FGBOU VO SOGMA

Educational and methodological developments

For SOGMA students.

Radiation diagnosis of diseases lungs.

Vladikavkaz, 2020

Topic: **Radiation diagnosis of lung diseases.**

Purpose of the lesson:

To study the radiation anatomy of the lungs. Methods for examining the organs of the chest. Diseases of the lungs and pleura

Specific objectives of the lesson:

Be able to:

1. Recognize the method of X-ray examination of the chest organs
2. Determine the anatomy of the lungs with various methods of radiation diagnostics.
3. Determine the general symptoms of lung pathology in an x-ray image.
4. Identify the different types of pneumonia.
5. Recognize radiological signs of malformations of the respiratory system.
6. Recognize the x-ray picture of various forms of pulmonary tuberculosis.
7. Determine the radiological signs of lung and mediastinal tumors.

Know:

1. Radiation anatomy of the lungs.
2. Age features of radiation anatomy of the lungs.
3. Symptom complex of lung diseases.
4. X-ray signs of types of pneumonia.
5. X-ray signs of foreign bodies of the respiratory tract.
6. classification of tuberculosis.
7. X-ray signs of various forms of tubeoculosis.
8. X-ray signs of tumors of the lungs and mediastinum.

Base of carrying out and material equipment:

1. Study room.
2. A training set of radiographs, bronchograms, computed tomograms, with the norm and pathology of the chest organs.
3. Tables, schemes.
4. Case histories of patients with ROD.

Literature:

1. Lindenbraten L.D., Korolyuk I.P., "Medical radiology and radiology", M. "Medicine", 2000
2. Zits V.R., Zits S.V. "Clinical and radiological diagnosis of respiratory diseases". 2009
3. Trufanov G.E. "Radiation diagnostics and radiation therapy", St. Petersburg, 2005.
4. Matthias Hofer "Chest X-ray", 2009.
5. Trofimova T.N. "Human Radiation Anatomy", St. Petersburg "SPbMAPO", 2005.
6. Lindenbraten L.D., Naumov L.B., "Medical radiology", M., "Medicine", 1984.
7. Rosenshraukh L.S., Vinner M.G. "Differential radiodiagnosis of respiratory and mediastinal diseases", "Medicine", 1991

Information block:

Anatomy of the lungs

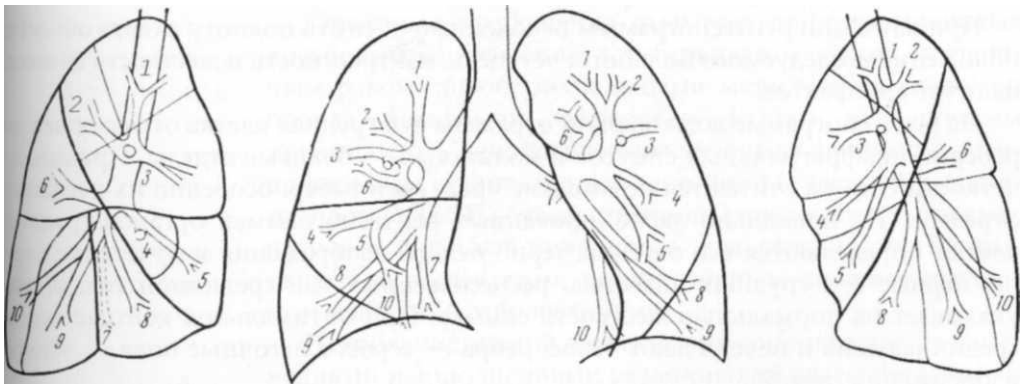
Normal chest x-ray

When studying a radiograph, it is necessary to assess the completeness of the coverage of the object, the position of the patient under study, the clarity, contrast and rigidity of the image, the presence of artifacts.

The radiograph should show the entire chest from the tops to the costophrenic sinuses and completely - the lateral sections. A sign of image clarity is the sharp contours of the shadows of the ribs, especially their front segments. On properly exposed chest radiographs, all shades of black-and-white image are defined and the first 3-4 thoracic vertebrae located above the median shadow are clearly visible, which indicates normal image rigidity. With optimal contrast, the median shadow and liver give white, the ribs - gray, and the pulmonary fields - black images. To correctly decipher the shadow picture, knowledge of the topographic anatomy of the chest organs, including the segmental structure of the lungs, the ability to correctly assess the quality of the radiograph and identify artefacts in the picture is necessary.

In accordance with the anatomical structure of the bronchial tree and according to the International Classification, there are three lobes of the right lung (upper, middle and lower), which contain 10 segments, and two

lobes of the left lung (upper and lower), containing 8 segments (Fig. 1). Sometimes the reed segments of the left lung (S_4 and S_5) are referred to as its middle lobe. It should be remembered that in the left lung, the apical (S) and posterior (S_2) segments are combined into one apical-posterior (S_1 + S_2) due to a common bronchial branch, and the medial-basal (S_7) segment is absent.

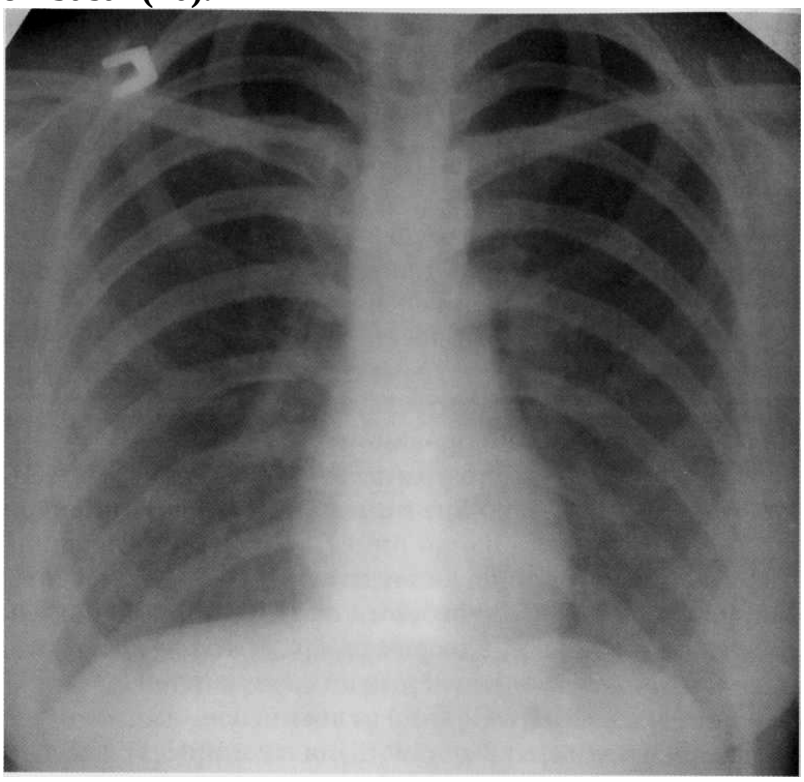


right side left side

Scheme of lung segments [46].

Right lung: upper lobe - apical (1), posterior (2), anterior (3); middle share — external (4) and internal (5); lower lobe - apical (6), medial-basal (cardiac) (7), anterior-basal (8), external-basal (9) and posterior-basal (10).

Left lung: upper lobe - apical-posterior (1-2); anterior (3), superior lingual (4), inferior lingual (5); the lower lobe is apical (6), anterior-basal (8), external-basal (9), and posterior-basal (10).



patient

19 years. Normal chest x-ray.

PNEUMONIA

Pneumonia is an acute infectious inflammation of the lung parenchyma, diagnosed on the basis of characteristic clinical and radiographic signs. Serious difficulties are caused by the differential diagnosis of pneumonia with pulmonary tuberculosis, primary cancer, endobronchial metastases, lymphoma, eosinophilic infiltrate, congestive heart failure (CHF), foreign body aspiration, pulmonary sarcoidosis, rounded atelectasis, respiratory distress syndrome and other diseases. Within the framework of the European Society of Pulmonology and the American Thoracic Society, the following international clinical classification of pneumonia has been recommended in recent years.

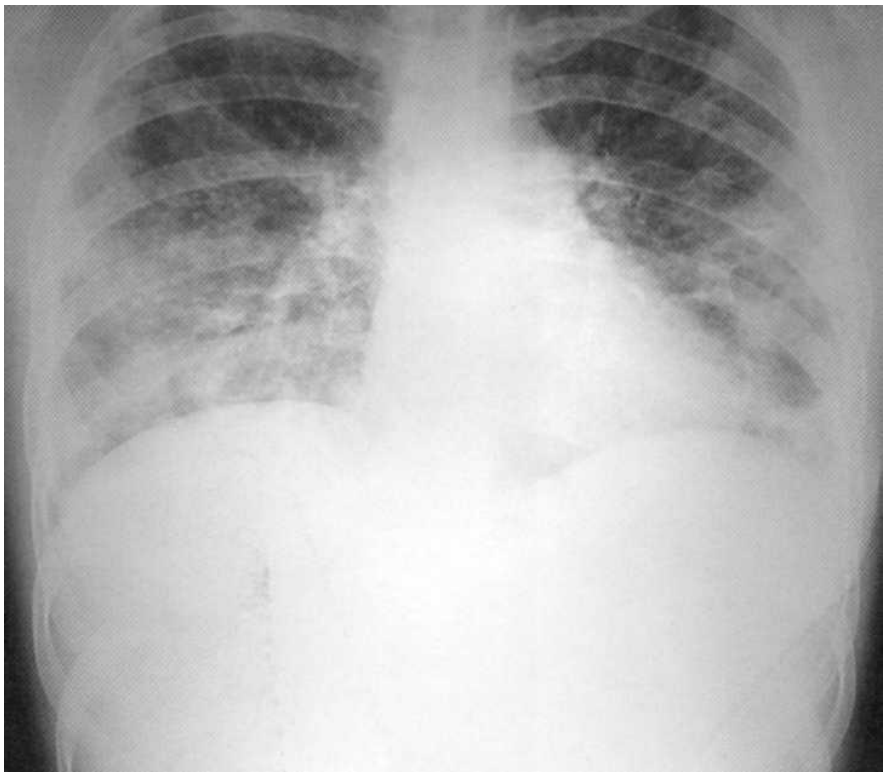
1. By form:
   a) out-of-hospital (primary, home);
   b) hospital (secondary, nosocomial), including aspiration;
   c) atypical (caused by mycoplasma, chlamydia, legionella);
   d) in patients with immunodeficiency states.
2. According to the prevalence and nature of lung tissue damage:
   a) focal (bronchopneumonia);
   b) lobar (croupous pneumonia, pleuropneumonia) - more often pneumococcal;
   c) segmental, polysegmental;
   d) interstitial.
3. By complications:
   a) uncomplicated;
   b) complicated:
      - lung destruction;
      - effusion pleurisy;
      - pleural empyema;
      - infectious-toxic shock;
      - other.
4. Downstream:
   a) acute;
   b) protracted.

Chest x-ray in a patient with pneumonia always involves the detection of focal infiltrative changes in the lung parenchyma. The prevalence of infiltration, the presence or absence of pleural effusion, and destruction cavities often correspond to the severity of the disease. With abscessing pneumonia, radiographs mainly determine bilateral infiltration of a focal-confluent nature of medium intensity with the presence of annular, rounded shadows due to decay cavities. The course of abscessing pneumonia is often complicated by exudative pleurisy.

X-ray allows you to clarify the nature and degree of damage to the lung tissue, diagnose many complications, evaluate the dynamics of the pathological process and the completeness of recovery.

X-ray picture to a certain extent due to the nature of the pathogen. With pneumococcal focal pneumonia, shading of the parenchyma of the lung is observed in the form of foci of various sizes - from small dissemination to 3- 4 см, of medium intensity, without clear contours. There is no symptom of air bronchography. Staphylococcal pneumonia is characterized by the presence of infiltrates and cavities of destruction. *K. pneumonia* often leads to the defeat of the entire lobe of the lung, which greatly increases in size. 2 days after the onset of the disease, decay cavities may appear, which are sometimes complicated by pyopneumothorax. In the latter case, everything that happens in the lung parenchyma will be covered by pleural effusion. Small focal-like shadows against the background of an enhanced pulmonary pattern are often observed in patients with mycoplasmal pneumonia.

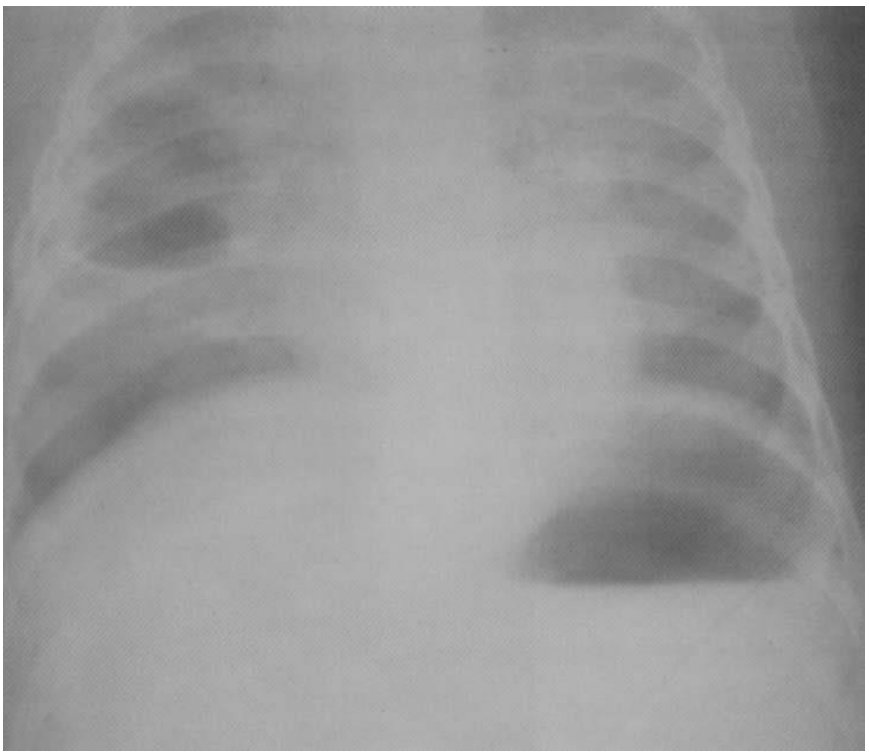
Thus, chest radiography (THC) allows you to objectively assess the nature and prevalence of pneumonia. However, it should be remembered that radiography does not have absolute sensitivity in visualizing focal-infiltrative changes in the lungs. In difficult cases of diagnosis, computed tomography (CT) of the chest organs is indicated. CT should be performed in case of damage to the upper lobes of the lungs, lymph nodes of the mediastinum, with a decrease in the volume of the lobe, suspicion of abscess formation, oncopathology, tuberculosis, and also with the ineffectiveness of "adequate" antibiotic therapy. CT is also appropriate if: a) a patient with obvious clinical symptoms of pneumonia has no changes on the radiograph; b) an x-ray examination of a patient with suspected pneumonia revealed changes atypical for this disease (obstructive atelectasis, signs of pulmonary infarction); c) with recurrent pneumonia in the same lobe (segment) as in the previous episode of the disease, or with prolonged pneumonia, the duration of the infiltrate exceeds 4 weeks.



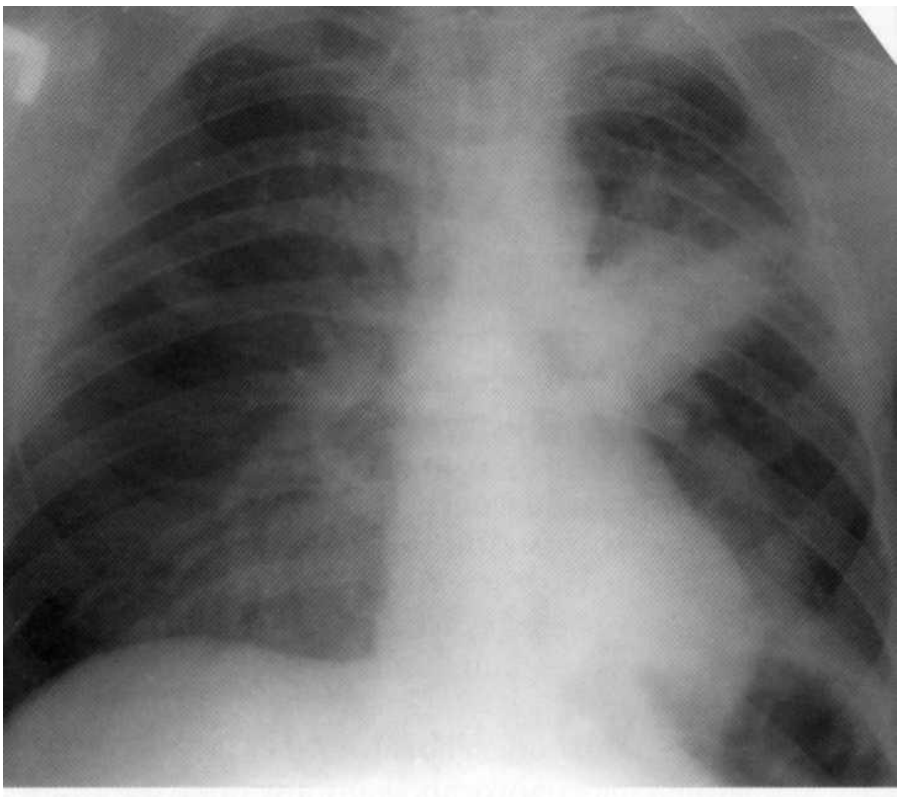
Patient, 10 years old. Bilateral lower lobe destructive pneumonia

Patient, 10 years old. Bilateral lower lobe destructive pneumonia of staphylococcal etiology. On the radiograph of the lungs on both sides in the lower lobes, infiltrative shadows with fuzzy external contours and individual focal enlightenments of various sizes and shapes are determined. On the right, there is a destruction cavity 4x5 cm in size. The costal pleura is involved in the process.

Patient, 65 years old. Community-acquired right-sided total pneumonia complicated by parapneumonic pleurisy. On the radiograph to the right of the II rib down to the diaphragm there is an infiltrative inhomogeneous intense shadow with fuzzy contours. Above the diaphragm on the right, the costophrenic sinus is not defined, which indicates the presence of pleural effusion. Left: vicarious emphysema.



Patient, age 3 months. Staphylococcal destructive pneumonia. On the right in the upper lobe there is a destruction cavity 3x4 cm in size with even internal contours. On the left in the upper lobe - an infiltrative inflammatory process. The diagnosis was confirmed on the section.



Patient, 29 years old. On the radiograph in S $_3$ - intense homogeneous shading associated with the root and relatively clear outer boundaries. Taking into account the localization and nature of the shadow, it was necessary to conduct a differential diagnosis with a blastomatous process. However, after complex non-specific antibacterial treatment in the hospital for 3 weeks, recovery occurred. Clinical diagnosis "left-sided upper lobe pneumonia".

ABSCESS OF THE LUNG

Abscess, lung gangrene and bronchiectasis as separate nosological forms were identified by Laennec back in 1819 г.

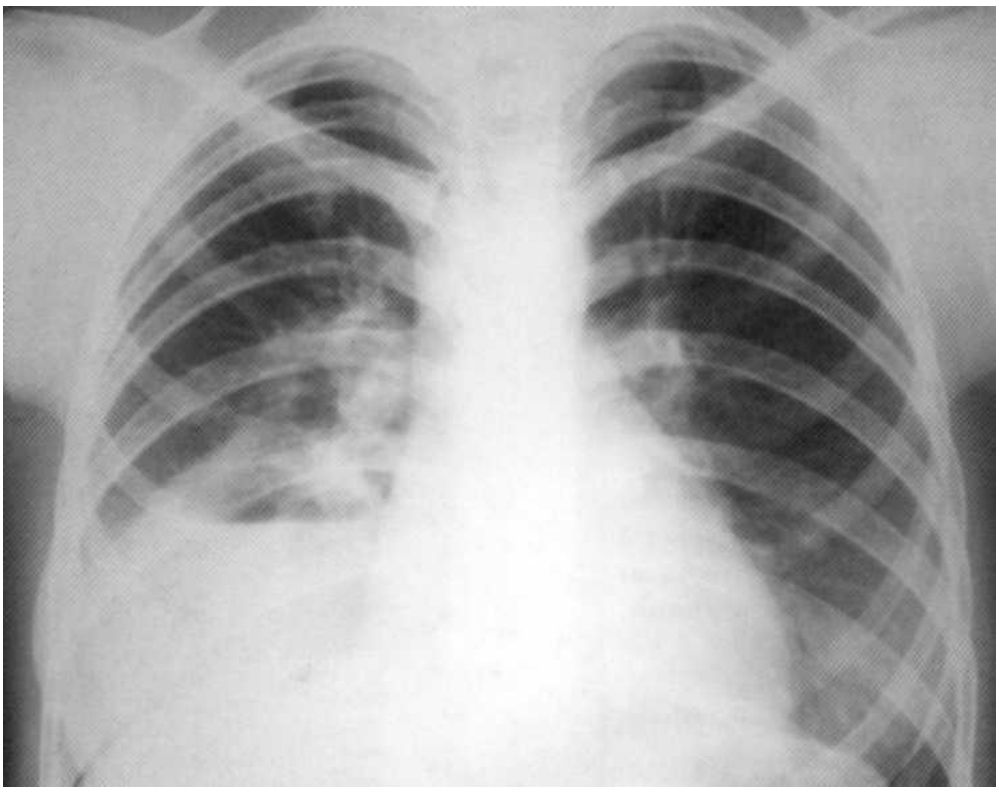
Lung abscess is a primary or secondary infectious-destructive process of non-tuberculous etiology with purulent fusion of lung tissue and the formation of one or more cavities surrounded by perifocal inflammatory infiltration. In the vast majority of cases, single lung abscesses are observed. In contrast to an abscess, massive infectious necrosis with ichorous (putrefactive) decay and tissue rejection, but without clear demarcation from viable parenchyma, is a more severe condition that is regarded as lung gangrene. Sometimes, with vigorous treatment, the gangrene of the lung transforms into a gangrenous abscess. In such cases, a cavity with melting sequesters is formed. Abscess, gangrenous abscess and gangrene of the lung are combined by the term "destructive pneumonitis", or "acute infectious destruction of the lungs."

Depending on the mechanism and path of occurrence, aspiration, obstructive, metapneumonic, hematogenous-embolic, lymphogenous, traumatic lung abscesses are distinguished. The risk of developing an abscess is high in patients with chronic lung diseases, bronchial obstruction due to cancer, aspiration pneumonia associated with chronic alcoholism, mental illness, structural changes in the pharynx and esophagus, neuromuscular disorders, anesthesia, local anesthesia of the bronchial mucosa during bronchoscopy, as well as a decrease in the antimicrobial reactivity of the body in patients with chronic alcoholism, diabetes mellitus, primary or secondary immunodeficiency. A tendency to destruction of lung tissue with the formation of an abscess is noted in pneumonia caused by gram-negative microbial flora, as well as caused by streptococcus and Friedlander's bacillus.

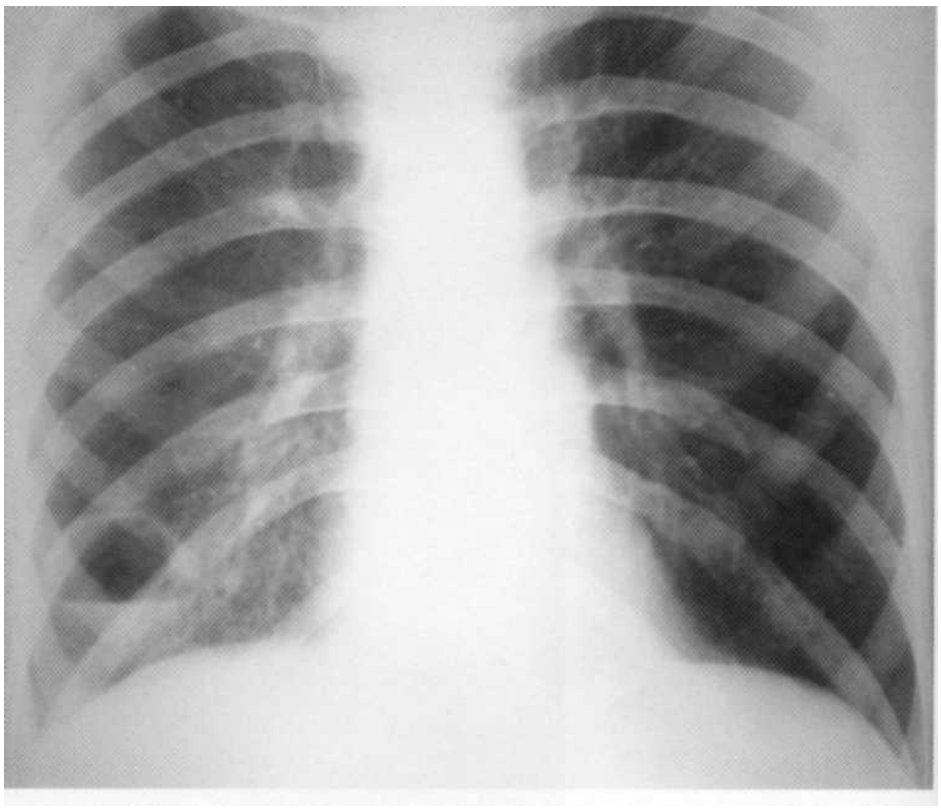
In patients with acute abscess, radiographs show a large (size 3- 10 см, and sometimes occupying almost the entire lobe of the lung) homogeneous shadow of the correct form with even contours. The abscess of the lung that arose on the basis of pneumonia gives a rounded shadow when it is still filled with necrotic masses and pus and is not drained by the bronchus (closed abscess). After the breakthrough of the abscess into the bronchus, an irregularly shaped cavity is formed with heterogeneous contents and walls of uneven thickness. As necrotic masses are rejected, the thickness of the capsule wall becomes more uniform, and the outer and inner contours of the cavity become clear. The cavity acquires an oval or almost rounded shape. A horizontal liquid level appears. Perifocally, infiltrative changes can be determined, and on the side of the lesion, the shadow of the lung root, as a rule, is expanded and unstructured.

Chronic abscess and pseudocyst are usually irregular and sometimes multilocular. Sequestration, uneven internal contour of the cavity, uneven abscess wall thickness are due to the presence of non- rejected necrotic masses. The horizontal level of fluid is characteristic of an acute lung abscess, and in a chronic abscess, the horizontal level is regarded as a consequence of a lack of drainage function of the bronchus. With a long-term chronic abscess or false cyst, calcified tracheobronchial lymph nodes are found in some cases on X-ray tomograms.

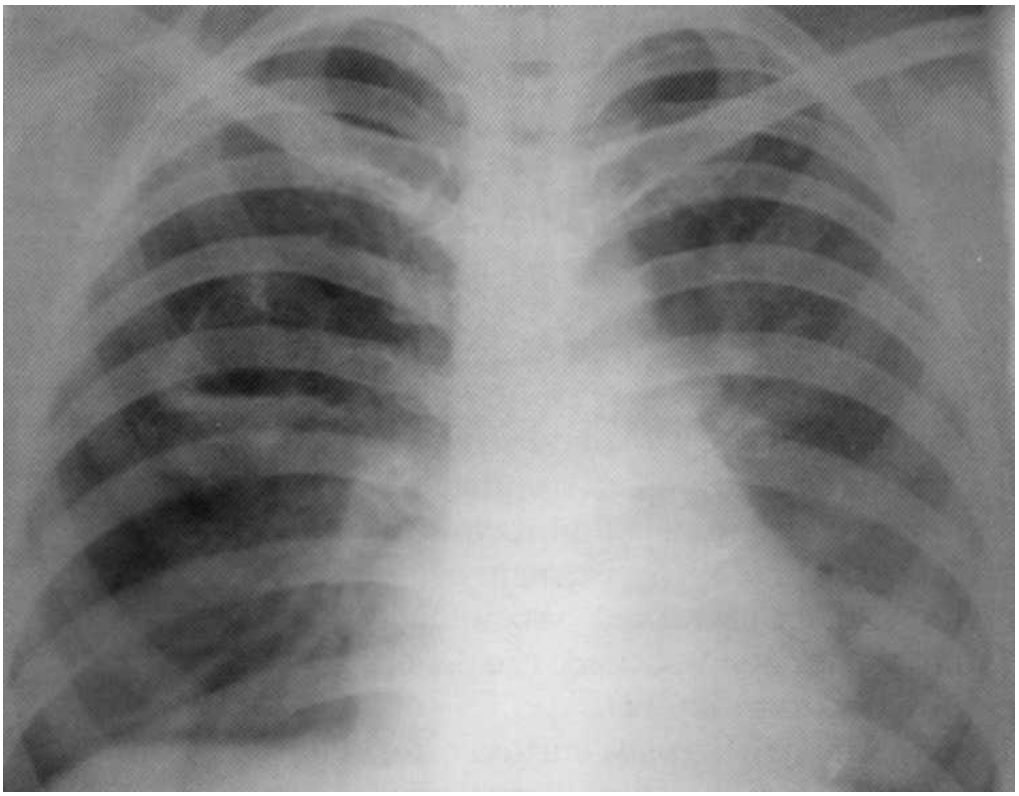
Differential diagnosis of acute and especially chronic abscesses is carried out with peripheral lung cancer in the destruction phase, limited tuberculosis (tuberculoma, cavernous process), echinococcosis, retention cyst. It should be noted that in patients with a lung abscess, the severity of the clinical picture generally corresponds to the changes detected by radiography, while tuberculoma, echinococcosis, and lung cancer occur for a long time with minor symptoms. A retention cyst is usually an incidental finding. Along with clinical and radiological data, it is important to take into account the results of bronchoscopy, cytohistological studies, the search for Mycobacterium tuberculosis (MBT), as well as the effectiveness of complex nonspecific antibiotic therapy. Sometimes computed tomography or nuclear magnetic resonance imaging (NMR) is needed to make a definitive diagnosis.



Patient, 13 years old. Long-term outpatient treatment for bronchitis and pneumonia. X-ray shows a large acute abscess of the lower lobe of the right lung with a horizontal level of fluid and inflammatory infiltration around. In the lower lobe of the left lung - fresh focal shadows.



Patient, 28 years old. He was treated on an outpatient basis for bronchitis, pneumonia, myositis. An acute abscess of the lower lobe of the right lung with clear external contours and a horizontal level of fluid against the background of blockade of the draining bronchus was found in the hospital. Operated: removed two segments of the lower lobe.



Patient, 21 years old. Diagnosis of acute bronchitis. She was treated on an outpatient basis. The reason for hospitalization was hemoptysis.
A chronic abscess of the upper lobe of the right lung was diagnosed in the hospital. The abscess cavity is deformed, there are small single sequesters, the horizontal level is insignificant.
In the upper lobe of the left lung - focal shadows.

BRONCHIOECTATIC DISEASE

One of the founders of the modern doctrine of bronchiectasis (BED) Tsigelnik A.Ya. (1968) considered it as an infected bronchiectasis.

The distinction between BEB (nosological form) and bronchiectasis (pathological condition) is fundamental, since the latter may not manifest itself clinically for a long time. Infection of bronchiectasis with the development of a chronic suppurative process leads to PEB, which should always be regarded as an acquired disease.

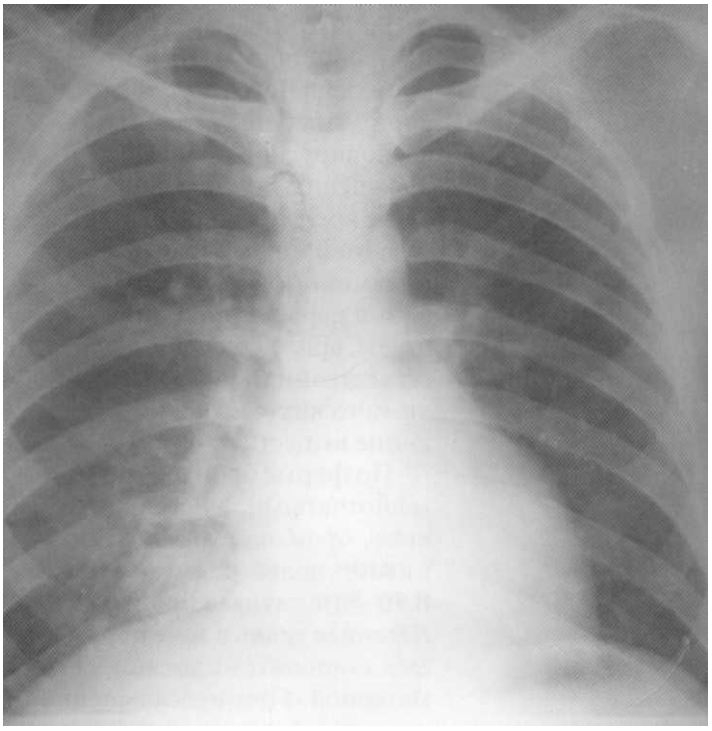
Bronchiectasis, as a rule, appears in early childhood against the background of postnatal impairment of differentiation of the bronchial tree after pneumonia, measles, whooping cough, scarlet fever, infectious parotitis, adenovirus infection, and only in 6% of cases are congenital. Also, bronchiectasis can occur against the background of inflammation in bronchial obstruction and atelectasis (foreign bodies in the bronchi, tumors), aspiration pneumonia (in people suffering from chronic alcoholism and drug addiction), hereditary anomalies (cystic fibrosis, congenital ciliary dyskinesia, intrapulmonary sequestration), exposure on the bronchopulmonary system of chemical compounds (ammonia vapor, chemical warfare agents).

The shape of bronchiectasis can be cylindrical, saccular, racemose and mixed. As a rule, bronchiectasis is localized in the basal segments of the lower lobes, rarely - in the middle and upper sections of the lungs. In 70-80% of cases, bronchiectasis is unilateral. The lung tissue in the affected area sharply decreases in volume, becomes dense, airless, in places emphysematous. In uncomplicated BEB, the infectious-inflammatory process occurs within the bronchial tree without obvious infiltration of the lung parenchyma.

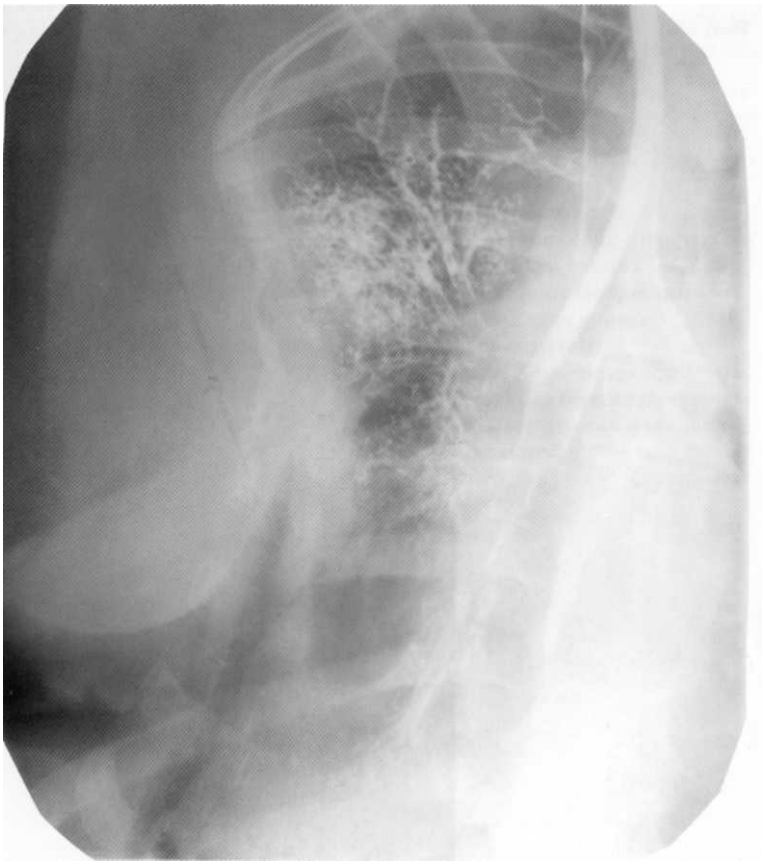
On radiographs in patients with PEB, a decrease in the volume of the altered part of the lung, lobular, segmental or lobar induration, areas of fibrosis and emphysema, air-filled cavities, as well as thickening and induration of the bronchi, and in rare cases, mediastinal displacement towards the lesion are found.

Bronchiectasis can be definitively verified by bronchography. The method allows to detect various forms and extent of changes in the bronchial tree.

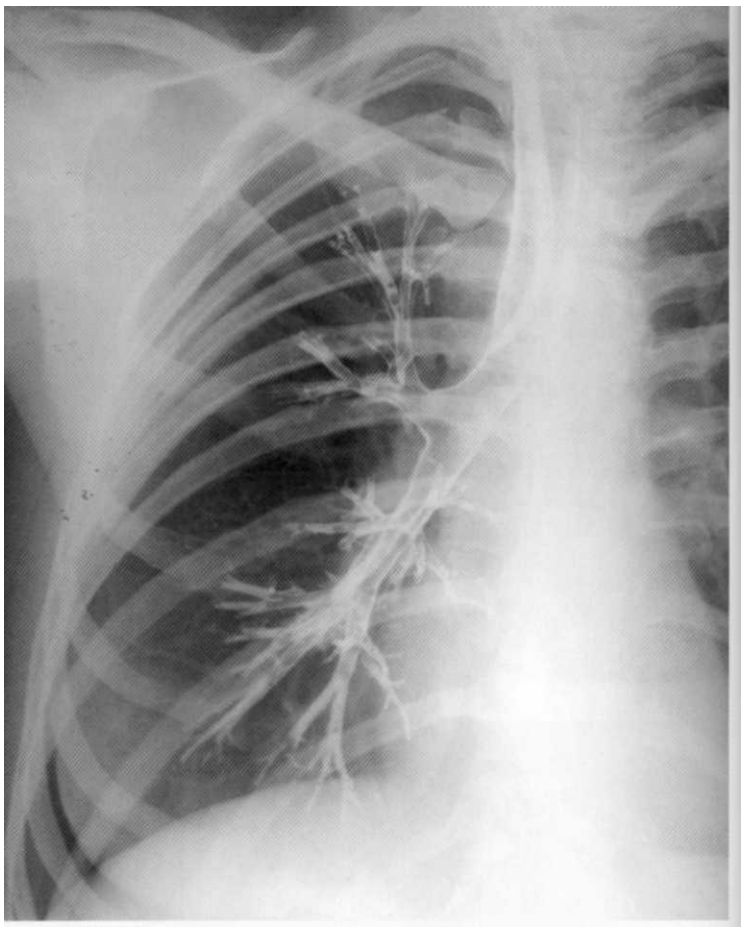
In recent years, bronchography has practically not been used due to the widespread introduction of CT and MRI of the lungs. However, bronchography, which is notable for its low price and ease of execution, can in most cases surpass both CT and NMR in informational content in PEB. Differential diagnosis of BEB is carried out with chronic purulent bronchitis, lung abscess, tuberculosis, lung cancer. When bronchiectasis is detected by bronchography, CT or MRI and the corresponding symptoms, the diagnosis becomes reliable. The reason for such studies should be the young age of the patient, a long history of the disease, frequent exacerbations, cough with purulent sputum, hemoptysis, intoxication syndrome, subfebrile temperature, predominantly asymmetric unilateral changes in the basal parts of the lung in the absence of a cavity or infiltrate, negative tests for MBT.



Patient, 23 years old. Clinical and radiographically diagnosed multiple bronchiectasis in the lower lobe of the right lung, in some of them - a horizontal level of fluid



Patient, 12 years old. She was treated for a long time for "chronic pneumonia" and bronchitis. Bronchography: various forms of bronchiectasis in the upper lobe of the right lung.



Patient, 20 years old. Suffering from recurrent bronchitis. To exclude bronchiectasis, bronchography was performed on the right. The diagnosis of bronchiectasis was ruled out: a normal bronchogram, the structure of the upper, middle and lower lobe bronchi is clearly visible.

PULMONARY TUBERCULOSIS

Pulmonary tuberculosis is the most common anthropozoonosis. The disease is caused by a specific pathogen - Mycobacterium tuberculosis. Highly virulent MBTs in animals and humans sensitive to them multiply rapidly in the body, are not destroyed by phagocytes and cause the progressive formation of tuberculosis foci.
Infection with tuberculosis occurs by aerogenic, less often by alimentary or contact routes. There are several types of mycobacteria pathogenic for humans: human, bovine and avian. The main source of infection is a sick person excreting MBT. Cattle with tuberculosis and, to a lesser extent, other domestic and wild animals pose a certain danger to humans . In these cases, MBT infection of the bovine species

occurs. The source of infection with the avian species MBT is sometimes sick poultry.

Primary infection (infection) with mycobacteria occurs in childhood and adolescence. Relapses of the disease in the future are due to endogenous reactivation of tuberculosis infection or exogenous superinfection. In this regard, primary and secondary forms of pulmonary tuberculosis are distinguished.

Primary tuberculosis complex

The primary tuberculosis complex occurs mainly in children and adolescents with primary MBT infection. The disease is characterized by damage to the lung tissue (primary affect), specific lymphangitis, and involvement of the regional lymph nodes of the root of the lung.

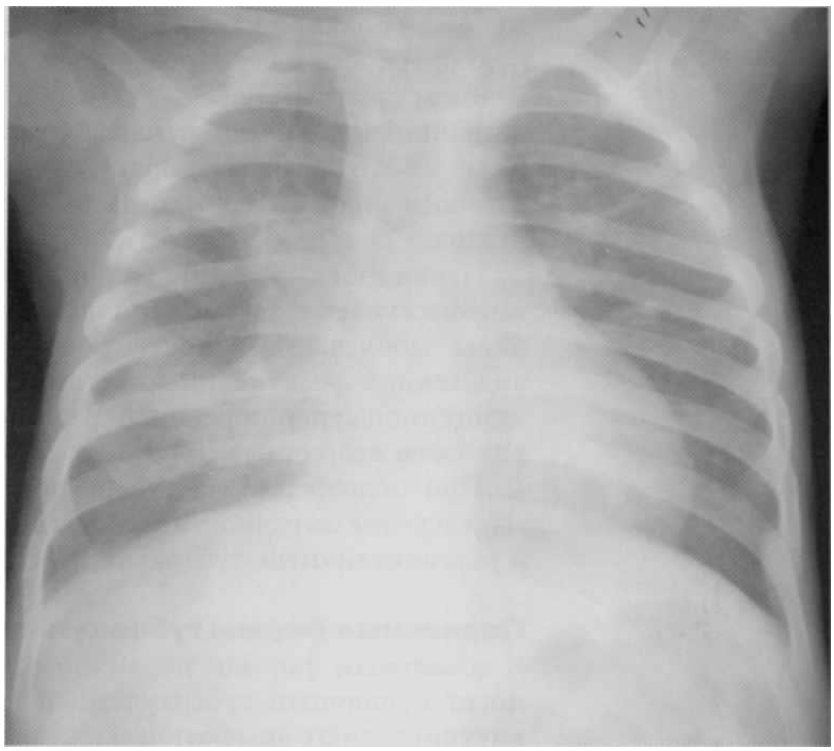
A sign of infection, and possibly a disease, is considered to be a "turn" of tuberculin tests, when for the first time in a patient's life a Mantoux test with 2 tuberculin units (TU) becomes positive [16, 33, 64, 65].

The clinical picture of the primary tuberculosis complex largely depends on the phase of the tuberculosis process (bronchogenic seeding, infiltration, destruction), the prevalence of tuberculosis changes and the presence of complications. To verify the diagnosis, an X-ray tomographic examination, a repeated Mantoux test, and a study of bronchial lavage for MBT (microscopy and seeding on nutrient media) are carried out.

With an uncomplicated primary tuberculosis complex, the disease proceeds with few symptoms. X-ray in the lungs reveals limited focal-infiltrative shadows, a slight increase in intrathoracic lymph nodes and mild lymphangitis.

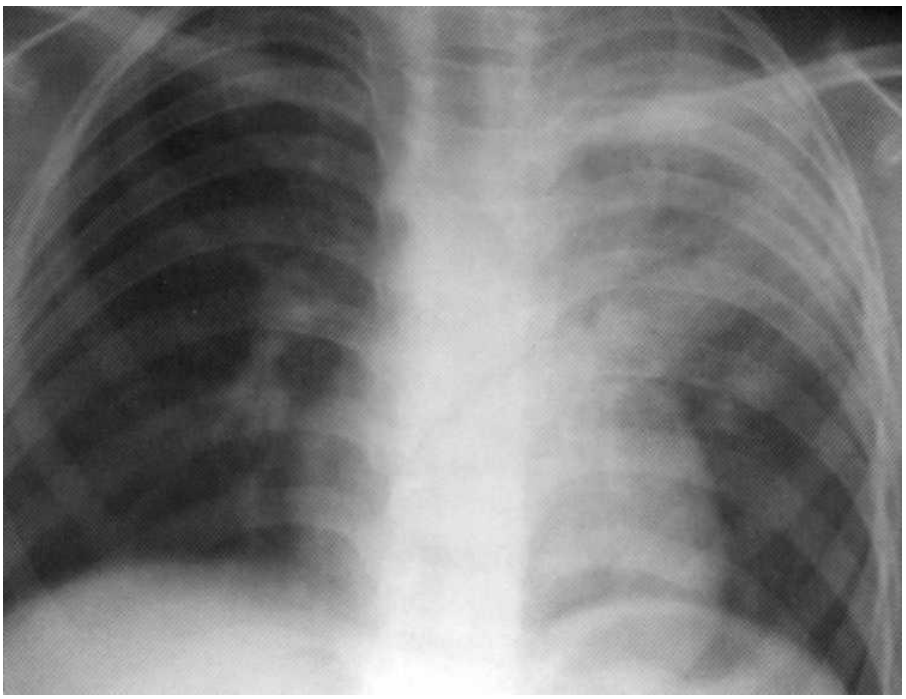
The complicated course of the primary tuberculosis complex is more common in children under the age of 3 years and can be manifested by intoxication, unproductive cough and shortness of breath. The centers of elimination, development of pleurisy, specific endobronchitis are characteristic. Sometimes a progressive course of the tuberculosis complex is observed with the formation of a primary cavity and a caseous-necrotic reaction in the lung and intrathoracic lymph nodes.

With modern treatment of the primary tuberculosis complex, as a rule, its resorption occurs. Sometimes recovery occurs with the formation of a focus of Gon and petrification of the lymph nodes of the root of the lung.

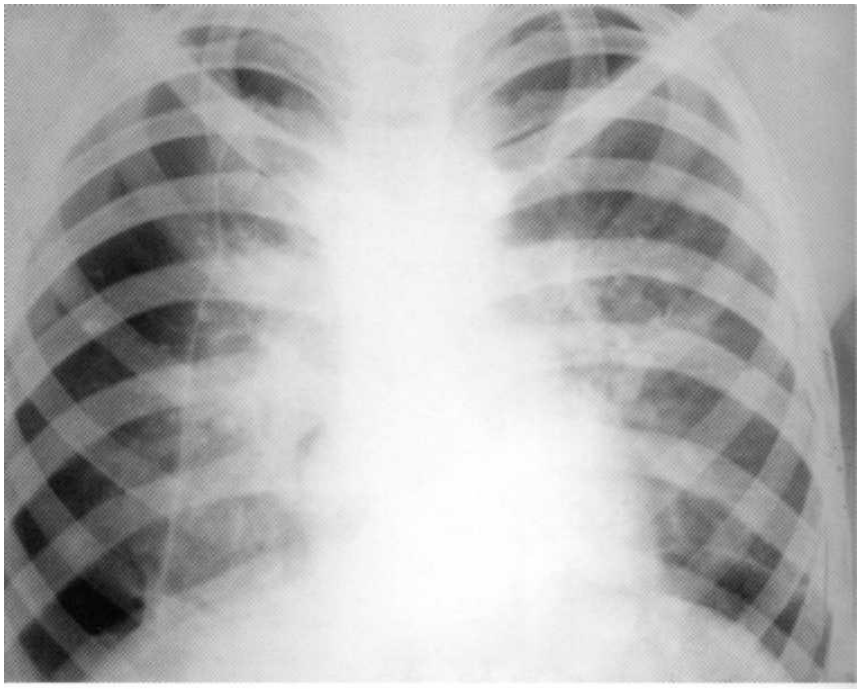


Patient, 5 **years old. Primary tuberculosis complex on the right in the infiltration phase. On the radiograph in the lower lobe of the right lung there is an intense homogeneous shadow with clear external contours, closely associated with the affected tracheobronchial and bronchopulmonary lymph nodes of the root of the lung.**

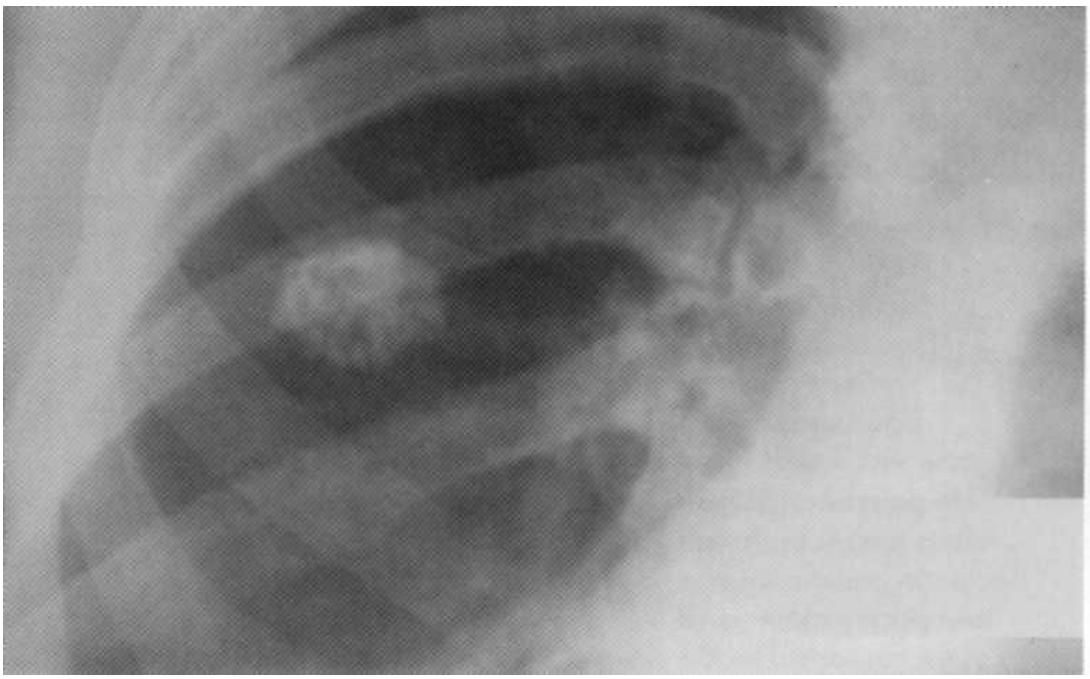
Mantoux test 18 мм



Patient, 1 year and 6 months. Primary tuberculosis complex in the phase of infiltration in the upper lobe of the left lung. Intensive homogeneous shading of the entire upper lobe is determined with lesions of the bronchopulmonary lymph nodes. Mantoux test 1 7 мм.



Patient, 15 **years old. Bilateral primary tuberculosis complex, complicated by spontaneous pneumothorax on the right. Mantoux test 1**8 мм



Patient, 17 years old. Gon's focus in the upper lobe of the right lung (one of the options for residual changes after the treatment of the primary tuberculosis complex).

Focal pulmonary tuberculosis

Focal pulmonary tuberculosis is the most common form of secondary tuberculosis, characterized mainly by productive inflammation in the lung parenchyma. It can develop as a result of hematogenous dissemination or along the lymphogenous pathway of reactivation from residual changes of post-primary tuberculosis infection in the lung tissue and mediastinal lymph nodes, or due to exogenous superinfection. At the same time, with qualified treatment, any more pronounced form of tuberculosis can result in limited fibro-focal processes.

In most cases, focal tuberculosis proceeds benignly with an erased clinical picture, mainly due to concomitant phenomena of chronic endo- or panbronchitis. During the exacerbation of the tuberculous process in the phase of infiltration and destruction, patients complain of an unproductive cough, subfebrile temperature, sweating, and general weakness. There may be hemoptysis. The physical data are little expressed. On auscultation, hard breathing, dry rales are sometimes heard. In the peripheral blood, a slight leukocytosis, a shift of the leukocyte formula to the left and an increase in ESR are determined.

The leading method in the diagnosis of focal pulmonary tuberculosis is the X-ray tomographic method. With the help of tomography, both "soft-focal" and fibro-focal tuberculosis can be detected. Tomography accurately enough allows you to determine the localization of foci, their number, density and nature of the external

contours. Usually, radiographs and tomograms reveal single or multiple foci of various prescriptions ranging in size from 0.5 to 1,0 смwith caseosis in the center, which are located in the upper cortical sections of one or both lungs (Fig. 73).
A certain importance in the diagnosis of focal tuberculosis is given to microscopic and bacteriological examinations of sputum for the detection of MBT. However, as experience shows, it is relatively rare to detect mycobacteria in patients with focal pulmonary tuberculosis.

Infiltrative pulmonary tuberculosis

Tuberculous infiltrate in the lung is a bronchopneumonic inflammatory focus with caseosis in the center. In contrast to focal forms with predominantly productive inflammation, infiltrative tuberculosis is characterized by a predominance of the exudative component, a tendency to deduction, bronchogenic seeding, as well as positive dynamics in inadequate chemotherapy [16, 33, 64, 65].

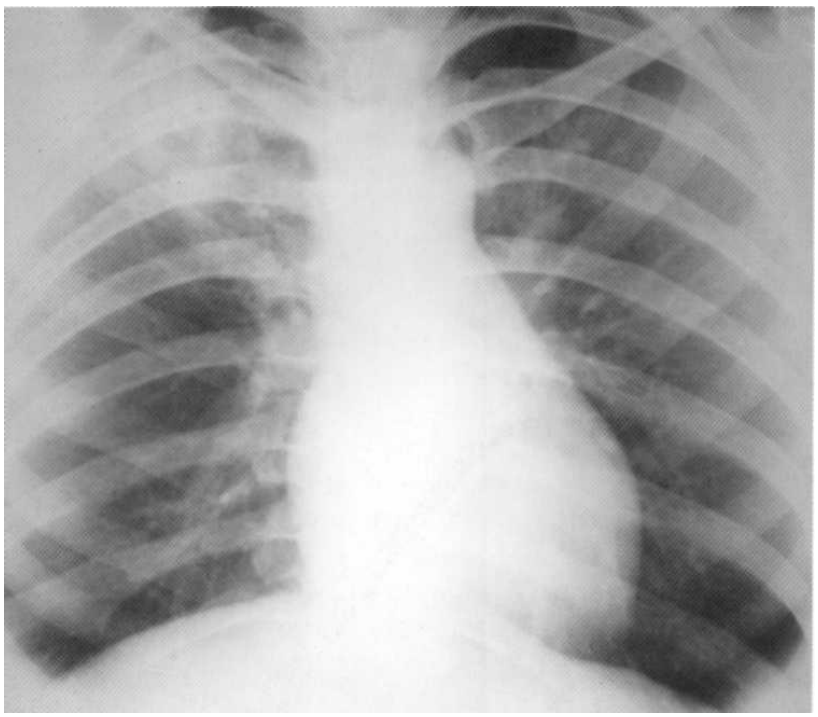
There are two main variants of the course of infiltrative tuberculosis: progressive (with the rapid formation of destruction and vivid symptoms) and involutive (with unexpressed symptoms).

The clinical picture of infiltrative pulmonary tuberculosis in many ways resembles pneumonia. Patients complain of subfebrile or moderate fever, cough with sputum, sweating, general weakness, sometimes hemoptysis. Physical data are much poorer than in nonspecific inflammatory diseases, and depend on the prevalence and phase of the process, the presence of destructive changes in the lung. In the blood, as a rule, moderate leukocytosis is determined with a shift of the formula to the left, an increase in ESR. Sputum examination by microscopy or culture on nutrient media often reveals MBT.

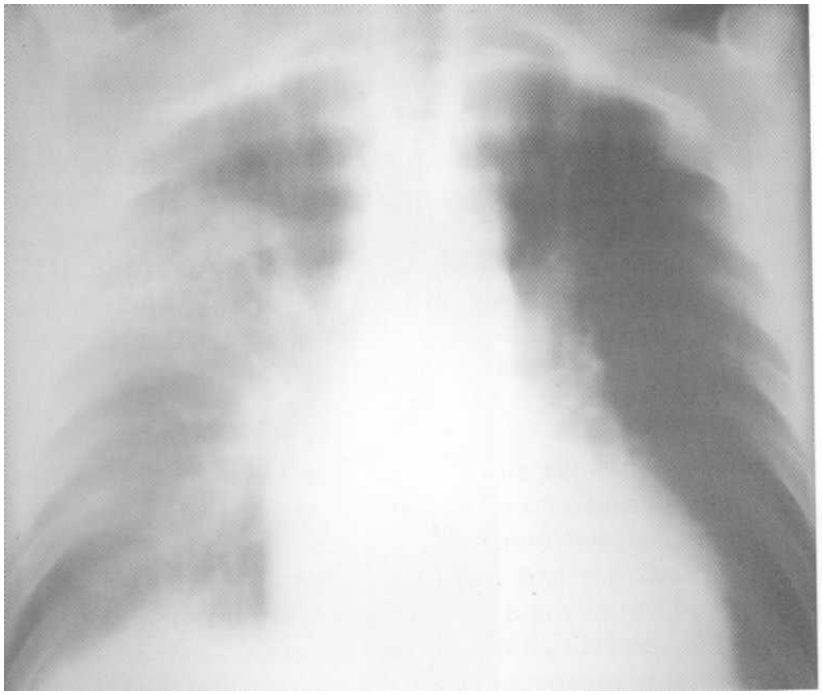
According to the nature of the clinical and radiological picture, several main variants of infiltrative changes in the lungs are distinguished [27, 46, 65].

1. Cloud-like infiltrate, defined as a gentle low-intensity homogeneous shadow with fuzzy blurred contours.
2. Rounded infiltrate, which is a homogeneous shadow of low intensity (this type also includes the early subclavian infiltrate of Assman).
3. Lobit is an extensive inhomogeneous infiltrate that captures an entire lobe of the lung and is represented by confluent large and small foci, in the center of which destruction is often detected.

4. Pericissuritis is an extensive infiltrative shadow with a clear edge on one side and a blurry one on the other. Such a shadow indicates the defeat of 1-2 segments located along the interlobar fissure.



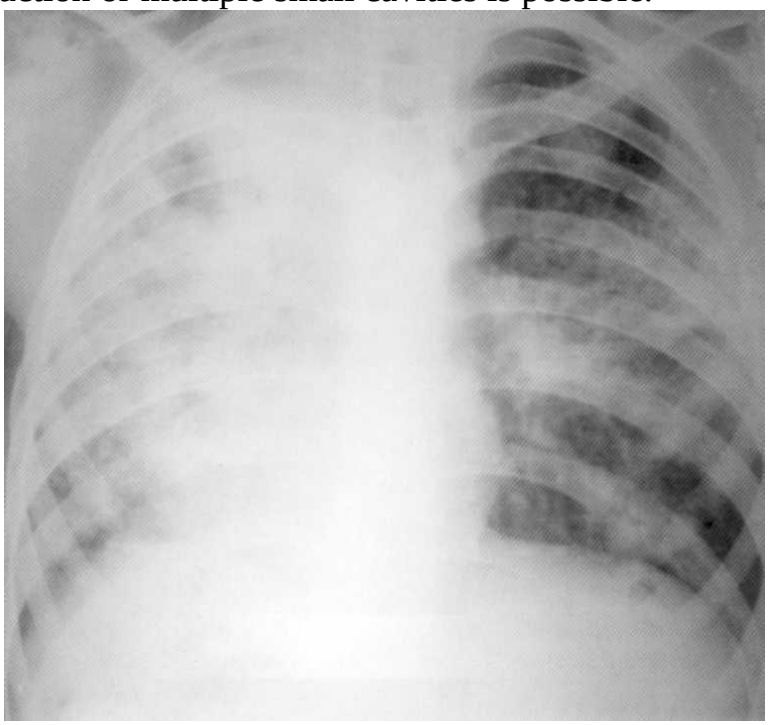
Patient, 14 years old. Infiltrative tuberculosis in the phase of destruction of the upper lobe of the right lung. On the radiograph in the projection of the upper lobe - an infiltrative shadow with fuzzy outer contours and enlightenment in the center. MBT (+). Mantoux test 15 мм.



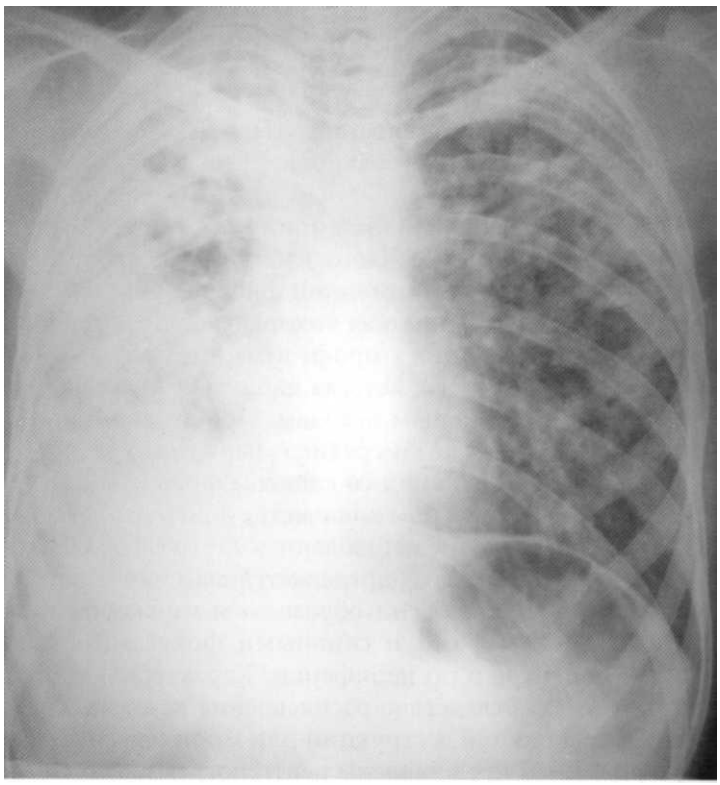
Patient, 38 years old. Tomogram. Infiltrative tuberculosis of the right lung in the phase of destruction, complicated by pleurisy. MBT (+). He was repeatedly treated for bronchitis and pneumonia.

Caseous pneumonia

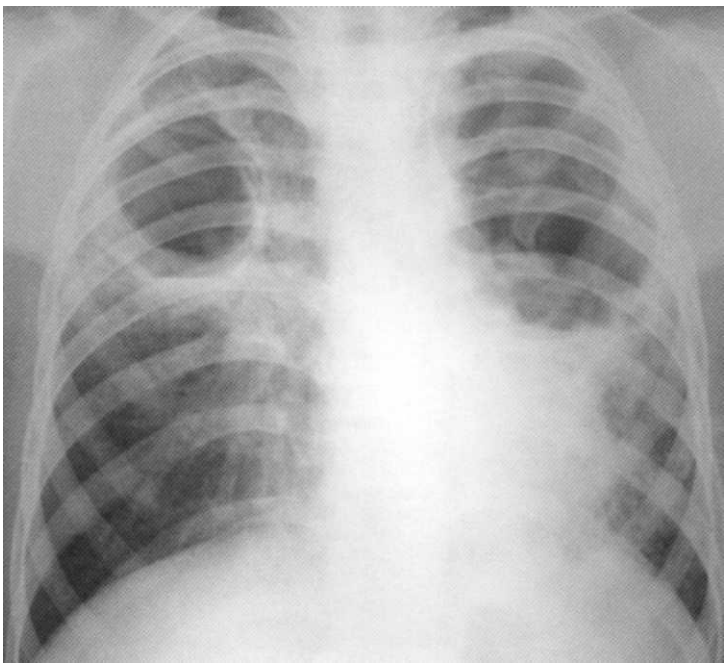
Caseous pneumonia is a form of progressive specific pneumonia in which caseification prevails over perifocal exudative infiltration. Caseous pneumonia develops as a result of a massive intake of highly virulent MBT into the body or as a complication of disseminated and fibrous-cavernous tuberculosis processes against the background of a sharp primary or secondary immunodeficiency. According to the incidence of caseosis of anatomical structures, unilateral or bilateral acinous, lobular and lobar caseous pneumonia are isolated. There is reason to believe that lobar caseous pneumonia, to a greater extent than acinous and lobular pneumonia, is an independent form of tuberculosis. On radiographs, massive shading of the lobe of the lung, one or both lungs is determined. The shadows are formed by multiple foci with fuzzy outer contours and confluent foci with numerous enlightenments in the center and along the periphery. Characterized by large foci of dropouts in other parts of the lungs. Due to the melting of caseous masses, the formation of giant cavities of destruction or multiple small cavities is possible.



Patient, 11 years old. Bilateral caseous pneumonia in the phase of infiltration and multiple destruction. Discovered for the first time. MBT (+).
Mantoux test 12 мм



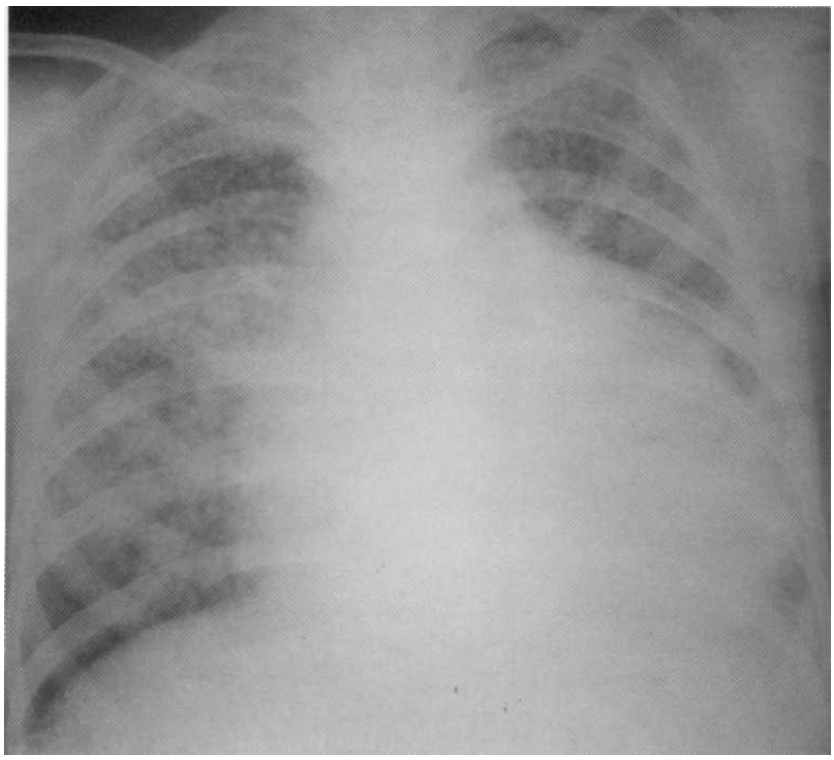
Patient, 15 years old. Bilateral total caseous pneumonia. Identified during fluorographic examination. MBT (+). Died in a tuberculosis hospital from pulmonary hemorrhage



Patient, 28 years old. Bilateral caseous pneumonia with multiple giant cavities of destruction. MBT (+). Extremely late diagnosis. The diagnosis was confirmed on the section.

Disseminated pulmonary tuberculosis

Disseminated pulmonary tuberculosis develops as a result of bacteremia. Variants of disseminated tuberculosis are distinguished by pathogenesis and clinical and radiological picture. In children, adolescents and young people, acute and subacute disseminated pulmonary tuberculosis can occur during primary infection. In such cases, the infection spreads by hematogenous and lymphogenous routes. The disseminated process in the elderly, as a rule, is a consequence of endogenous reactivation of old tuberculosis foci. Miliary tuberculosis is a generalized process with the course of the lungs, liver, spleen, meninges and other organs and systems. The symptomatology of the disease is determined by the predominance of lesions of certain organs. In patients with miliary tuberculosis of the lungs, radiographs reveal multiple, small (1-2 mm in diameter), the same type of non-confluent foci of medium intensity, densely and evenly located throughout all lung fields. Due to the large number of foci, the vascular pattern of the lung is not visible. In subacute disseminated tuberculosis, both small and larger confluent foci appear. In patients with chronic disseminated pulmonary tuberculosis, radiographs show foci of various sizes and intensity, sometimes forming conglomerates, sometimes with destruction. Often develops exudative pleurisy.



Patient, 24 years old. Acute disseminated (miliary) pulmonary tuberculosis complicated by exudative pericarditis. Identified for the first time during fluorographic examination. The patient received treatment in the TB hospital for about 10 months. There was a complete resorption of focal changes.

Cavernous tuberculosis is characterized by the presence in the lungs of a formed thin-walled cavity without signs of perifocal inflammation, extensive bronchogenic dissemination and fibrous changes in the adjacent lung tissue. Caverns are formed in patients with infiltrative, disseminated, focal tuberculosis, with the decay of tuberculoma or with late detection of the disease, when the destruction phase ends with the formation of a cavity. In the latter case, the signs of the original form of tuberculosis practically disappear.

Cavernous tuberculosis proceeds in waves. During the period of remission of the process, clinical symptoms may be absent. During an exacerbation, intoxication syndrome, cough, and sometimes hemoptysis appear. MBT is often detected, especially in the absence of chemotherapy.

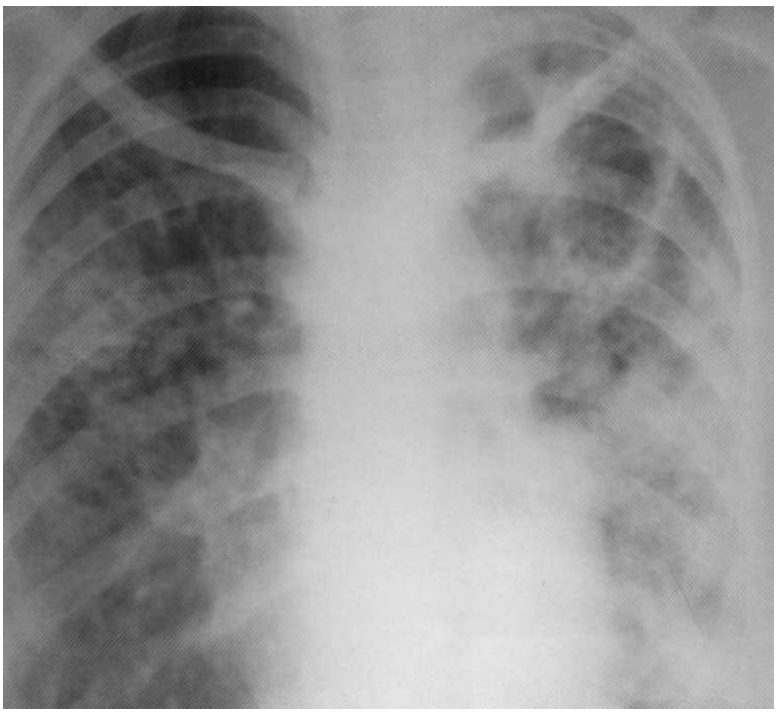
The main methods for diagnosing cavernous tuberculosis are radiography and X-ray tomography of the lungs and sputum examination for MBT. On radiographs, an annular shadow with thin walls is determined. Of particular importance in patients with cavernous pulmonary tuberculosis is the study of blood tests in dynamics. Shift of the leukocyte formula to the left, lymphopenia and an increase in ESR often

indicate an exacerbation of the disease with relative clinical well-being. Verification of the diagnosis must be carried out in a specialized hospital. Differential diagnosis should be carried out with a decaying tumor, chronic abscess, single cyst, bronchiectasis.

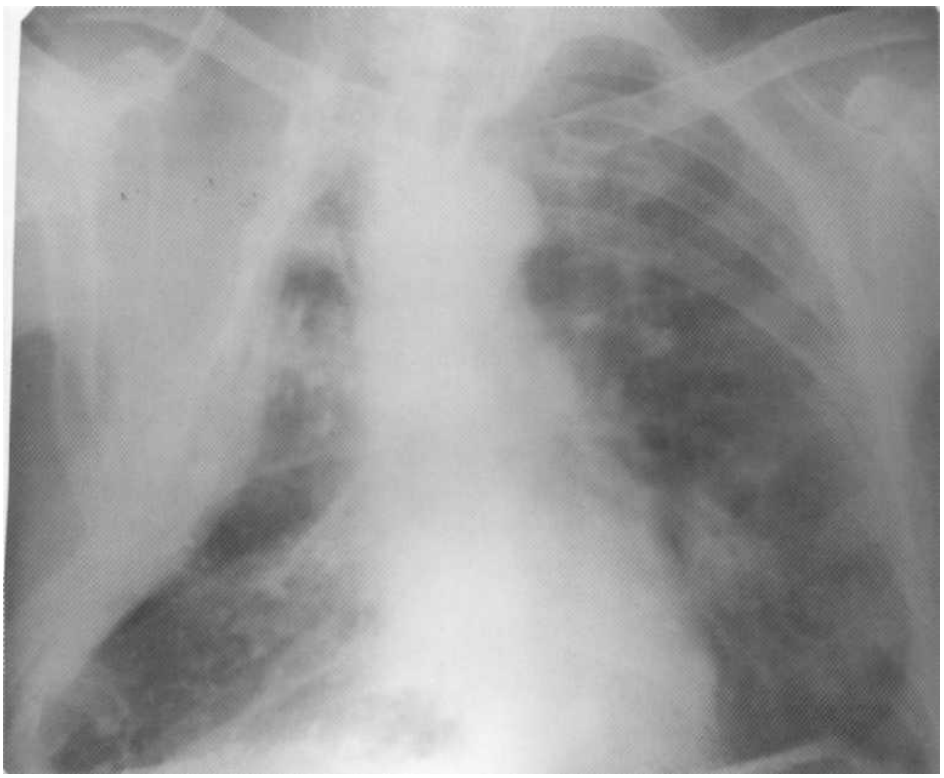
Cavernous tuberculosis is a transitional form and is rare. More often, the development of fibrous-cavernous tuberculosis is observed, in which one or more cavities (caverns) are formed in the lungs against the background of pronounced fibrous changes and bronchogenic dissemination with a predominance of productive inflammation over exudative inflammation. The wall of the fibrous cavity is a dense capsule consisting of three layers: a layer of caseous necrosis, a specific granulation ridge, and nonspecific granular tissue with fibrous changes. Pneumosclerosis, cysts, bronchiectasis, emphysema, thickening of the pleura develop perifocally, vascular damage is observed in the form of varicose veins and aneurysms of arteries in the bronchial wall, which can lead to hemoptysis and pulmonary bleeding. The cavity communicates with the bronchial tree and may look like draining bronchi.

F ibrous-cavernous pulmonary tuberculosis occurs with a change in periods of exacerbation and remission. Taking into account the variety of symptoms of the disease, three clinical variants can be conditionally distinguished: 1) limited, relatively stable rose-cavernous tuberculosis; 2) progressive fibrous-cavernous tuberculosis; 3) fibrous-cavernous tuberculosis with complications and further progressive course up to the development of caseous pneumonia, patients complain of fever, sweating, loss of appetite, weight loss, general weakness, cough with sputum, hemoptysis. Sometimes there is a rupture of the wall of the cavity, and spontaneous pneumothorax occurs. The main method of verification of fibrous-cavernous tuberculosis is clinical and radiological in combination with frequent detection of MBT in sputum.

On radiographs of patients with fibrous-cavernous tuberculosis, one or more irregularly shaped caverns with thick walls are detected against the background of a polymorphic picture in the form of widespread and, as a rule, bilateral fibrotic changes, deformation of the pulmonary pattern, expansion and displacement and mediastinum towards old and massive changes, pleural layers , bronchogenic dissemination. Cavities can range in size from a few centimeters to giant cavities.



Patient, 12 years old. For the first time, bilateral fibrous-cavernous pulmonary tuberculosis was diagnosed. MBT (+). On the radiograph on the left in the upper lobe there is a giant cavity with dense fibrous walls and infiltration occupying the entire left lung. On the right — foci of bronchogenic dissemination of a polymorphic nature and multiple cavities of destruction.



Patient, 42 years old. Right-sided thoracoplasty for fibrous-cavernous pulmonary tuberculosis. On the left - multiple foci of various sizes and densities (result

Tuberculoma of the lungs.

Pulmonary tuberculoma is a relatively rare form of tuberculosis, manifested by the presence in the lung of an encapsulated caseous focus ranging in size from 1 to 3 in diameter or more. Distinguish homogeneous, layered, solitary and conglomerate tuberculomas. Usually they do not progress for many years and appear. However, some tuberculomas (usually larger than 3- 4 см) are prone to progression. With an exacerbation of the disease, coughing, hemoptysis, signs of intoxication may appear.

In the diagnosis of tuberculoma, X-ray tomographic data and the study of a biopsy obtained during bronchoscopy are important. It is rare to identify MBT. On the radiograph, a rounded shadow with clear outer contours is found. Sometimes in a rounded focus, crescent-shaped enlightenment is determined due to destruction. Perifocal infiltration is also possible. and foci of bronchogenic seeding.

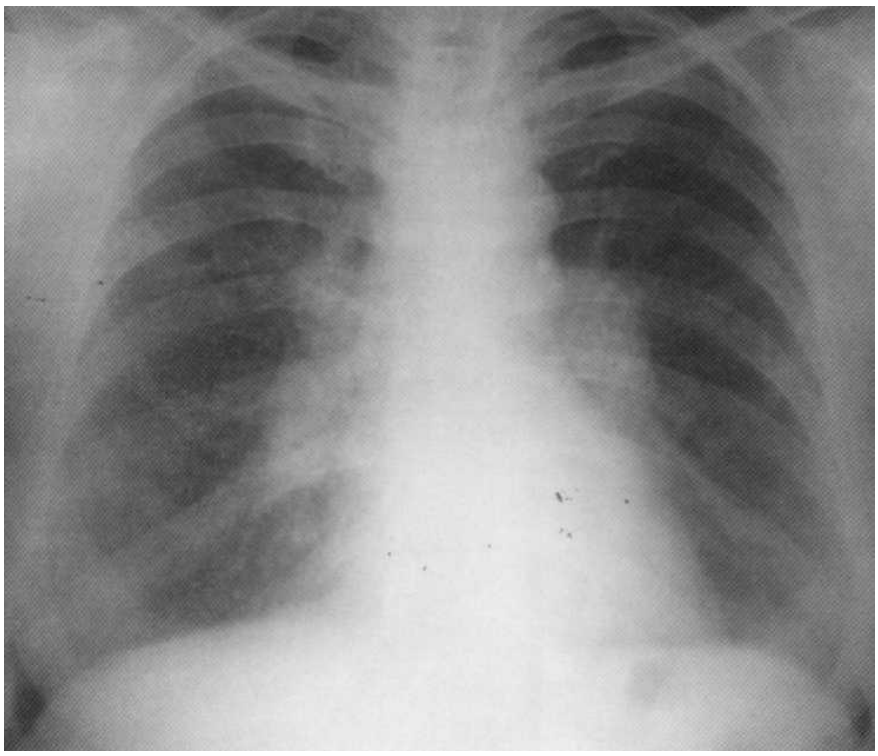
Sarcoidosis of the lungs

Pulmonary sarcoidosis is a systemic chronic benign disease of unclear etiology, which is based on violations of immune mechanisms (changes in the ratio of T-lymphocyte subpopulations), leading to the formation of epithelial cell granulomas in organs and tissues without pronounced caseosis and perifocal inflammation with an outcome in resorption or fibrosis .

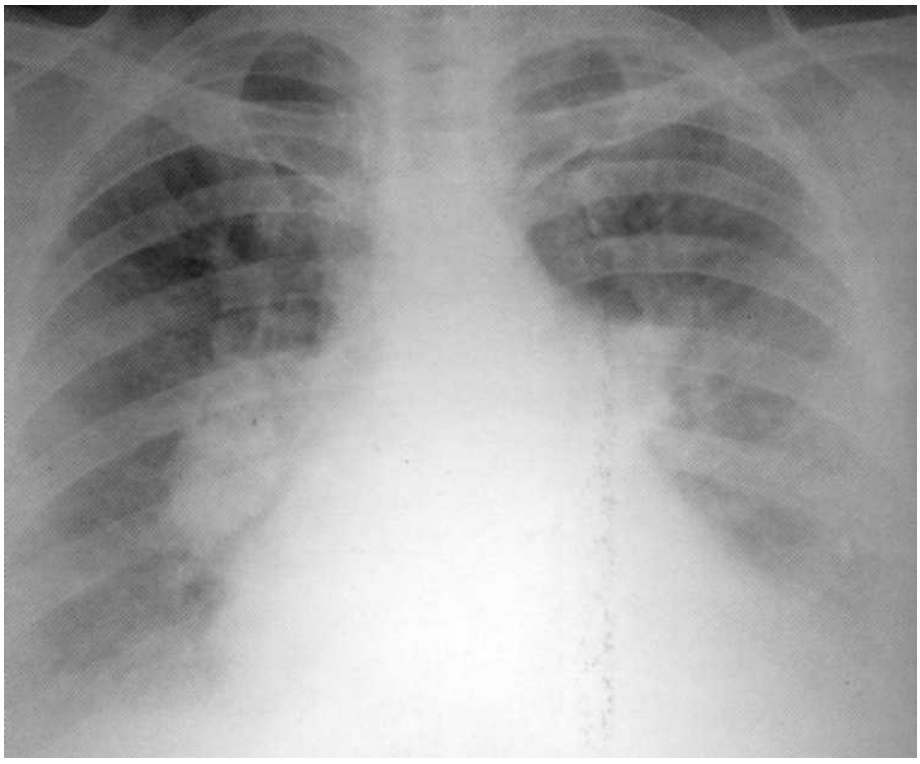
At present, both in Russia and abroad, the international radiographic classification of chest sarcoidosis developed by the Committee of the European Respiratory Society and the World Organization of Sarcoidosis and Other Granulomatous Diseases (1999) has begun to be used, including five stages:

- stage 0 - normal radiograph (in the absence of visible radiological changes, the diagnosis of sarcoidosis cannot be excluded if the patient has skin lesions);
- stage I - bilateral mediastinal lymphadenopathy (DLS);
- stage II - DLS in combination with infiltration of the pulmonary parenchyma;
- stage III - pulmonary infiltration without DLS;

stage IV - pulmonary fibrosis.



Patient, 38 years old. Sarcoidosis stage I. Revealed by chance during a fluorographic examination. The defeat of the intrathoracic lymph nodes is determined. Complaints of a slight cough, weakness, discomfort in the chest. Mantoux test is negative. She was treated on an outpatient basis. After 3 years there was a complete recovery.



Patient, 55 years old. Sarcoidosis and stages. Revealed during fluorographic examination. The diagnosis was confirmed histologically. Mantoux test 5 мм. On the roentgenogram - bilateral enlargement of the intrathoracic lymph nodes with infiltration around them and involvement of the paracostal pleura on the left in the process.

The basis of the radiological symptom complex in patients with sarcoidosis of the respiratory organs are signs of adenopathy of the lymphatic system in the vast majority of cases bilateral), dissemination and interlicial changes in the lung tissue caused by pneumosclerosis and alveolitis. Characterized by polymorphism of focal shadows in the lungs, their predominantly basal localization.

Differential diagnosis of sarcoidosis of the respiratory organs is carried out primarily with lymphogranulomatosis, lymphoma, lung cancer, and tuberculosis.

SILICOSIS

Silicosis is the most common and severe type of pneumoconiosis, which occurs in workers in the mining, engineering, porcelain and faience and metallurgical industries.

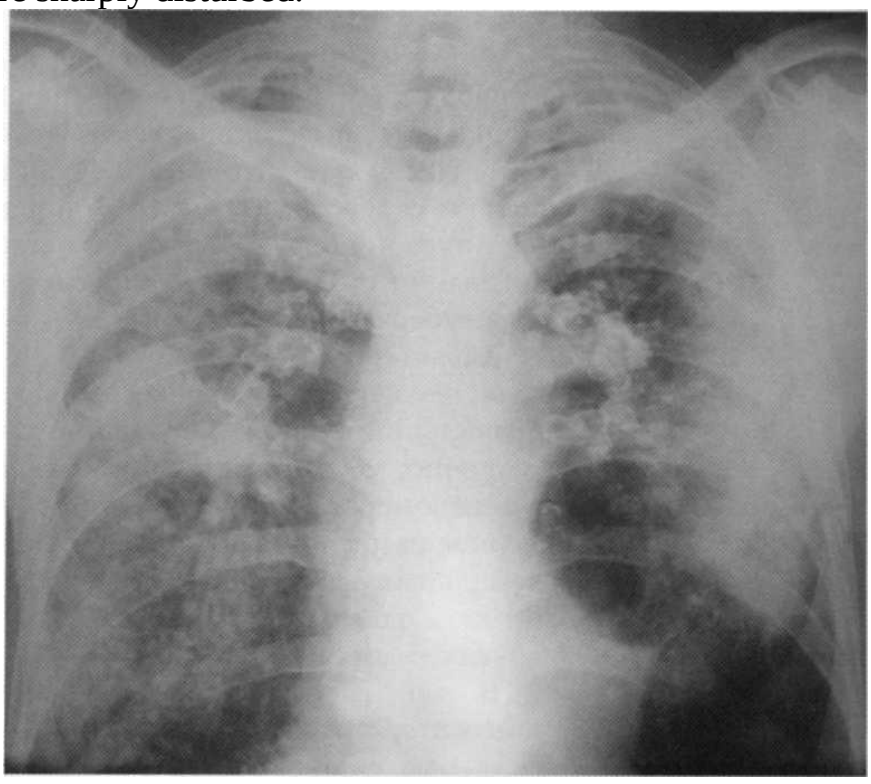
The disease is associated with a prolonged toxic effect on the bronchopulmonary system of silicon dioxide (SiO 2) contained in quartz dust in a free state. The time of contact with dust leading to disease varies widely and ranges from 3 to 10 years or more.

A characteristic morphological element of silicosis is a granuloma, which is a nodule of a rounded or irregular shape. The number of silicotic nodules is different, in places they merge, forming large nodes and conglomerates. At the same time, an uneven growth of fibrous tissue is found in the alveolar septa, along the bronchi and blood vessels, leading to the appearance of lobular atelectasis in some areas of the lung, and emphysema in others.

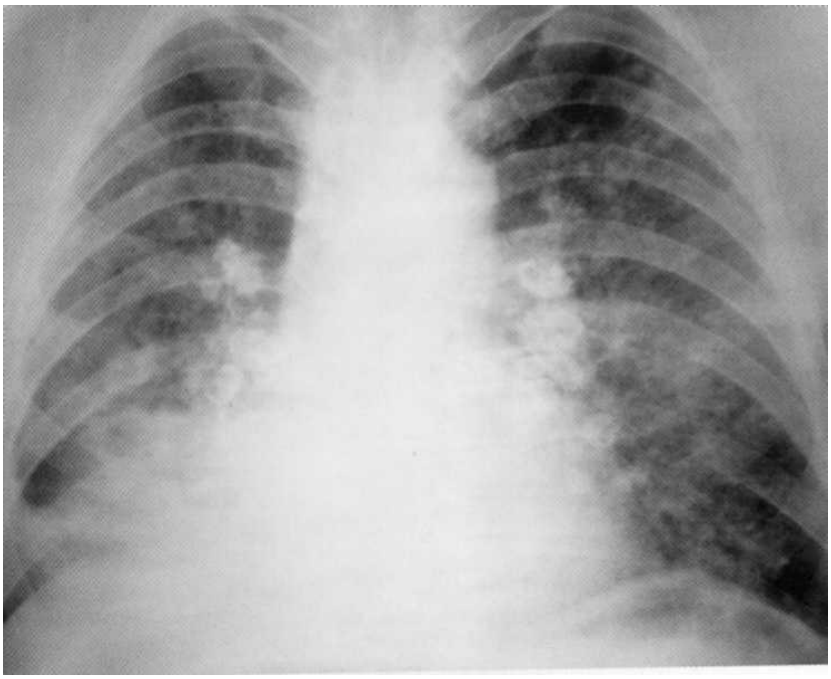
Depending on the predominance of the nodular process or interstitial fibrosis, three forms of silicosis are distinguished: nodular (most common), diffuse sclerotic (interstitial), which proceeds relatively benignly, and nodular (tumor-like, tumorous), requiring differential diagnosis with lung tumor. In the tumorous form, silico-tic nodules merge into large nodes, which can occupy most of the lobe or even the entire lobe of the lung. In patients with silicotuberculosis, the morphological picture is largely determined by the predominance of the silicotic or tuberculous process.

Clinicoradiologically, three stages of silicosis are distinguished [48]. In stage I, on radiographs on both sides, expansion and compaction of the roots of the lungs,

a symmetrical increase in the bronchovascular pattern, its restructuring according to the cellular type, the presence of a small number of small nodular shadows, mainly in the middle parts of the lung fields, are determined. In the initial period of the disease, patients complain of a rare dry cough, vague intermittent pain in the chest. Sometimes a boxed tone of percussion sound, hard breathing, scattered dry rales are detected. Indicators of the function of external respiration for a long time can be within the normal range. In the II stage of silicosis, radiographic signs of fibrosis and emphysema of the lungs increase, there is an increase in the number of nodules that form focal shadows ranging in size from 1 to 10 ммwith clear contours. During this period, patients complain of cough with a small amount of mucopurulent sputum, shortness of breath during exertion, and eventually at rest. There are obstructive-restrictive disorders of the function of external respiration. Clinical and instrumental signs of pulmonary hypertension can be detected. Auscultation reveals an accent of the II tone in the second intercostal space on the left at the edge of the sternum; on the ECG - an increase in the P wave in leads II, III , aVF , deviation of the electrical axis of the heart to the right, on radiographs - bulging of the second arc along the left contour of the median shadow, with Doppler echocardiography - a noticeable increase in systolic and mean pressure in the pulmonary artery. In the III stage of silicosis (clinical and radiological), nodules can merge into large nodes and conglomerates, deformation of the bronchial tree and calcification of the roots of the lungs are detected. Stage III of the disease is characterized by an increase in respiratory failure, asthma attacks may occur. A box percussion sound is determined above the lung fields, hard, sometimes weakened breathing, dry and wet rales, and pleural friction noise are heard. The main parameters of the function of external respiration are sharply disturbed.



Patient, 59 years old. Miner with over 30 years of experience. On the radiograph, large conglomerates are visible on both sides, represented by focal and infiltrative changes. The X-ray picture corresponds to stage III silicosis (tumor-like form). Based on the clinical and laboratory examination, silicotuberculosis was established. MBT (+). Respiratory failure 2 degrees.



Patient, 60 years old. In the past - a miner with many years of experience. Silicosis stage III , nodular form. On the radiograph on both sides - total fibrosis with large conglomerates and lesions of the lymph nodes. Severe emphysema. Respiratory failure 2 degrees.

LUNG CANCER

Lung cancer (bronchial carcinoma, bronchogenic cancer) is a malignant tumor that develops from the epithelium of the mucous membrane of the bronchial tree.

The clinical picture of LC depends on the localization of the tumor (central, peripheral), growth form (endophytic, exophytic), histological structure (small cell, non-small cell), secondary inflammatory
changes in the lung tissue (cancerous pneumonitis, perifocal pneumonia), stage of the disease, features of the nonspecific hyperergic reaction of the body to the tumor (paraneoplastic syndromes).

Central lung cancer

The leading symptom in the clinical picture of central (bronchogenic) LC is an unproductive cough that does not bring relief to the patient. The disease develops

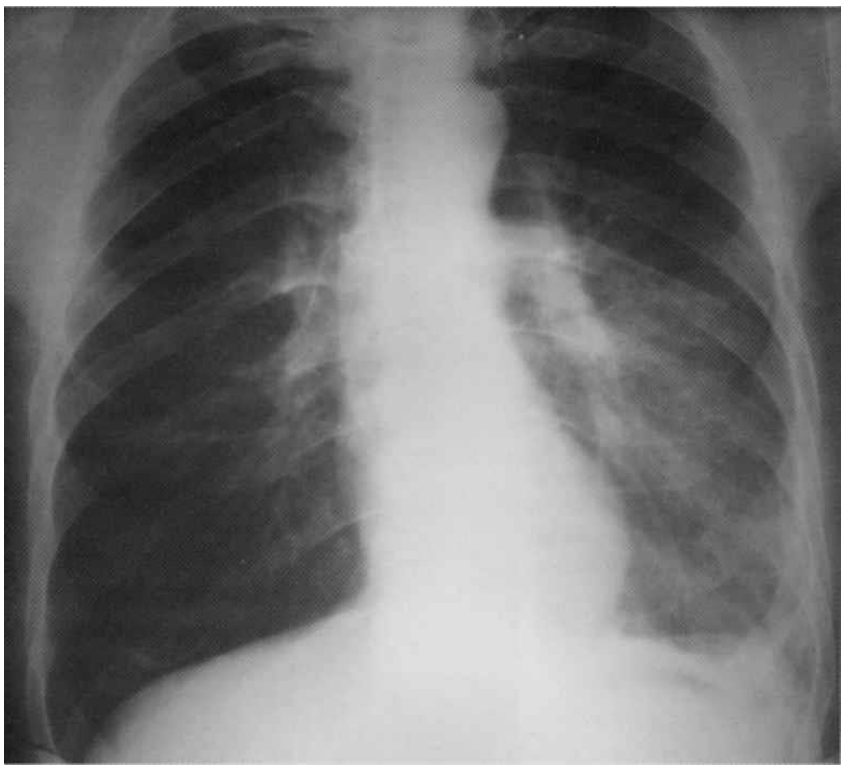
gradually, the increasing intensity of a persistent, untreated cough in a patient with chronic bronchitis makes it possible to suspect a neoplasm. Not abundant mucous or mucopurulent sputum is characteristic, sometimes with streaks of blood due to ulceration and superficial decay of the tumor. Occasionally, hemoptysis and pulmonary hemorrhage are observed.

With endobronchial tumor growth, hypoventilation and obstructive emphysema of the segment occur, and then characteristic signs of atelectasis. Shortness of breath of varying severity, vague pains of varying intensity in the chest appear. Sometimes on the side of the lesion, one can detect lagging of the chest during breathing, weakening of bronchophony and voice trembling (their amplification is observed in pneumonia), dull percussion sound. On auscultation, breathing is sharply weakened or absent. Occasionally, dry "bronchial" rales or crepitus may be heard. It is possible to develop obstructive pneumonitis or paracancrotic pneumonia, manifested by an increase in cough with the release of mucopurulent sputum, high fever, chest pain on the side of the lesion, leukocytosis with a shift of the formula to the left, an increase in ESR.

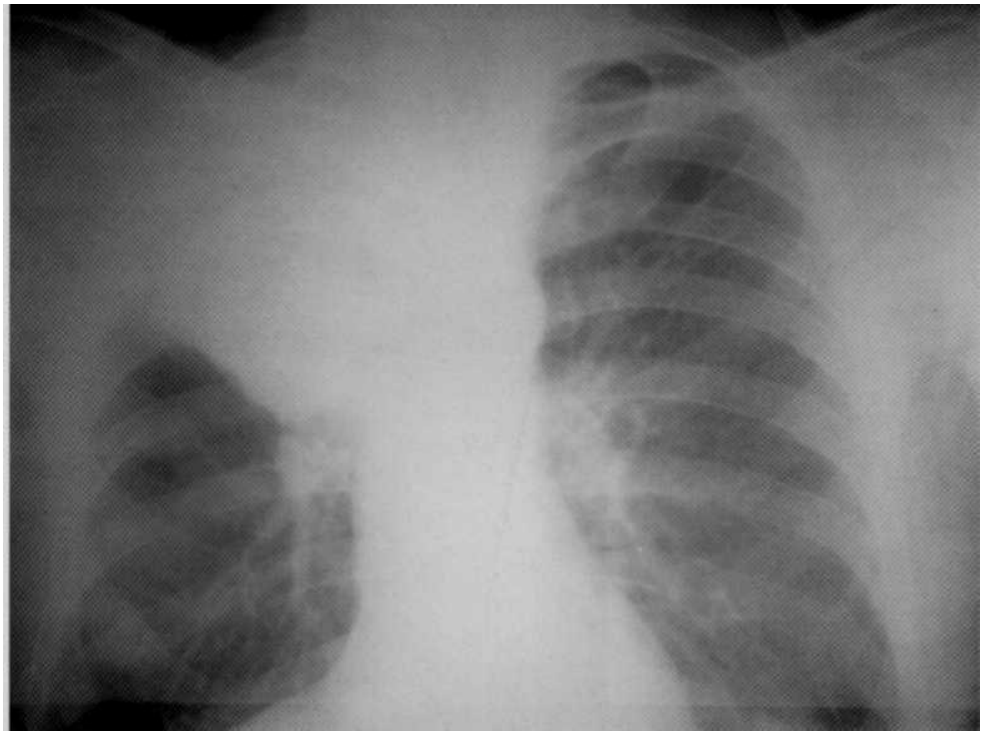
Germination of the tumor in the pleura, chest wall, pericardium or diaphragm (stage III RL) is accompanied by persistent pain syndrome, the development of exudative pleurisy with accumulation of serous-hemorrhagic fluid in the pleural cavity. After evacuation, the exudate quickly (sometimes within a day) accumulates again, which undoubtedly distinguishes the course of tumor pleurisy from tuberculosis, parapneumonic, etc. Late symptoms of the disease are cachexia and general weakness.

Diagnosis of central RL should be comprehensive and include polypositional chest radiography, sputum examination, bronchoscopy with endobronchial biopsy. Patients with pleural effusion perform therapeutic and diagnostic pleural puncture. Central PD is characterized by complex dynamics of the shadow picture, objectively reflecting the steady progression of the disease. On radiographs, shadow phenomena progressively appear due to various objects: a tumor node, atelectasis of a segment or the entire lobe of the lung, hyperplastic lymph nodes, pleural effusion, metastases. Often there is an infiltration of the pulmonary parenchyma due to obstructive pneumonitis or paracancer pneumonia. When the tumor grows into the spine, signs of its destruction are clearly visible on the lateral radiographs.

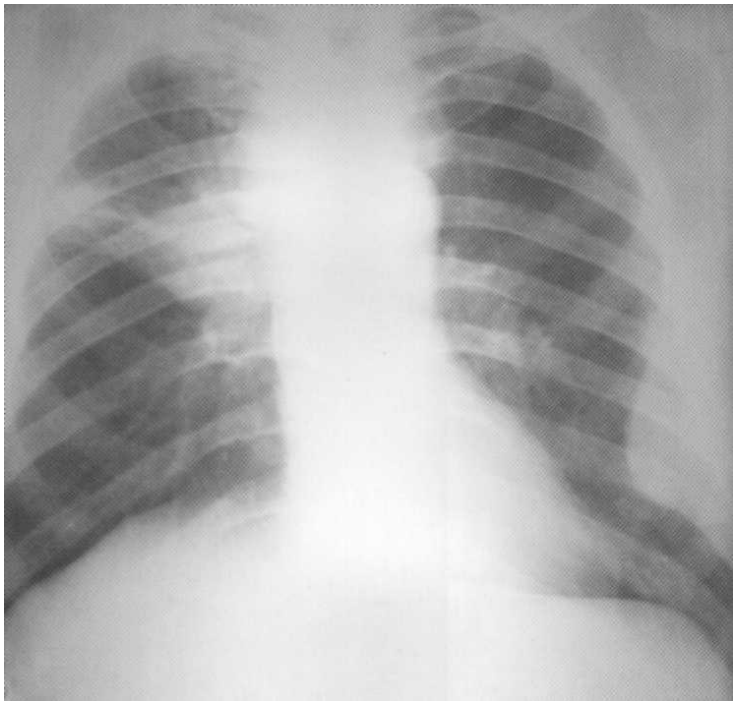
X-ray changes depend on the localization and form of the central RL (endobronchial, branched peribronchial or peribronchial nodular). A primary tumor less than 5 in diameter 6 ммcannot be detected on radiographs. A larger node is defined as a limited homogeneous shading of medium intensity, associated with the root of the lung or adjacent to the mediastinum, with a convex outer contour, sometimes with a noticeable radial radiance directed outward from the shadow of the tumor.



Patient, 61 years old. He was repeatedly treated on an outpatient basis for recurrent pneumonia. In the hospital clinical and radiographically verified left-sided central cancer with hypoatelectasis of the upper lobe ($T_2N_1M_0$ stage II). The diagnosis was confirmed by CT.



Patient, 47 years old. Central cancer of the upper lobe of the right lung ($T_2N_2M_Q$, stage IIIA). Histologically, squamous cell carcinoma



Patient, 57 years old. Central cancer of the upper lobe of the right lung with atelectasis in S 3 (T 2 N 2 M „ stage IV). Limited paracostal pleurisy on the left as a result of metastasis.

Peripheral lung cancer

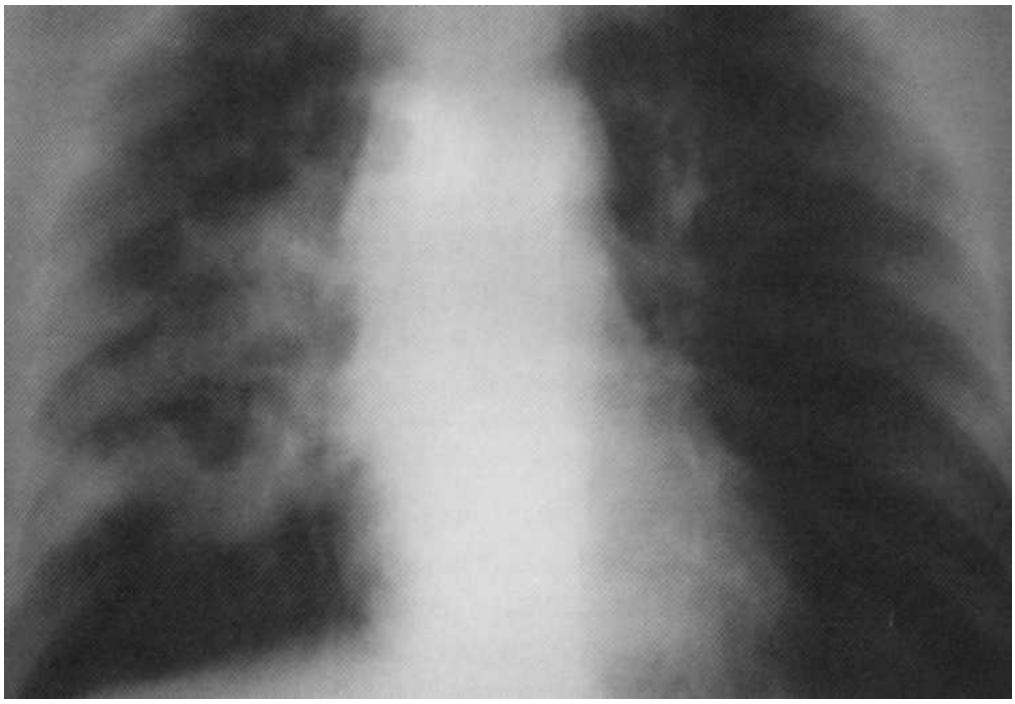
Peripheral lung cancer for a long time (2-5 years or more) can be asymptomatic and detected by chance during a fluorographic examination. Cough and hemoptysis are observed much less frequently than with central cancer, and are caused by secondary germination of large bronchi. In advanced cases, the development of carcinomatous pleurisy is possible.

In peripheral cancer, the shadow of the tumor node with clear external contours is revealed radiographically. The collapse of the tumor leads to the formation of a cavity with thick walls and uneven internal contours, sometimes with a small level of fluid.

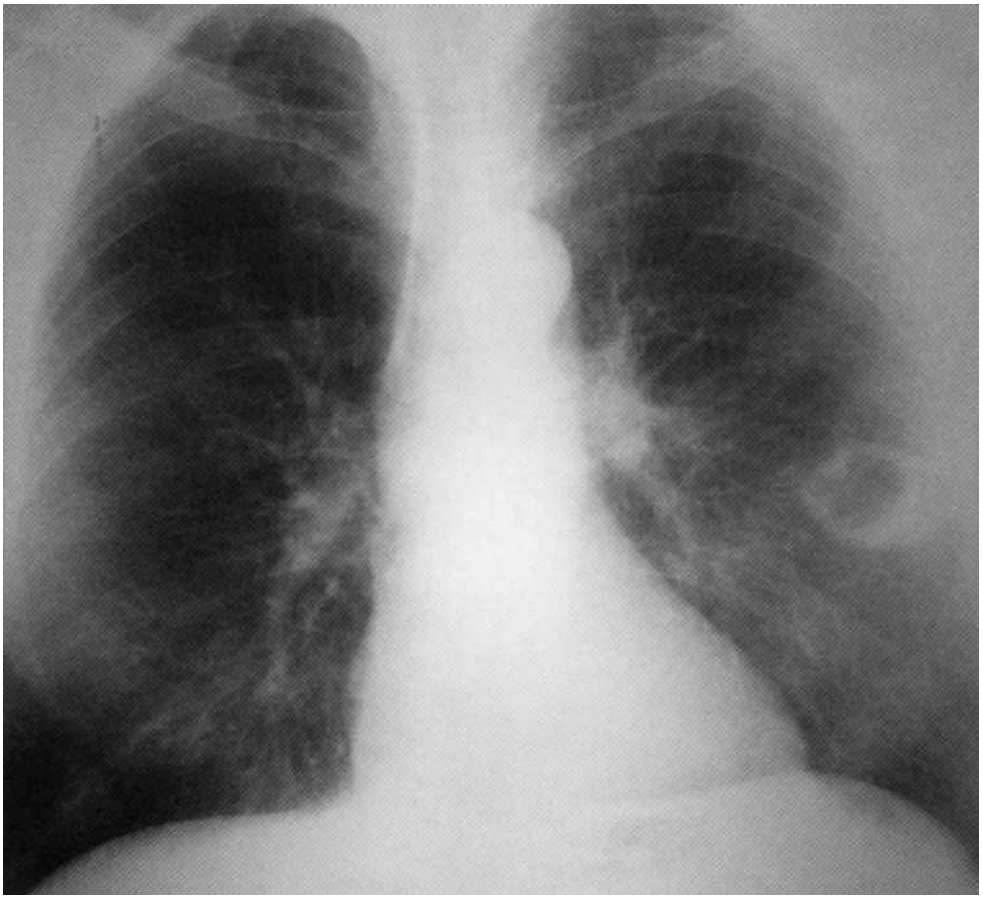
Differential diagnosis of peripheral lung cancer should be carried out with cancer metastases of other locations, benign tumors, abscesses, retention cysts, prolonged pneumonia, tuberculomas, echinococcosis.

If a lung tumor is suspected, in addition to radiography, CT or NMR is indicated, as well as bronchoscopy or transthoracic puncture biopsy, to verify the diagnosis.

Patient, 52 years old. Peripheral cancer of the upper lobe of the right lung with germination in the nearby bronchi ($T_3 N_2 M_0$, IIIA stage). The radiograph shows an intense homogeneous oval-shaped shadow with clear external contours involving the lymph nodes of the lung root.



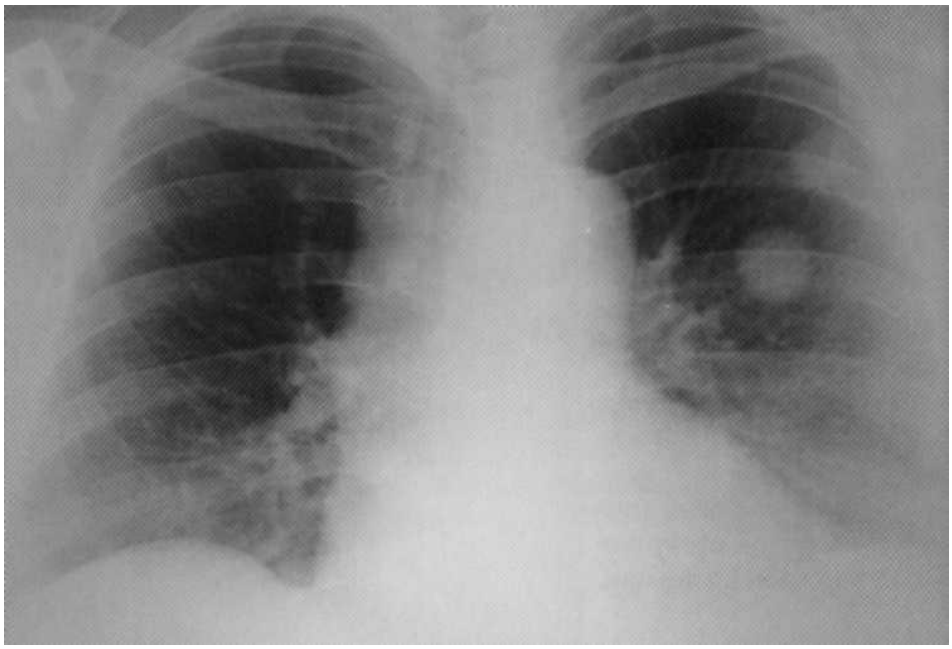
Patient, 60 years old. He was treated for tuberculosis for a long time. Tomogram: cancer of the right lung in the phase of multiple decay - cavity form of peripheral cancer ($T_3 N_2 M_0$, IIIA stage). The patient was operated on, the diagnosis was confirmed histologically - squamous cell carcinoma.



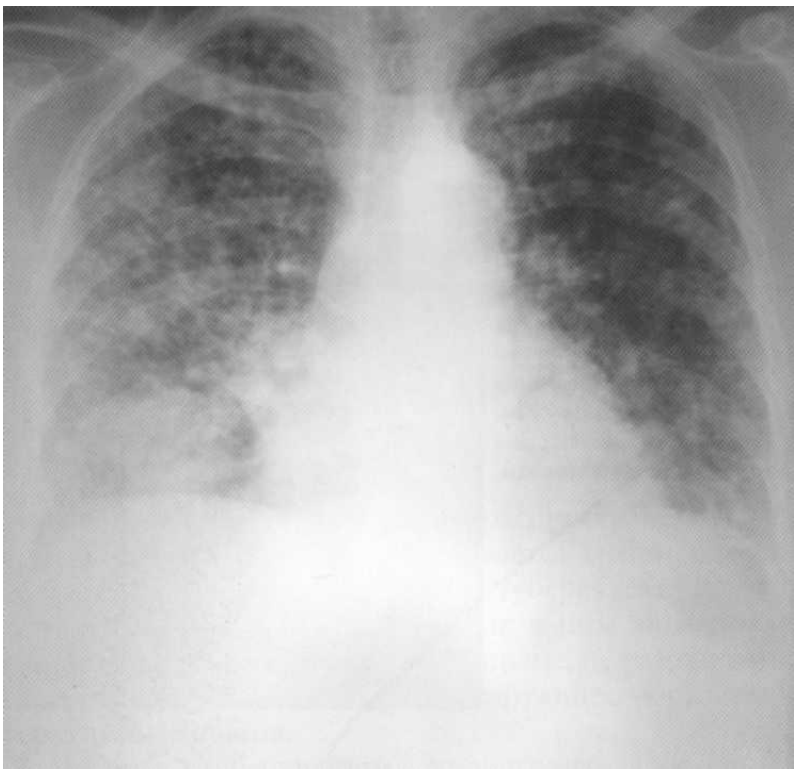
Patient, 62 years old. Peripheral cancer of the lower lobe of the left lung in the decay phase is a cavity form of peripheral cancer ($T_2 N_0 M_0$, stage I).

Metastatic lung disease

Metastatic lesion of the lungs occurs with primary cancer of the stomach, kidneys, thyroid gland, prostate, ovary and cancer of other localizations. On radiographs, metastases in the lungs can be determined as multiple focal shadows of various sizes. The clinical picture in metastatic cancer depends on the degree of lung damage, localization and other features of the primary tumor.



Patient, 50 years old. She has a history of radical surgery for cancer of the left ovary. After 3 years, metastases were detected in the upper lobe of the left lung: 2 tumor-like formations with a diameter of 27 and23 мм



Patient, 67 years old. Bilateral total metastatic process in the lungs with lesions of the spine. The primary localization of cancer is in the left ovary. On the radiograph - focal shadows (larger on the right) of various sizes and intensity in places of a confluent character with the involvement of the lymph nodes of the lung root in the process.

Test tasks

1. Smallest autonomous unit of the lung
   A. lobule
   B. segment
   B. acinus
G. sublobule

2. The root of the lung is enlarged
   A. pneumonia and collagenoses
   B. central cancer
   B. collagenoses
   G. with all these diseases

3. Bronchography of a cystic lung is characterized by
   A. convergence and deformation of the bronchi
   B. no change in the bronchial tree
   B. deformation of the bronchi and cysts
   G. deformation of the bronchi without contrasting cysts

4. In acute pneumonia, it is better to use the method
   A. Routine X-ray
   B. Routine X-ray with CT
   B. routine X-ray and bronchoscopy
   D. CT and bronchography

5. Central lung cancer often occurs in the bronchi
   A. intermediate
   B. segmental
   V. equity
   G. main

6. Acute pneumonia mainly affects
   A. pleura
   B. mantle layer lobe
   B. nuclear layer of the lobe
   G. nuclear and mantle layers to the same extent

7. Tuberculous infiltrate is characterized
   A. heterogeneous triangular darkening of a segment or lobe of the lung
   B. darkening the segment with a decrease in volume
   B. round focus with decay and liquid level
   D. darkening with a fuzzy contour and dropout foci

8. The most characteristic x-ray sign of emphysema
   A. expansion of pulmonary roots
   B. strengthening and deformation of the lung pattern
   B. increased transparency of lung fields
   G. change in lung pattern and roots of the lungs

9. Vascular pattern can be seen on a chest x-ray
   A. from birth
   B. from the first month of life
   V. from 1 year
   G. after 3 years

10. With croupous pneumonia, most often the corresponding root
   A. not extended
   B. expanded and displaced
   B. expanded with bumpy contours
   G. expanded and unstructured