

To the Development of Atypical Pneumonia in Children Contributing Risk Factors

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Abstract: This article discusses the development of atypical pneumonia in children. Useful information about risk factors, diagnosis and treatment.

Keywords: Atypical, chlamydia, mycoplasma, legionella, mycoplasma pneumoniae, human mycoplasma, ureaplasma urealyticum.

Atypical pneumonia-This is an infectious inflammation of the lung tissue, the causative agents of which are legionella, chlamydia, mycoplasma and viruses. Outpatient pneumonia accounts for 7-20%.

Mycoplasmas number 120 species and belong to the class Mollicutes. In humans, 13 types of mycoplasmas, 2 types of choleplasma and 1 type of ureaplasma have been identified. There are 3 types of human disease: Mycoplasma pneumoniae, Mycoplasma hominis, Ureaplasma urealyticum. These pathogens are spread through the air when an infected person sneezes or coughs. The incubation period is up to 3 weeks. Typically, the season is in the autumn-winter season, but transmission of the disease persists throughout the year [1].

With both natural and experimental infections, 40-90% of patients become ill on days 3-11 of the incubation period. Patients who are not susceptible to the pathogen will spread the mycoplasma for several weeks and become a source of infection. They have an increased titer of antibodies in the blood without clinical symptoms. Pneumonia and bronchitis are predominantly characteristic of M. pneumoniae. This is why most children of preschool and school age get sick. Among children and adolescents, pneumonia with atypical mycoplasma occurs from 10% to 20%, among adults - from 2-3%. There are many diseases in families and organized social organizations. Formed immunity is unstable[2].

The viral form of atypical pneumonia develops as a result of previous respiratory infections with influenza, parainfluenza, and respiratory syncytial virus.

Legionella, chlamydia, mycoplasma are bacteria and viruses. The vector can reproduce in human cells and cannot live outside the human body. This feature makes them belong to intracellular parasites, similar to the feature of viruses.

Mycoplasmas grow under aerobic and anaerobic conditions in a medium supplemented with serum. Special organelles that provide communication with human cells ensure parasitism inside the cell. Living in the form of filaments, they synthesize proteins that are resistant to the membrane of epithelial cells of the respiratory tract. After binding to an epithelial cell M. pneumoniae produces hydrogen peroxide and superoxide, which damage squamous epithelial cells. But there is also a mechanism of its pathogenesis that is not associated with the direct action of an infectious agent, which is a pathoimmunological process in response to the

introduction of mycoplasma antigens [3]. Antibodies to glycolipid antigen can act as autoantibodies in the process of confrontation with red blood cells and brain cells. Mycoplasma infection manifests itself in the following clinical forms: rhinitis, pharyngitis, tracheitis, bronchitis, pneumonia.

Usually Mycoplasma infection is asymptomatic and is detected when seroconversion is detected. If the respiratory tract is affected, the patient's complaints do not correspond to objective data. The onset of the disease is slow, headache, lethargy, mild fever [4].

Respiratory symptoms. From a dry cough to a wet cough with clear sputum, accompanied by severe discomfort. Cough is the most common and persistent symptom. Shortness of breath is very rare and develops slowly. Mycoplasma infection is characterized by fever, but not very high. There is no correlation between fever, blood test and chest x-ray. Symptoms of pharyngitis - in 6-59% of cases, rhinorrhea - in 2-35%, ear pain (myringitis) - in 5%, sinusitis without symptoms, dry and wet snoring with small bubbles, percussion sound does not change.

Extrapulmonary symptoms of mycoplasma infection. Hemolysis occurs with an increase in the titer of cold agglutinins [5]. Catarrhal pancreatitis, meningitis (catarrhal), meningoencephalitis, neuropathy, and cerebral ataxia are observed. Accompanied by maculopapular rashes on the skin (there is a connection with Stevens-Johnson syndrome), myocarditis, glomerulonephritis, myalgia, arthralgia (there are no real symptoms of arthritis). Mycoplasma pneumonia is usually mild or moderate in severity. In the prodromal period, patients complain of upper respiratory tract congestion, sore throat, dry cough, headache and malaise. In these cases, low-grade fever and paroxysmal wet cough are observed for 2-3 weeks. In about a quarter of cases the process is bilateral. In severe cases, the disease is characterized by high fever, severe poisoning, arthralgia, myalgia, nosebleeds, polymorphic skin rashes, enlarged cervical lymph nodes, the appearance of protein or blood in the urine, enlarged spleen, degenerative changes in the myocardium [6,7]. Mycoplasma pneumonia often progresses slowly. Sometimes its course is based on deformed bronchitis, bronchiolitis, bronchiectasis, and pneumosclerosis.

Chlamydia is an intracellular parasite that often affects the eyes, respiratory system and genitourinary system. Chlamydia differs from other prokaryotes in the size of its genome (600 million Daltons) and in this respect is compared only with mycoplasma. There is no peptidoglycan in their cell wall. The growth process of this microorganism is complex and has two different forms: elementary and reticular.

In the reticular form, bacteria multiply inside the cell. Intermediate forms formed after the division of reticular forms inside the cell leave the cell and become elementary forms. These elemental forms re-enter the human cells and the growth process continues. Outside human cells, chlamydia exists in elemental form [8].

Types of chlamydia: *S. trachomatis*, trachoma, lymphogranulomatosis venereum and urogenital pathology, *C. pneumoniae*, respiratory diseases, *C. psittaci*, ornithosis. Inflammatory processes depend on the influence of an infectious agent and various immunopathological processes. A delicate case of a pathogenetic situation is the connection between atherosclerosis and coronary heart disease. *C. pneumoniae* is the most common type of chlamydia in human diseases, occurring in 100 cases per 100,000 population among adults and children [9]. *C. pneumoniae* is often asymptomatic or has few symptoms. But severe levels of SARS are also observed.

Respiratory symptoms. For dry cough or clear sputum, etc. signs of severe intoxication, chest pain, slightly developed dry or moist rales are revealed. Chlamydial pneumonia begins in the form of rhinitis, pharyngitis, and acute respiratory viral disease. Then a very high body temperature, muscle and joint pain, shortness of breath, dry cough, sometimes with a small amount of sputum, appears. Many patients have enlarged cervical lymph nodes (lymphadenopathy).

Extrapulmonary symptoms of chlamydial infection. Meningoencephalitis in patients Guillain-Barré syndrome, reactive arthritis, and myocarditis are also found. The diagnosis is confirmed on the basis of epidemiological, clinical and laboratory methods.

In 1976, the disease was discovered in participants in the American Legionnaires' Congress. The causative agent of SARS is a gram-negative aerobic bacillus – *Legionella pneumophila*. The infection predominantly develops in the summer months [4,10].

Legionella pneumonia (“*Legionella disease*”) is caused by the bacteria *Legionella pneumonila*, which lives in water pipes and containers, fountains, and cooling water devices. It is transmitted by drinking or inhaling contaminated water, in air-conditioned rooms, bodies of water, during colonization on metal, plastic, rubber surfaces of water-circulating engineering equipment, as well as through aerosol spread. The incubation period is 2-10 days.

Clinically, legionellosis manifests itself in 2 different ways: Legionnaires' disease - pneumonia and panthiac fever (without local symptoms), headache, fever, malaise are observed and go away without treatment. In the absence of treatment for outpatient legionella pneumonia or with ineffective antibacterial therapy, the mortality rate is 16-30%, and for hospital-acquired pneumonia - up to 50%. Legionnaires' disease is accompanied by symptoms of pneumonia and gastrointestinal symptoms.

The disease begins with an intoxication syndrome, then local symptoms are added: cough with the release of a small amount of sputum (sometimes with an admixture of sputum, sometimes with sputum, sometimes with expectoration of blood), chest pain.

The occurrence of some symptoms of *Legionella pneumonia*: cough - 41-92%, fever - 42-97%, temperature $>38.8^{\circ}\text{C}$ - 88-90% ($>40^{\circ}\text{C}$ - 20-62%), shortness of breath - 25-62%, headache - 40-48% , myalgia and arthralgia - 20-40%, diarrhea - 21-50%, nausea/vomiting - 8-49%, neurological symptoms - 4-53%, chest pain - 13-35% In severe cases, high fever according to An epidural history indicates *Legionella* infection; the addition of gastrointestinal symptoms confirms the diagnosis [10,11].

Legionella pneumonia affects various parts of the respiratory system. This type of atypical pneumonia occurs as a pathological process in the form of fragmented pneumonia with severe swelling of the terminal bronchioles and alveoli, massive exudation and interstitial lung tissue on the affected side. The disease is characterized by high fever, severe tremors (shaking or gnawing) and headache [11].

Patients complain of a cough, first dry, then with mucus or mucopurulent sputum. The course of the disease is aggravated by shortness of breath, muscle and chest (pleural) pain, nausea, vomiting, diarrhea, tachycardia, and abdominal pain. The most serious complication of atypical *Legionella pneumonia* is respiratory failure and secondary renal failure, which can be fatal.

Legionellosis extrapulmonary signs of infection. Rarely, complications such as endocarditis, myocarditis, pericarditis, sinusitis, paraproctitis, pancreatitis, peritonitis, pyelonephritis are observed, especially in patients with immunodeficiency.

Symptoms of Legionnaires' disease: diarrhea or symptoms of gastrointestinal diseases, neutrophilia and gram-negative bacilli are detected when sputum is stained with Gramsulide. Hyponatremia in blood test. Treatment with β -lactams and aminoglycosides is ineffective.

The main method for diagnosing atypical pneumonia is radiography. With bilateral x-ray examination, heterogeneous infiltration of low and medium intensity and diffuse reticular sharp changes in the pattern of bronchi and vessels are observed in the lung tissue. In most cases, an X-ray examination of the lungs reveals increased peribronchial and focal infiltration, disc-shaped atelectasis, enlarged lymph nodes of the lung root, and signs of pleurisy. Laboratory tests: hemolytic anemia with an increase in the titer of cold agglutinins, reticulocytosis. Leukocytosis is not observed. Thrombocytosis may occur in response to anemia.

Cerebrospinal fluid: increased lymphocytosis and protein content are detected. During immunological examination: the titer of IgM and Ig G antibodies against mycoplasma, chlamydia, and legionella increases. Positive result: antibody titer $\geq 1:32$ or increase in blood by 4 times. The appearance of antibodies is observed on days 7-9 of illness, maximum - at 3-4 weeks. The polymerase chain reaction is based on the detection of specific mycoplasma DNA. The sensitivity of this method is 93%, specificity is 98% [1,7].

Additional examination methods include a complete blood count (leukocytosis indicates infection), bronchoscopy, bacteriological examination of sputum and blood. To identify the pathogen, bacteriological culture of sputum, a nasopharyngeal smear, enzyme-linked immunosorbent assay (ELISA), complement fixation reaction (CFR), radioimmunoassay, radioimmunoassay (RIF), PCR tests are performed.

In most cases, macrolides, tetracyclines and fluoroquinolones are recommended empirically for suspected atypical pneumonia in a situation where the causative agent of the disease has not been identified at the time of treatment.

Erythromycin 1 g every 6 hours is effective. Azithromycin has advantages over erythromycin and clarithromycin. Doxycycline is used as a second antibiotic for atypical pneumonia at a daily dose of 100 mg. Of the fluoroquinolones, sparfloxacin 400 mg is prescribed in the first days, then 200 mg per day. Ciprofloxacin can also be prescribed. For hemolysis and central nervous system damage, corticosteroids and anti-inflammatory drugs are prescribed; for these complications, plasmapheresis can be performed, but its effectiveness has not been proven.

For prevention purposes, it is necessary not to travel to epidemically disadvantaged regions, to exercise strict control over patients coming from these disadvantaged regions, to disinfect vehicles, and to use disposable masks when communicating with patients.

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