Radiological research methods and radiological semiotics of chronic nonspecific lung diseases

Prepared by the Department of "Visual Diagnostics" of KazNMU named after S. D. Asfendiyarov

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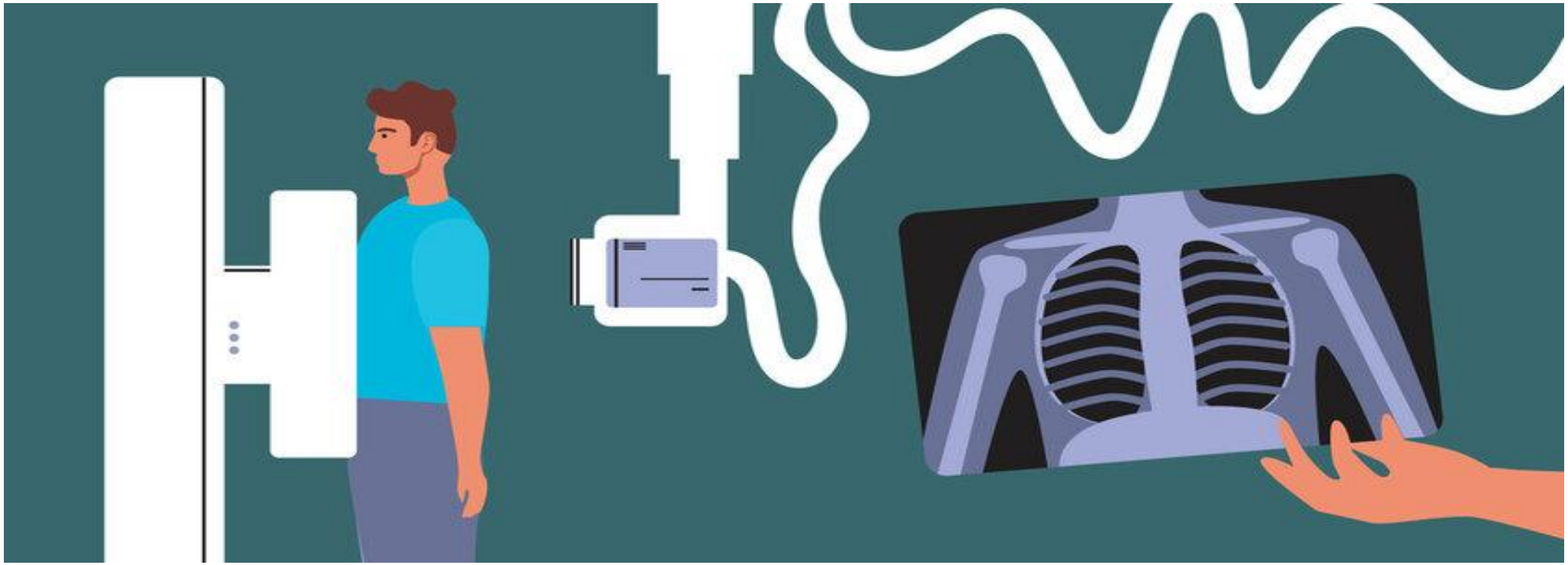
- Radiological methods of chest organs research
- Radiological anatomy of chest organs
  Radiological semiotics of chronic nonspecific lung diseases :
- 1. Chronic bronchitis
- 2. Bronchiectatic disease
- 3. Emphysema
- 4. Pneumosclerosis
- 5. Chronic nonspecific pneumonia

Radiological research methods chest organs

- Fluorography
- Radioscopy
- Radiography
- Tomography
- Bronchography
- Angiopulmonography
- Ultrasound diagnostics
- Computed tomography
- Magnetic resonance imaging
- Radionuclide diagnostics (Scintigraphy, PET / CT)

The X-ray method is a method of studying the structure and function of various organs and systems, based on a qualitative and quantitative analysis of the X-ray beam that has passed through the human body.



Fluorography

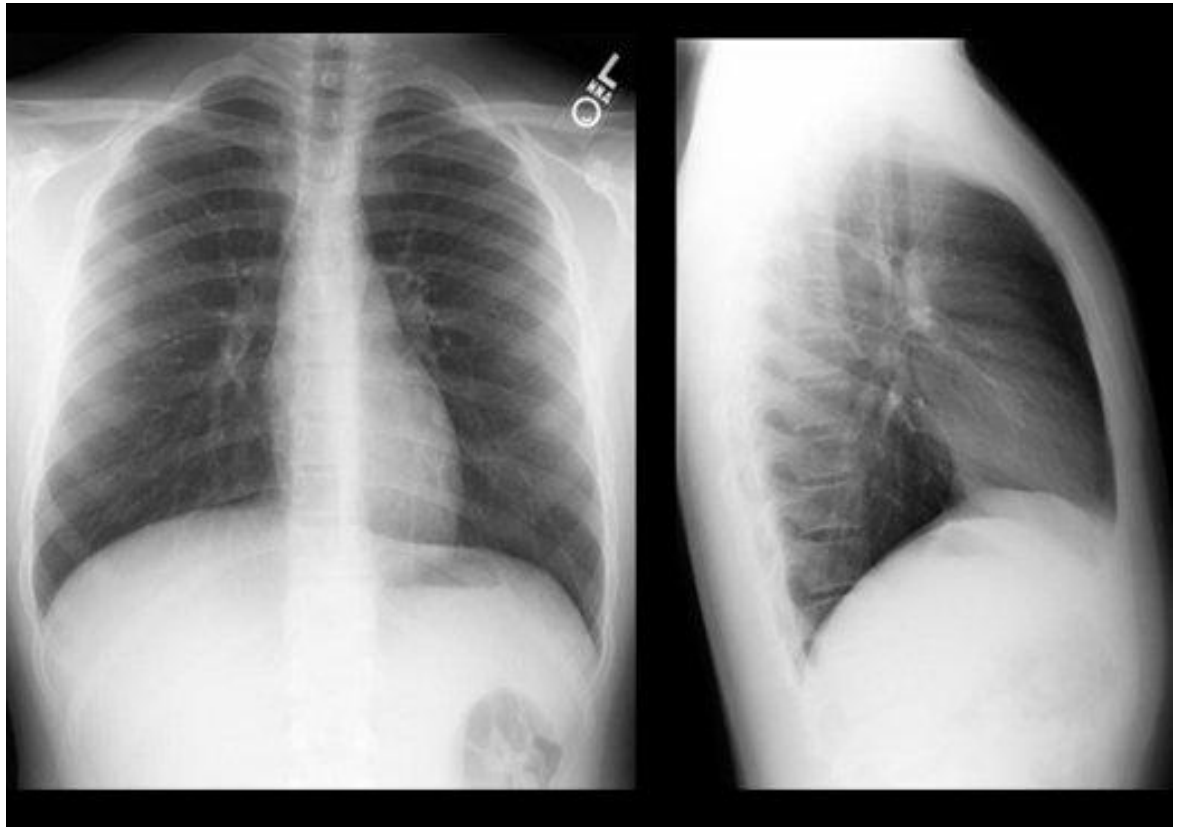
- the method of X-ray examination, which consists in photographing an image from a fluorescent X-ray screen (which is used more often), the screen of an electron-optical converter or systems designed for subsequent digitization of images, on a small-format photographic film-usually 110x110 mm, 100*100 mm.

Radioscopy

- Radioscopy (Greek. scopeo-to consider, observe) is an X-ray examination in which a mobile X-ray image of the organ under study is obtained on the screen
- The method makes it possible to examine the patient in various positions, to assess the topographic and anatomical features of the studied organs and the functional state of some organs and systems (excursion of the diaphragm, heart contractions, the act of swallowing, etc.).

Radiography

- Radiography (greapho-to write, to depict) is an X-ray study in which an X-ray image of an object is obtained, fixed on information carriers (X-ray film, digital detector)

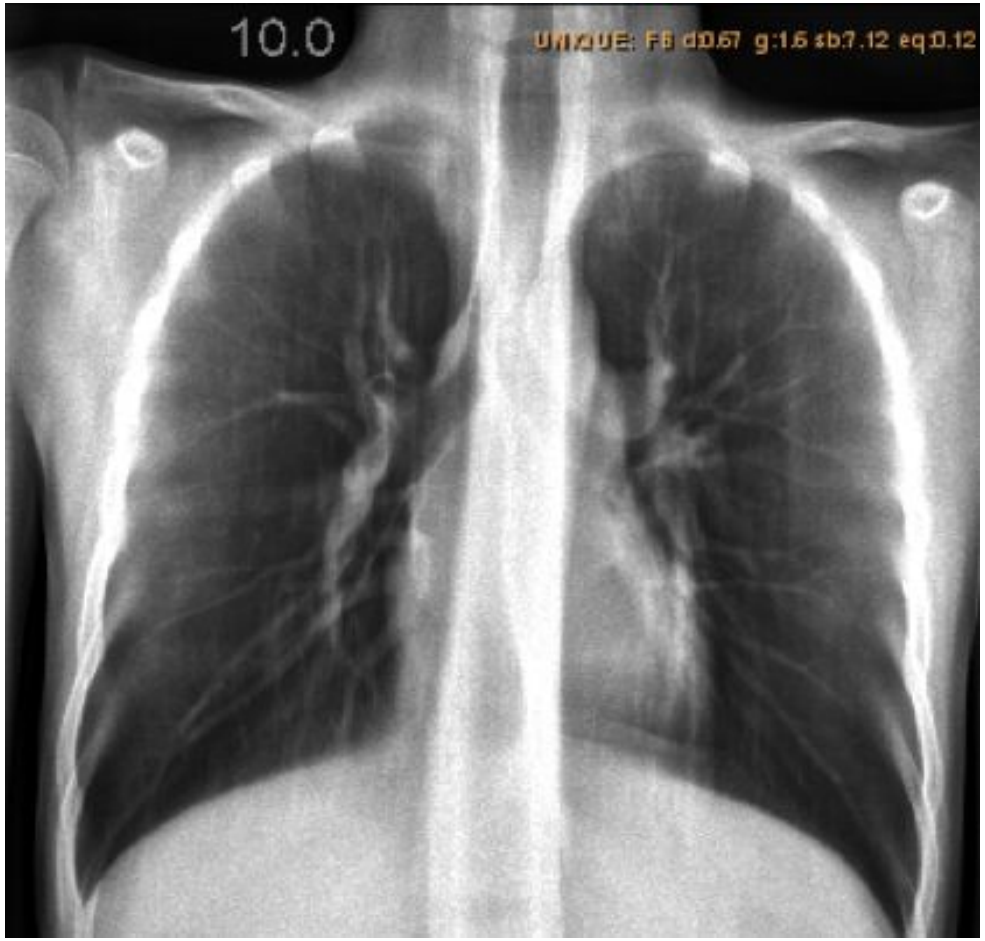


Radiography

- **Overview radiography** is an image of the entire organ under study or the entire anatomical area.
- **Targeted radiography** is a selective fixation of the organ of interest or its part, providing an optimal image of the pathological focus.

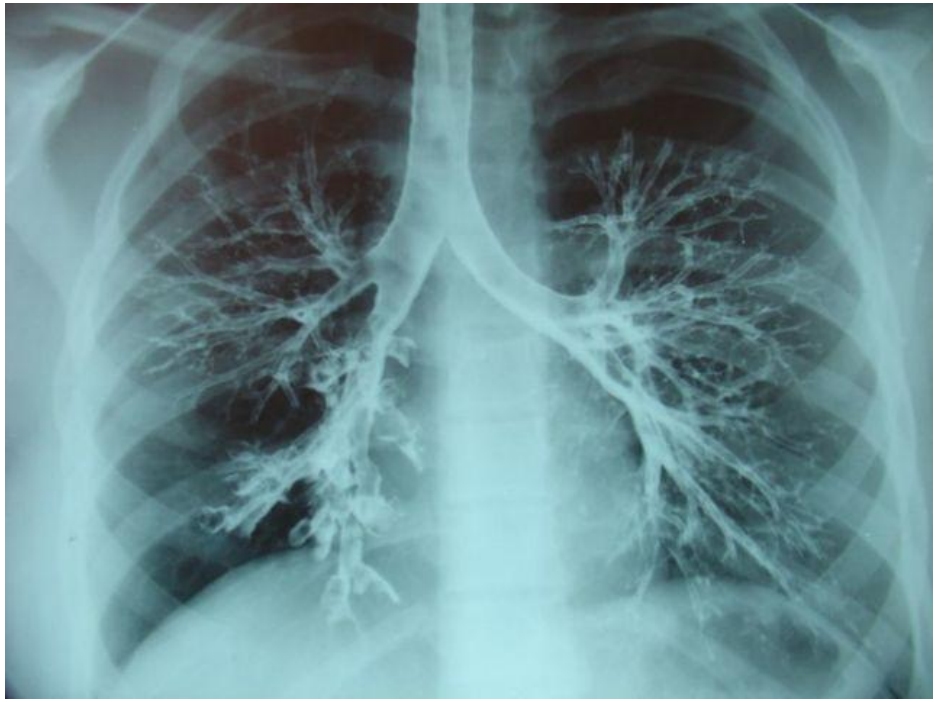
Tomography

- **Tomography** (from the Greek. tomos-layer) is a method of layer-by-layer X-ray examination.
- **Linear tomography** is a technique of layer-by-layer X-ray examination. It is used to obtain an isolated image of structures located in the same plane, as if it divides the summation images into separate layers. Until now, X-ray tomography is widely used in pulmonology, but with the advent of computed tomography (CT), the value of the technique is steadily decreasing.



Bronchography

- Bronchography allows you to get an image of the bronchial tree when a radiopaque substance is injected into it.

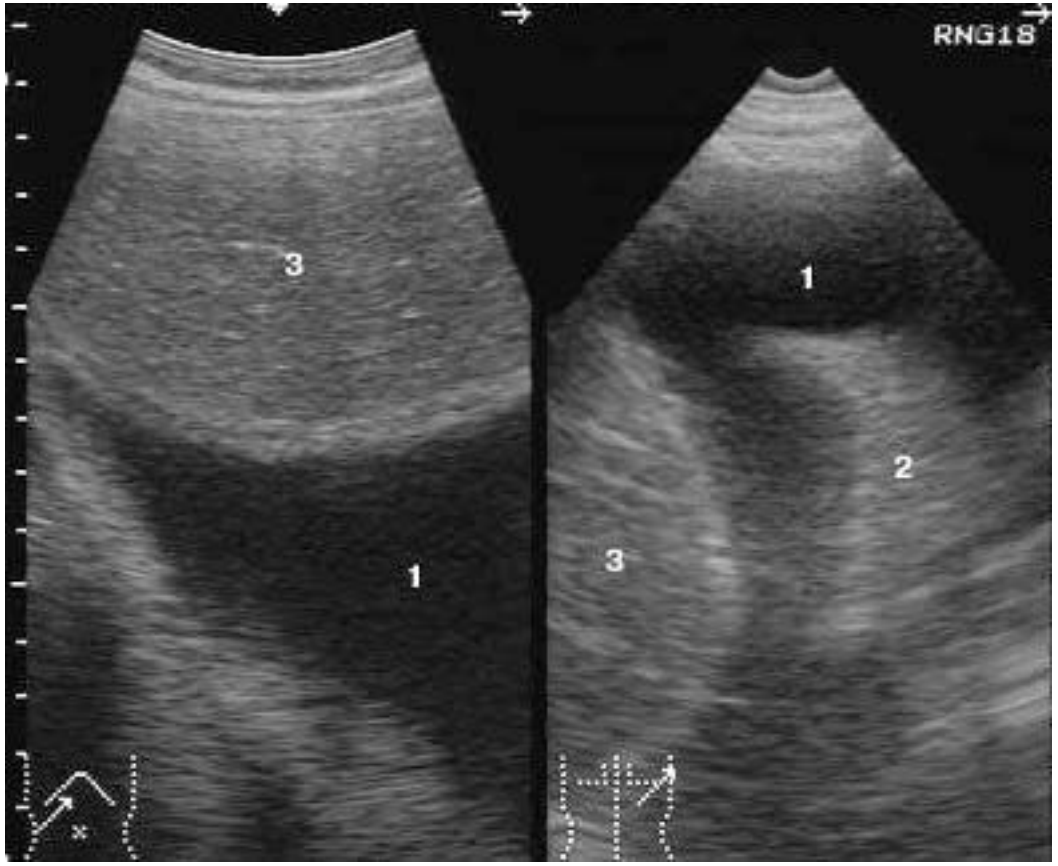


Angiopulnomography

- Angiopulmonography is an X-ray contrast study of the vessels of the small circle of blood circulation.

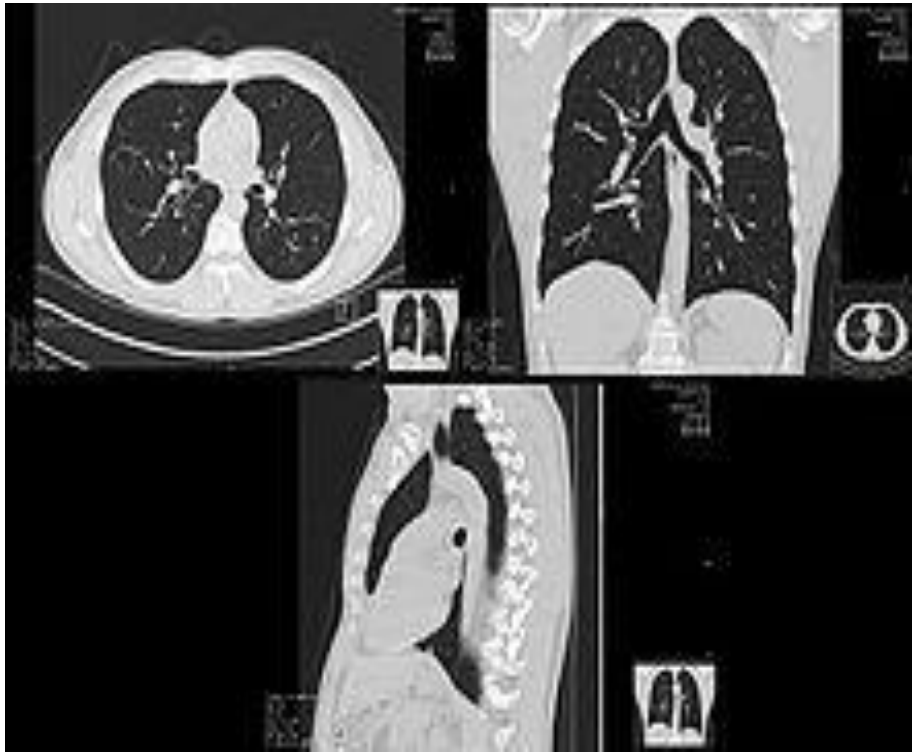
ULTRASONIC RESEARCH METHOD

- The most common indication for ultrasound examination of the thoracic cavity is to determine the presence of fluid in the pleural cavity
- Sonograms of the chest wall by access from the hypochondrium (a) and through the intercostal space (b):
  1-fluid in the pleural cavity;
- 2-preloaded lung;
- 3-liver



Computed tomography

- The method of computed tomography (CT) consists in obtaining a layered image of the lungs. The method has a higher resolution in comparison with radiography and is the most informative method of radiation diagnosis of respiratory diseases.



MAGNETIC RESONANCE RESEARCH METHOD

- The advantage of MRI is fully manifested in the assessment of the chest wall, pleura, lung roots, mediastinal organs. MRI does not make it possible to visualize the lung parenchyma, but it is possible to assess the structure of tumor-like formations in the lungs (decay, the presence of liquid, fat inclusions, vascularization), to trace the dynamics of the process during treatment.

T1-VI of the mediastinal organs in the coronary projection at the level of tracheal bifurcation:
1-tracheal lumen,
2-right main bronchus,
3-left main bronchus

RADIONUCLIDE RESEARCH METHOD

Radionuclide research methods consist in the introduction into the body (intravenously or by inhalation) of substances containing a radioactive label, followed by the study of their distribution in tissues by the emitted radiation.

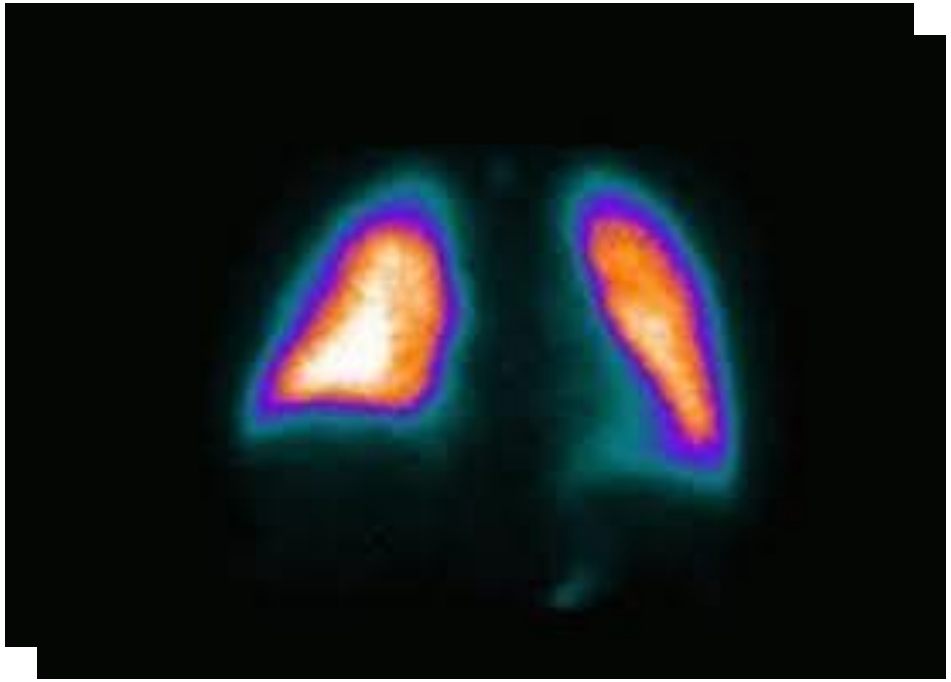
Radionuclide methods of lung research are carried out mainly in two versions:

- - **perfusion scintigraphy** to assess the state of blood flow in the small circle of blood circulation;

- - **inhalation scintigraphy** to assess the fundation of external radiation.

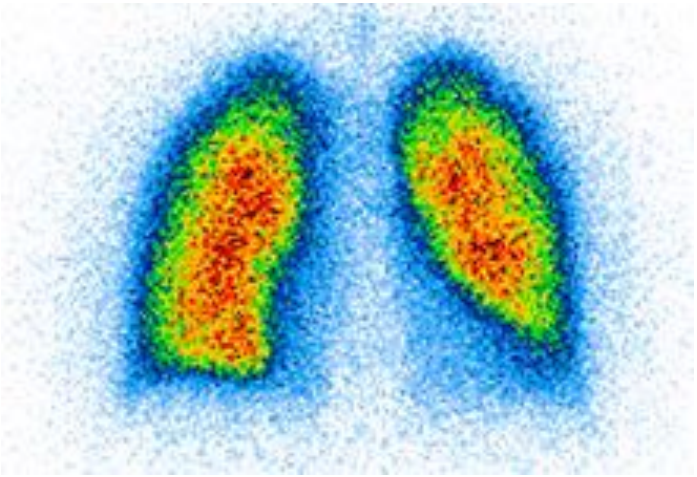
Perfusion scintigraphy

- To assess the state of microcirculation, a solution containing macroaggregates or microspheres of human serum albumin labeled Tc-99m (Tc-99m-MMA or Tc-99m-MCA) is administered intravenously. When the vessels of the lungs are affected, macroaggregates do not enter the capillary network of pathologically altered areas of the lungs and this is displayed on scintigrams in the form of accumulation defects

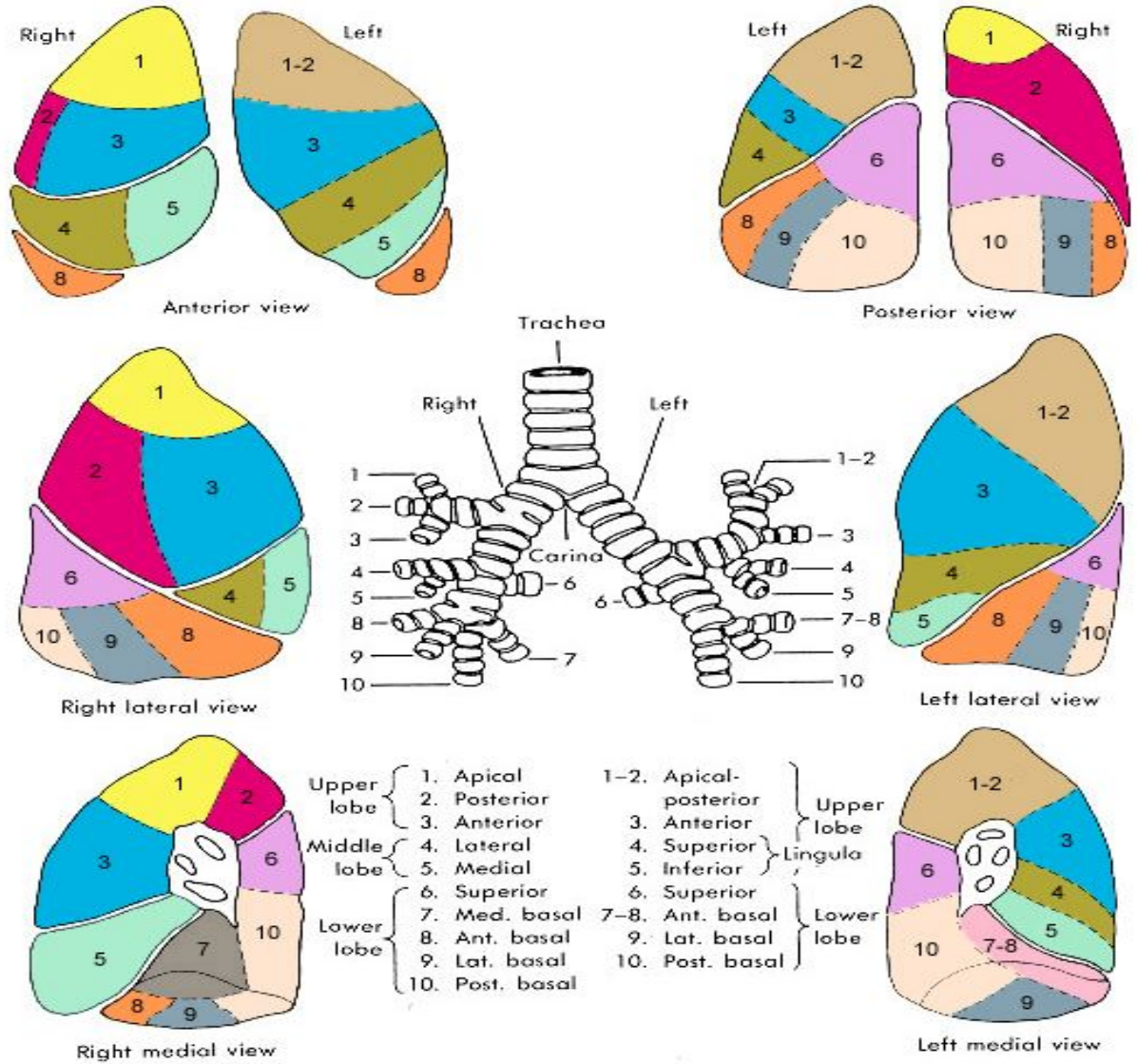


Inhalation scintigraphy

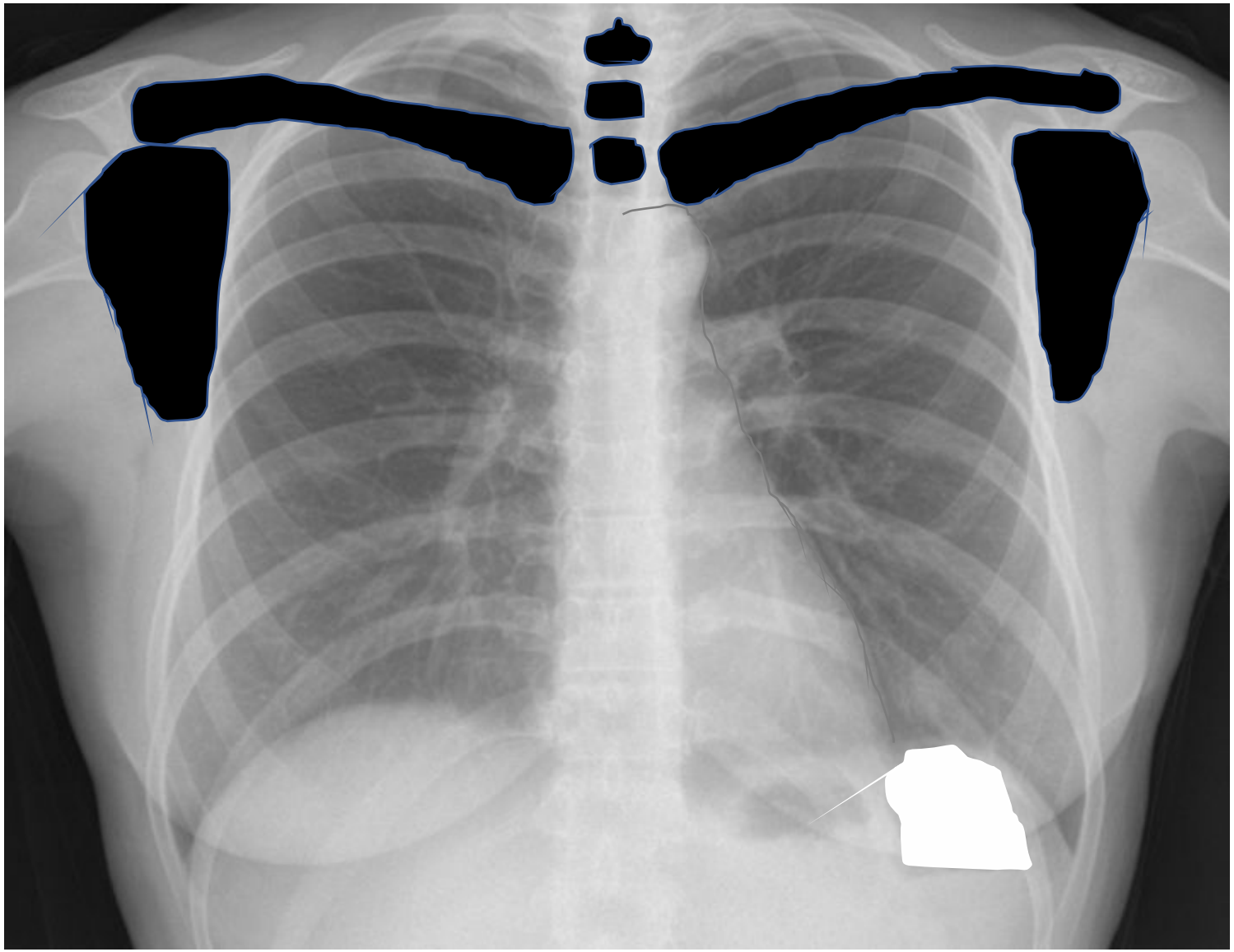
- To assess the function of external respiration, the patient is given a gas mixture containing various inert gases: xenon (Xe-133, Xe-127), krypton (Kr-81m) or an aerosol containing microspheres of human serum albumin (Ts-99m-MCA). Places of reduced accumulation of RFP correspond to areas of ventilation disorders, the causes of which may be cicatricial and tumor stenosis of the bronchi, obstructive bronchitis, asthma, pneumosclerosis, atelectasis.



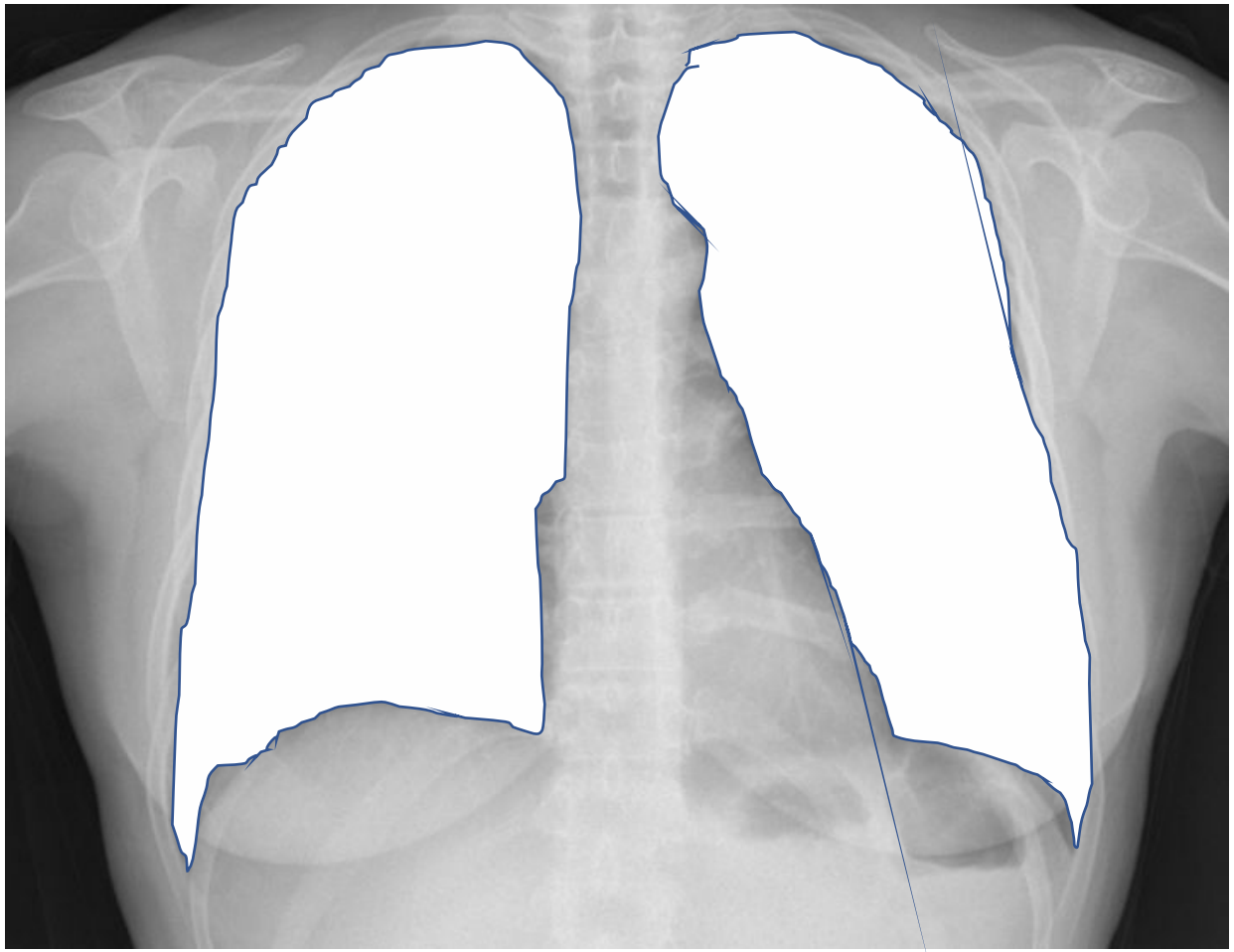
Representation of the lobular and segmental structure of the lungs



Proper positioning of the patient

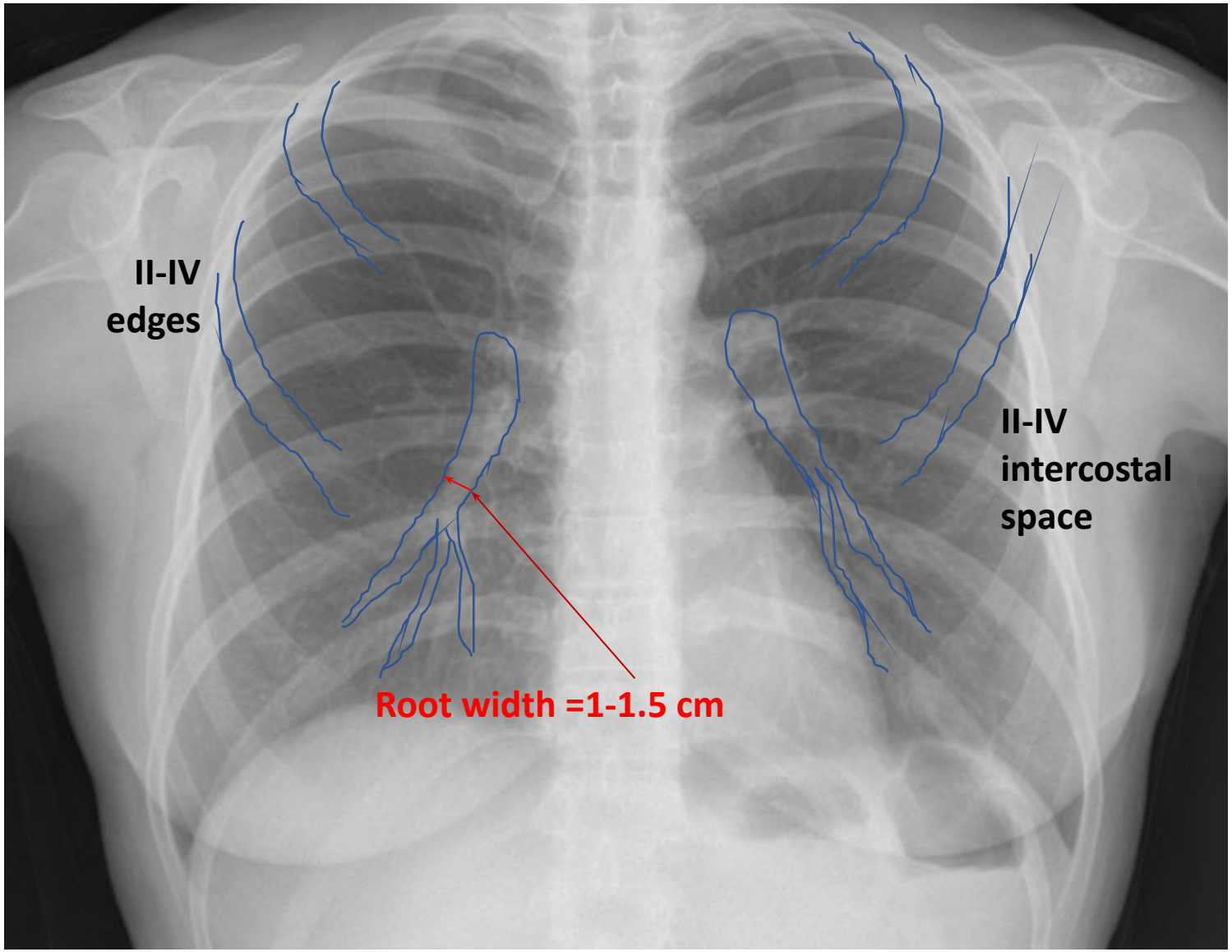


Pulmonary fields

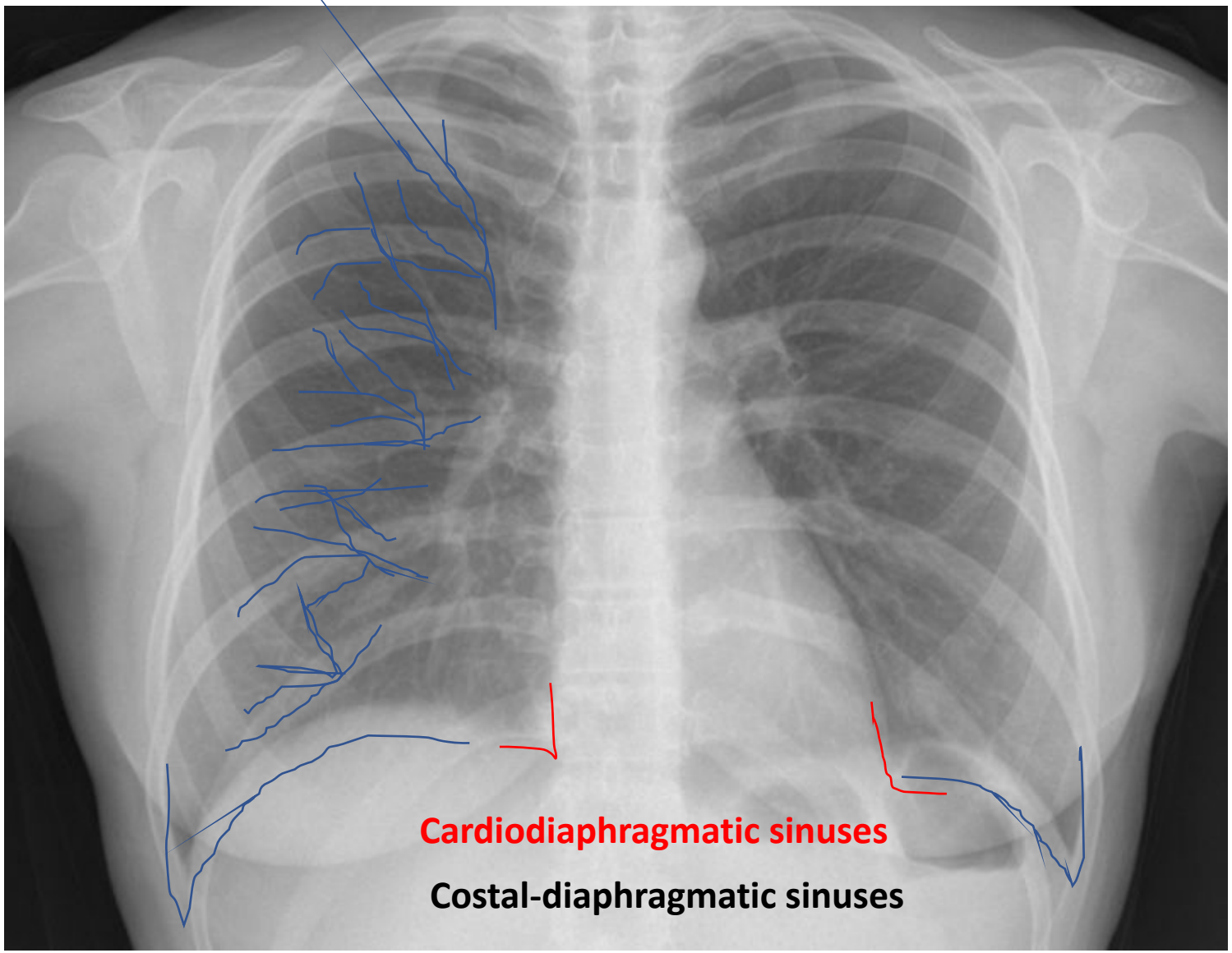


The roots of the lungs

the left root is 1-1. 5 cm higher than the right one

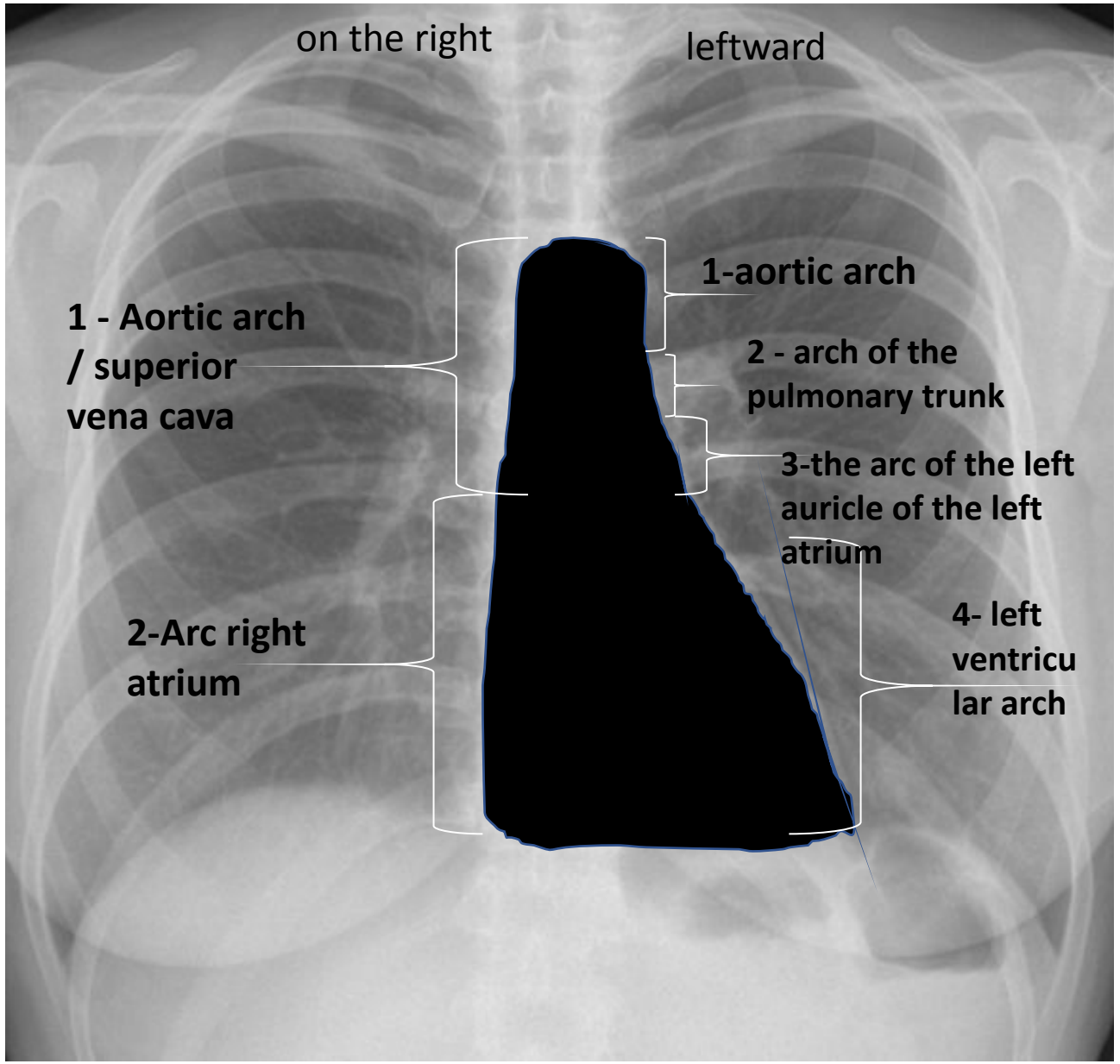


Lung pattern

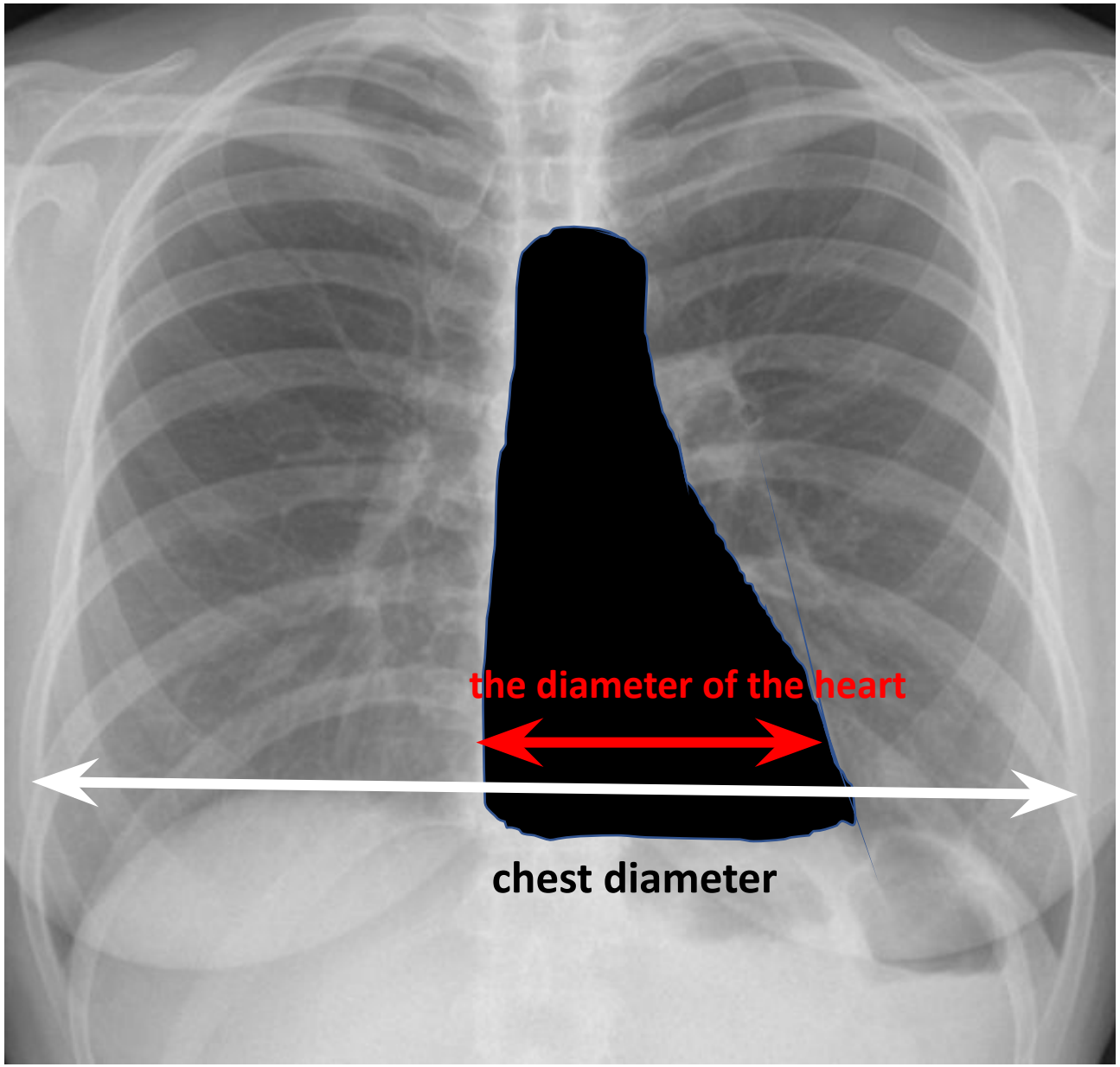


SHADOW OF THE HEART

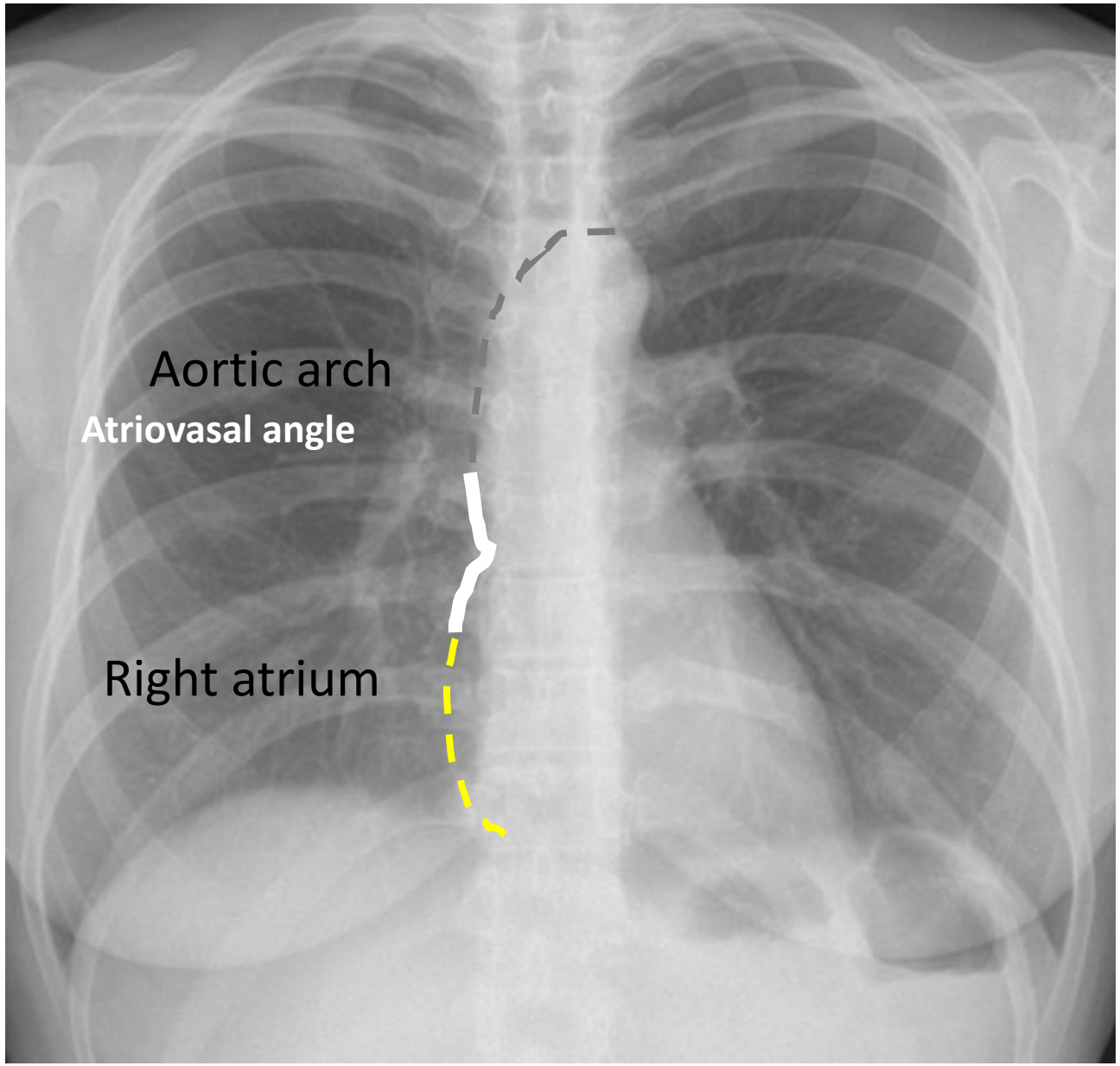
Arcs of the heart



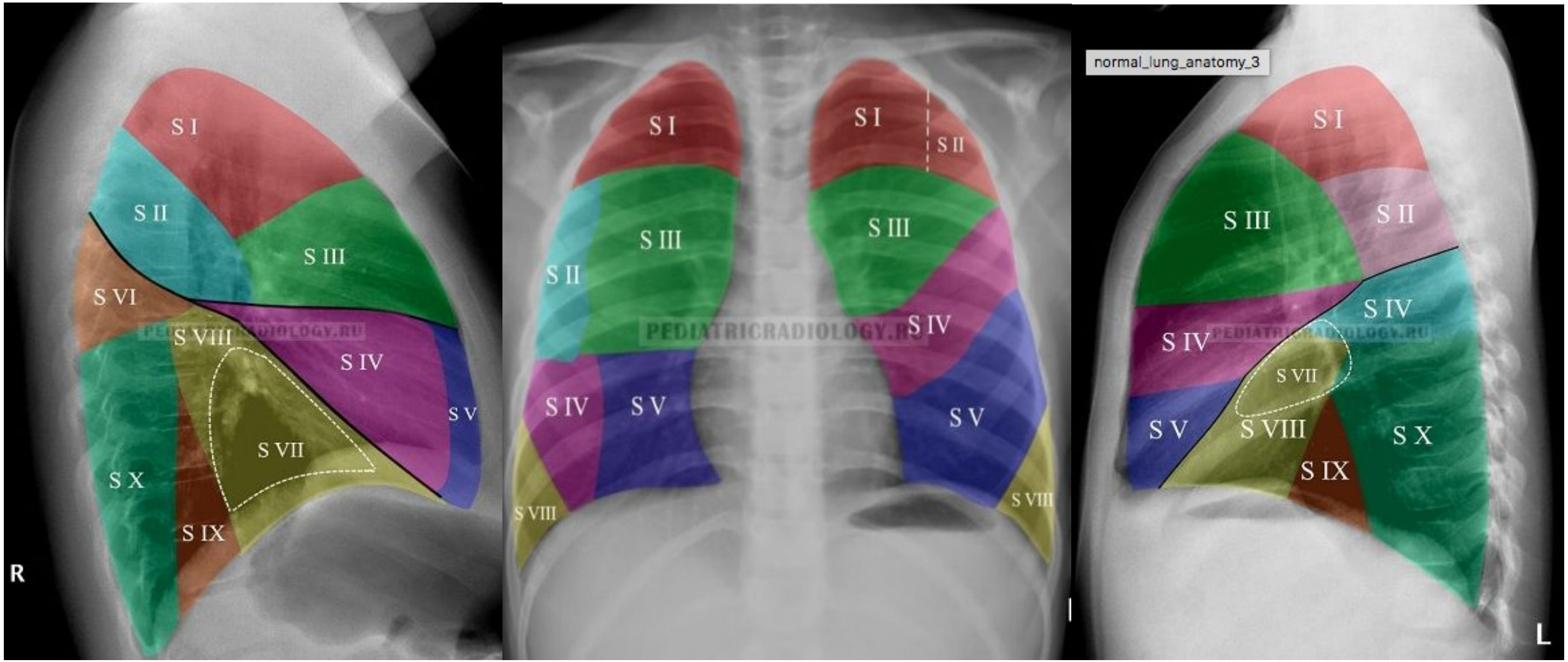
Cardiothoracic index = $\frac{\text{the diameter of the heart}}{\text{chest diameter}}$ = **0,4-0,5**

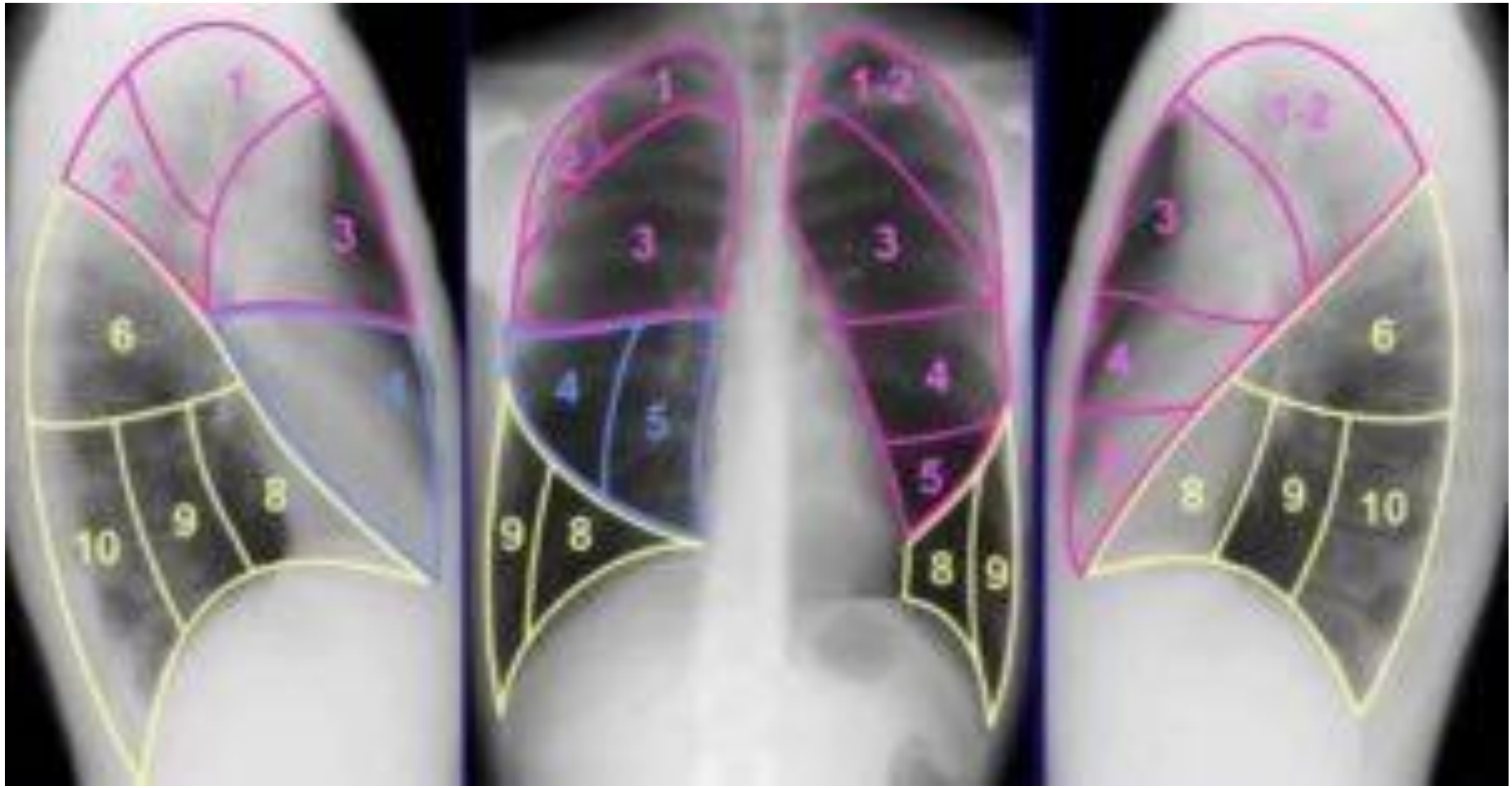


Atriovasal angle



Segmental structure on the radiograph

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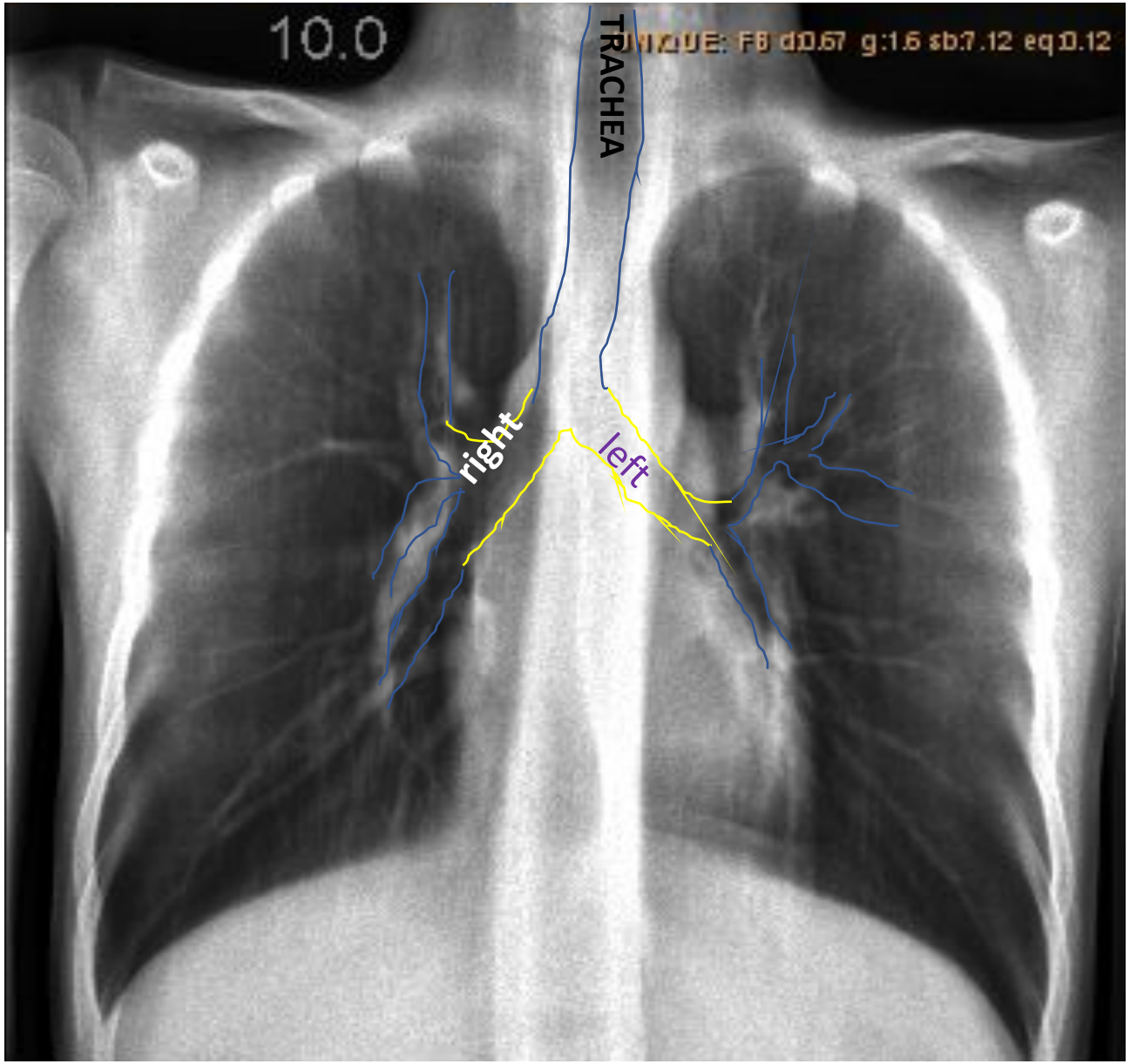
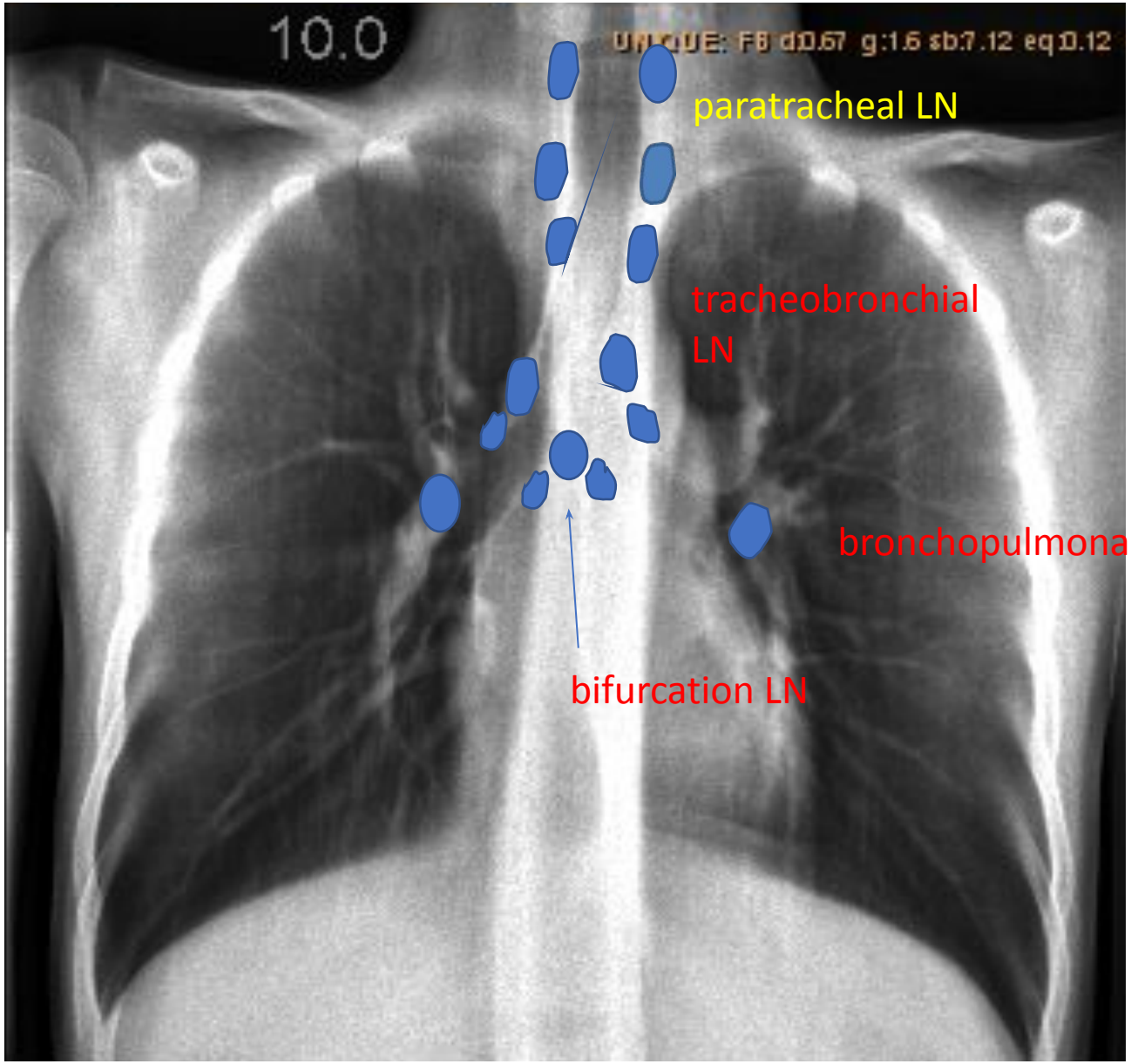
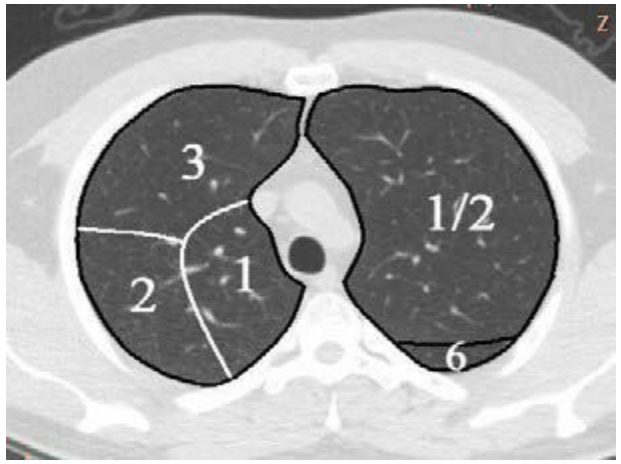
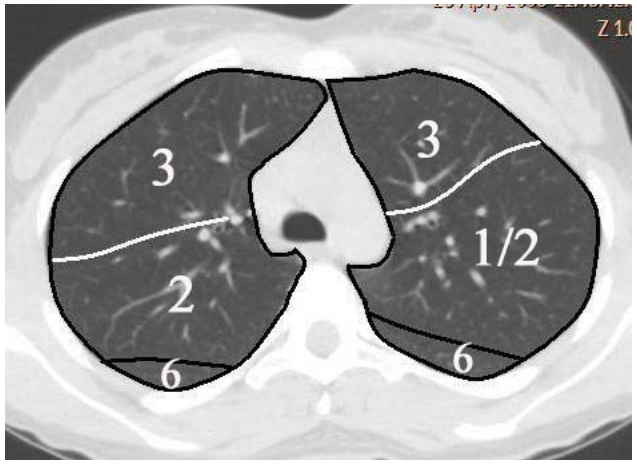
Linear tomography

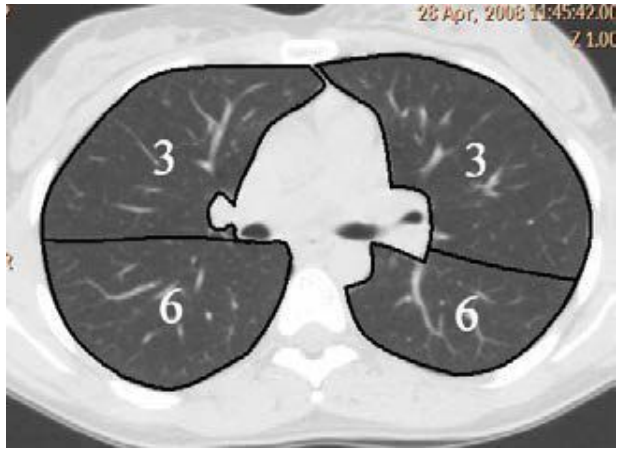


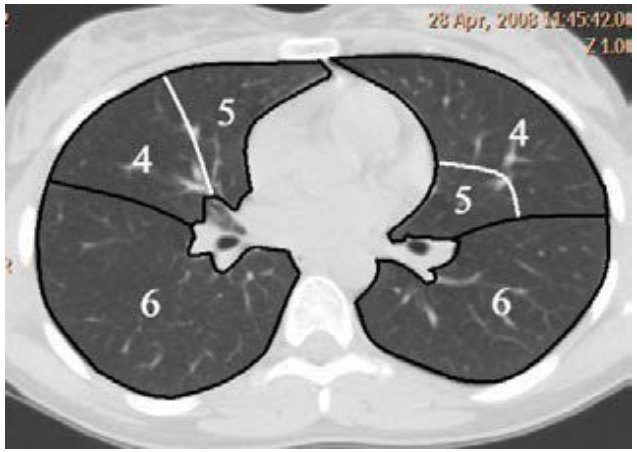
Mediastinal lymph nodes

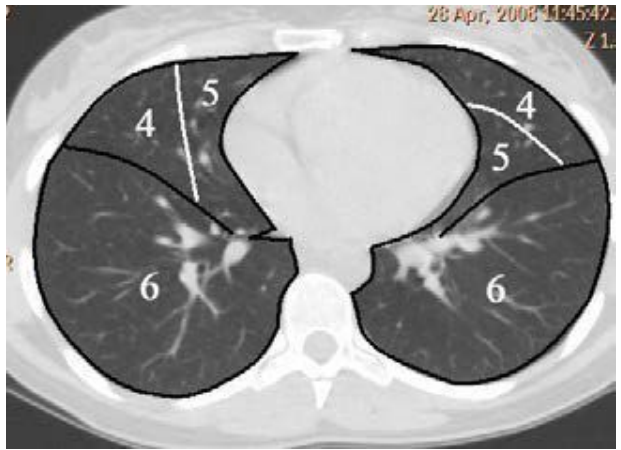


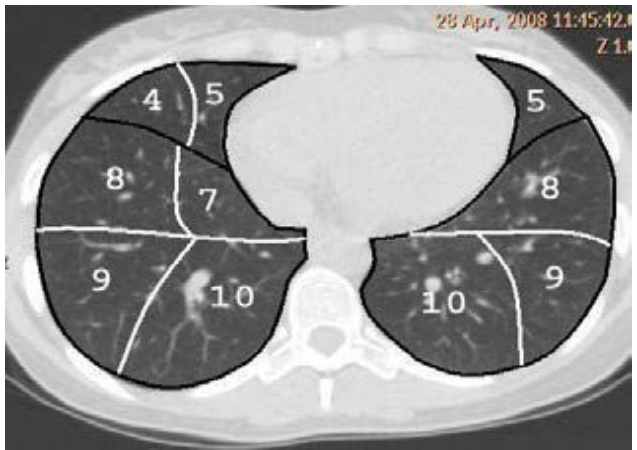




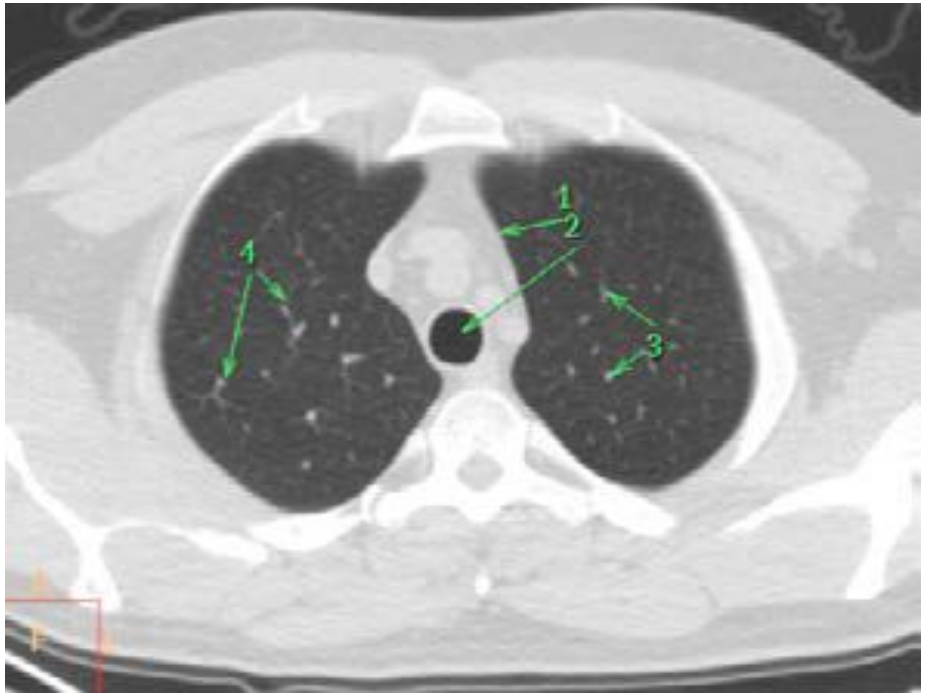




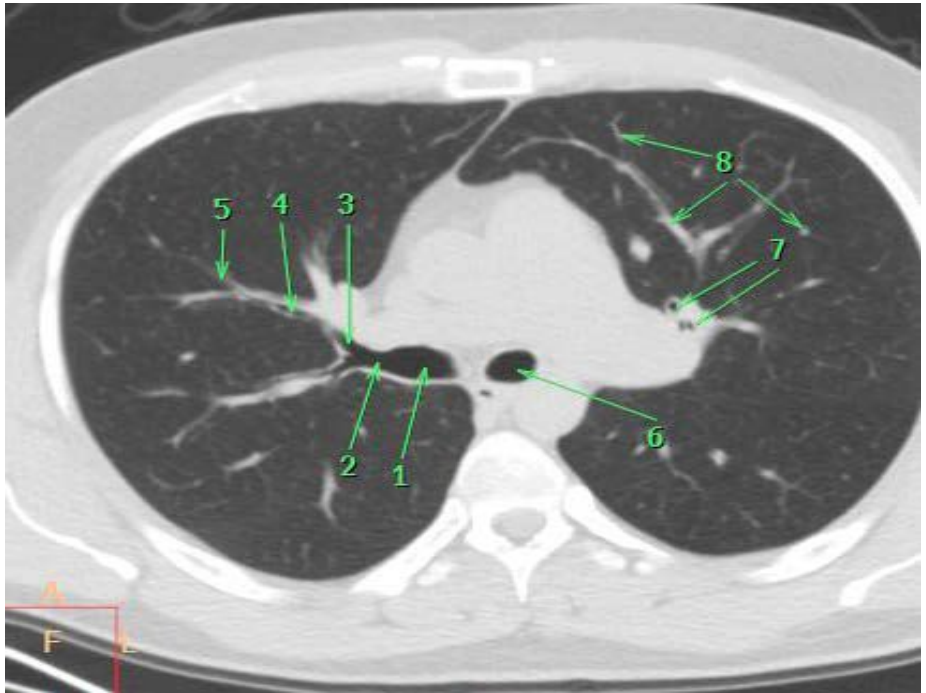




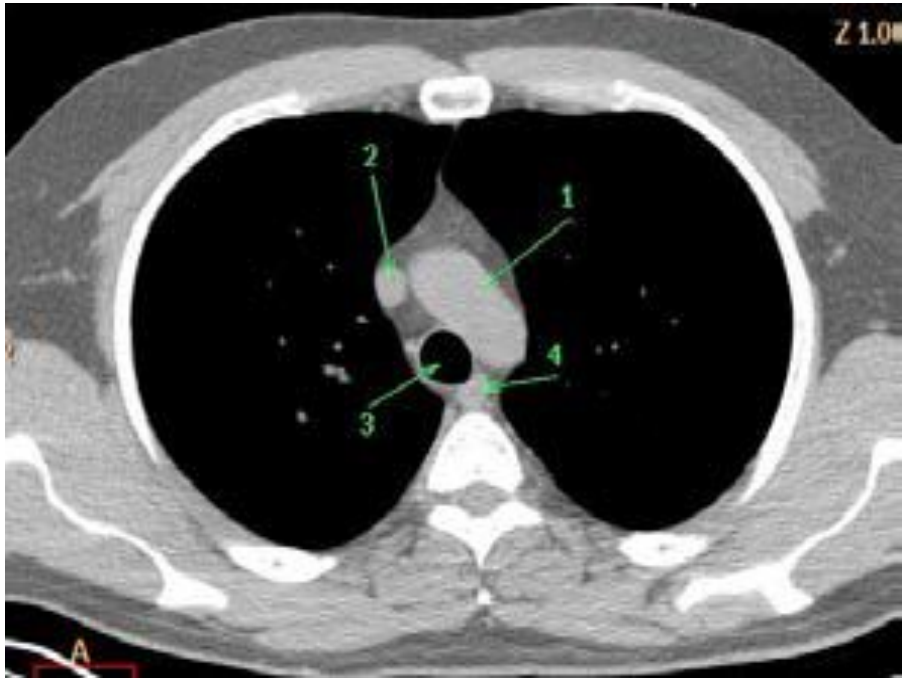
- Bronchopulmonary segments during computed tomography



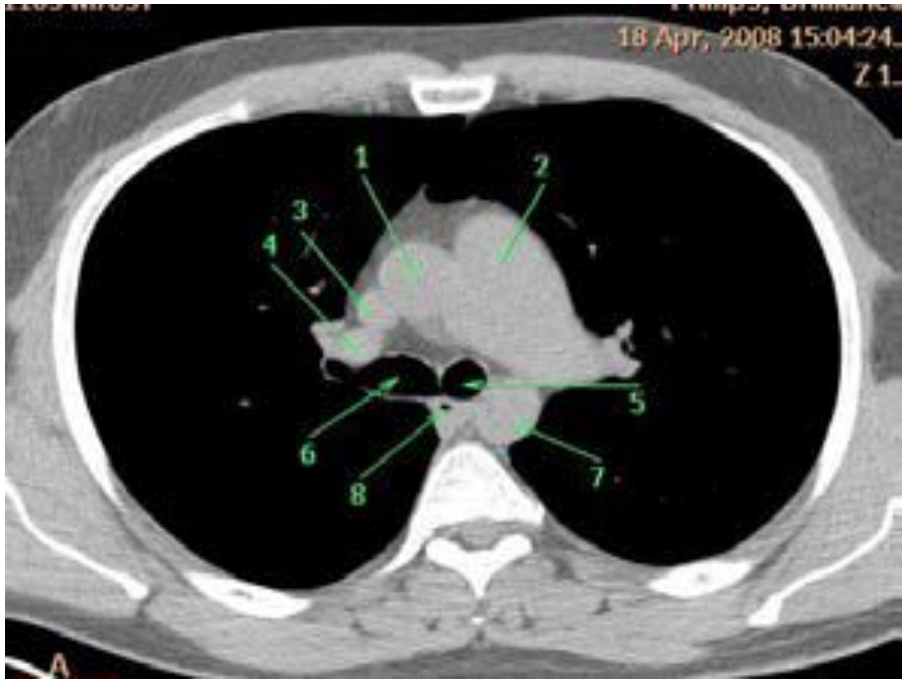
CT at the level of the upper lobes in the pulmonary window: 1-contour of the upper mediastinum; 2-trachea; 3, 4-pulmonary pattern – various sections of small branches of blood vessels



CT at the level of tracheal bifurcation in the pulmonary window: 1-lumen of the right main bronchus;
2-right upper lobe bronchus;
3-anterior segmental bronchus of the upper lobe of the right lung;
4-subsegmental bronchus;
5 – bronchial lumen of the V-th order;
6 – left main bronchus;
7-cross-sections of segmental bronchi;
8-sections of vessels in different planes

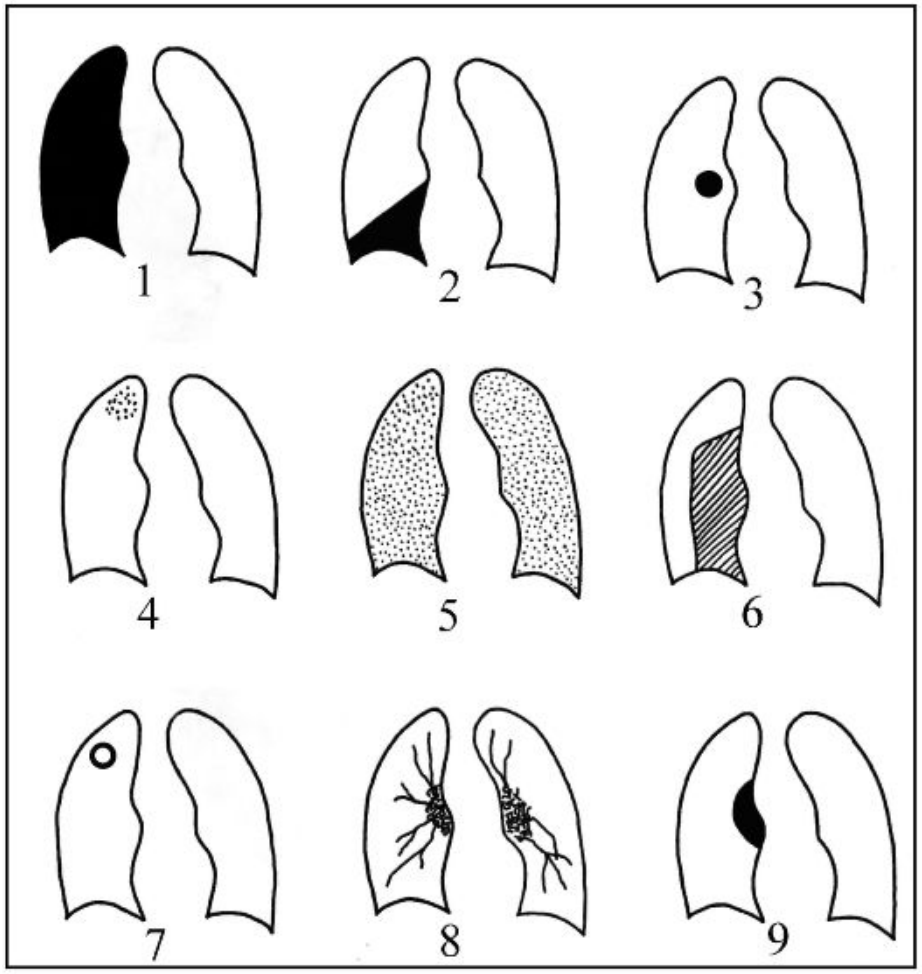


CT scan at the level of the aortic arch in the mediastinal window: 1 – the aortic arch;
2-superior vena cava;
3-trachea;
4-esophagus



CT at the level of the trunk of the aircraft in the mediastinal window: 1-ascending aorta;
2-the trunk of the pulmonary artery;
3-superior vena cava;
4-branch of the right pulmonary artery;
5 – left main bronchus;
6 – right main bronchus;
7-descending aorta;
8-esophagus

The main radiological syndromes of respiratory system damage



- 1. The syndrome of extensive (total and subtotal) shading.
- 2. Limited shading syndrome.
- 3. Round shadow syndrome.
- 4. The syndrome of limited focal dissemination.
- 5. The syndrome of extensive focal dissemination.
- 6. The syndrome of extensive enlightenment.
- 7. The syndrome of limited enlightenment.
- 8. The syndrome of changes in the pulmonary pattern.
- 9. Lung root change syndrome.

Chronic nonspecific lung diseases

- Chronic nonspecific lung diseases(CNL), a group of chronic diseases of the bronchopulmonary system, different in causes and mechanisms of development, but having a number of common clinical, functional and morphological manifestations: cough, shortness of breath, violation of bronchial patency, fibrosis, combined with destructive and inflammatory changes in the bronchi, blood vessels, lung parenchyma.
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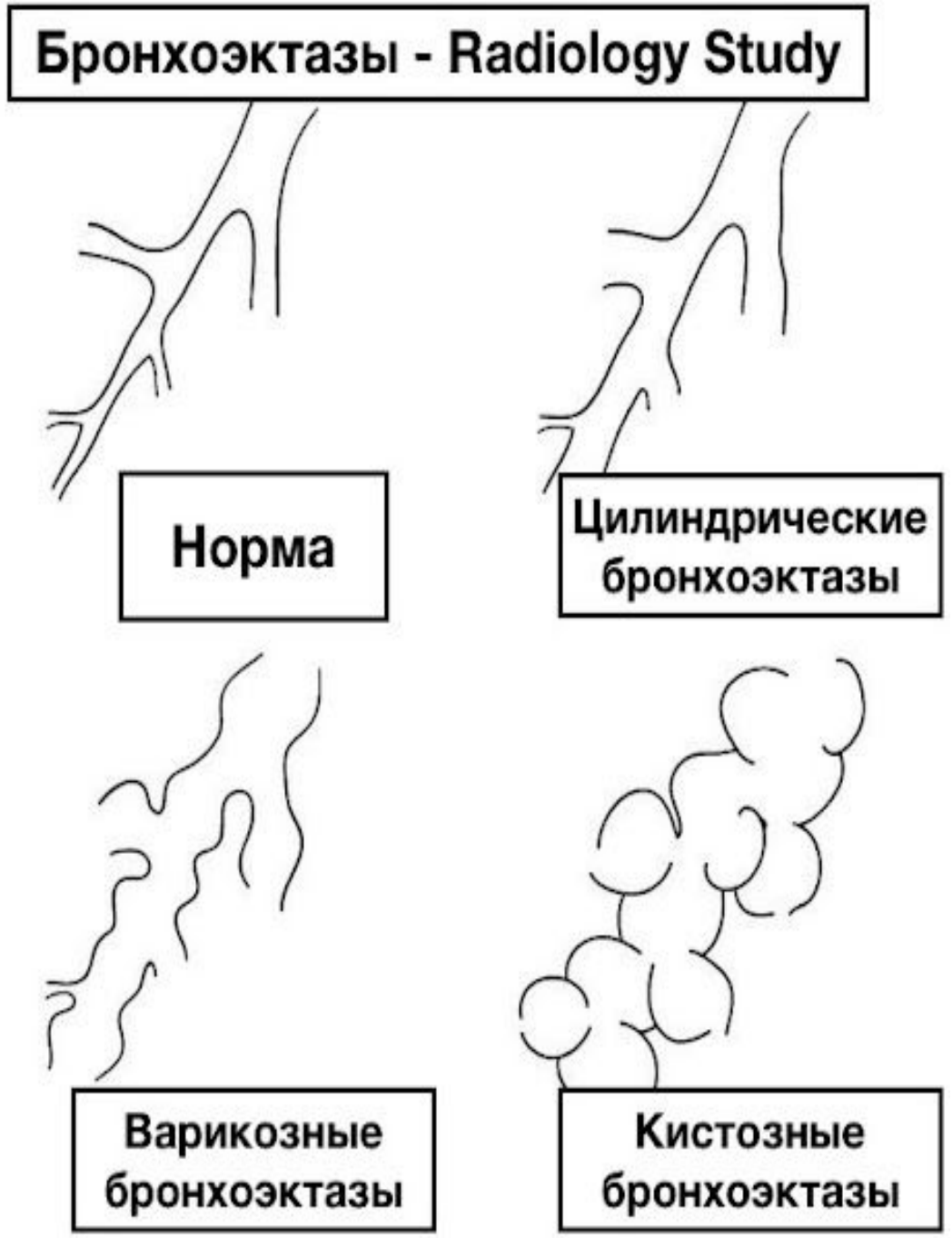
Chronic bronchitis

- **Chronic bronchitis** is a group of common diseases in which there is a diffuse inflammatory lesion of the bronchial tree. With chronic bronchitis: - a decrease in the structure of the lung root; some increase in it, vagueness; indistinctness of the contours; - an enhanced and greatly altered pulmonary pattern; - thickening of the walls of the bronchi (the so-called "tram rails")

Bronchiectasis

- persistent, irreversible expansion of the branches of the bronchial tree, caused by the destruction of the walls of the bronchi and / or a violation of neuromuscular tone due to inflammation, sclerosis, dystrophy, hypoplasia of their structural elements



- Bronchography: expansion of the bronchial lumen in bronchiectasis
-

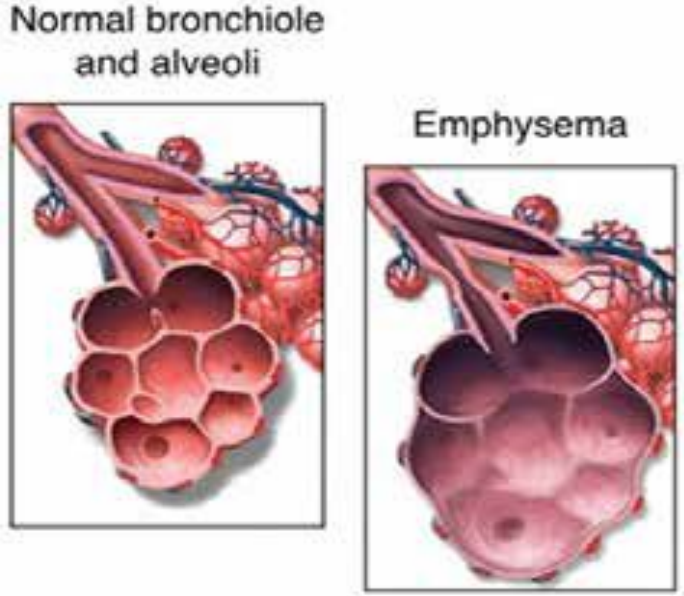
Bronchography. Bronchiectasis

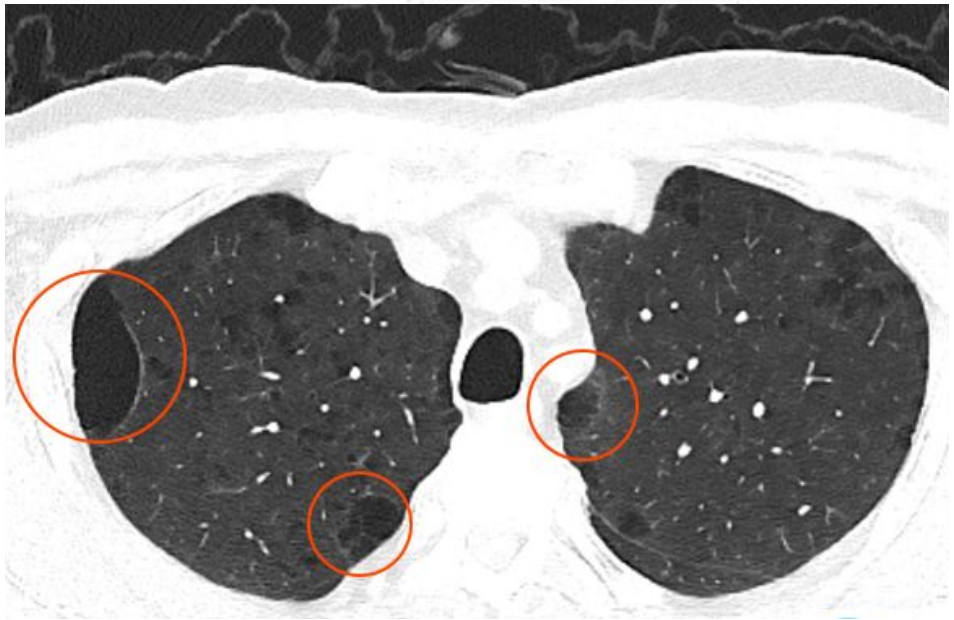
- Computed tomography: in bronchiectasis-visualization of the expansion of the bronchial lumen without artificial contrast

Computed tomography. Bronchiectasis

Emphysema syndrome of the lungs

- Emphysema of the lungs is an anatomical alteration of the lungs, accompanied by the destruction of the interalveolar septa and pathological expansion of the air spaces



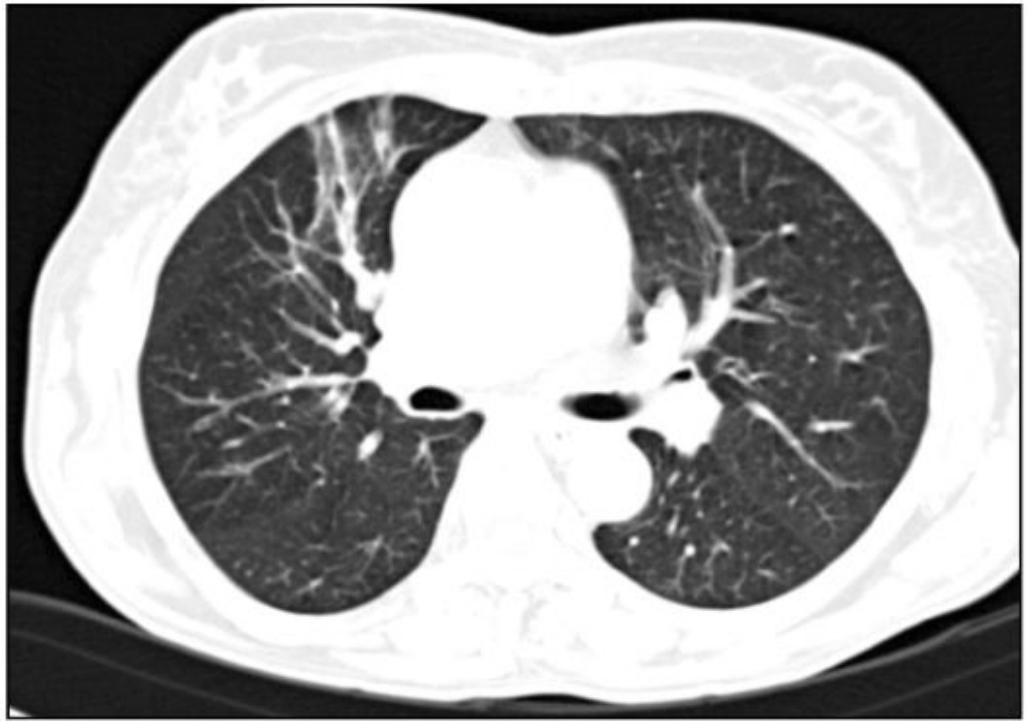


According to the degree of involvement in the pathological process of acinus, the following types of emphysema of the lungs are distinguished:

- **panlobular (panacinar)** - with the defeat of the whole acinus;
- **centrilobular (centriacinar**) – with a lesion of the respiratory alveoli in the central part of the acinus;
- **perilobular (periacinar)** - with a lesion of the distal part of the acinus;
- **okolorubtsovaya (irregular or uneven);** bullous (bullous lung disease in the presence of air cysts-bull).
- There are particularly distinguished congenital lobar emphysema of the lungs and McLeod's syndrome-emphysema with an unclear etiology, affecting one lung.

Pneumosclerosis

- **Pneumosclerosis** is a pathological replacement of connective lung tissue, as a result of inflammatory or dystrophic processes in the lungs, accompanied by a violation of elasticity and gas exchange in the affected areas.



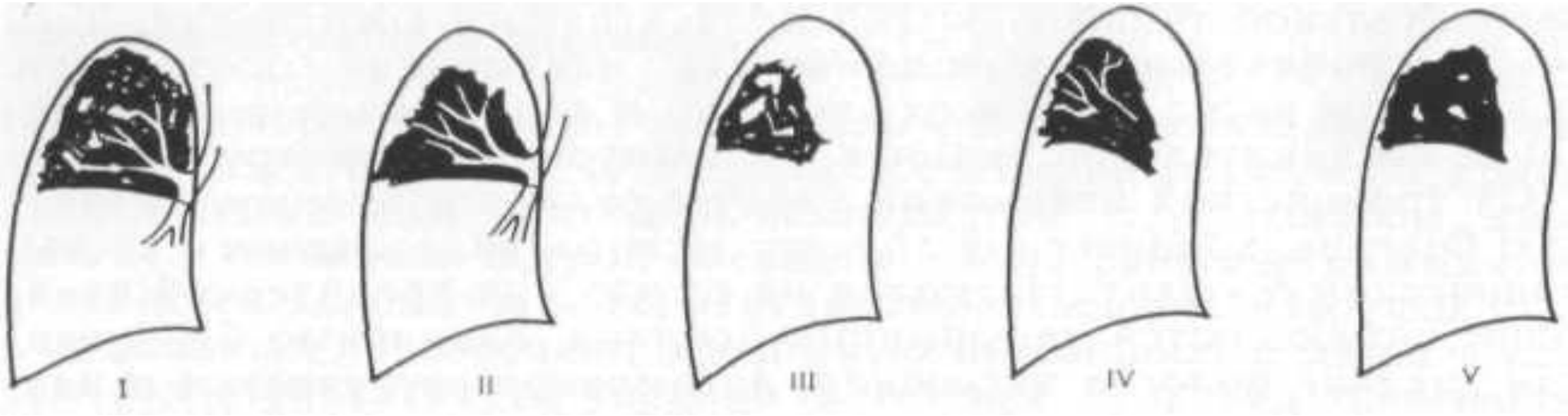
Limited pneumosclerosis of the antero-basal segment of the right lung

According to the degree of severity of the replacement of the pulmonary parenchyma with connective tissue, there are:

- **pneumofibrosis** - severe limited changes in the lung parenchyma, alternating with air lung tissue
- **pneumosclerosis** (actually pneumosclerosis) - compaction and replacement of the lung parenchyma with connective tissue;
- **pneumocyrrosis** is an extreme case of pneumosclerosis, characterized by complete replacement of the alveoli, vessels and bronchi with connective tissue, pleural compaction, displacement of the mediastinal organs to the affected side.

CHRONIC NONSPECIFIC PNEUMONIA

- a limited inflammatory process of the lungs, characterized by the development of purulent-necrotic foci, the growth of connective tissue and foci of productive inflammation. The term "chronic nonspecific pneumonia" refers to chronic inflammation of all structures in the affected area, the proliferation of connective tissue and abscessing (destruction).



- Variants of the tomographic picture in chronic pneumonia, occupying a fraction (I, II) or segment (III-V).