

ACUTE PNEUMONIA IN CHILDREN (Lecture for english-speaking students)

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Definition - P. - is acute infectious disease with bacterial inflammation of lung parenchyma particularly alveolar tissue.

This inflammation is local one. It has focal, segmental or lobar volume.

Children 2-3 years age of old suffer from pneumonia most often. It involves of 45-50% all cases of pneumonia in children. It is not often disease in babies and infants.

Etiology. P. is inflammation caused by bacteria. In foreign literature you can read about of viral P. But it is discussion viewpoint. The diagnostic criteria of viral P. are very undefined both clinical and x-ray one.

Bacterial agents of P.

Streptococcus pneumonia, Staphylococcus aureus and others, Streptococcus, Micoplasma pneumonia, Haemophilus influenza, Escherihia coli, Pseudomonas aeruginosa, Proteus vulgaris and mirabilis, Klebsiella, Chlamidia pneumonia, Pneumocistis carinii, Candida albicans and other fungi.

They are the most spread etiologic agents of P. in children.

What is a role of virus infection in etiology of P.?

Many of acute respiratory illness («common cold») in children begin as viral disease. P. develops when bacterial infection joins to viral one. It may be consider as complication of viral respiratory disease. So in some cases etiology of P. is mixt infection - viral plus bacterial one.

The etiology of P. depends on at least two factors. They are - age of patient and place where a child falls in sick.

In newborns etiologic factors are staphylococcus (nosocomial infection), Chlamidia pneumonia, if woman suffers from genital chlamidiosis. In this case a newborn receives infection from his mother. Fs immune system of newborn is compromised his pneumonia may be caused by pneumocistis carinii or fungi.

In the older children the most often agents are the same in adults. If a child falls in sick by pneumonia at home the most common etiologic agents are pneumococcus, Haemophilus influenza, micoplasma pneumonia. Such pneumonia is called domestic one.

If a child falls in pneumonia in a hospital gram-negative agents prevail. They are Escherihia coli, Pseudomonas aerugenosae, Proteus, Klebsiella. More dangerous agent is meticyllin-resistant staphylococcus (MRS).

Pneumonia developed in hospital is called as nosocomial or hospital one. They are as a rule the most sever and bad cured diseases.

The pathogenesis

There are two components of pathogenesis of acute pneumonia - infectious toxicosis and oxygen insufficiency. The first one is caused by action of bacteria, their toxins on central nerve system and some organs (heart and others). The vital functions become disturbed: thermoregulation, cardiac system, metabolism, circulation, reology of blood and others. In infants the disorders in gastrointestinal tract are common when pneumonia. The severity of pneumonia in big rate depends on degree of toxicosis.

The causes of oxygen insufficiency are next ones.

The first of all there is disorder of ratio between ventilation and perfusion, it is blood circulation in lungs. In normal condition there is equal ratio between ventilation and perfusion. If alveoli is ventilated they are perfuse. When ventilation is absent perfusion ceased also. It is in normal condition. In pneumonia the part of alveoli in inflammation focus is switched off from ventilation but perfusion of them is continuing. The blood in this inflamed focus is unsaturated by oxygen. As a result general level of blood oxygenation decreases. It is one of causes of oxygen insufficiency in pneumonia.

Another cause of insufficiency of O₂ is disorder of normal diffusion through alveolar/capillary membrane. In pneumonia the membrane thickens because of edema and cell infiltration. As you know the diffusion capacity depends on thickness of membrane. The diffusion of oxygen through membrane from alveoli to blood falls down in pneumonia. The level of oxygen saturation blood decreases result in hypoxemia. The third mechanism of O₂ insufficiency in pneumonia is disorder of bronchial passage or bronchial obstruction. It takes place when pneumonia has in its onset acute respiratory viral illness. In this case there is viral bronchitis and pneumonia occurs becomes complication of the disease. Such pneumonia has name - bronchopneumonia. In bronchial obstruction the alveoli ventilation falls down and hypoxemia takes place.

Three of these mechanisms take part in pathogenesis of pneumonia in more or less degree. In some case one of them prevails in other case another one.

Clinics

The clinical symptoms of the disease in children depend on several factors. They are, the first of all, age of patients, etiologic factors or agents (mixt infection), and treatment - it is adequate or not.

You must different specific and unspecific symptoms of pneumonia.

The unspecific symptoms are result of infectious toxicosis. They are fever, fatigue, lower appetite, in infant regurgitation or vomiting, and they are expressed heavier in beginning of pneumonia.

The severity of infectious toxicosis depends on toxygenic characteristic of

etiologic agents. There are very toxigenic agents, and they develop severe toxicosis - high fever, somnolence, and in some cases seizures. The most toxigenic agents are staphylococcus, pneumococcus, Friedlander bacilli, Klebsiella, pseudomonas aeruginosae, and some others.

If etiologic agents are not highly toxigenic, the degree of heaviness symptoms of toxicosis will not be severe: not high temperature, not hard status. In some cases, especially in premature newborns, temperature may be normal and even subnormal. The agents with mild toxigenic property are fungi (Candida), protozoa (pneumocystis carinii), chlamidia and others.

The specific symptoms of pneumonia are asymmetric breathing excursion of thorax, dullness of percussion sounds in the chest, rales in lungs when auscultation. The sick side of the chest where the pneumonic focus there is moves slower than well one.

The dullness has local character and cutoff borders may be marked.

The rales are main symptom of pneumonia. You have to remember that in onset of the disease you can not always hear rales in auscultation. If pneumonia begins as alveolitis alveoli are filled by exudate, and air can not enter in them. That is why in the beginning of pneumonia rales may be not heard at all. Further the rales in acute pneumonia have local and constant or stable feature. You hear them for some days and - it is very important - in the same place. It is main specific symptom of pneumonia.

A cough is not specific symptoms of the disease. It may be in acute respiratory viral illness (common cold), bronchitis and tracheobronchitis, whooping cough, chronic epiglottitis, at others many conditions. Cough takes place in pneumonia but not always in the beginning of illness.

Dispnoea - the disorder of breathing - in pneumonia has character of tachypnoea. It may be associated with high temperature or oxygen insufficiency. In bronchoobstructive component in clinical picture dispnoea has expiratory feature. In severe cases, especially in infants, may be groaning breathing.

As symptoms of heavy toxicosis occur cardiac impairment, gastro-intestinal disturbance (vomiting, diarrhea), neuralgic symptoms (headache, dizziness, seizures).

Diagnosis

Anamnesis: The disease has acute beginning as a rule. Common cold may be before pneumonia. Slow onset of disease is specific for protozoa or fungi. It must be kept in mind that symptoms of toxicosis are first symptoms of pneumonia. Specific symptoms occur later. The symptoms of toxicosis are not specific ones that is why right diagnosis of pneumonia is very difficult in first days of the disease.

X-ray investigation. The main x-ray symptom of pneumonia is a shadow due to dullness of lung tissue in impaired part of the organ. The shadow may be focal (nodular) or segmental and lobar. Because pneumonia may be focal, segmental or lobar, one-sided or both-sided. The segmental and lobar pneumonia often are caused pneumococcus, staphylococcus, Friedlander bacilli. The focal < especially both-sided pneumonia used to be fungal, chlamidial or caused by pneumocystis carinii. The x-ray investigation is verification procedure in the condition. Blood analysis. In typical cases, in bacterial pneumonia there are neutrophilic leukocytosis with left shift in formula of white blood count and elevated erythrocytes sedimentation. These laboratory symptoms are characteristic for bacterial disease and they may be light or mild in pneumonia caused Escherichia coli and other gram-negative flora.

In pediatric practice it is impossible to assess sputum of patient. The babies can not expectorate sputum. Furthermore the agents from sputum think not to be caused agents. They reflect mouth and bronchi flora.

Classification

Clinical forms:

Focal pneumonia

Segmental pneumonia

Lobar pneumonia

Interstitial pneumonia

Current of disease:

Acute pneumonia - duration no more than 4 weeks

Prolonged pneumonia - duration more 4 weeks

Recurrent pneumonia - relapse of acute events before full recovery previous one

Severity of disease:

Without complication

With complication - complications of acute inflammation process - destruction of lung tissue: abscess, bullas, pneumotorax, and piopneumotorax.

- out lung complications - symptoms of heavy toxicosis: disseminated blood coagulation syndrome, heart impairment, gastro-intestinal disorders, headache, seizures, and sepsis development.

Nowadays it is important indicate where - at home or in hospital patient became ill, this is pneumonia is domestic one or nosocomial one.

Management

In goal of a prophylaxis of hospital infection the patient with pneumonia may be leave at home. The children with sever pneumonia, premature, with sever anemia or hypotrophia must be hospitalized, desirably in box. The diets for sick children

must be light. The breast-feeding for babies is preferred. If breast milk is not available a formula-feeding is suitable. The number of feeding per day must be elevated for infant and the premature. The part of milk or formula for one feeding must be lower to one third or half of normal in these cases.

The main part of management of pneumonia is antibacterial medicines.

They use antibiotics for treatment pneumonia. What antibiotic drug should select for start treatment? For decision of this question we keep in mind the age of patient and place where he became ill.

The newborn child may be infected from his mother if she suffers from chlamydial or staphylococcus infection being pregnant. So pneumonia in these children may be chlamydial or staphylococcal origin. If child falls ill in hospital the causal agents are gram-negative florae (see above). If patient became ill at home the more possible agents are pneumococcus haemophilus influenza, micoplasma pneumoniae et al.

Taking these data in his mind physician elects antibiotic drugs for cure his patient. We use penicillin and its generics if patient is toddler or teenager and fallen ill at home. We guide using cephalosporines in combination with aminoglycosides if patient is baby and became ill in hospital. Nowadays it is considered as «gold standard» for management of nosocomial pneumonia.

If antibiotic treatment is adequate we continue using this drugs for 5-7 days.

In controversy case we change antibiotic drug 1-2 days after beginning cure.

In severe cases we use detoxic infusion therapy- intravenous insertion of 5% solution of glucose or isotonic solution in dose 20-30 ml/kg. In case of severe oxygen insufficiency inhalation of O₂ is used.

The whole duration of management must be in average 7 - 10 days.

After discharge from hospital a pediatrician of general practice observe the child for one month. In time may be relapse of pneumonia.

The prophylaxis of the disease is prophylaxis of acute respiratory viral infection (common cold)