THE IMPORTANCE OF C-REACTIVE PROTEIN AND CYTOKINES IN THE DIAGNOSTICS OF COMMUNITY-ACQUIRED PNEUMONIA IN CHILDREN

Introduction. Community-acquired pneumonia is one of the most common serious illnesses in childhood. The implementation of new diagnostic approaches to the management of children with community-acquired pneumonia is based on the assessment of biomarkers that appear during the inflammatory response of the host organism against the microorganism. These biomarkers include a number of cytokines and C-reactive protein, the study of which in the diagnosis of bronchopulmonary pathology in children is a promising direction. Despite the fact that C-reactive protein and cytokines are generally accepted markers of inflammation, the establishment of clear diagnostic and prognostic levels of these indicators is difficult due to the heterogeneity of groups of people with this pathology [1, 2, 3].
Pneumonia, according to classical pathophysiological concepts, is one of the most common causes of systemic inflammatory response syndrome and is one of the leading causes of death among infectious diseases [4, 5]. According to the observations of the last 10–20 years in intensive care wards of specialized departments, the mortality rate in severe pneumonia reaches 15–30% [6, 7]. At the same time, the incidence of CAP in developed countries of the world, depending on the level of development and well-being of the population, varies on average from 1 to 11.6% among young and middle-aged people. In the age group over 65, PFS occurs 4 times more often and is 25–44% [8]. Despite its wide distribution, medical and social significance, the overdiagnosis of pneumonia, according to different authors, ranges from 16 to 52%, while the range of underdiagnosis varies from 0.9 to 18% [9].

This leads to the fact that the mortality rate in pneumonia does not decrease, and the number of patients with a protracted, asymptomatic course, as well as with severe and systemic complications in the course of the disease, is steadily increasing. It is now generally accepted that the pathogenesis of most diseases of moderate and more severity, including diseases of infectious etiology, is based on general and local patterns of the formation of systemic inflammation syndrome. The products of tissue damage and the vital activity of microorganisms, toxins and catabolic substances, immune complexes and a number of other factors simultaneously and in varying degrees of severity activate the mechanisms of the development of the inflammatory reaction. Mediators are factors that regulate the inflammatory process.

Currently, the determination of the concentration of CRP in the blood of patients with CAP is regulated in a number of international standards. Thus, according to the recommendations of the British Thoracic Society, it is advisable to measure the CRP content at the beginning of antibiotic therapy, as well as after a few days [10]. European experts set the threshold value of CRP> 100 mg / L in the presence of clinical symptoms of infectious lesions of the respiratory system as the basis for the diagnosis of pneumonia and the immediate initiation of antibiotic therapy. In modern conditions, the determination of CRP activity is mandatory in the diagnosis of pneumonia in children [11]. The opposite picture is described at
CRP concentrations <20 mg / L, when, against the background of symptoms of bronchial and / or lung damage, it is necessary to conduct an additional diagnostic search for alternative causes of suffering of the respiratory system (exacerbation of chronic bronchitis, pulmonary embolism, heart failure, etc.) [12].

The aim of the study was to determine the level of C-reactive protein and cytokines in children with community-acquired pneumonia.

**Materials and methods.** The study included 100 patients with community-acquired pneumonia aged 1 to 15 years, admitted to hospital treatment in the department of pulmonology of the Republican Scientific and Practical Medical Center of Pediatrics of the Ministry of Health of the Republic of Uzbekistan. General clinical and biochemical research methods were carried out. The content of C-reactive protein in blood serum was determined on an automatic immunochemiluminescence analyzer Immulite 2000 (Siemens, Germany). Immunological studies were carried out by studying the level of cytokines by ELISA using test systems of LLC «Cytokin» (St. Petersburg, Russia). The data obtained were processed by the Fisher - Student variation statistics method.

**Research results.** Studies have shown that the level of C-reactive protein in the blood serum of children with community-acquired pneumonia in the initial period of the disease was significantly higher (6.7 times), amounting to 30.2 ± 2.1 mg / l compared with the control group. We also revealed more significant changes in the content of C-reactive protein in the blood in community-acquired pneumonia in children of the older age group, while in young children in the acute period of the disease they were less pronounced (P <0.05).

Analysis of the results of the study of cytokines showed that in community-acquired pneumonia, the level of IL-1β increases 3.5 times compared with the data of the control group, which averaged 101.7 ± 6.7 pg / ml (P <0.01). The IL-6 level in children with community-acquired pneumonia was 2 times higher than in the control group (p <0.05). The IL-4 level in children with community-acquired pneumonia was 2.3 times higher than the control (P <0.01). In community-acquired pneumonia, the level of IL-8 is 2.3 times higher than in the control group (P <0.01). When analyzing the TNFα content in patients with community-acquired pneumonia,
THEORY AND PRACTICE OF SCIENCE: KEY ASPECTS

we noted its increase to 63.5 ± 3.2 pg / ml (P <0.01), compared with the control group, it increased 1.5 times (42.3 ± 2, 1 pg / ml, P <0.05). In children with community-acquired pneumonia, the level of serum IFNγ averaged 24.6 ± 1.4, which is 1.3 times lower than in the control group (P <0.01).

It should be emphasized that due to the presence of many large and significant studies, the threshold, diagnostically reliable CRP levels for the diagnosis of both PFS itself and its various complications and stages do not vary significantly and are widely known. The key values of the CRP concentration were also determined for cohorts of patients of different age and severity of the disease. In the opinion of the overwhelming majority of authors, the diagnostically significant threshold level of CRP in PFS should exceed 50 mg / L. Highly specific for pneumonia is the level of CRP concentration of more than 100 mg / l, allowing in controversial cases to positively resolve the issue of the need to prescribe empirical antibiotic therapy.

**Conclusion.** Thus, the assessment of biomarkers of C-reactive protein inflammation is an informative indicator in the diagnosis of community-acquired pneumonia in children, their increase confirms the bacterial nature of the pathological process, which will avoid the unjustified prescription of antibacterial drugs. The revealed imbalance of the cytokine status in children with community-acquired pneumonia contributes to the protracted course of the pathological process and serves as an additional criterion for assessing the severity of inflammation.

In assessing the diagnostic value, the most significant in descending order were the levels of TNF-α and CRP, which have higher indicators of diagnostic sensitivity, specificity and the largest area of the characteristic curve. The use of a complex of inflammatory markers (IL-6, TNF-α, CRP and PCT) increases the diagnostic and prognostic ability regarding the use of one of the markers of inflammation. The inclusion of biomarkers of the activity of the inflammatory process to the CURB-65 scale increases the efficiency of predicting the unfavorable outcome of community-acquired pneumonia. By solving the discriminant equation in terms of markers of inflammation in the peripheral blood and prognostic scales, in patients with community-acquired pneumonia, it is possible to predict the development of complications from the first day of hospitalization.
References: