

ASSESSMENT OF IMMUNE SYSTEM STATE OF CHILDREN WITH PNEUMONIA

Turayev Telmon Temirovich

Department of Pediatrics, Bukhara State Medical Institute

Abstract. The danger of the disease is related to the important role that the lungs play in the human body. After all, the lungs perform the function of delivering oxygen to the body's tissues and, therefore, the defeat of such an important organ can have serious consequences.

Keywords: pneumonia, oxygen, mucous membrane, pneumonia, respiratory tract inflammation, Atypical pneumonia..

The lungs receive oxygen from the upper respiratory tract during inhalation. In the special bubbles of the lungs – the alveoli-the process of enriching the blood with oxygen takes place.(3) At the same time, carbon dioxide enters the alveoli from the blood, which is released outside when exhaling. The inner surface of the lungs has a mucous membrane, the purpose of which is to protect the lungs from negative external influences.

Pneumonia is a serious infectious disease that affects people of all ages. And children are no exception. Recently, there has been an increase in the number of acute infectious diseases of the respiratory system, and lung inflammation is the most dangerous of them. Therefore, parents should understand what it is – pneumonia, how to recognize this disease, and what to do in case of its occurrence in the child.

Each lung consists of 10 segments, which are grouped into lobes – in the right lung there are three of them, in the left-two. With lung inflammation, the infectious process affects the internal structures of the lungs, which significantly complicates the process of breathing and gas exchange. And this can also affect other organs, especially the heart.

Gas exchange does not exhaust the functions of the lungs in the body. They also participate in the following processes:

- body temperature control,
- * filtration of harmful substances ,
- * regulation of the amount of liquids and salts,
- * blood purification,
- * elimination of toxins,
- * synthesis and neutralization of proteins and fats.

With infectious diseases of the gastrointestinal tract, poisoning, injuries and burns, the load on the lungs increases many times, and they can not cope with the removal of toxins from the body. This can trigger an infectious process in the lungs.

Types of pneumonia

Unlike other respiratory diseases, the proportion of cases with a purely viral etiology is small. In about 80% of cases, we are talking about lung damage by various strains of bacteria. In childhood, the majority of diseases with pneumonia are associated with three types of bacteria-pneumococcus, mycoplasma and pulmonary chlamydia. However, other types of bacteria can also become a source of the disease.

These include staphylococci, streptococci, Klebsiella, Hemophilus coli, Escherichia coli, Pseudomonas aeruginosa, Mycobacterium tuberculosis, and some others. Much less often, the lungs suffer from the effects of pathogenic fungi, and even less often, pneumonia caused by helminths can be observed.

Pathogens are also distributed unevenly across age groups. Pneumonia in infants and preschool children is most often caused by pneumococci. In primary school age, children are more likely to be exposed to mycoplasma pneumonia. Teenagers most often suffer from pneumonia caused by chlamydia.

According to the size and shape of the area of inflammation, pneumonia is divided into:

- * focal,
- * segmental,
- * drain pipe,
- croupous,
- left-sided,
- right-hand side.

In focal pneumonia, there are only individual foci of inflammation about 1 cm in size, and in draining these foci merge together. In segmental pneumonia, one of the segments of the lungs is affected. With the croup type of lung inflammation, the entire lobe is covered by the pathological process.(9)

In bronchopneumonia, not only the lung tissue is affected, but also the bronchial mucosa. Usually, bronchopneumonia is a consequence of bronchitis.

Less common is purely viral pneumonia. The causative agents of this form of the disease can be influenza viruses, parainfluenza, adenoviruses. Bilateral pneumonia is most often caused by pneumococci and Hemophilus coli. Atypical pneumonia in a child is most often caused by mycoplasmas and chlamydia. This type of pneumonia can last longer, and is difficult to treat with antibiotics.

Hospital-acquired pneumonia is most often caused by staphylococci, Pseudomonas aeruginosa, and Klebsiella.

Features of lung inflammation in childhood

Left-sided pneumonia in a child is most often more severe than right-sided pneumonia. This is due to the fact that the lungs have an asymmetric structure, and the airways on the left side are narrower than on the right. This circumstance makes it difficult to remove mucus and contributes to the rooting of the infection.

It is well known that children are more likely to develop pneumonia than adults. There are several reasons for this fact. First of all, young children have a rather weak immune system compared to adults. And the second reason is that the respiratory organs of a child are not as developed as those of an adult. In addition, the narrowness of the respiratory passages in children causes stagnation in them of mucus and makes it difficult to remove it.

Also, in infants, breathing is usually carried out with the help of movements of the diaphragm, which are affected by the state of the gastrointestinal tract.(1) A violation of its work, which is expressed, for example, in bloating, immediately affects the lungs – there are stagnant phenomena in them, leading to an increase in the number of pathogenic microorganisms. Infants also have relatively weak respiratory muscles that prevent them from coughing up phlegm effectively.

Symptoms of pneumonia in a child

How does pneumonia manifest itself? The symptoms of pneumonia in children of different ages are somewhat different. However, it is worth noting that with all types of pneumonia, there is such a symptom as respiratory failure. It is expressed, first of all, in increased breathing in pneumonia, which usually does not happen in infectious diseases of the upper respiratory tract. Normally, the ratio of pulse and respiratory rate is 3 to 1. However, with pneumonia, the ratio can reach 2 to 1 and 1 to 1. That is, if the child's pulse is 100, then the respiratory rate can be more than 50 breaths per minute. Despite the increased respiratory rate, it is usually shallow, shallow.

How else can you determine respiratory failure? There are a number of other signs that indicate it, for example, blueness of the skin surfaces, primarily in the area of the nasolabial triangle. Sometimes there may be a pallor of the skin.

Secondly, with pneumonia, there is another characteristic sign – a high temperature. The level of hyperthermia in pneumonia is usually much higher than in other respiratory diseases and can reach +39-40 ° C. However, this symptom may not occur in all types of pneumonia. Signs of SARS in a child include a subfebrile temperature or a temperature slightly higher than +38 ° C. Sometimes there may be such a scenario of the disease, when the temperature rises to high values in the first days, and then decreases. In addition, in children under one year of age, due to the imperfection of the immune system, the temperature can also remain within the subfebrile range even in the most severe forms of pneumonia.

Signs of pneumonia in a child include other respiratory symptoms. First of all, it's a cough. As a rule, it can be observed if the infection affects not only the lungs, but also the bronchi, which is most often the case in practice, as well as if pneumonia is a complication of acute respiratory infections.(2) Cough can be varied, but as a rule, it is not completely dry, but is associated with the discharge of sputum. Or, in the first days of the disease, a dry cough appears, and then it turns into a cough with expectoration of sputum. The variety of manifestations is characterized by bilateral croup pneumonia. In children, symptoms of this form of the disease include not only cough, but "rusty" sputum, including red blood cells from damaged small capillaries.

With the development of pneumonia in a child, symptoms will include signs of intoxication – headaches, nausea, dizziness. In some types of pneumonia in children, symptoms may include chest pain, sometimes in the hypochondrium.

The symptoms of pneumonia in an infant may not be as pronounced as in older children. Often, the symptoms of pneumonia in infants include only a subfebrile temperature and a cough (in some cases, it may be absent). Therefore, the recognition of the disease at the age of one year is difficult.(2) You should pay attention to indirect symptoms – low muscle tone, lethargy, breast rejection, anxiety, frequent regurgitation.

Causes of occurrence

Due to the causes of pneumonia, it is divided into primary and secondary. Primary pneumonias include cases of disease that arise directly from infection with pathogenic microorganisms. Secondary pneumonias include cases of diseases that are complications of other respiratory diseases – ARVI, bronchitis, influenza, sore throat, etc.

In most cases, we are talking about secondary diseases. It should be noted that viral respiratory diseases very often provoke the occurrence of pneumonia and prepare the ground for them by the fact that they weaken the immune system and lower the protective properties of bactericidal sputum formed in the lungs.

Quite rarely, pneumonia is transmitted from person to person by airborne droplets.(5) As a rule, the causative agents of the disease already live in the body, long before it begins, and are just waiting in the wings to begin their attack on the lungs. The trigger that can trigger the activation of pathogenic microflora can be an infectious disease of the upper respiratory tract, influenza, weakening of the immune system, for example, as a result of hypothermia of the body.

A special group of cases of pneumonia includes so-called hospital infections.(6) They occur in hospitals, if patients are treated for other diseases. Hospital-acquired pneumonia is caused by specific, hospital-acquired strains of bacteria that are highly resistant to traditional antibiotics.

Thus, pneumonia can also cause congestion in the lungs associated with long bed rest. In young children, congestion in the lungs can also be caused by intestinal

infectious diseases, in which there is bloating and normal ventilation of the lungs is disrupted. Also, the occurrence of pneumonia can contribute to the frequent regurgitation of food by the child, in which vomit with intestinal pathogens contained in them can partially enter the lungs.

If pneumonia occurs in newborns, then there can be two main reasons for this – either the child was infected directly in the maternity hospital, or was infected already in the womb.(7)

Other factors contributing to the disease:

- * stress,
- * beriberi,
- * poor nutrition,
- * passive smoking of others.

Diagnostics

In a child, acute pneumonia can only be diagnosed by a doctor. At the first sign of pneumonia in a child, a therapist should be called. An experienced doctor can determine the focus of inflammation by listening to noises and wheezes in the lungs and tapping the chest. Also, other diagnostic signs are used to recognize the disease: respiratory failure, the nature of hyperthermia, damage to the upper respiratory tract.

However, in order to unambiguously diagnose and determine the location of the focus of the disease, in most cases, radiography is required. On the X-ray image, the degree of lung damage and the area of spread of the pathological process are clearly visible. It is this sign that is most important in the diagnosis.

However, X-rays do not always allow you to determine the causative agent of the disease. But the treatment strategy largely depends on this information. For this purpose, bacteriological tests are used – the isolation of antibodies to the pathogen or the pathogens themselves from the blood and sputum droplets.(8) However, it is not always possible to clearly identify the pathogen, since sputum may contain several potentially pathogenic microorganisms at once. In addition, a violation of the leukocyte formula, an increase in the level of ESR (20 mm/h or more), and a decrease in hemoglobin are taken into account. However, a significant increase in the number of white blood cells does not accompany all types of pneumonia. The maximum increase in the number of white blood cells is observed in chlamydia infections (30,000 per μ l).

Forecast

In most cases of pneumonia in children, provided timely access to a doctor, the prognosis is favorable. Pneumonia in newborns and infants, especially in premature infants, is a serious threat to life.(9) Also dangerous for their severe complications of pneumonia caused by staphylococci and streptococci, as well as *Pseudomonas aeruginosa*. In most cases, with proper treatment, the likelihood of complications is low.

Complications

Pneumonia in a child at the age of 2 years can take severe forms and spread to other organs.

Among the most common complications are lung abscess, destruction of lung tissue, pleurisy, air ingress into the pleura area.

Complications of pneumonia in children that affect other organs:

- heart failure,
- * sepsis and septic shock,
- meningitis,
- * myocarditis,
- * endocarditis,
- * pericarditis,
- * violation of blood clotting.

Treatment

Treatment of acute pneumonia in a child can be carried out both in the hospital and at home. The choice of a particular option is made by the doctor, based on the following factors •

- * the age of the child,
- patient's condition,
- the expected type of disease,
- the ability of parents to provide proper care for the child,
- * the presence of smokers in the family.

If acute pneumonia is not cured, it can become chronic, lasting up to six months.

Treatment of bacterial pneumonia in a child is carried out mainly with the help of antibiotics.(10) Of course, during the first examination, the doctor often does not have the opportunity to accurately determine the type of pathogen. Therefore, general antibiotics are prescribed first, or an antibiotic is selected based on approximate assumptions. Subsequently, as the diagnostic data accumulates, this appointment can be either canceled or confirmed. The effectiveness of the antibiotic is evaluated in the first days after the appointment, usually 2-3 days later. How do I know if the drug has worked? If, against the background of its reception, the patient's condition improves – a decrease in temperature, a weakening of symptoms indicating pulmonary insufficiency, then drug therapy with this drug continues. If there is no improvement, then another drug is used. By this time, the doctor may already have data on the nature of the infection that can help him make the right choice.

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