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Use of Carnitine to Children with Carditis on the Background of Community - Acquired Pneumonia

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Abstract: Pneumonia in children is one of the urgent problems in pediatrics, which is determined by the continuing high incidence and severe prognosis, especially in young children. The aim of the study was to evaluate the effectiveness of the use of carnitine in the treatment and prevention of myocarditis in children with community – acquired pneumonia. We examined 80 children aged 1 to 7 years with pneumonia, which we divided into 2 groups. Group I (control) included 40 children who were on standard treatment. Group II (main) included 40 sick children with pneumonia, who had a violation of the cardiovascular system and parenterally received the drug carnitine. The results obtained underline that the use of carnitine for pneumonia in children reduces the risk of severe unwanted heart complications and reduces the length of hospital stay by an average of 1.8 bed-days in comparison with standard therapy.

Key words: carnitine, myocarditis, community-acquired pneumonia, children.

Relevance. For several decades, severe pneumonia has remained one of the pressing problems of modern medicine due to the steady trend towards an increase in the number of patients and a consistently high mortality rate, despite the use of new principles and methods of treatment [3,4]. The probable cause of this is the untimely diagnosis and, as a consequence, the late start of treatment, as well as the impossibility of adequately assessing the effectiveness of therapy. The diagnosis of pneumonia in children often causes difficulties, especially if signs of respiratory failure developed against the background of ARVI. The problem of acute myocarditis is currently due to its widespread, especially in childhood.

One of the main causes of acute myocarditis today is acute respiratory viral infections (ARVI), which remain the most common and global diseases in children. Despite the relative epidemiological well-being over the past 8-10 years, they still account for 70 - 90% of infectious pathology and cause enormous socio-economic damage [5]. Each flu epidemic is accompanied by an increase in the number of cases of acute myocarditis, which determines the relevance of studying this problem. Complicated forms of acute respiratory viral infections are of the greatest importance in clinical practice, causing a severe course of the disease and determining an unfavorable prognosis [2].

An even more serious task is the timely diagnosis of complications of pneumonia, especially myocarditis, since the detection of this cardiac complication allows avoiding severe, and sometimes fatal, consequences for the patient. The frequency of myocarditis in pneumonia, according to different authors, varies from 1% to 15. From a diagnostic point of view, there are no specific electrocardiographic changes characteristic only of myocarditis.

Objective. To evaluate the effectiveness of carnitine in the treatment and prevention of extracardiac pneumonia in children with carditis.

Materials and methods of research. We examined children aged 1 to 7 years with community-acquired pneumonia who were hospitalized in the emergency pediatrics and pediatric intensive care

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departments of the SF RSCEM. The exclusion criteria were: a history of an infectious disease within a month before hospitalization, organic heart pathology (congenital and acquired heart defects, cardiomyopathy), signs of rheumatic fever and coronary vascular pathology. A total of 80 patients with community-acquired pneumonia who met the exclusion criteria were included in the study. The patients were randomly divided into 2 groups. Group 1 (control) included 40 children who were receiving standard treatment. Group 2 (main) included 40 sick children with pneumonia who had a disorder of the cardiovascular system and received carnitine parenterally. The therapeutic dosage of the drug was 50-100 mg/kg/day, the daily dose was prescribed 2 times a day during the entire period of the disease. As a preventive measure against repeated attacks of cardiological symptoms, the drug was prescribed at a dose of 10 mg/kg/day, the duration of anti-relapse therapy was 60 days.

The effectiveness of the therapy was assessed using clinical, laboratory and instrumental methods for diagnosing myocarditis.

The effectiveness of the antioxidant drug was assessed based on objective signs of cyanosis, congestive wheezing in the lungs and tachycardia. The severity of cyanosis in patients was assessed by central and peripheral distribution, and cough was assessed using a 4-point system: 0 points - no cough, 1 point - a single cough, 2 points - moderate cough and 3 points - frequent, painful cough. Tachycardia and cyanosis were the main signs of heart damage in pneumonia, which tended to continue even after the intoxication from the underlying disease had disappeared.

Additional criteria for the effectiveness of therapy were the duration of oxygen therapy and the duration of hospitalization. The patients were managed in accordance with the specifics of the Emergency Medical Care Service, diagnostic and treatment standards (the recommended maximum periods of inpatient treatment for bronchopulmonary diseases were observed). The discharge criteria were: satisfactory condition, SpO2≥95%, decreased cough, dyspnea and tachycardia. The presence of changes in the electrocardiographic study of a “metabolic nature” according to the cardiologist's conclusion and minor persistent oral cyanosis were not contraindications for discharge. Patients were monitored until the main symptoms of the disease were completely resolved.

Study results. After the study, the main indicators of patients in the compared groups upon admission to the hospital were analyzed and compared. The analysis showed that the patients selected for the main and control groups were comparable in terms of gender, age, and address indicators. After 6 months of treatment, a reliable effect of carnitine therapy on hemodynamic parameters was established: LVEF in the treatment group increased from 26±6.2% to 45.6±8.6% vs. in the placebo group, where there was a decrease in EF from 27.7±5.8% to 21.3±5.4%; end-diastolic volume in the treatment group decreased from 25.7±50.1 to 140.7±50.6 vs. in the placebo group, where there was an increase in EDV from 245±46.3 to 280.6±48.9. The most frequent change recorded on the ECG is sinus tachycardia, which was observed in 48 patients, ST segment changes in 12, AV block in 7, left bundle branch block in 37 patients. Thus, the most valuable electrocardiographic parameter in patients suffering from myocarditis is the change in the QRS complex.

Discussion of results. Myocarditis is an inflammatory lesion of the heart muscle of infectious, toxic-infectious, infectious-allergic, autoimmune and toxic etiology [6]. This is a disease predominantly of childhood and young people, although the disease can develop at any age. Myocarditis can be caused by any viral or bacterial agents, as well as non-infectious factors. The most common cause of the disease is viruses. In 6-8% of cases, myocarditis develops during or shortly after various sporadic or epidemic viral infections [1]. Of the bacterial myocarditis, the most dangerous are diphtheria (infectious-toxic), myocarditis in scarlet fever, typhoid fever and salmonellosis, tuberculosis, yersiniosis (intestinal and pseudo-tuberculosis), in generalized streptococcal and staphylococcal infections and tonsillogenic myocarditis associated with these pathogens [7,8]. In the pathogenesis of myocarditis, the similarity of immunopathological phenomena with a variety of etiological factors is important. The pathogenesis of viral myocarditis with viremia for 24-72 hours, subsequent attack of cardiomyocytes by cardiotropic viruses through specific cellular receptors, cytoplasmic replication of the virus with suppression of synthesis of its own protein macromolecules, DNA, RNA due to

synthesis of proteins encoded by the virus, changes in the cardiomyocyte, its death and triggering of immune mechanisms of inflammation in the myocardium has been experimentally established. The developing heart failure (HF) is accompanied by hyperproduction of neurohormones and further systemic and myocardial synthesis of proinflammatory cytokines (TNF-α, IL1, IL6, IL8), initiating remodeling and progressive dysfunction of the myocardium. Against the background of the anatomical and physiological features of the myocardium of newborns and young children, these processes are the cause of rapid maladaptive myocardial remodeling with the development of sphericity, cardiomegaly with impaired LV function, rapid circulatory decompensation, and rhythm disturbances. Clinically, this correlates with the severity of manifestations and prognosis of the disease.

Conclusion. Thus, the inclusion of the drug levocarnitine in patients with changes in the cardiovascular system was highly effective. The use of the drug causes a decrease in complicated cardiorespiratory syndromes and posthypocic changes in the ventricular myocardium, which allows us to conclude that carnitine has a certain advantage as a prophylactic agent for preventing the development of chronic cardiovascular pathology under the "mask" of community-acquired pneumonia in children and further transformation of the disease into various cardiopathies.

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