%), foamy discharge from the mouth (78.1%), shortening of the percussion sound (94.1%), and cough (66.9%).

On auscultation, crepitation (53.6%), moist rales (71.6%), and weakened breathing (41.3%) were recorded.

In the peripheral blood parameters of the examined children in the main group with pneumonia against the background of CHD, anemia, leukocytosis and leukopenia, thrombocytopenia, and lymphocytosis were encountered. In children with community-acquired pneumonia without CHD, anemia and leukocytosis were observed. As for the biochemical analysis parameters, the most pronounced increase in pCO2 was observed in children of subgroup I against the background of a significant decrease in pO2. In children of this group, an imbalance of plasma electrolytes was revealed — that is, against the background of a sharp decrease in calcium and hematocrit, a significant increase in sodium and chloride was observed.

The constancy of the acid-base balance is one of the main components of the body's homeostasis. The indicators of this system lie within a strict reference range, which points to the importance of its regulation and the maintenance of constancy.

Our study revealed the presence of moderate hypoxemia and mixed acidosis in the patients of the second group, whereas in the patients of the first group these changes were of a profound nature — that is, as the severity of the pneumonic process increased, the deficiency of oxygen and bases worsened.

According to radiological examination of the respiratory organs, in children with community-acquired pneumonia against the background of CHD, bilateral lung involvement was detected in 96.1%, while in pneumonia without CHD it was found in 74.2% of cases (Fig. 1).

Pneumonia with CHD *Pneumonia without CHD*

Unilateral localization was more often observed in pneumonia without

CHD (21.6%) compared with pneumonia with CHD (1.9%). The earliest and often the only sign of pneumonia with CHD was an increase in lung transparency combined with an enhancement of the vascular pattern.

To identify the etiological agents, we examined the posterior pharyngeal wall of the children or took swabs from the tracheobronchial aspirate and nasopharynx. As our studies showed, S. aureus was encountered in children with and without CHD in 45.2% and 43.1% of cases, respectively. S. pyogenes was observed only in children with pneumonia and CHD, in 5.9% of cases. E. coli and S. epidermidis were identified in both groups. Candida albicans and S. pneumoniae were observed in children with community-acquired pneumonia without CHD, as well as in 7.8% of cases in children with CHD in combination with TORCH infection.

The ECG examination findings of the observations established sinus tachycardia in community-acquired pneumonia with CHD in 44.3% and in pneumonia without CHD in 19.3%. Signs of right ventricular hypertrophy increased almost threefold in the main group (up to 20.4%) and only 0.8-fold in the comparison group. Signs of left ventricular hypertrophy were found in 11.1% of children in the main group and 24.2% in the comparison group. Conduction disturbances and first-degree AV block occurred less frequently; however, significant differences were noted only for conduction disturbances (7.9% vs. 18.1%, $P<0.05$), whereas the frequency of AV block was low and did not differ statistically ($P>0.05$).

Our observations indicate that, against the background of a heart defect, pneumonia in early childhood is often difficult to diagnose, since the symptomatology of such a disease combination is close to the clinical manifestations of cardiovascular syndrome — with distinct signs of circulatory insufficiency within not only the systemic but also the pulmonary circulation. Against the background of a heart defect, the pneumonic process usually responds poorly to treatment, and an abundance of rales of various calibers persists in the lungs for a long time.

Thus, the combination of pneumonia with CHD is a cause of unfavorable mutual influence of different conditions and not only aggravates their course but also worsens the prognosis.

Conclusions

The treatment of pneumonia that proceeds with gross circulatory disturbances requires intensive therapeutic measures aimed not only at combating inflammation of the lungs but also at eliminating disorders of the functions of the cardiovascular apparatus.

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