PREVALENCE OF CARDIOVASCULAR SYSTEM INVOLVEMENT IN CHILDREN WITH PNEUMONIA

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Abstract: *Background. Acute pneumonia remains one of the leading causes of morbidity in childhood and is frequently accompanied by complications involving various organs and systems. In recent years, increasing attention has been paid to cardiovascular involvement in children with pneumonia, even in cases without obvious clinical manifestations of cardiac pathology. Early identification of myocardial dysfunction is important for improving treatment outcomes and preventing complications.*

Objective: *To study the degree and frequency of cardiovascular system involvement in children with acute pneumonia.*

Materials and Methods. *Thirty children aged from 1 month to 14 years who were hospitalized with a diagnosis of acute pneumonia were examined. Among them, 20 children were admitted during the first week of illness and 10 during the second week. Depending on the clinical form of pneumonia, the patients were divided into two groups. The first group included 9 children with a toxic form of pneumonia, while the second group consisted of 21 children with a localized form of acute pneumonia. Clinical examination and electrocardiographic evaluation were performed in all patients.*

Results. *Children with toxic pneumonia had severe general conditions accompanied by high fever, respiratory failure, and pronounced electrocardiographic abnormalities. ECG changes included sinus tachycardia, myocardial repolarization disorders, right axis deviation, right ventricular overload, intraventricular conduction disturbances, and prolonged electrical systole. In children with localized pneumonia, cardiovascular abnormalities were less pronounced clinically; however, electrocardiographic changes such as arrhythmias, repolarization disorders, and signs of right ventricular overload were still detected in many cases. ECG abnormalities were recorded in approximately 50% of patients with localized pneumonia despite the absence of clinical signs of cardiovascular dysfunction.*

Conclusion. *Cardiovascular involvement is common in children with acute pneumonia and may occur even without obvious clinical manifestations. Myocardial dysfunction is more severe in toxic pneumonia, but electrocardiographic changes are also frequently observed in localized forms. Careful cardiovascular assessment and ECG monitoring are important components of the comprehensive evaluation of children with pneumonia.*

Keywords: *pneumonia, children, cardiovascular system, myocardial dysfunction, electrocardiography, arrhythmia, pediatric cardiology.*

INTRODUCTION

Acute pneumonia is one of the most common infectious diseases in childhood and remains a major medical and social problem worldwide. Despite advances in diagnostic methods and antimicrobial therapy, pneumonia continues to be associated with significant morbidity and risk of complications, particularly in young children.

In addition to respiratory manifestations, pneumonia may affect other organs and systems, including the cardiovascular system. Toxic effects of infection, hypoxia, inflammatory mediators, and metabolic disturbances may contribute to myocardial involvement and functional cardiac abnormalities. In pediatric patients, these changes are often subclinical and may not be detected during routine physical examination.

Recent studies indicate that electrocardiographic abnormalities in children with pneumonia occur more frequently than previously assumed. Myocardial dysfunction may manifest as arrhythmias, repolarization disturbances, conduction abnormalities, and signs of ventricular overload. These changes are especially important in severe forms of pneumonia associated with intoxication and respiratory insufficiency.

Early recognition of cardiovascular involvement in children with pneumonia is essential for timely management and prevention of complications. Therefore, comprehensive cardiovascular assessment, including electrocardiography, should be considered an important part of the diagnostic evaluation in pediatric pneumonia. The aim of the present study was to investigate the frequency and severity of cardiovascular system involvement in children with acute pneumonia.

Materials and Methods. The study included 30 children aged from 1 month to 14 years who were hospitalized with a diagnosis of acute pneumonia. Study Desig A clinical and instrumental examination of the patients was performed during hospitalization. Depending on the clinical form of pneumonia, the patients were divided into two groups: Group 1: 9 children with toxic pneumonia; Group 2: 21 children with localized acute pneumonia. Among the examined children. 20 patients were admitted during the first week of illness; 10 patients were admitted during the second week of illness.

Clinical Examination. All patients underwent: physical examination; assessment of respiratory function; cardiovascular evaluation; electrocardiographic examination (ECG). Particular attention was paid to: heart borders; heart sounds; liver enlargement; respiratory failure; ECG abnormalities.

Electrocardiographic Assessment. Electrocardiograms were analyzed for: heart rhythm disturbances; myocardial repolarization disorders; electrical axis deviation;ventricular overload; conduction abnormalities; duration of electrical systole. The obtained results were analyzed using descriptive statistical methods.

Results. Clinical Characteristics of Patients. Children with toxic pneumonia presented with severe general conditions upon admission to the hospital. Most patients had: body temperature above 38°C; signs of respiratory failure; pronounced intoxication syndrome.

Among the 9 patients with toxic pneumonia: 6 had expansion of cardiac borders; 2 demonstrated hepatomegaly. These findings indicated significant involvement of the cardiovascular system in severe forms of pneumonia.

Electrocardiographic Changes in Toxic Pneumonia.All children with toxic pneumonia demonstrated significant ECG abnormalities. The following changes were observed: sinus tachycardia — in 8 patients; myocardial repolarization disorders — in 7 patients; right axis deviation — in 5 patients; signs of right ventricular overload — in 6 patients; intraventricular conduction disturbances — in 2 patients; prolonged electrical systole — in 1 patient. These findings suggest pronounced myocardial dysfunction associated with severe inflammatory and hypoxic processes.

Electrocardiographic Changes in Localized Pneumonia. Children with localized pneumonia generally had milder clinical manifestations. Signs of respiratory failure were absent or observed only during the first day of inpatient treatment. Despite the absence of obvious cardiovascular abnormalities during clinical examination, ECG changes were still identified in many patients. The most common electrocardiographic findings included: arrhythmias; myocardial repolarization disturbances; signs of right ventricular overload; prolonged electrical systole. However, ECG abnormalities in children with localized pneumonia were less pronounced compared with patients suffering from toxic pneumonia.Electrocardiographic changes were detected in approximately 50% of children with localized pneumonia.

Discussion. The results of this study confirm that cardiovascular involvement is relatively common in children with acute pneumonia. Even in the absence of clinical signs of cardiac pathology, electrocardiographic abnormalities may indicate functional myocardial disturbances. Several mechanisms may explain myocardial involvement in pneumonia: hypoxemia caused by respiratory insufficiency; toxic effects of infectious agents; inflammatory cytokine activity; metabolic disturbances; autonomic nervous system dysfunction. Children with toxic pneumonia demonstrated more pronounced cardiovascular abnormalities, including significant ECG changes and clinical manifestations such as cardiomegaly and hepatomegaly. These findings are likely associated with severe intoxication and increased myocardial stress.At the same time, children with localized pneumonia also demonstrated ECG abnormalities despite relatively mild clinical manifestations. This emphasizes the importance of instrumental examination even in clinically stable patients. Sinus tachycardia and myocardial repolarization disorders were the most frequent ECG abnormalities observed in this study. Similar findings have been reported in pediatric studies investigating myocardial dysfunction associated with respiratory infections. The presence of right ventricular overload may be explained by increased pulmonary vascular resistance and hypoxic pulmonary vasoconstriction during pneumonia. Overall, the study highlights the importance of careful cardiovascular monitoring in pediatric patients with acute pneumonia.

Conclusion. Cardiovascular system involvement is frequently observed in children with acute pneumonia and may occur even in the absence of obvious clinical symptoms. The most significant findings of the study include: high frequency of electrocardiographic abnormalities; pronounced myocardial dysfunction in toxic pneumonia; presence of subclinical cardiovascular disturbances in localized pneumonia. Electrocardiographic changes were recorded in approximately 50% of children with localized pneumonia despite the absence of objective cardiovascular signs. Therefore, comprehensive cardiovascular

assessment and ECG monitoring should be included in the routine evaluation of children with pneumonia for early detection of myocardial dysfunction and prevention of complications.

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