

# **Radiologic diagnostics of chest cavity**

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**Визуальная диагностика**

**КазНМУ**

# Methods of respiratory organs examination:

Radiography

Radioscopy

Bronchography

Angiopulmonography

Ultrasound diagnostics

CT scan

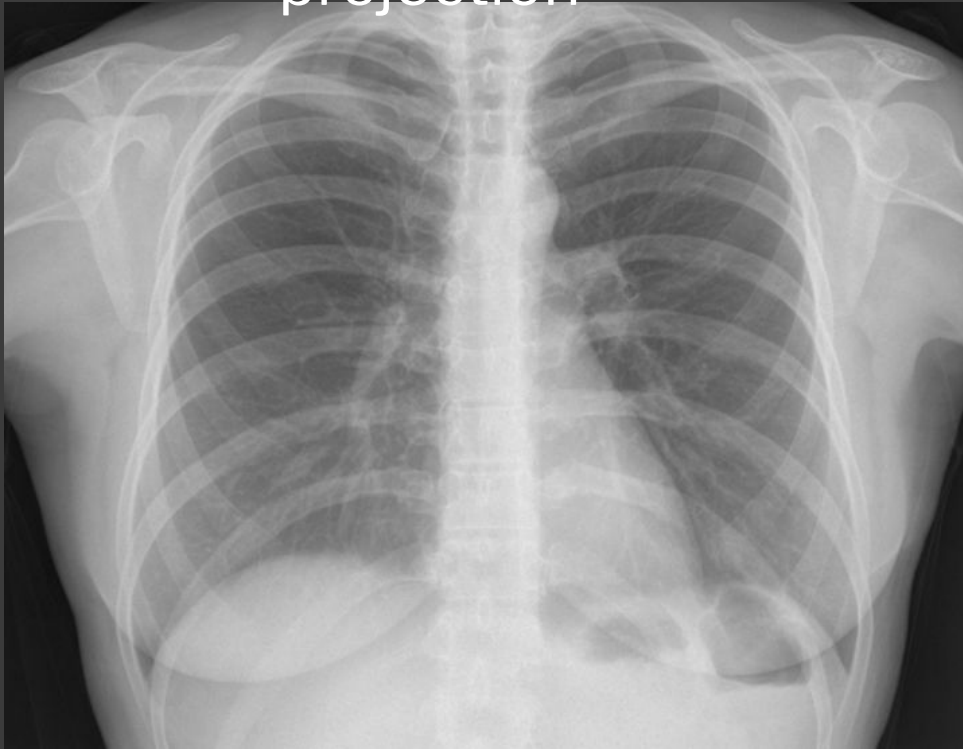
Magnetic resonance imaging

Radionuclide Diagnostics

PET

# Radiography of chest organs

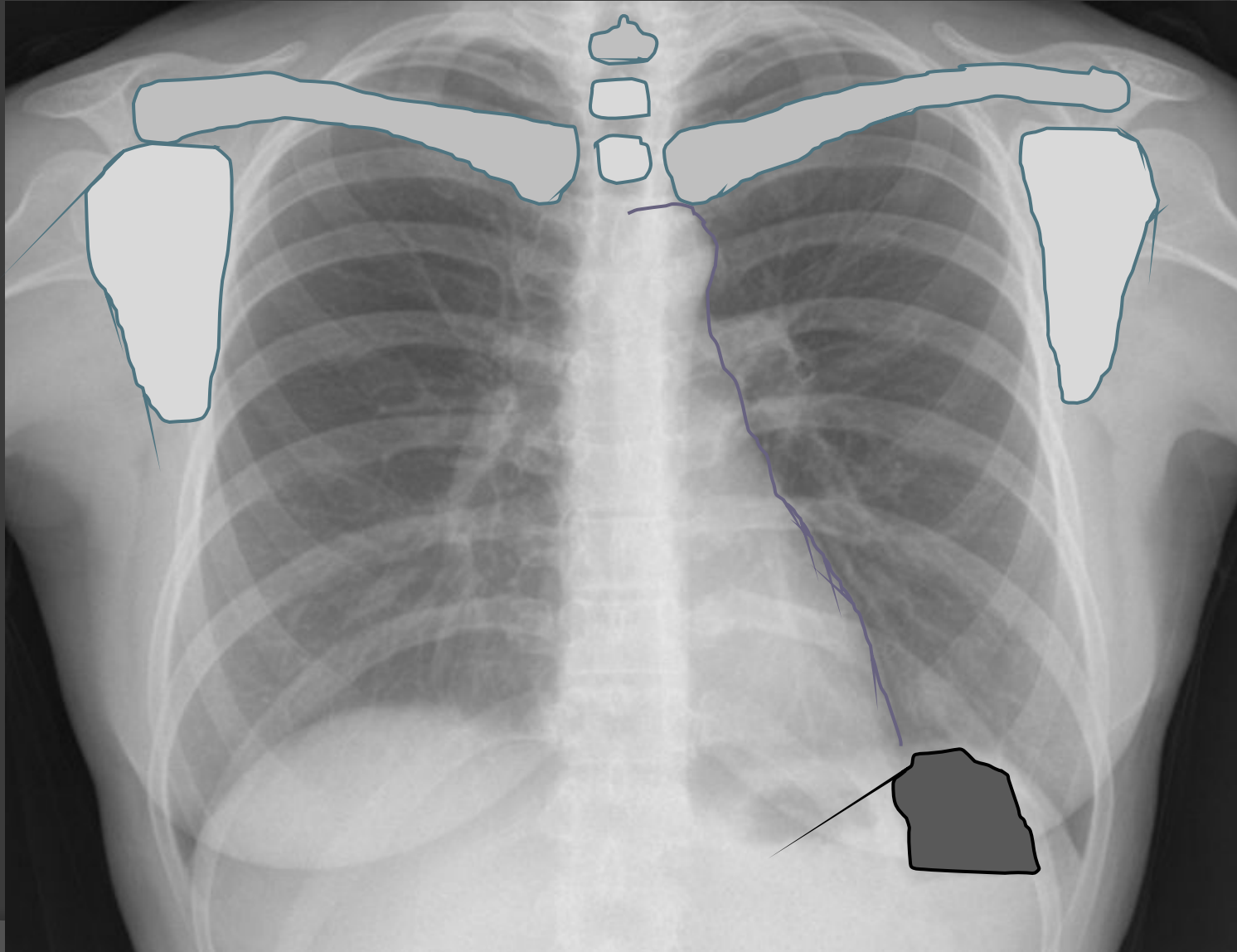
Direct  
projection



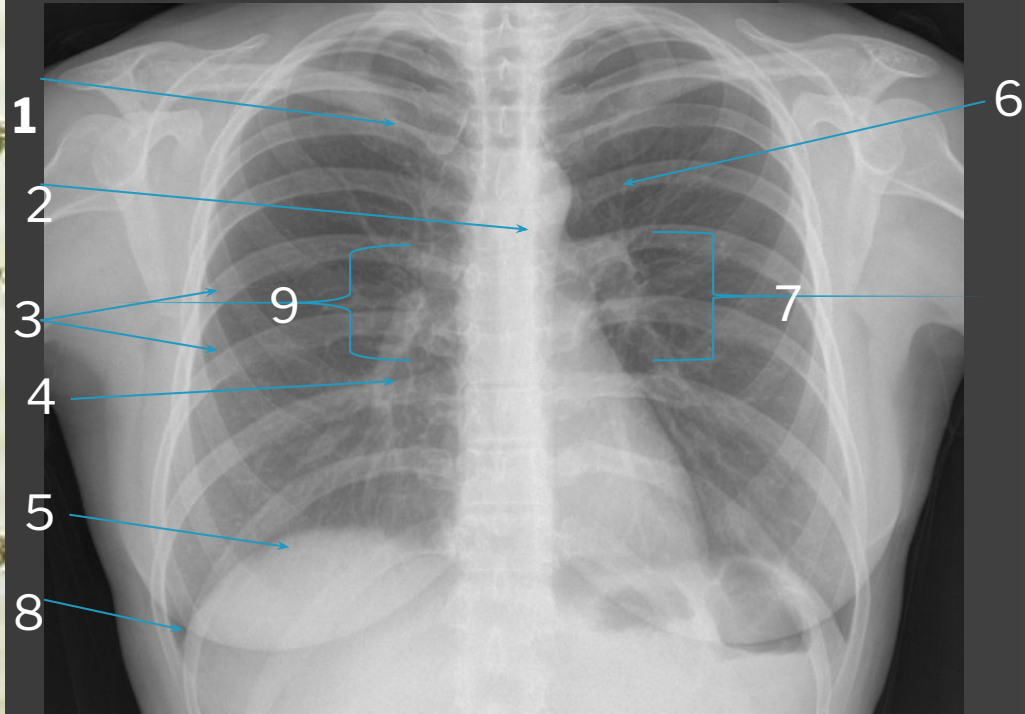
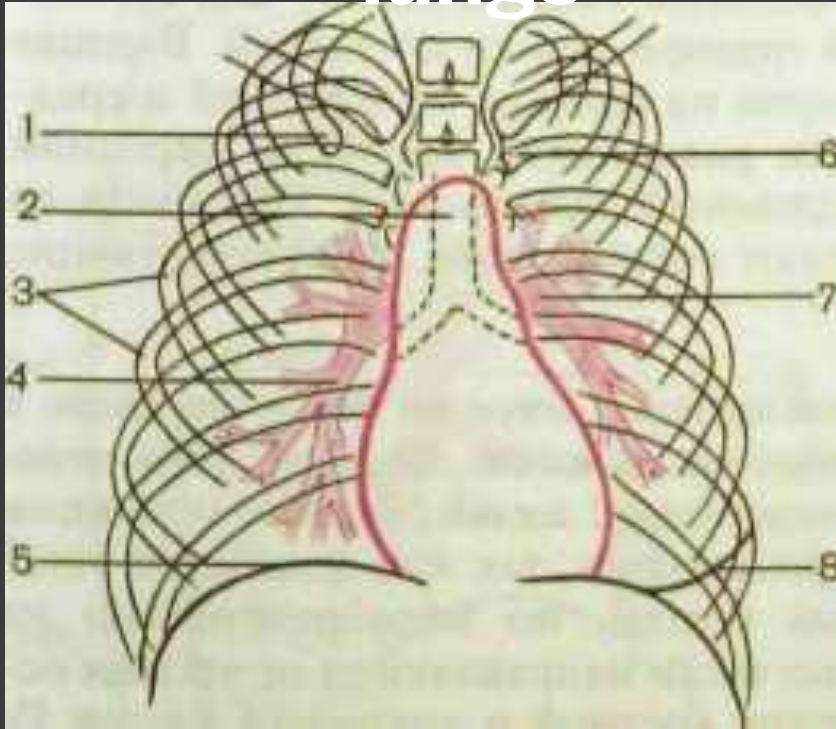
Lateral  
projection



# Correct position of patient

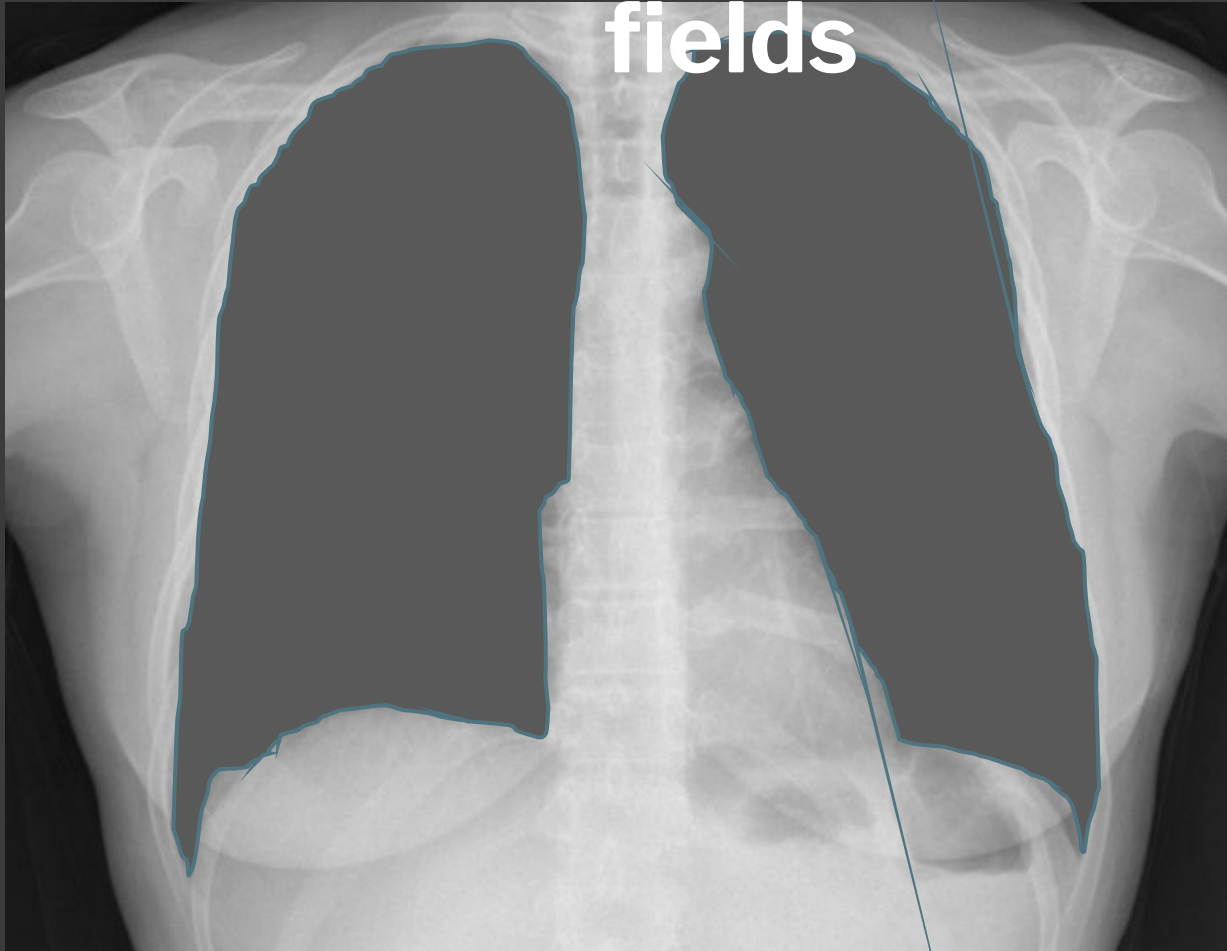


# Normal X-ray anatomy of the lungs



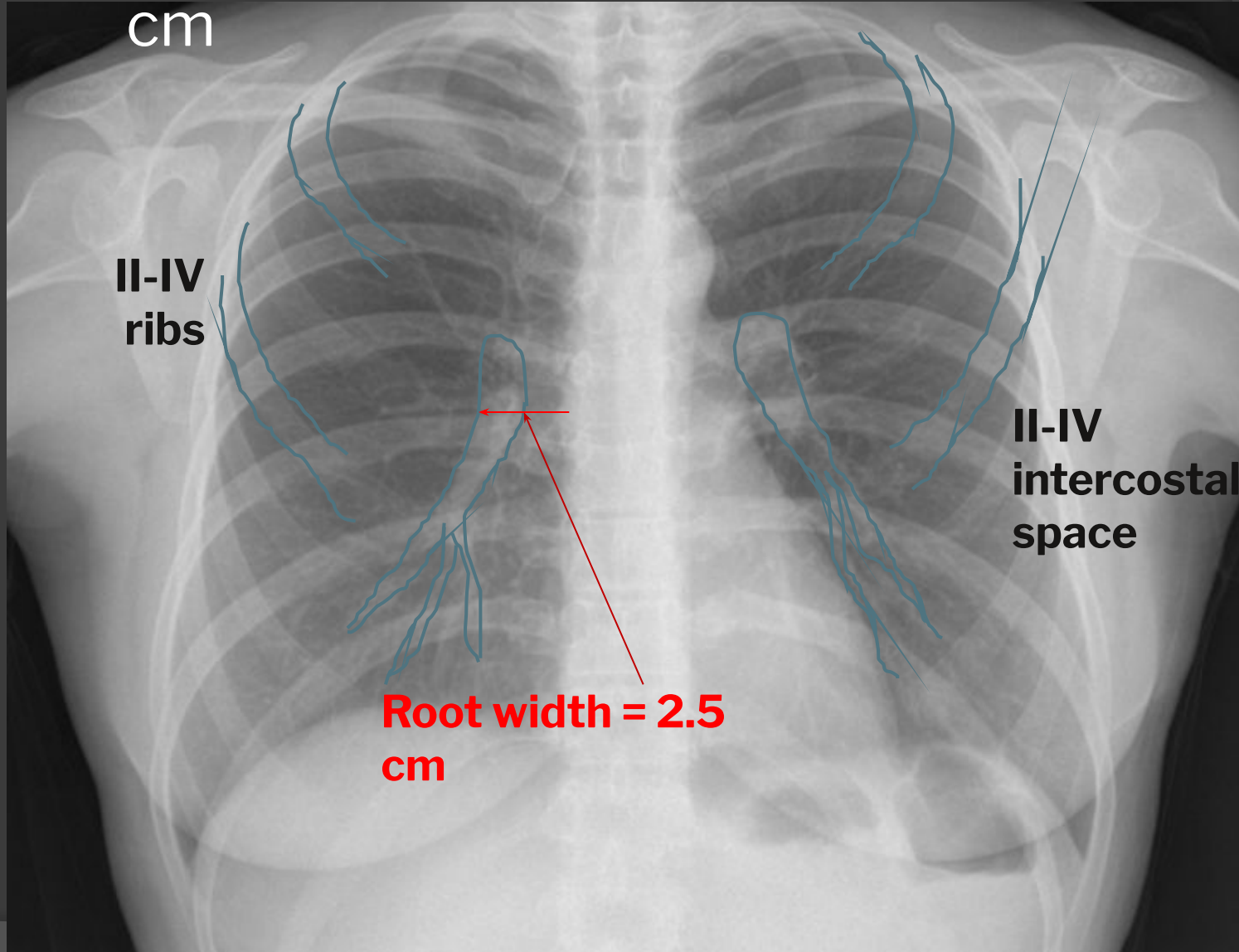
- 1 — anterior end of rib; 2 — trachea and major bronchi; 3 — ribs;  
4 — right lower-lobe artery; 5 — diaphragm; 6 — posterior end of rib;  
7 — root of the left lung; 8 — left breast contour, 9- root of

# Pulmonary fields

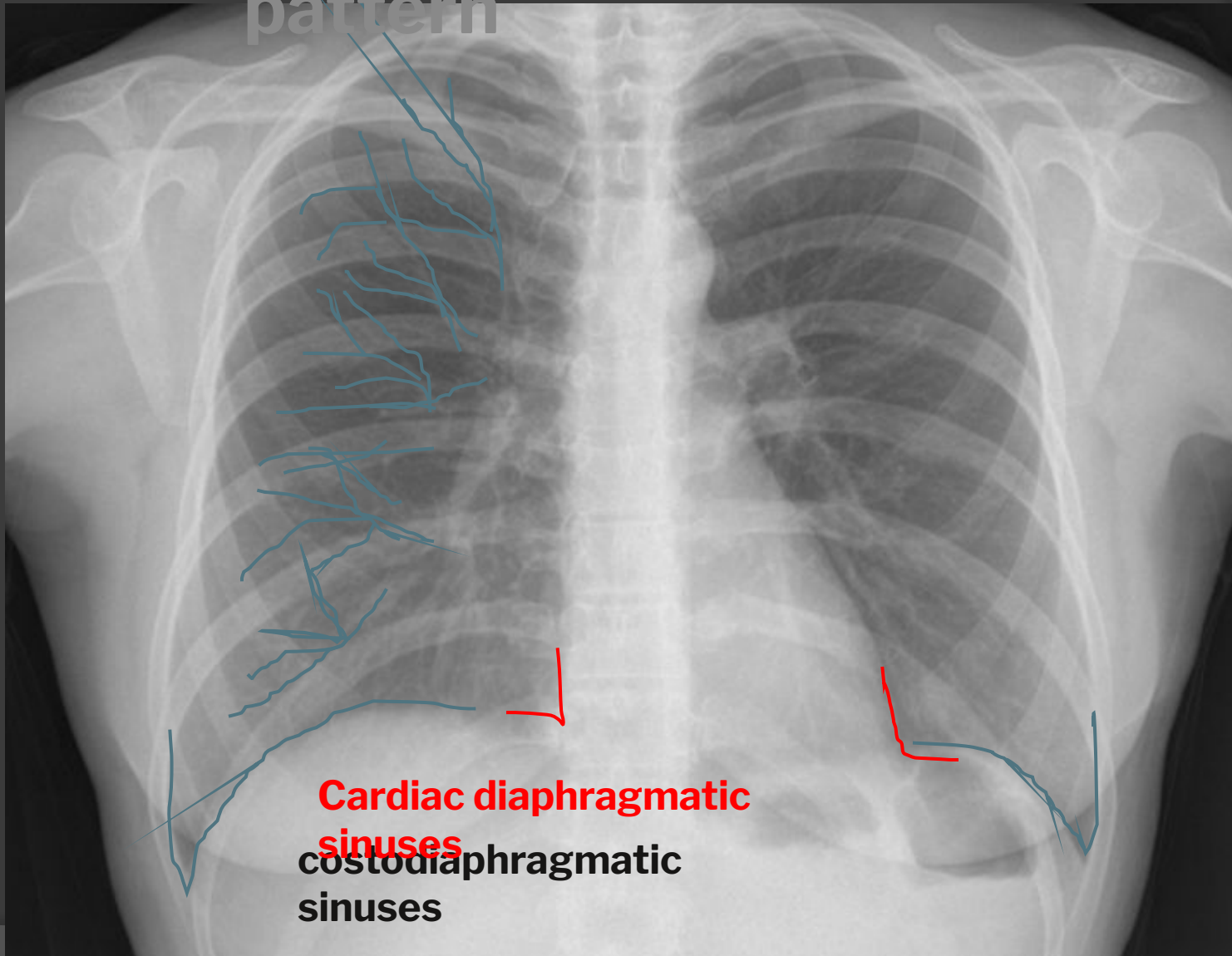


# Roots of the lungs

the left root above the right is 1-1.5  
cm



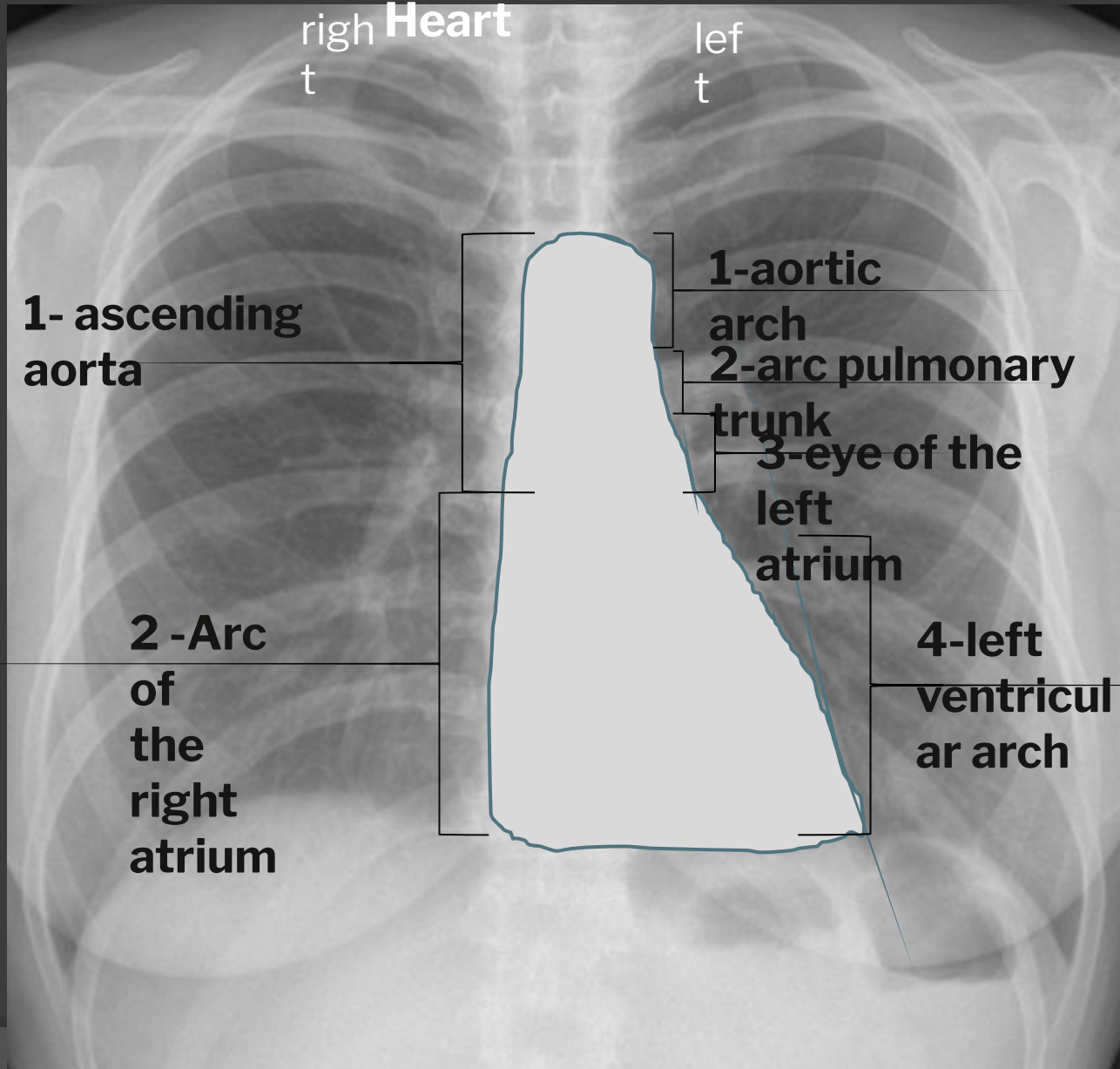
# Pulmonary pattern



**Cardiac diaphragmatic  
sinuses**  
costodiaphragmatic  
sinuses



# SHADOW OF THE HEART



Cardiothoracic  
index =

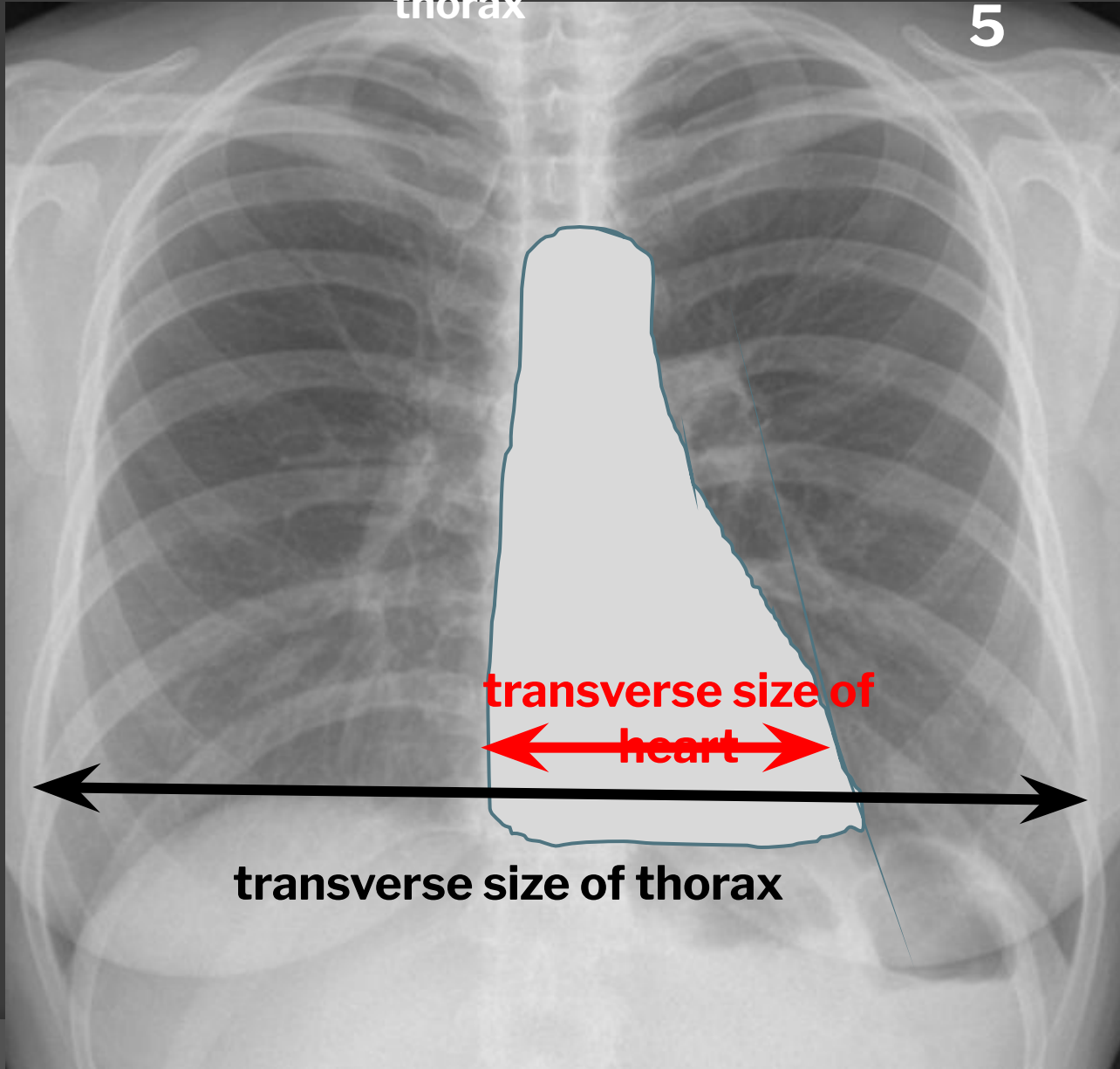
transverse size of heart



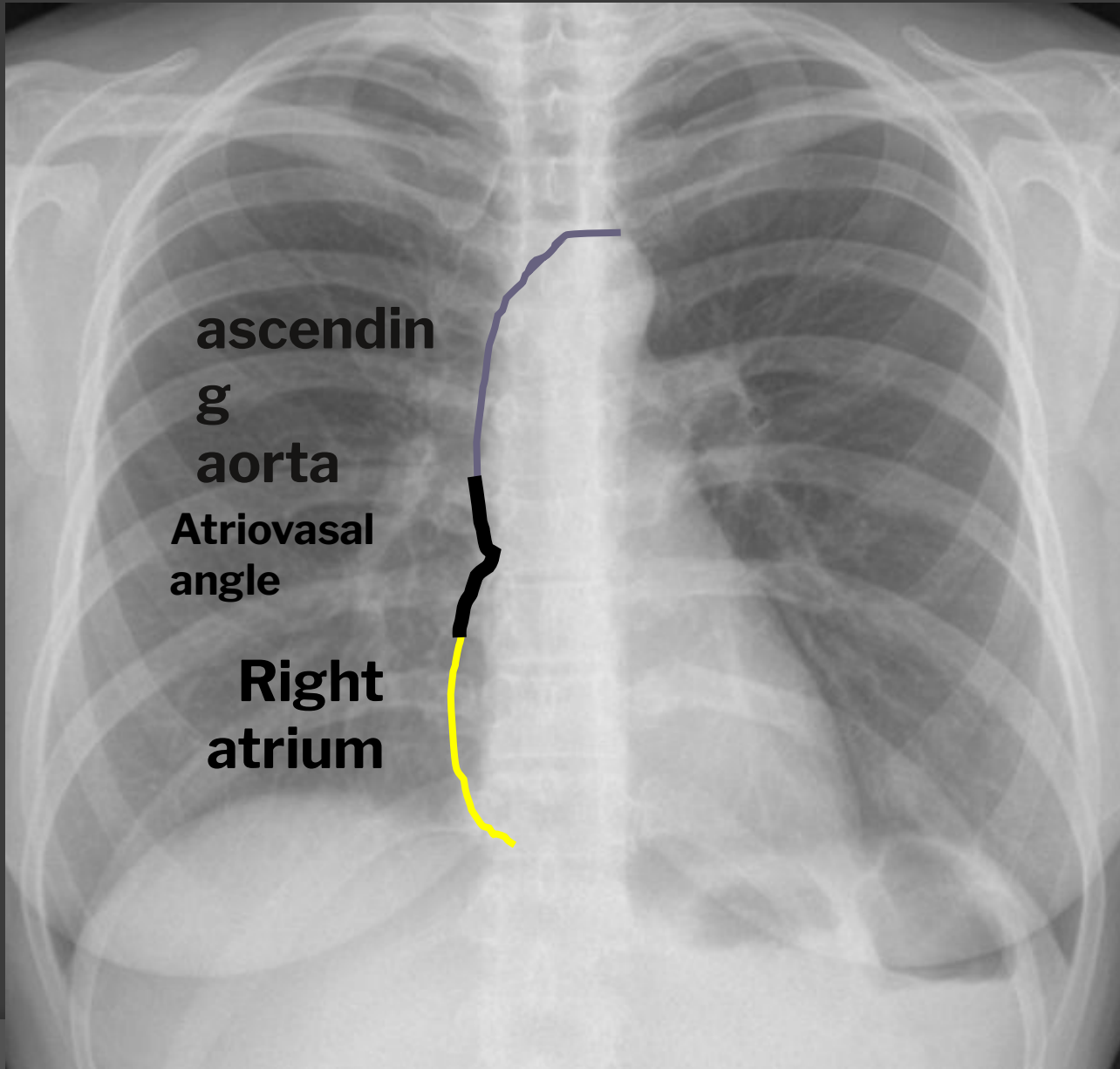
=

transverse size of  
thorax

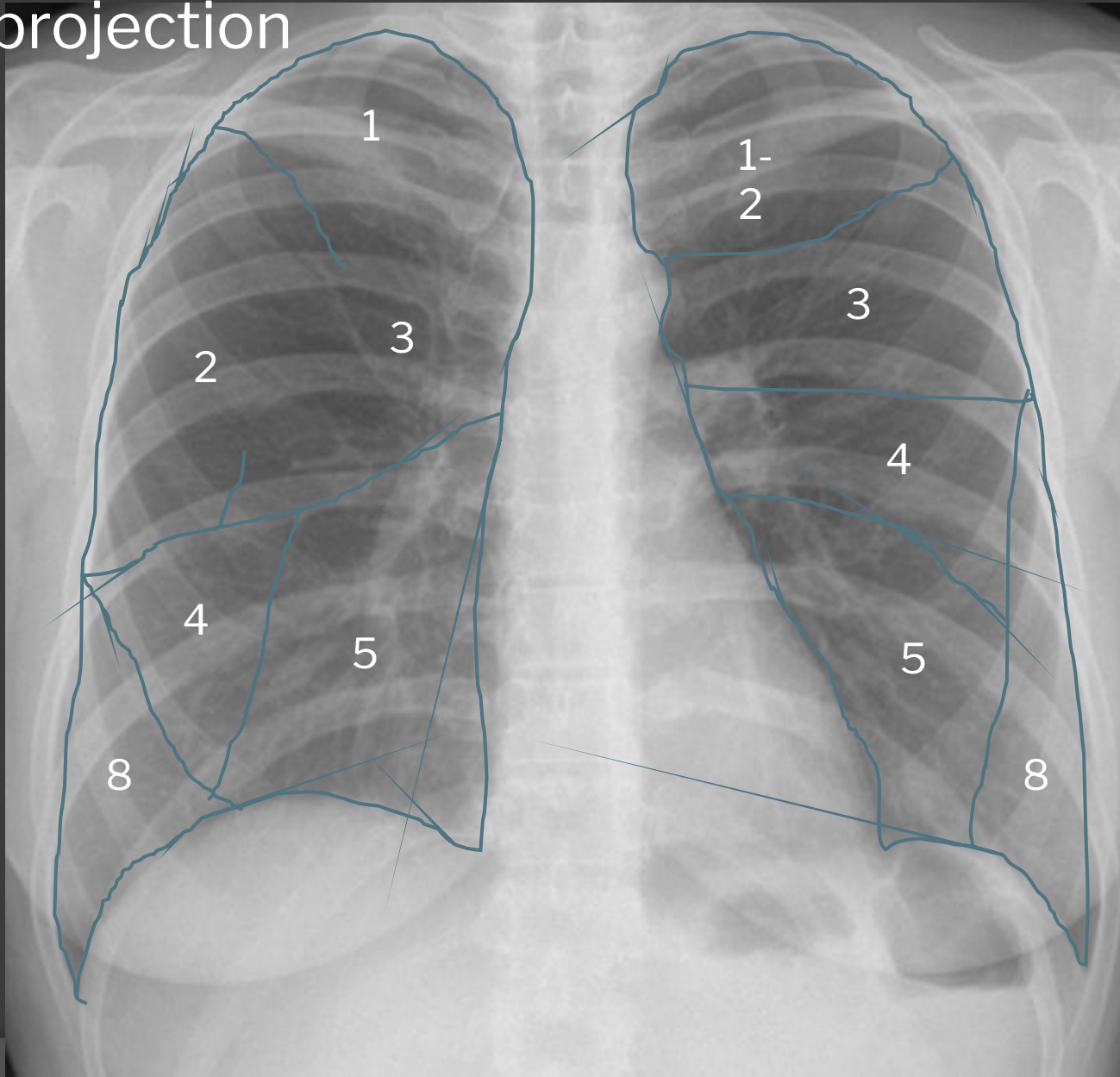
0,4-0,  
5



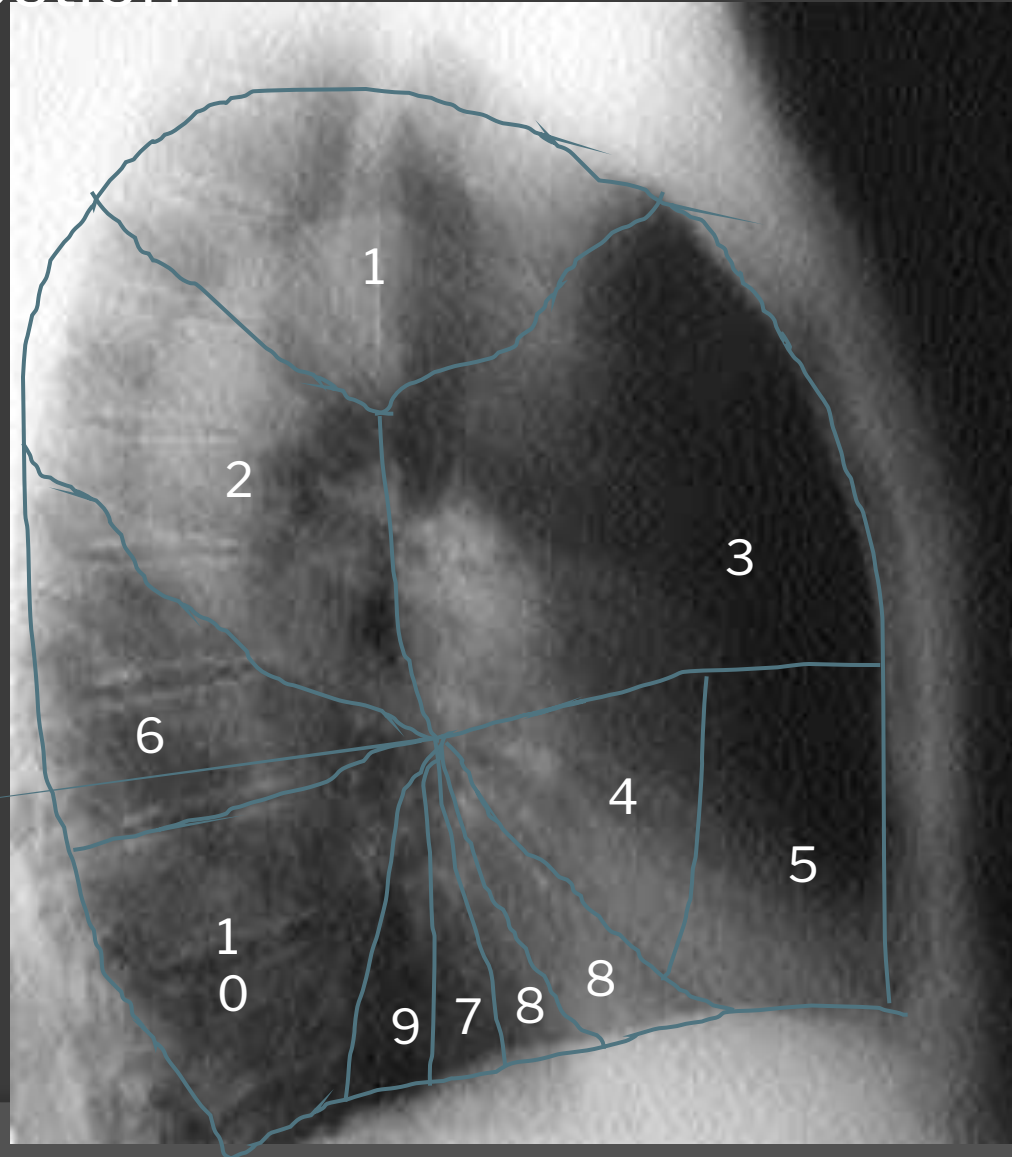
# Atriovasal angle



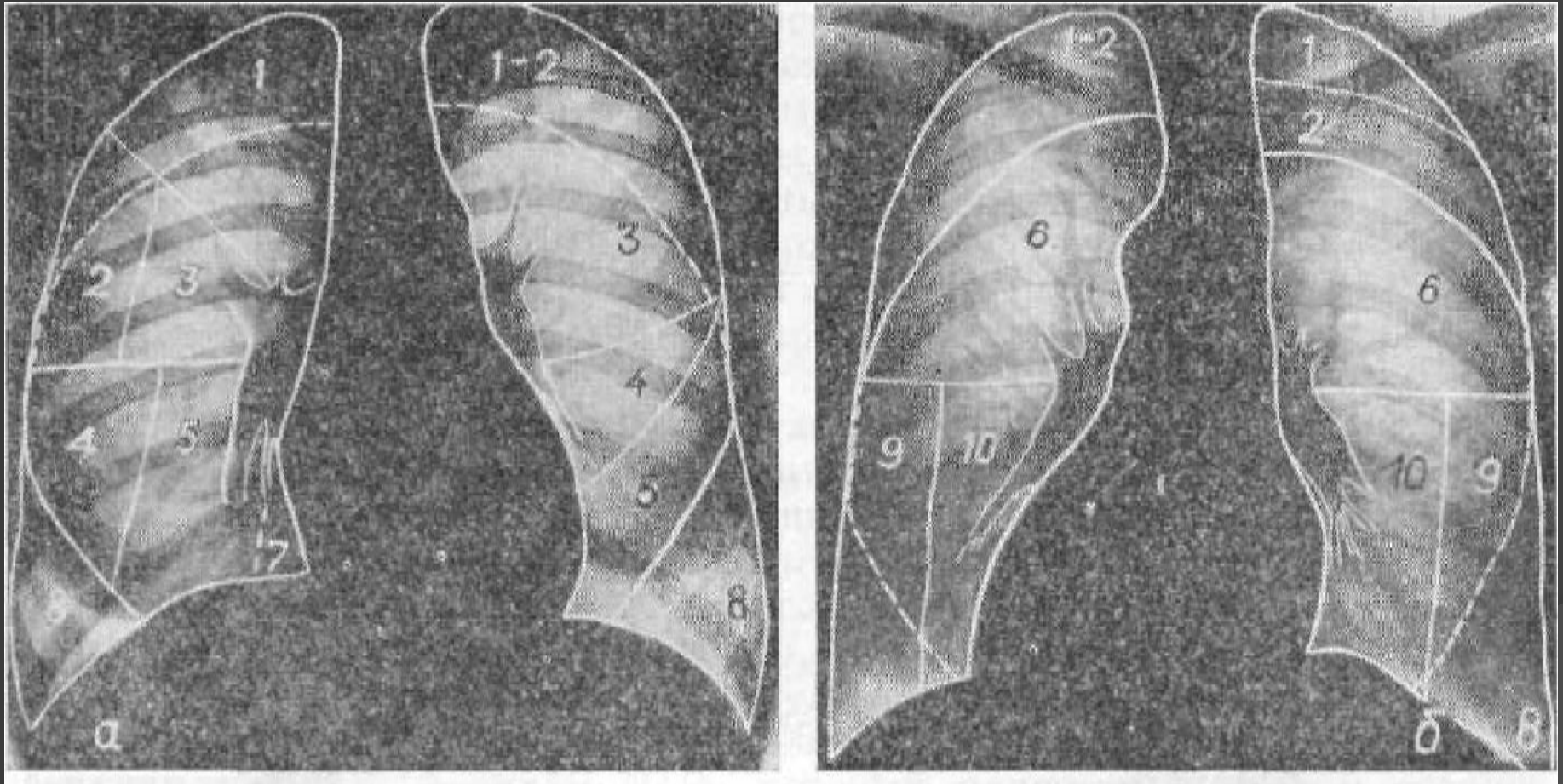
# Segments of the lungs in a straight projection



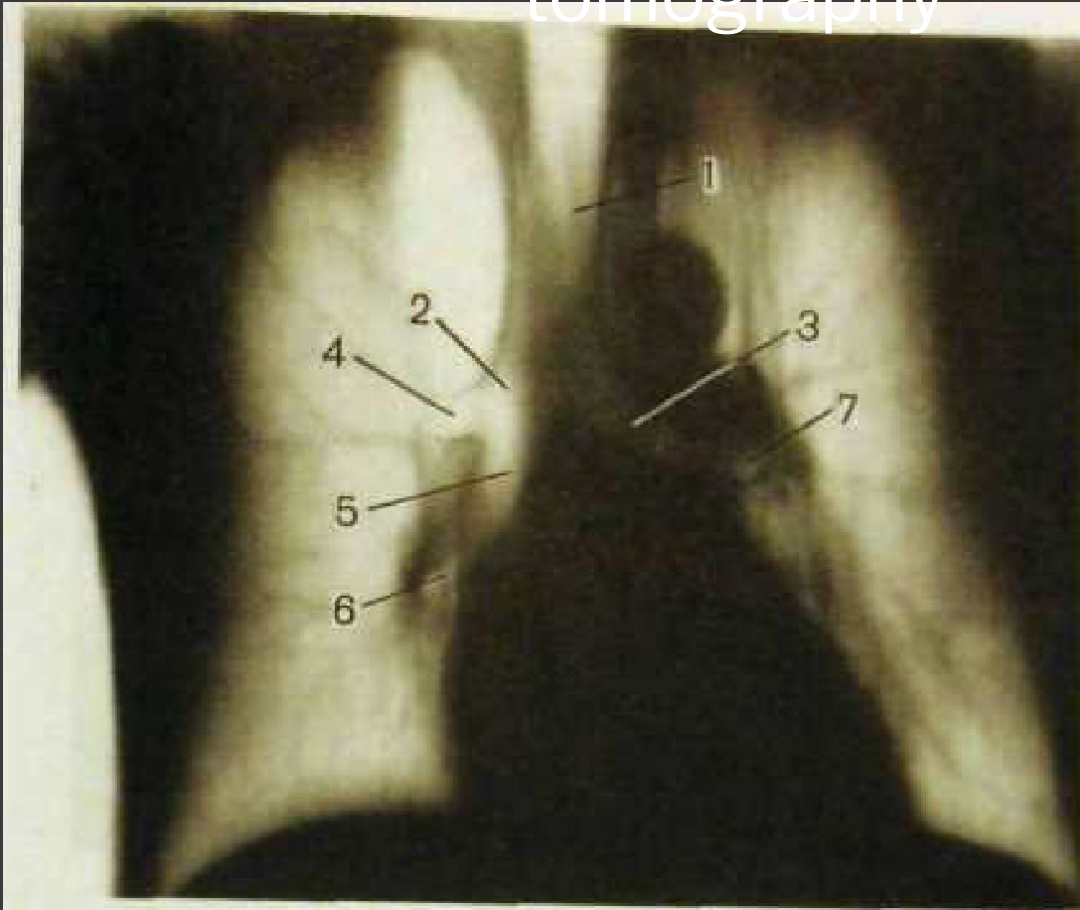
# Lung segments in lateral projection



Segments of the lungs in a straight projection (front, back)

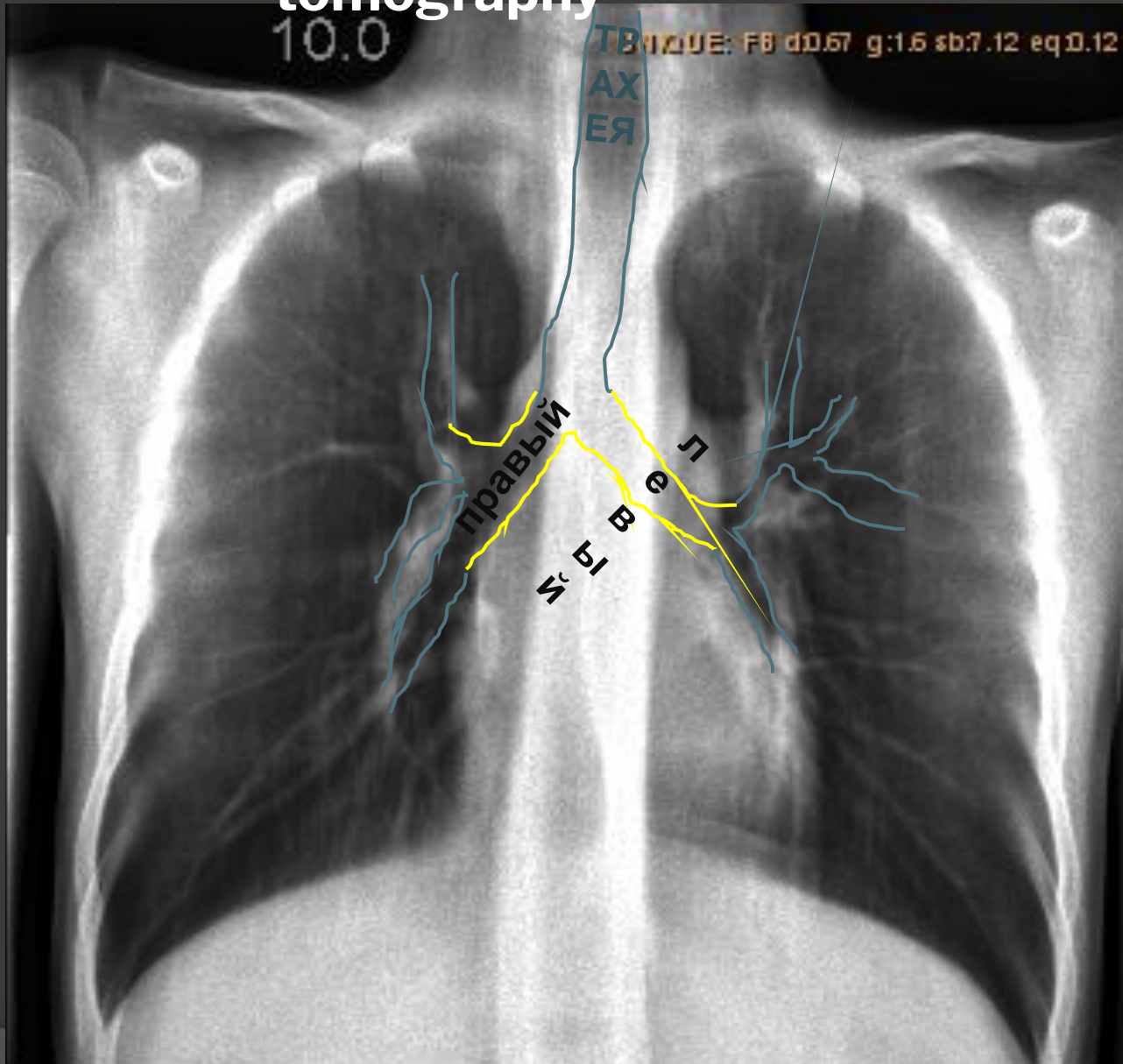


# Median tomography



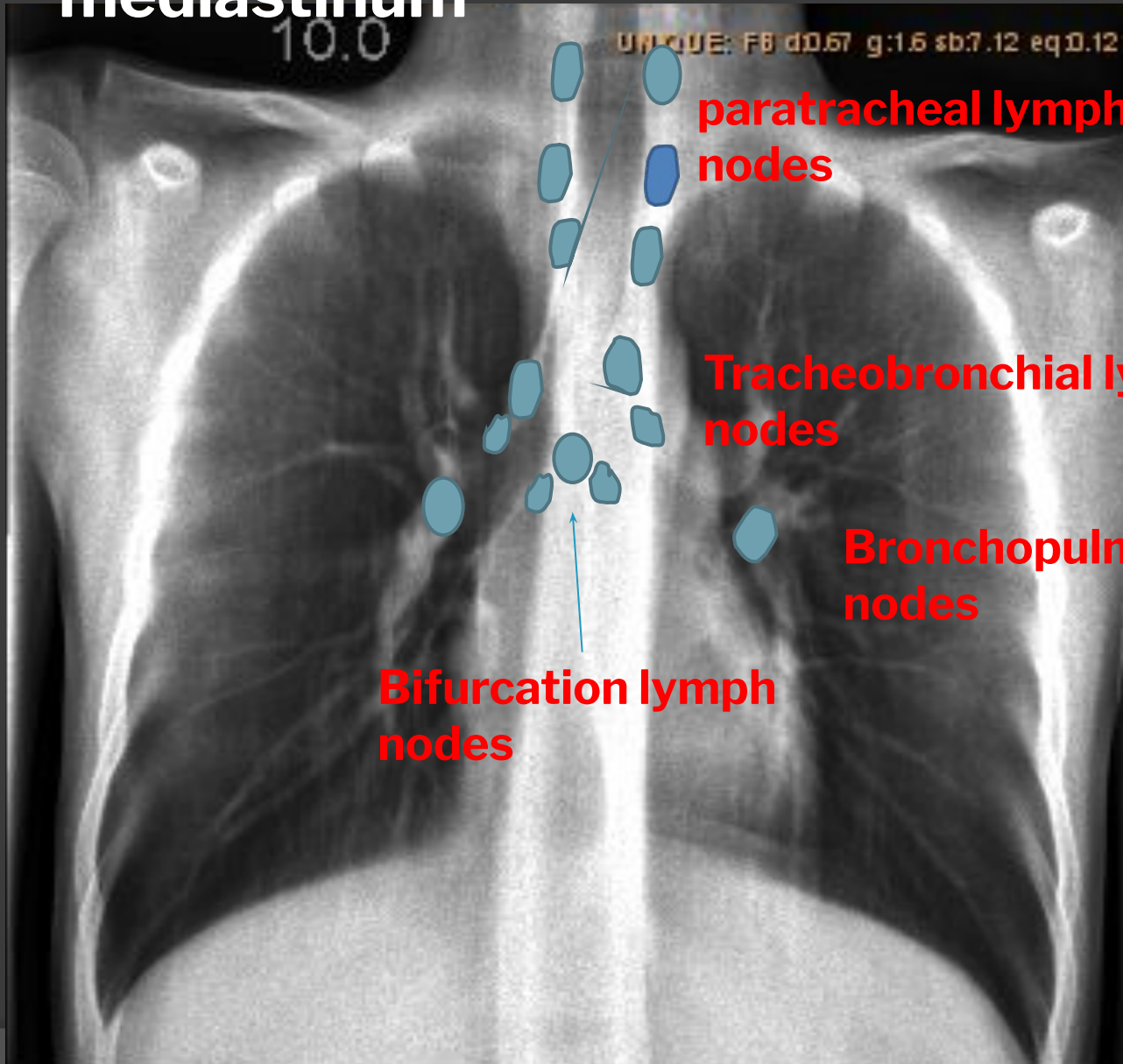
- 1-trachea**
- 2-right main bronchus**
- 3-left main bronchus**
- 4-right upper lobe  
bronchus**
- 5-right mid-lobe  
bronchus**
- 6-right lower lobe  
bronchus**
- 7-left upper lobe  
bronchus**

# Linear tomography





# Lymph nodes of the mediastinum



Art. carotis comm. dext.    Art. carotis comm. sin.

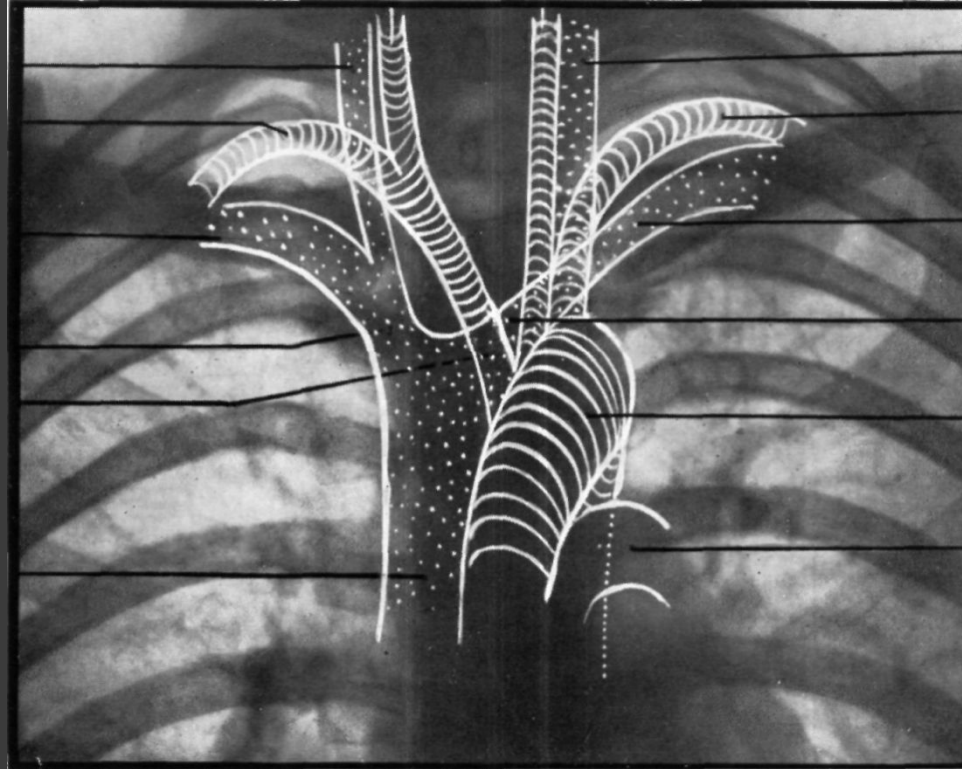
V. jugularis int. dext.

Art. subclavia  
dext.

V. subclavia  
dext

V. anonyma  
dext.  
Art. anonyma  
dext.

V. cava sup.



V. jugularis int. sin.

Art. subclavia sin.

V. subclavia sin.

V. anonyma sin.

Arcus  
aortae

Art. pulm. sin.

# X-ray examination methods

- Radiography
- Radioscopy
- Linear tomography
- Fluorography

# Radioscopy

X-ray examination method in which an X-ray image of an object is obtained on the monitor screen in **real time**.

# Radioscopy



X-ray tube

X-ray radiation

fluorescent screen



## Indications:

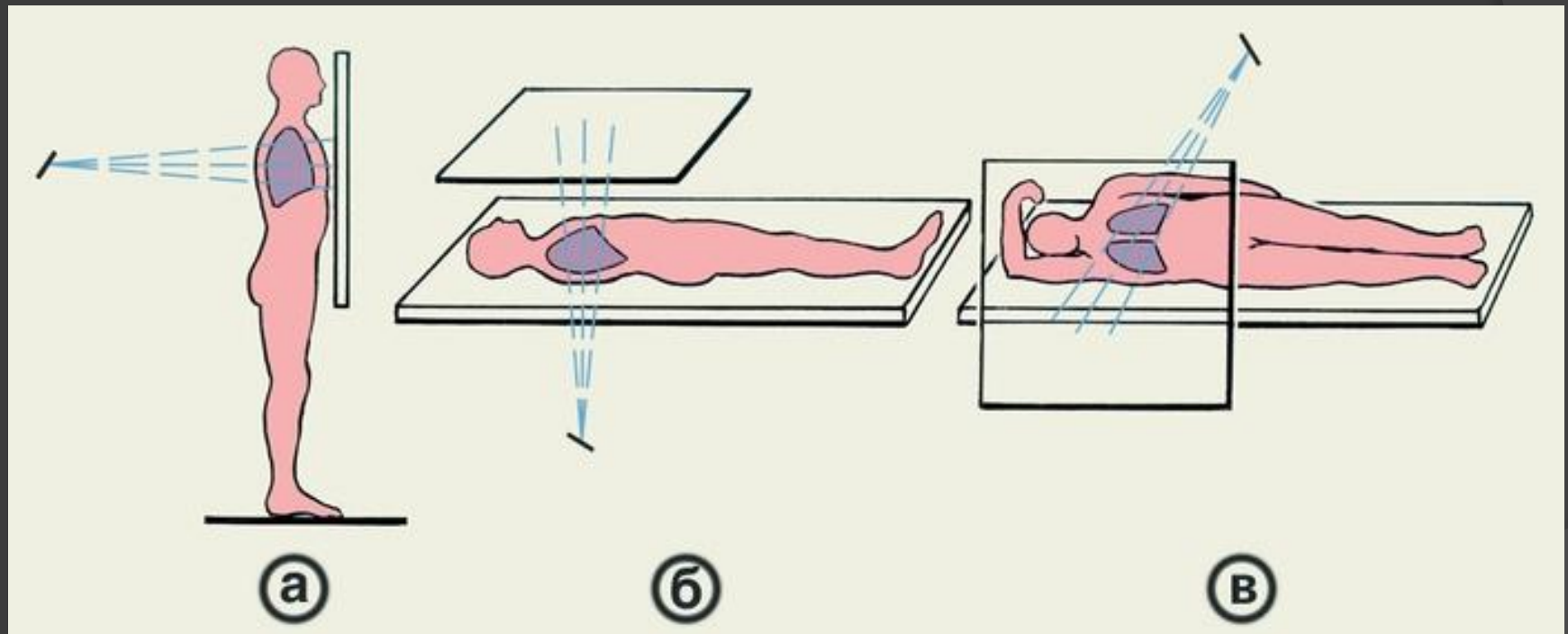
- polypositional study
- real-time evaluation of the function
- conducting the catheterization, angioplasty under the control of radioscopy

## Disadvantages:

- high radiation load
- subjectivity of data
- lack of documentation

# Methods of radioscopy

a - orthoscopy, b - trochoscopy,  
v-lateroscopy





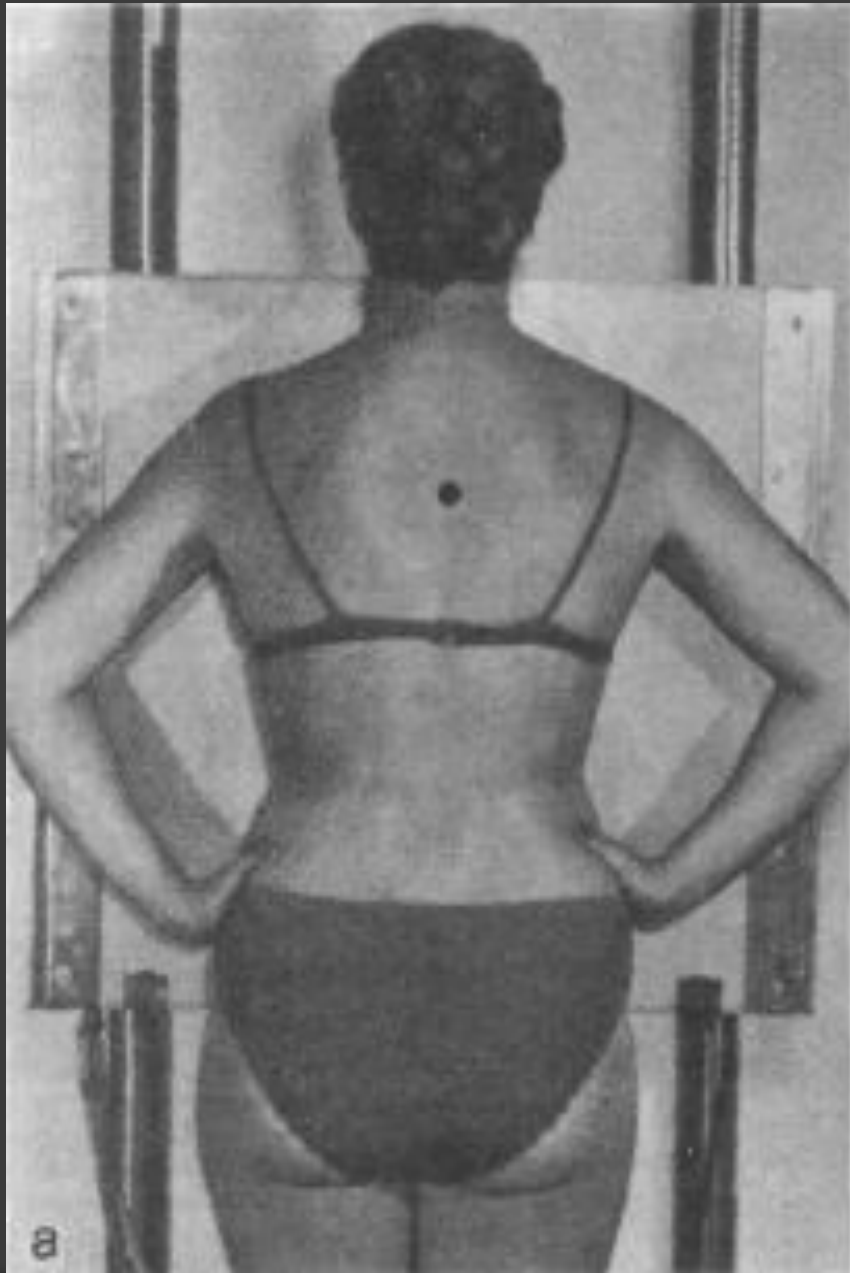


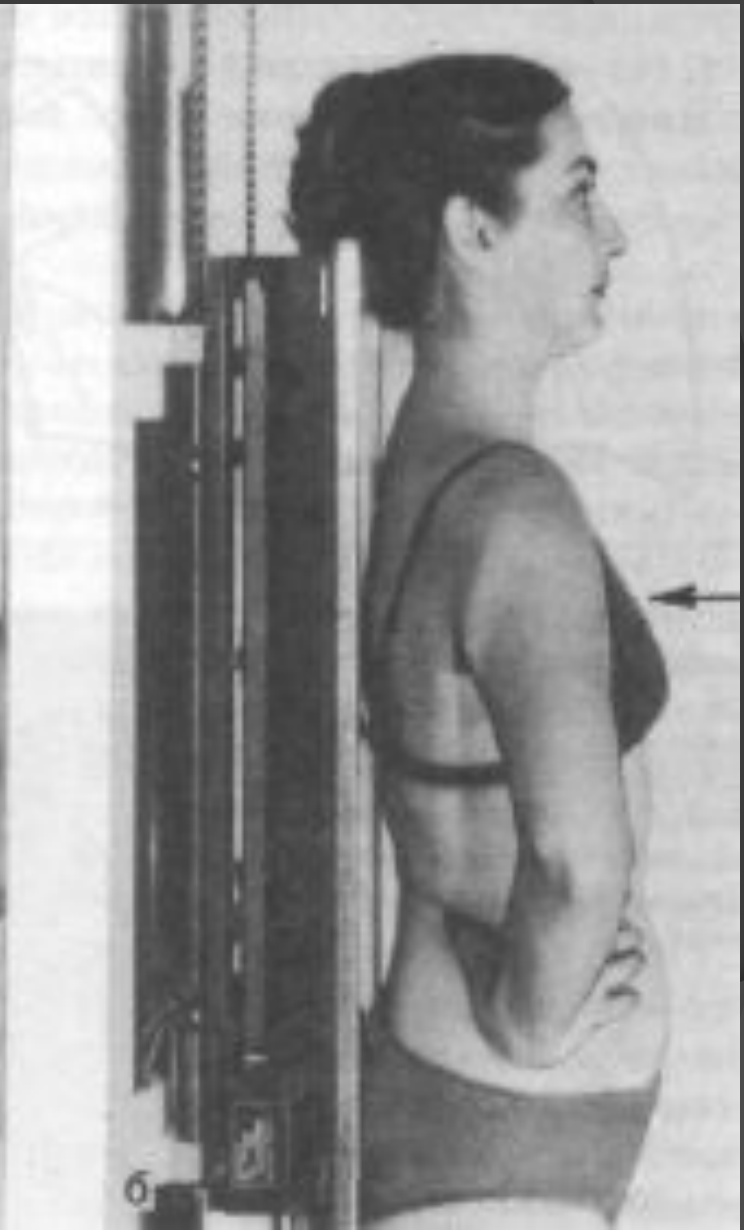
# Radiography

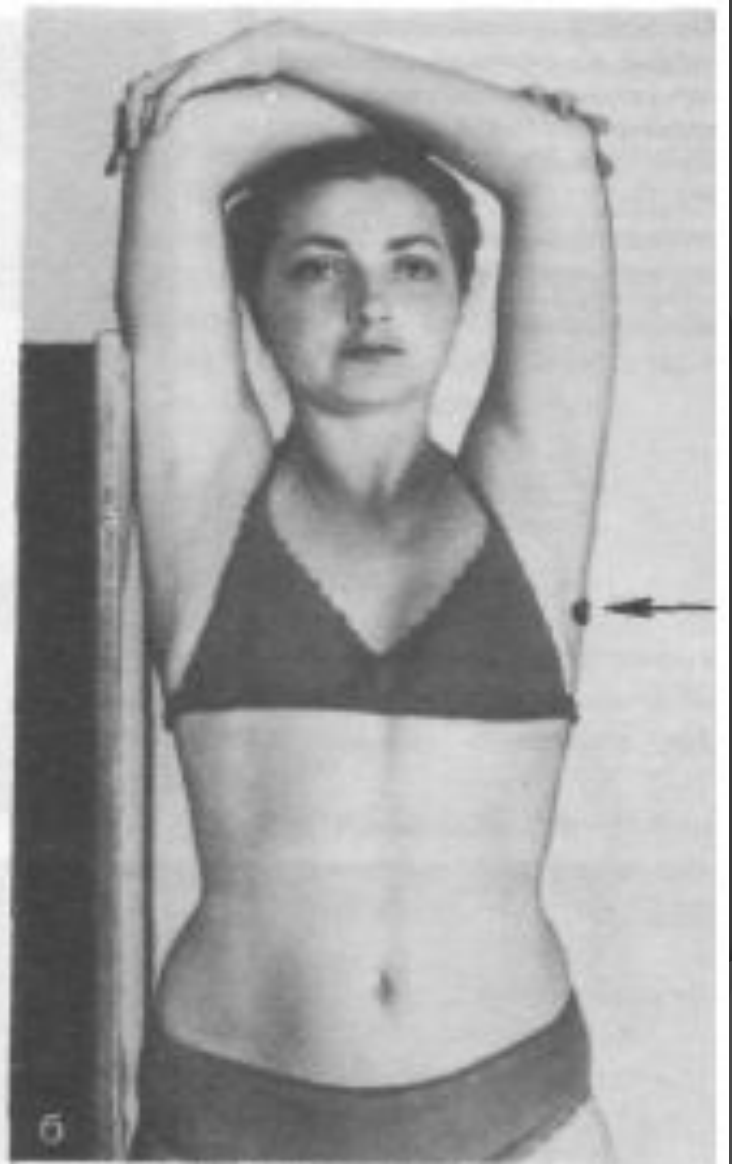
**An X-ray examination method in which a fixed X-ray image of an object is obtained on a film or in computer memory.**

## Advantages of radiography:

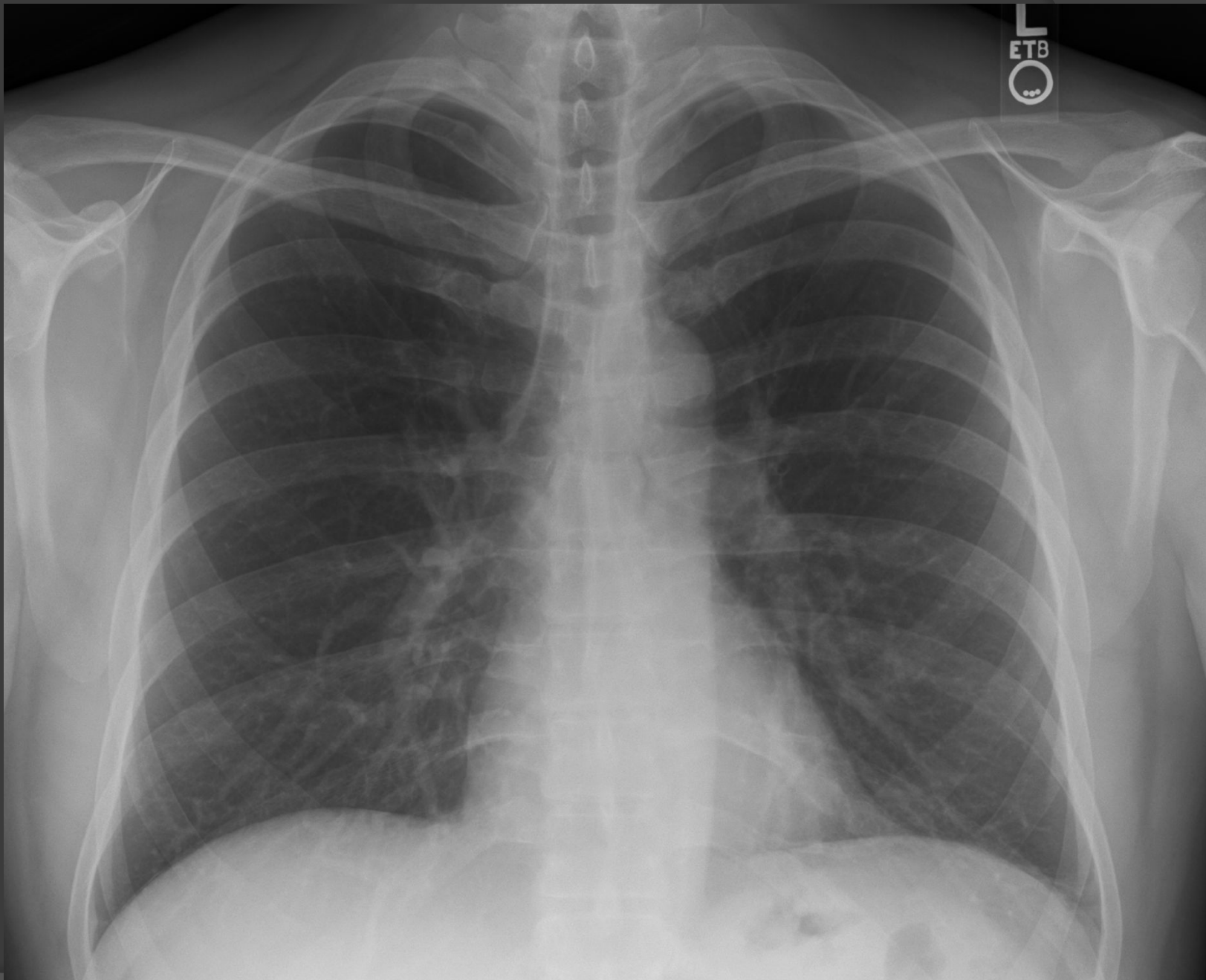
- better detectability of small parts
- less radiation load
- the possibility of an objective assessment for follow-up and comparison

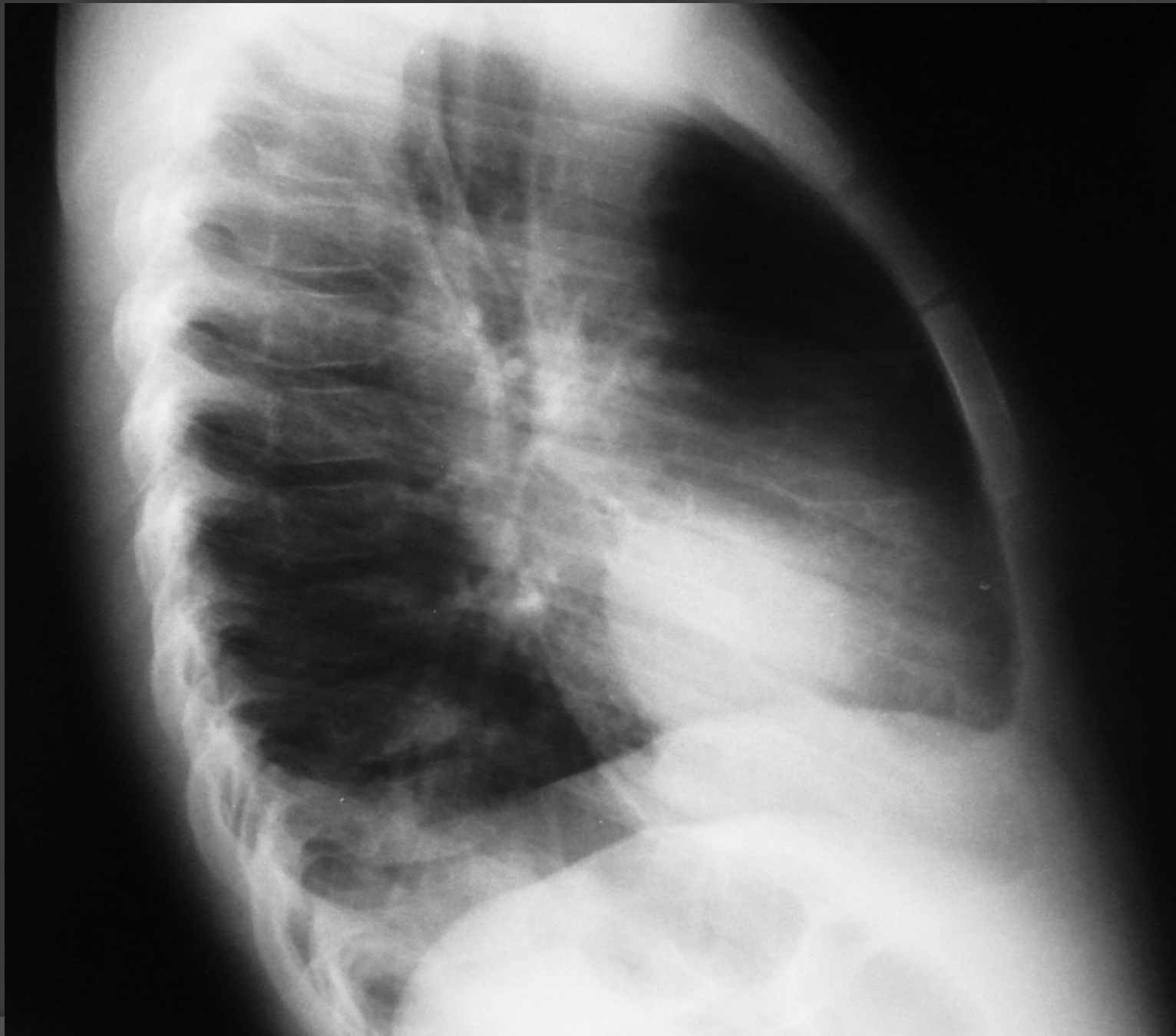






L  
ETB  
O





# Fluorography

The method of X-ray examination consists in photographing the image from a fluorescent screen, screen of an electron-optical converter or systems intended for the subsequent digitization of images, on a film of a format 100x100, 110x110 mm.



# Fluorography



10 cm

**X-ray tube**

↓ **X-ray radiation**

**fluorescent  
screen**



**camera**

## Advantages of fluorography :

- low cost of research
- the possibility of conducting mass verification studies

## Disadvantages of fluorography:

- high radiation load
- ban on conducting research for persons under 15 years of age

## **Main applications**

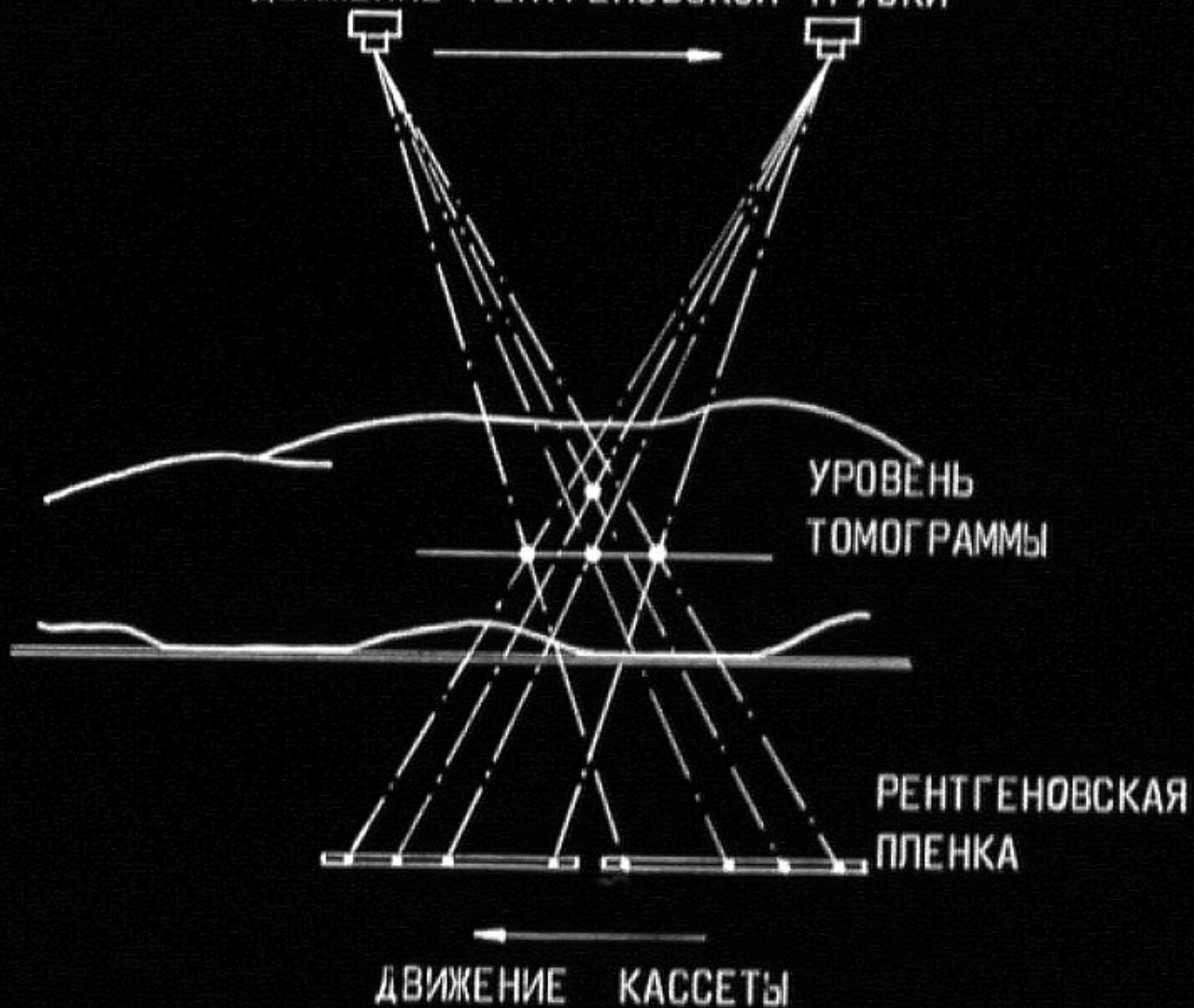
- Chest examination for early detection of tuberculosis



## **Linear tomography**

The method of X-ray examination is to obtain an image of an object at a specified depth.

ДВИЖЕНИЕ РЕНТГЕНОВСКОЙ ТРУБКИ





## **Main applications**

Investigation of pulmonary parenchyma, trachea and major bronchi, intrathoracic lymph nodes, paranasal sinuses, larynx, separate structures of the spine.



# Tomography of chest organs



# Evaluation of the quality of the radiograph

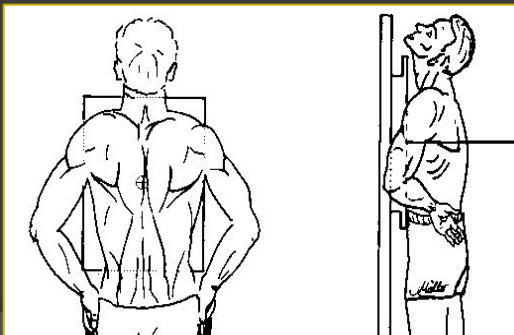
- ① **Completeness of volume** : the whole chest from the tops of the lungs to the costal-diaphragmatic sinuses is displayed
- ② **Position of the patient**: the same distance between the medial contour of the clavicles and the spinous process of the vertebra (Th 3), the scapula is outward from the pulmonary fields, clavicles are arranged horizontally.
- ③ **Precision**: clear contours of the diaphragm, front segments of the ribs, visualization of all elements of the pulmonary pattern and the contours of the heart (in adults, the sharpness is evaluated by the left contour, in children up to 1 year on the right contour of the heart )
- ④ **Contrast** : equally expressed black, white and gray colors
- ⑤ **Hardness**: on the front radiographs, the outlines of the first 3-4 thoracic vertebrae, located above the middle shadow, on the lateral - a clear image of the head of the humerus, a clear visualisation of the elements of the pulmonary pattern



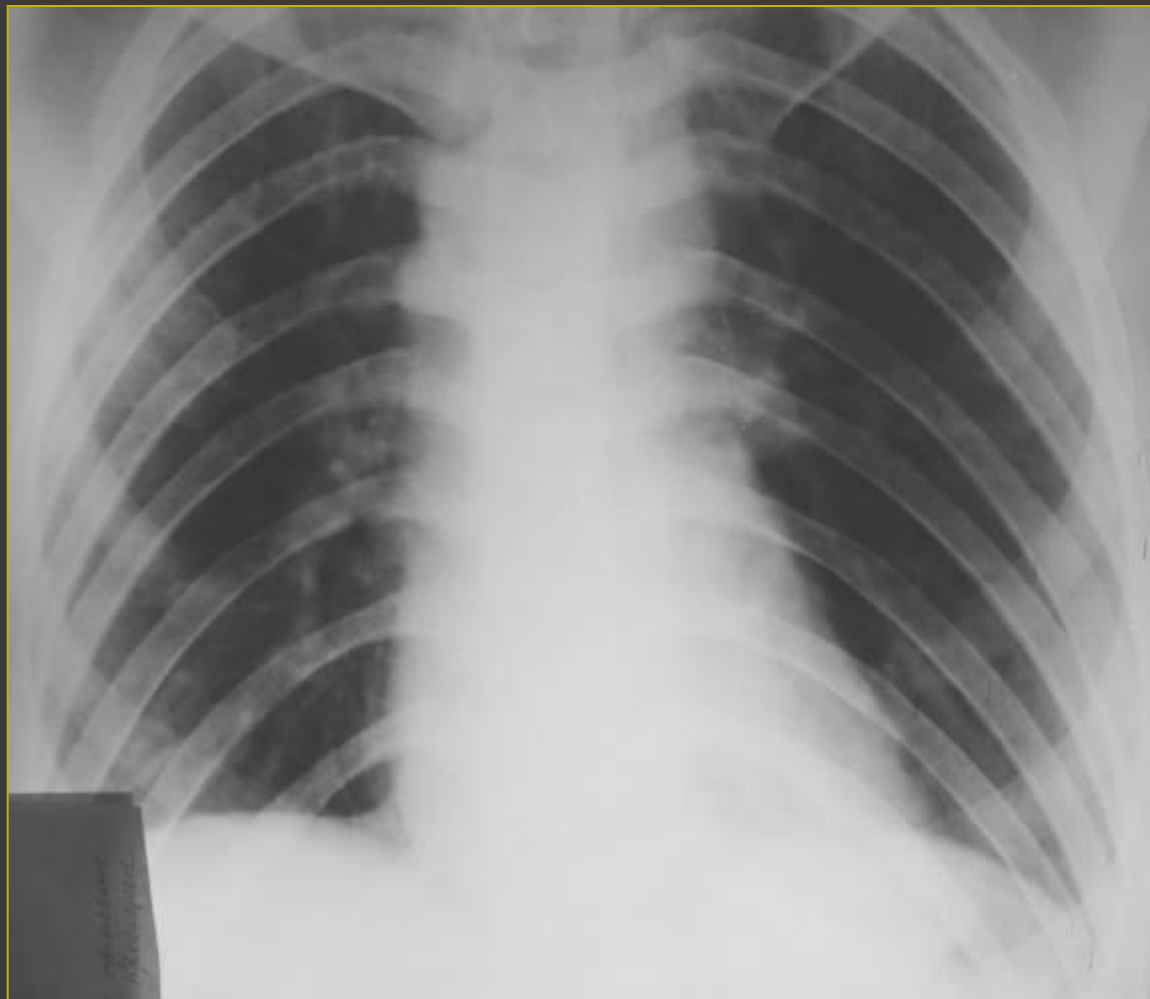
## Прямая проекция

### Критерии правильно выполненной рентгенограммы

- Видны легочные поля на всем протяжении и диафрагмальные синусы
- Изображение лопаток не наслаивается на легочную ткань
- Ключицы расположены горизонтально
- Расстояние от средней линии (остистые отростки) до грудинных краев ключиц одинаково с обеих сторон



# Прямая проекция



- Ширина задних отрезков ребер значительно меньше передних
- Контуры задних отрезков ребер более четкие, чем контуры передних

## Исследование на вдохе и выдохе

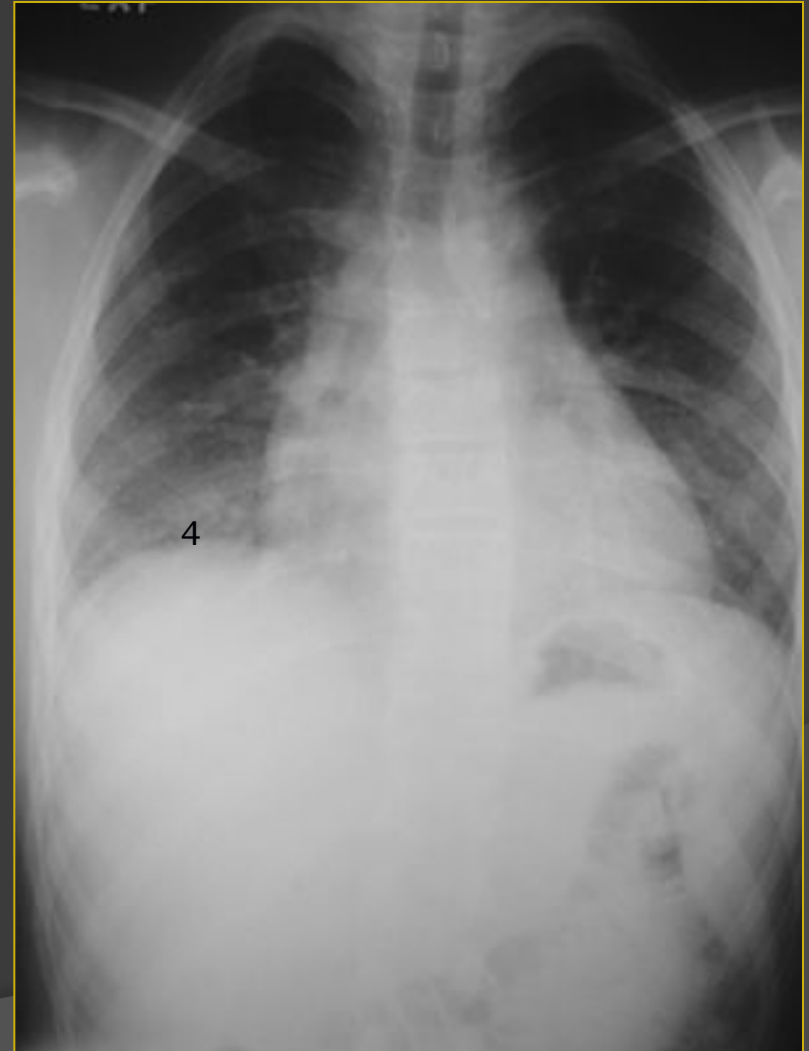
Рентгенография легких производится в фазу глубокого, но не форсированного вдоха.

Диафрагма справа в норме располагается на уровне переднего отрезка 6-го ребра, слева на одно ребро ниже.

На выдохе снижается прозрачность легочных полей, сердце становится более широким.

Фазы дыхания	Вдох	Выдох
Выполняется	В фазу глубокого, но не форсированного вдоха.	На выдохе
Диафрагма	6-7 ребро Уплощена	4-5 ребро Выпуклая
Легочный рисунок	Обычный	Усилен и сгущен
Легкое	Прозрачность обычная	Прозрачность понижена в средних и нижних отделах
Рёбра	Расположены косо	Расположены горизонтально
Сердце	Узкое и расположено вертикально	Широкое, расположено горизонтально

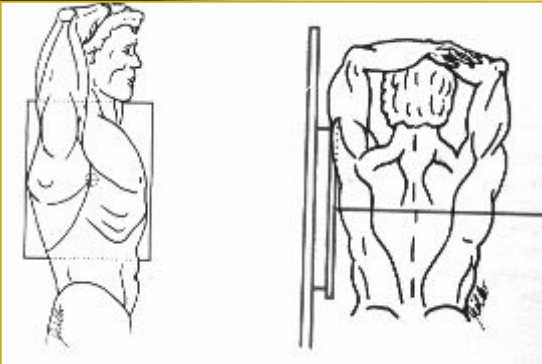
# Inspiration and expiration examination



# Боковая проекция

## Критерии правильно выполненной рентгенограммы

- Видны легочные поля на всем протяжении (верхушки и реберно-диафрагмальные синусы).
- Четкое изображение грудины в боковой проекции
- Отчетливо прослеживаются рентгеноанатомические детали





Благодарю за внимание