



PNEUMONIA IN CHILDREN

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Summary

Pneumonia is an acute infectious disease of the lung parenchyma, pneumonia can be caused by viruses, bacteria and fungi. Pneumonia can be prevented through immunization, adequate nutrition, and elimination of environmental factors. Pneumonia caused by bacteria can be treated with antibiotics, but only about 30% of children with pneumonia receive the antibiotic they need. Among respiratory diseases, pneumonia is the most important single cause of death among children worldwide. Every year, it claims the lives of approximately 1.1 million children under the age of five. It is the cause of all deaths of children under the age of five worldwide. Pneumonia is ubiquitous, can be prevented with simple measures, and can be treated with simple, inexpensive drugs with proper care and with early detection and timely admission to hospitals of sick children.

Keywords: pneumonia, atypical pneumonia, children, diagnostics, antibiotics

Pneumonia is an acute infectious disease of the lung parenchyma, diagnosed by the syndrome of respiratory disorders or physical data in the presence of focal or infiltrative changes on the radiograph. The presence of these radiographic signs of the "gold standard", according to WHO, with a high degree of probability indicates a bacterial etiology of the process and allows you to exclude from the range of diseases defined as pneumonia, most lesions of the lower respiratory tract: bronchitis, including obstructive ones, caused by respiratory viruses and not requiring antibiotic treatment. [1.5.7]

Relevance:

The wide spread of acute pneumonia poses a great danger to children. Pneumonia is the leading single cause of death in children worldwide. Every year, it claims the lives of approximately 1.1 million children under the age of five. It is the cause of all deaths of children under the age of five worldwide. Timely correct diagnosis of acute pneumonia in children, assessment of the severity of the course of the disease, taking into account concomitant diseases, the correct choice of antibiotic therapy allows children to fully recover from pneumonia, reduce complications and mortality from pneumonia. Pneumonia is divided into outside and nosocomial. Community-acquired





pneumonia occurs in a child under normal conditions, nosocomial after 72 hours of hospital stay or within 72 hours after discharge from there. Allocate also pneumonia of newborns.[2.4.5]

Problem: Community-acquired pneumonia remains a major medical problem due to its prevalence and high mortality. *Streptococcus pneumoniae* is the most common causative agent of community-acquired pneumonia. Along with this, atypical pathogens of pneumonia (*Mycoplasma pneumoniae*, *Legionella* sp., *Chlamydia pneumoniae*) play a significant role, which together are responsible for the occurrence of approximately 40% of cases of community-acquired pneumonia, as the main or co-pathogens, while mortality can increase and reach 25% . Laboratory methods for detecting atypical flora cannot be called routine and generally available, pathogens are not detected by Gram staining, and cultivation of these microbes by conventional microbiological methods is difficult. There are no significant differences in clinical and radiographic manifestations of infections caused by typical and atypical flora. Therefore, empiric therapy for community-acquired pneumonia should be chosen taking into account the need to suppress both typical and atypical flora.[6.8]

It is important to distinguish between "typical" forms with a clear, homogeneous appearance, focus or infiltrate on the radiograph and "atypical" with inhomogeneous, not having clear boundaries of changes. The severity of pneumonia is determined by pulmonary heart failure, toxicosis and the presence of complications (pleurisy, pulmonary destruction, infectious toxic shock). With adequate treatment, most uncomplicated pneumonia resolve in 2-4 weeks, complicated in 1-2 months, a protracted course is diagnosed in the absence of reverse dynamics within 1.5 to 6 months. The following are subject to hospitalization: The age of the child is less than 2 months, regardless of the severity and prevalence of the process, the age is up to 3 years with the lobar nature of lung damage, the age is up to 5 years with damage to more than one lobe of the lung, Leukopenia < 6 thousand, leukocytosis > 20 thousand , atelectasis, children with severe encephalopathy of any genesis, children of the first year of life with intrauterine infections, children with congenital malformations, especially of the heart, children with concomitant bronchial asthma, diabetes mellitus, diseases of the cardiovascular system, kidneys, oncohematology, children from poor social and living conditions, lack of guaranteed implementation of therapeutic measures at home. Pneumonia is diagnosed by auscultation and percussion.[2.3]

Signs of pneumonia: fever, shortness of breath, cough, wheezing in the lungs. Temperature above 38.0°C for more than 3 days, shortness of breath in the absence





of signs of bronchial obstruction (>60 /min in children under 2 months, >50 at the age of 2-12 months and >40 in children 1-5 years), asymmetry of moist rales. Hemograms for the diagnosis of pneumonia are not as significant as it is commonly believed, clinical signs have a higher diagnostic efficiency. Leukocytosis below $15 \times 10^9 / l$ is observed in the first days of the disease in 40% of patients with coccal and 96% of atypical pneumonia, in fact, as often as with bronchitis. And only numbers above $15 \times 10^9 / l$ make it possible to exclude the viral etiology of lesions of the lower respiratory tract with a moderate probability, since such figures are possible with bronchitis (RS viral in children aged 2-3 months). CRP >30 mg/L and PCT >2 ng/mL are more reliable for diagnosing pneumonia. Levels of leukocytosis above $15 \times 10^9 / l$ and procalcitonin (PCT) above 2 ng/ml exclude atypical pneumonia, however, at lower levels, the differences are almost completely smoothed out.[3.4.6]

Atypical pneumonia differs little from SARS and bronchitis in terms of marker levels. With pneumonia in children of the first half of the year caused by *C. trachomatis*, very high leukocytosis ($30-40 * 10^9 / l$) and eosinophilia of more than 5% are often found. Community-acquired pneumonia. At the age of 1-6 months, atypical forms caused by *Chlamidia trachomatis* are often observed. In more than half of the patients, typical pneumonias are associated with food aspiration, cystic fibrosis, primary immunodeficiency, their pathogens are gram-negative intestinal flora, staphylococci. Atypical pneumonia with an identified pathogen occurs in 7-20% of community-acquired pneumonia. Taking into account patients without clear clinical symptoms and in the absence of identification of the pathogen, this percentage may be higher. Often among atypical pneumonias, mycoplasma pneumonia occurs.

Pneumonia in children is caused by pathogens that usually circulate in the respiratory tract, the detection of these pathogens in sputum does not indicate their etiological role. Detection by any method of viruses, mycoplasmas, chlamydia, fungi, pneumocystis in the absence of a clinical picture of the corresponding pneumonia is not proof of their etiological role, as well as the presence of pneumonia itself. Detection of IgM antibodies to chlamydia and mycoplasma is of diagnostic value, but during the first week after the onset of pneumonia caused by mycoplasma, they are often absent. Often, mycoplasma infection is asymptomatic and is detected only when seroconversion is detected. With the development of respiratory tract damage, the patient's complaints often do not correspond to scarce objective data. The onset is gradual, with headaches, malaise, fever, not reaching a high degree of severity. Respiratory tract symptoms: Dry, hacking to productive cough with light sputum. Cough is the most common symptom of a respiratory tract infection. In patients with



mycoplasma infection, cough is always present, but among those who cough, only 3-10% of patients with pneumonia.

Shortness of breath is a rather rare symptom, if it occurs, it is mild.

Fever - a characteristic symptom of mycoplasma infection - does not reach a high degree of severity. Basically, there is no correspondence between fever and X-ray picture and blood tests. Symptoms of pharyngitis in 6-59%. Rhinorrhea in 2-35%. Pain in the ear (myringitis) in 5%. Asymptomatic sinusitis. On physical examination, unexpressed wheezing (dry or wet, finely bubbling) is detected, most often no changes are detected on percussion. Extrapulmonary manifestations of mycoplasma infection: Hemolysis, accompanied by elevated titers of cold agglutinins, catarrhal pancreatitis, catarrhal meningitis, meningoencephalitis, neuropathy, cerebral ataxia, maculopapular skin lesions (describes the relationship with Stevens-Johnson syndrome), myocarditis (not often), glomerulonephritis (not often), myalgia, arthralgia (without a picture of true arthritis).

Objective methods of examination: X-ray examination most often reveals an increase in the pulmonary pattern, characteristic of peribronchial infiltration, but there may be focal infiltrates, discoid atelectasis, an increase in the lymph nodes of the lung root, pleurisy. Laboratory data: hemolytic anemia with increased titers of cold agglutinins and reticulocytosis. Leukocytosis is not noted. Thrombocytosis is possible as a response to anemia. Immunological diagnostics: determination of titers of antimycoplasmal antibodies (IgM, IgG).

Positive result: the initial increase in antibody titers $\geq 1:32$ or a 4-fold increase in dynamics. The appearance of antibodies is noted by 7-9 days, and a maximum - by 3-4 weeks of the disease. Determination of antigens (the most reliable results within one week from the onset of the disease). Polymerase chain reaction is based on the determination of the specific DNA of mycoplasma pneumonia. The sensitivity of the method is 93%, the specificity is 98%. Pneumonia caused by pneumococci and Haemophilus influenzae type b occurs in 10% of children; usually these are children who fell ill as a result of contact with a patient with acute respiratory infections. In children 6 months - 6 years old, the most common causative agent of pneumonia is pneumococcus, at the age of 7-15 years, the main bacterial causative agent of typical pneumonia is pneumococcus. The selection of antibiotics for the treatment of pneumonia is optimal when deciphering its etiology, however, express methods are not always reliable and available. An acceptable alternative is to determine the most likely pathogen, taking into account the obvious symptoms, as well as the age of the affected child, the time and place of the onset of the disease. The choice of an antibacterial agent for pneumonia is carried out empirically, taking into account





different pathogens at different ages, the severity of the process and the likelihood of pathogen resistance. If there is uncertainty about the etiology, a drug or a combination of two drugs with a broader spectrum can be used. Indications for replacing the drug is the absence of a clinical effect within 36-48 hours for mild and 72 hours for severe pneumonia, as well as the development of side effects. In complicated pneumonia, treatment begins with parenteral drugs, replacing them with oral ones when the effect occurs (stepwise method). For non-severe pneumonia, both in the hospital and in the clinic, oral drugs are preferable, if therapy was started parenterally, after reaching the effect (temperature drop), you should switch to an oral drug: amoxicillin, amoxicillin clavulanate (augmentin), cefuroxime-axetil (zinnat), acting both pneumococci and *Haemophilus influenzae*.

Phenoxymethylpenicillin-benzathine (pox syrup) and first-generation cephalosporins suppress only the coccal flora, so they are best used in older children. The frequency of pneumonia caused by atypical pathogens (mycoplasmas, chlamydia and legionella) is 20% or more among all community-acquired pneumonia. Therefore, for empirical therapy of community-acquired pneumonia with an unknown pathogen, it is recommended to use a combination of beta-lactam antibiotics and macrolides or monotherapy with new fluoroquinolones (sparfloxacin, etc.). These drugs have a wide spectrum of antimicrobial activity, including coccal flora, gram-negative and atypical pathogens. In atypical pneumonia, macrolides and azithromycin are the drugs of choice. Since they also act on the coccal flora, these agents can be used in individuals with an allergy to b-lactams, but their widespread use is undesirable due to the stimulation of drug resistance of the flora. Evaluation of the effectiveness of treatment is carried out after 24, 36 and 48 hours of treatment. The full effect is recorded when the temperature drops below 38.0 ° C (without antipyretics) and the general condition improves, appetite appears, while the x-ray picture may improve or remain the same. This indicates the sensitivity of the pathogen to the drug, therefore, treatment with this drug should be continued. A partial effect is recorded with an improvement in the general condition and appetite, as well as the absence of negative dynamics in the focus, but while maintaining a febrile temperature, this picture is observed with a purulent focus (destruction) or an immunopathological process (metapneumonic pleurisy).

At the same time, the antibiotic is not changed, the full effect occurs later - when the abscess is emptied or anti-inflammatory drugs are prescribed. If the patient remains febrile, increases infiltration in the lungs or general disorders, it is considered that there is no effect, in these cases an immediate change of antibiotic is required. The duration of treatment for non-severe pneumonia is 5-7 days, for complicated





forms 10-14 days (2-3 days after the temperature drops). With nosocomial pneumonia, the drug is replaced according to bacteriological data or empirically already after 24-36 hours, at the first signs of inefficiency. Fluoroquinolones are used in children over 12 years of age and in extremely severe cases in younger patients with resistance to enterobacillary, *Pseudomonas aeruginosa* and atypical flora. In anaerobic processes, metronidazole is used; in fungal etiology processes, fluconazole, ketoconazole. Treatment of non-severe pneumonia under good conditions is possible at home. With the rapid onset of the effect of antibiotics, other types of therapy are not needed. Antipyretics are not prescribed for pneumonia, as this may make it difficult to assess the effectiveness of treatment. Ventilation is a must. Before the onset of the effect, bed rest, with rapid reverse dynamics, the child is transferred to half-bed rest, and from the 6-10th day to the general regime. Hardening can be resumed after 10-14 days, but heavy physical exertion (sports) is permissible after 6 weeks, with mild and 12 weeks after complicated pneumonia. During this time, pulmonary blood flow is restored. Appetite, reduced in the first days, is quickly restored, which makes the prescription vitamins. Physiotherapeutic procedures on the chest (iontophoresis, microwave, etc.), including during the reparation period, are ineffective.

Conclusions: With early detection and timely hospitalization of sick children with acute pneumonia in pediatric areas by pediatricians, it reduces the lethal outcome and the appointment of adequate therapy.

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