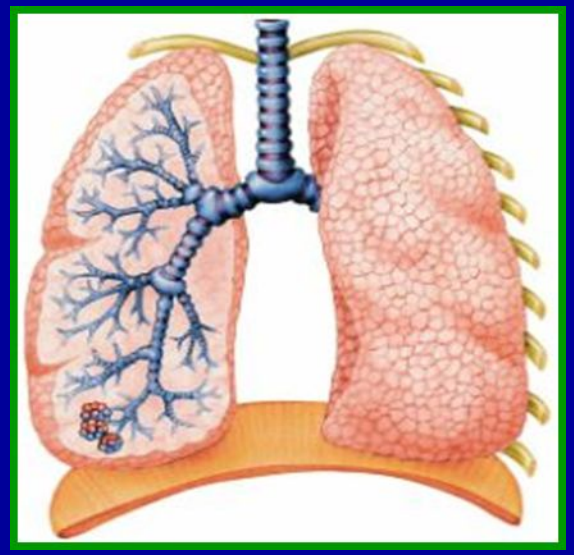
Physical examination of the respiratory system



Palpation of the chest

Percussion of the lungs

Inspection of the chest (inspectio thoracis)

This is the objective method of examination based on visual evaluation of condition and pathological changes in thorax

Static inspection **– based on revelation of thorax features *without taking* into the act of breathing**

Dynamic inspection **- based on revelation of thorax features *with taking* into the act of breathing**

Static inspection

Physiological shapes :

- Normosthenic,
- Hypersthenic,
- Asthenic

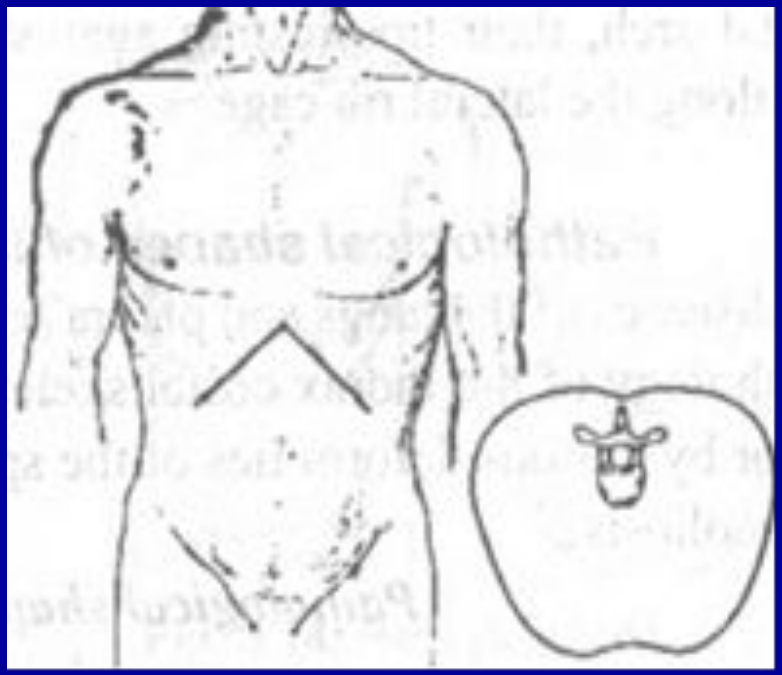
The asymmetry of the chest (enlarged volume of the half of the chest, decreased volume of the one part of the chest)

Pathological shapes :

- emphysematous (barrel)
- paralytic
- rachitic or pigeon
- funnel
- foveated
- scoliotic
- kyphotic
- kyphoscoliotic

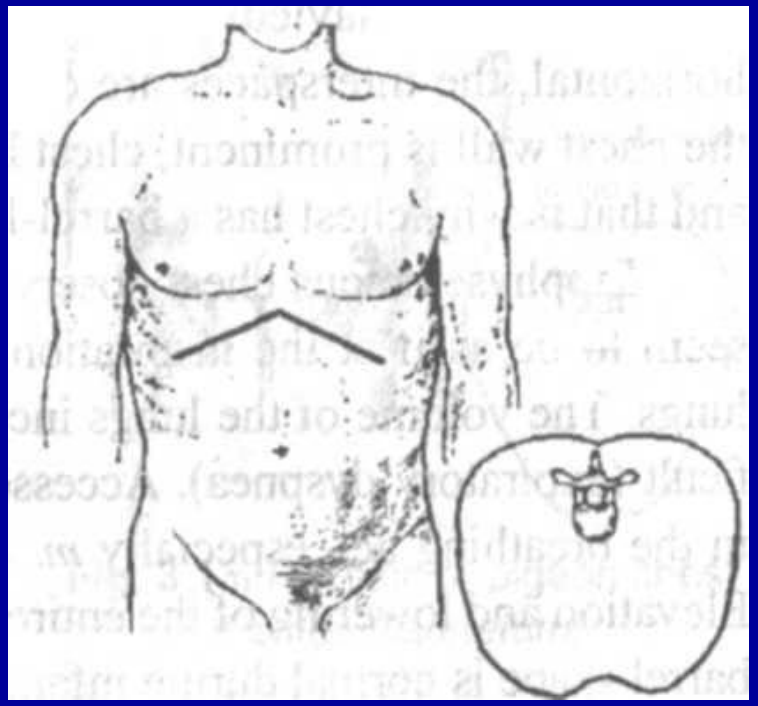
Normosthenic chest:

- The shoulders are under the right angle to the neck
- Supra- and infraclavicular fossae feebly expressed
- The ribs are moderately inclined
- The interspaces are visible, but moderate expressed
- Epigastric angle is near 90 degree
- The lateral diameter is larger than anteroposterior
- Scapulae closely fits to the chest and are on the same level



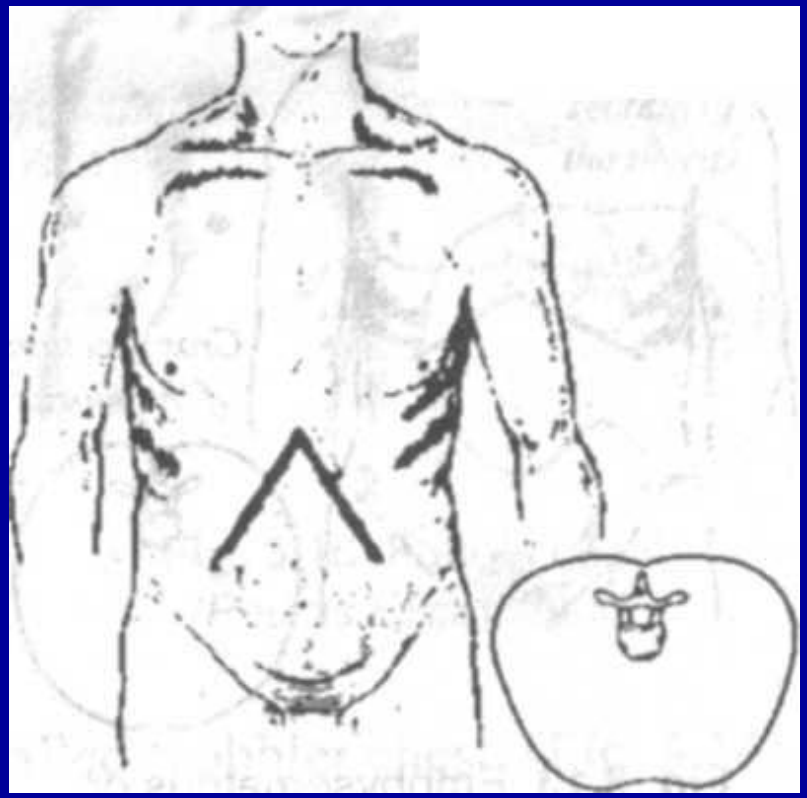
Hyperstenic chest

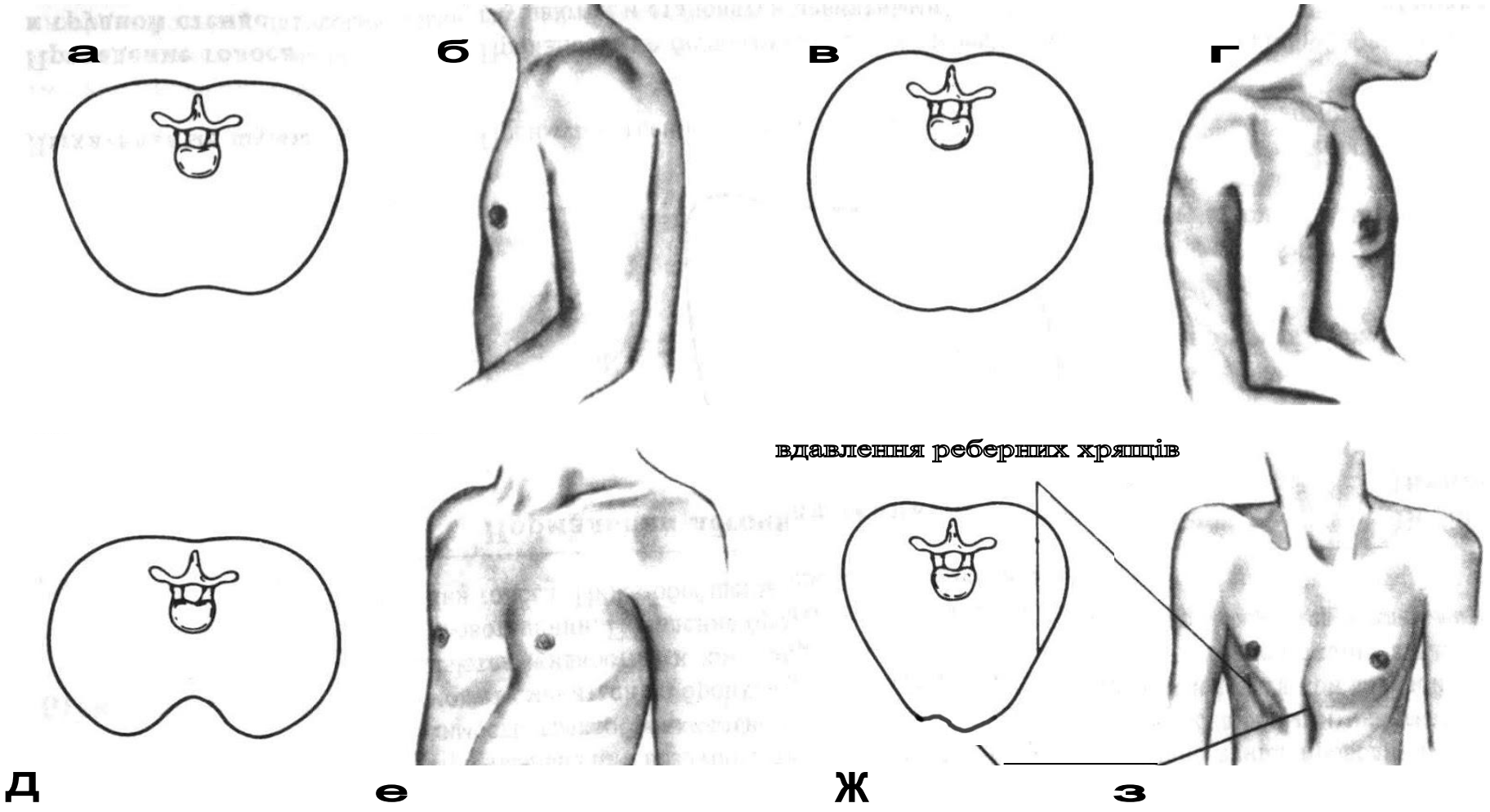
- The shoulders are wide and the neck is short
- Supra- and infraclavicular fossae are absent (level with the chest)
- Direction of the ribs are nearly horizontal
- The interspaces are narow and slightly expressed
- Epigastric angle exceeds 90 degree
- The lateral diameter is about the same as anteroposterior
- The chest has form of a cylinder
- Scapulae closely fit to the chest



Asthenic chest

- The shoulders are sloping and are under the dull angle to the neck
- Clavicles are well visible
- Supra- and infraclavicular fossae are distinctly pronounced
- The ribs more vertical, direct downward
- The interspaces are wide and pronounced
- Epigastric angle is less than 90 degree
- Both lateral and anteroposterior diameter are smaller than normal





The shapes of the chest (cross - section and appearance)

а,б – thorax of healthy adult; в,г – barrel thorax.

д,е – funnel thorax; ж,з – rachitic thorax.

Dynamic inspection

Participation of the accessory muscles in act of breathing (bronchial asthma, respiratory insufficiency or heart failure)

Participation parts of the chest in breathing act (pleuritis, pleural commissure, complications after surgical operations on the lung, lung tumors)

Type of respiration :

- thoracic (costal)
- abdominal (diaphragmal)
- mixed

Respiration rate:

- Normal at rest 16-20 per 1 min.
- Frequent (more than 20 per 1 min.) – tachypnoë
- Slow (less than 16 per 1 min.) – bradypnoë

Respiration depth:

- moderate
- deep
- superficial

Respiration rhythm:

- regular, irregular

Palpation

This is the objective method of examination based on evaluation of condition and pathological changes in thorax during its feelings

Identification of tender areas (widespread or local, in Valle points)

Thorax resistance (normal, increased, decreased)

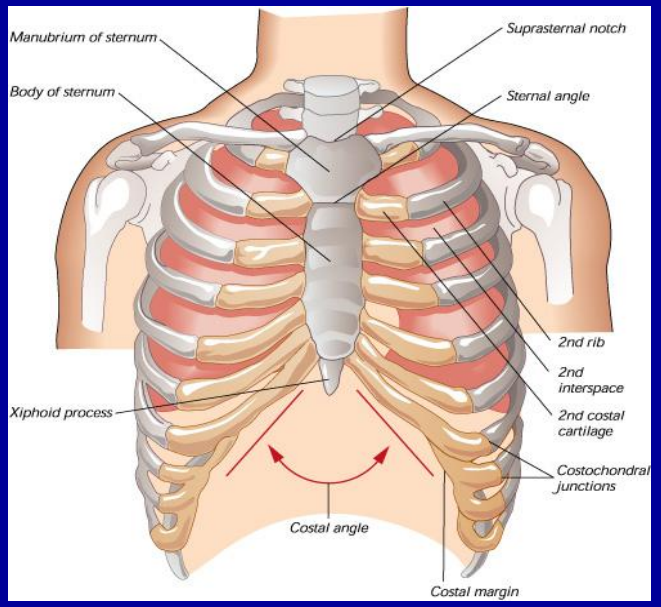
Tactile vocal fremitus (normal, increased, decreased)

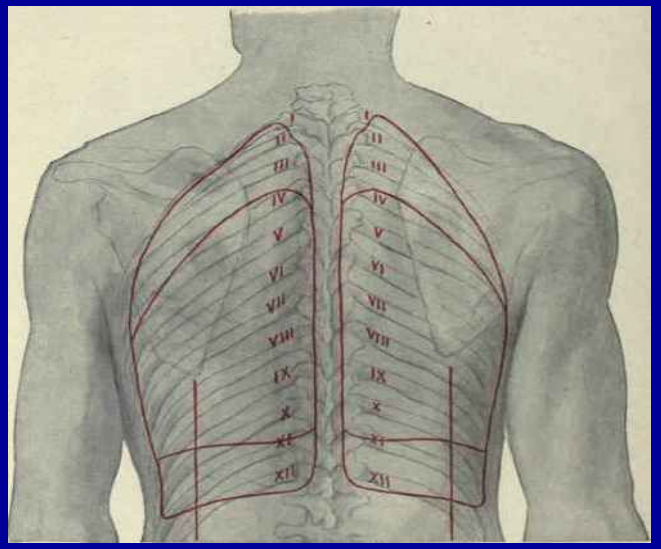
Chest expansion (in addition to inspection)

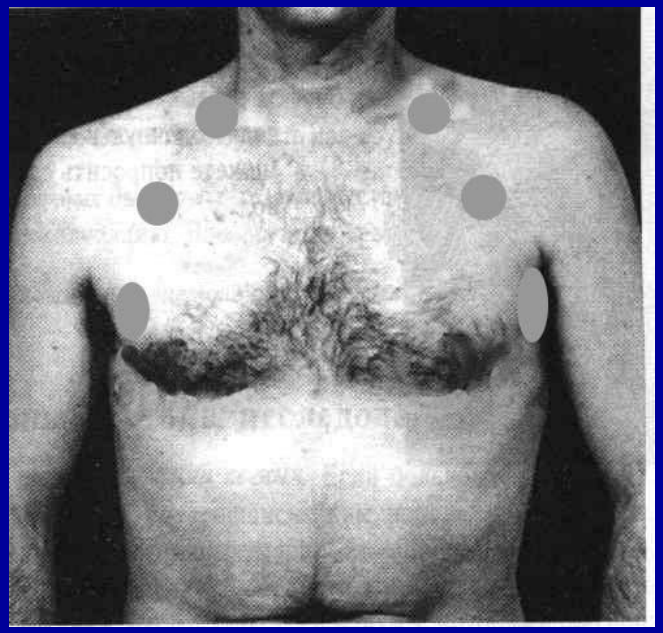
Assessment of epigastrical angle (in addition to inspection)

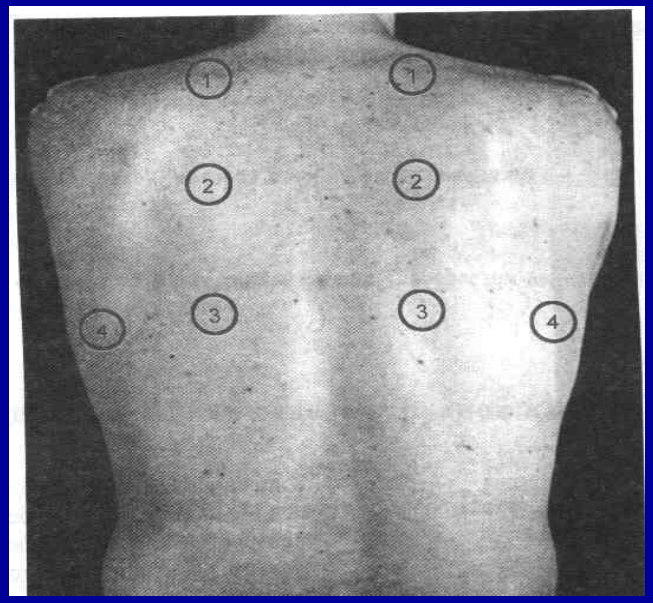
Topographic regions of the chest

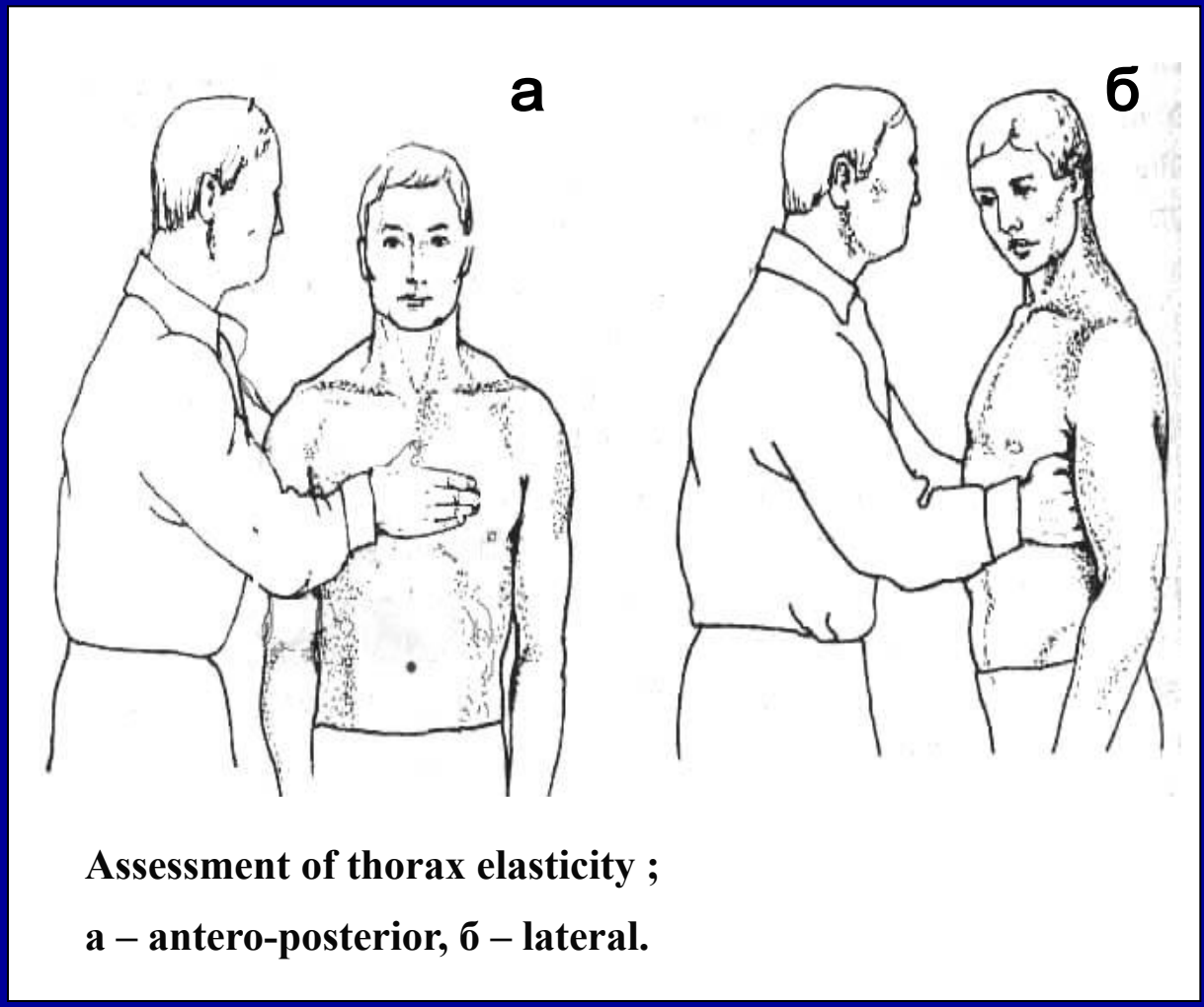
- Supraclavicular region – above clavicles
- Infraclavicular region – below clavicles
- Suprascapular regoin – above scapulae
- Interscapular region – between the scapulae
- Infrascapular region – below scapular











Assessment of thorax elasticity ;

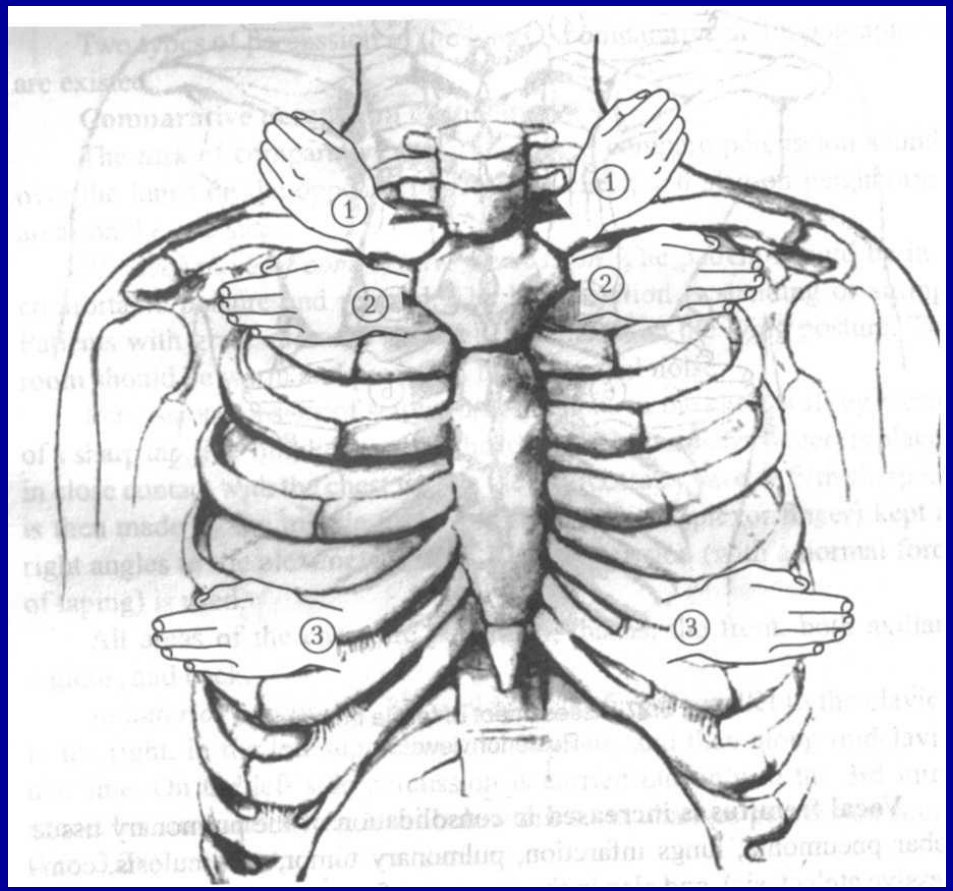
а – antero-posterior, б – lateral.

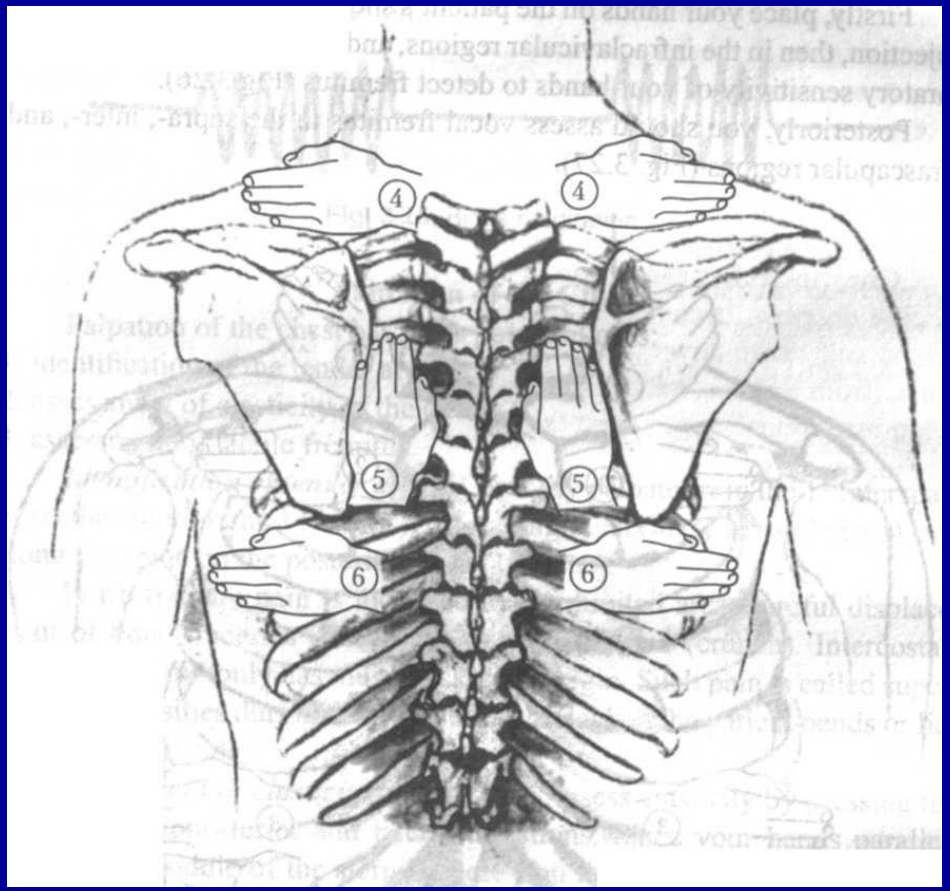
TACTILE VOCAL FREMITUS:

palpable vibrations transmitted through the bronchopulmonary tree to the chest wall when the patients speaks

Anteriorly - midclavicular line
Laterally - midaxillary line
Posteriorly - above scapula , parascapular "paraspinal", below scapula

TACTILE VOCAL FREMITUS:





Increased TVF

- Thin chest wall
- Lobar pneumonia
- Lungs infarction
- Pulmonary tumor
- Tuberculosis
- Compressive atelectasis
- Air cavity communicated with bronchus

Decreased TVF

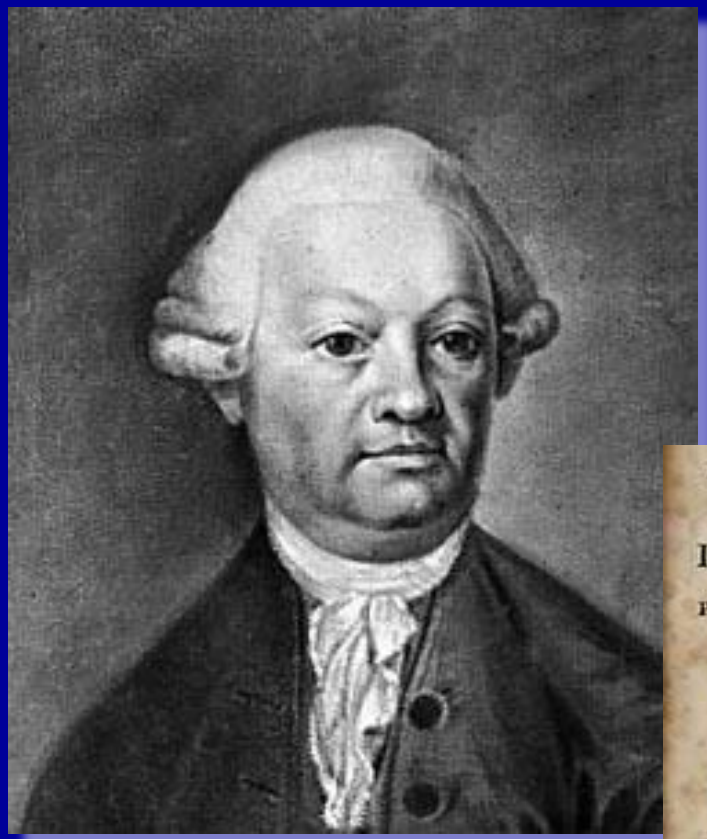
- Pleural effusion
- Pleural fibrosis
- Pneumothorax
- Thick chest wall (edema, subcutaneous fat)

Vocal fremitus can be absent when significant amount of fluid or air are accumulated in the pleural cavity

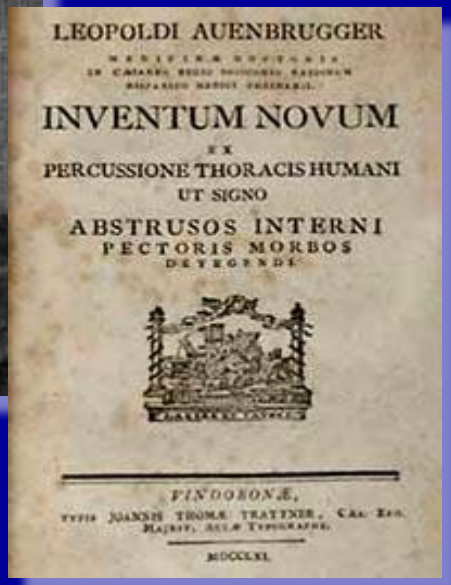
Palpation of the chest

Palpation of the chest

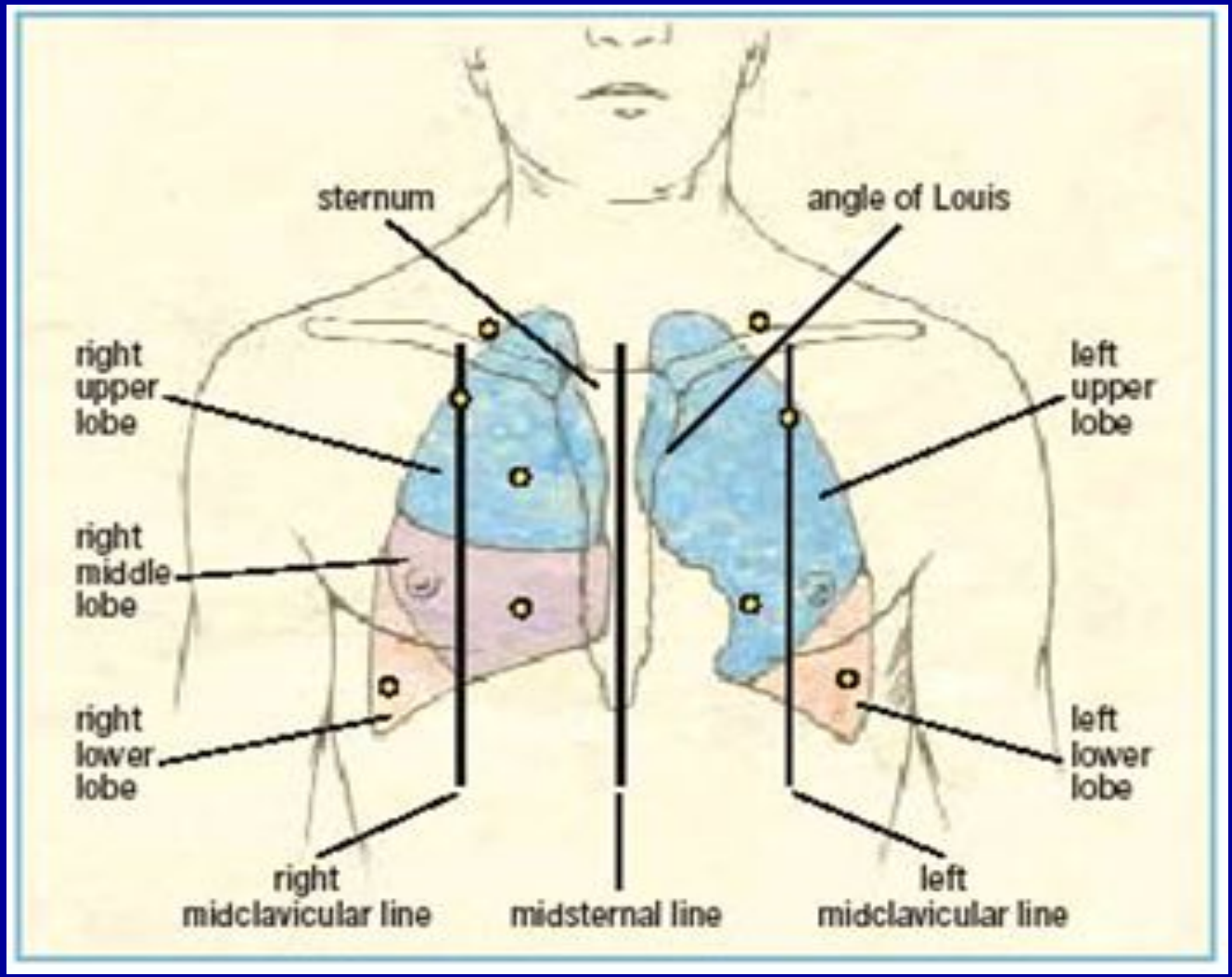
(Jean Nicholas Corvisart, 1755-1821)



(L.Auenbrugger, 1722-1809)

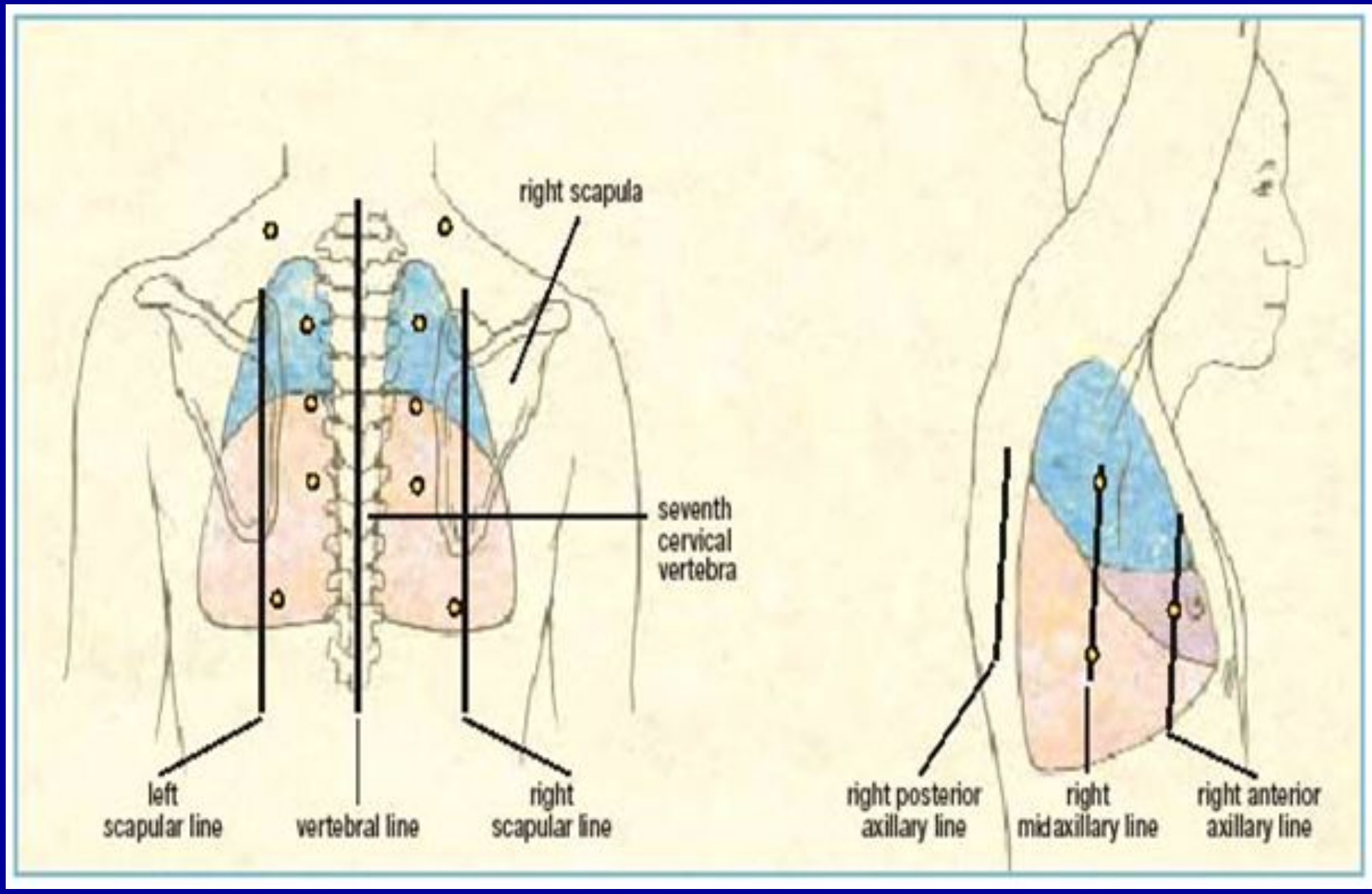


Topographic regions and lines of the chest

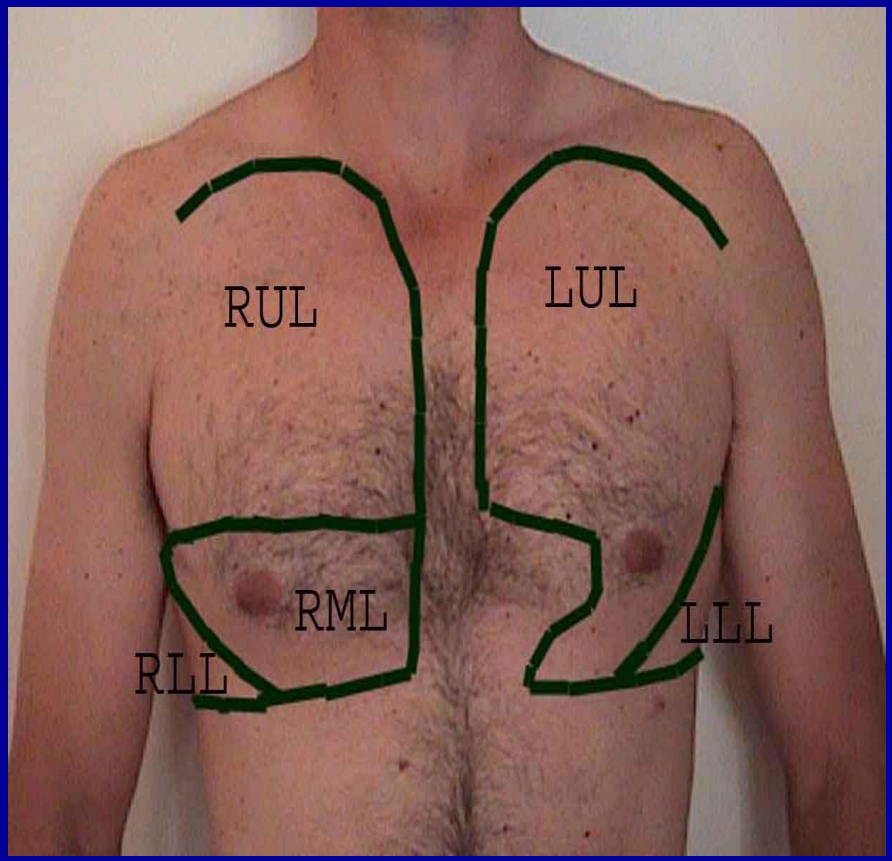


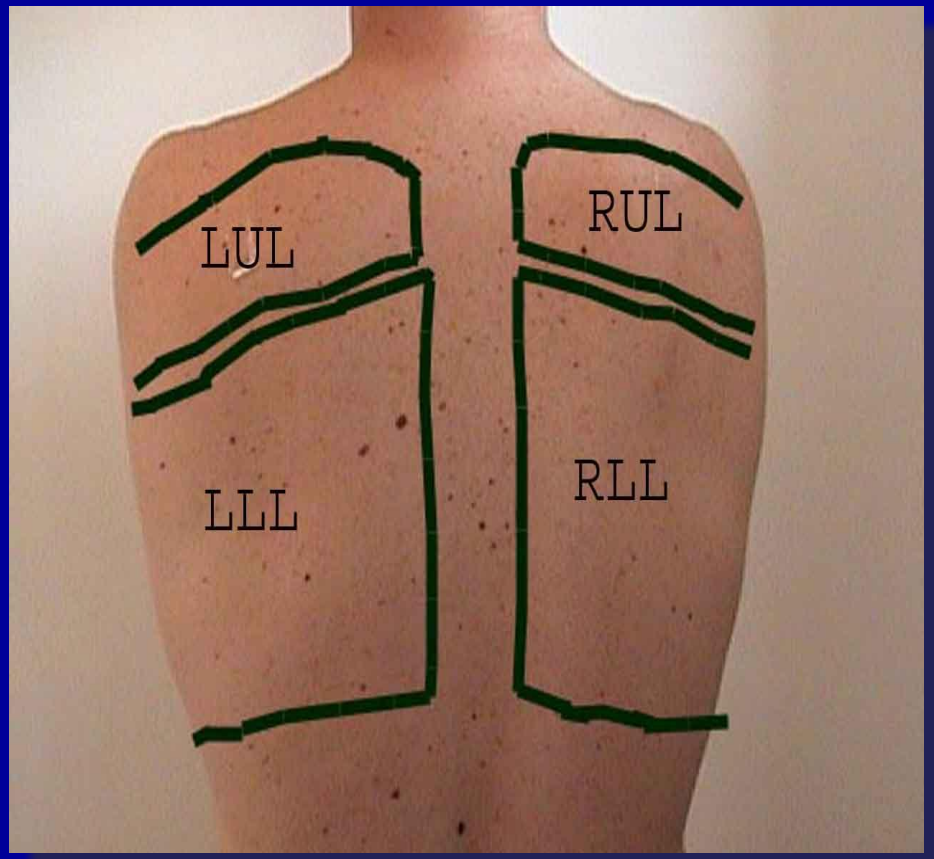
Topographic regions and lines of the chest

- The left and right midaxillary lines – linea axillaris media dextra and sinistra
- The left and right posterior axillary lines – linea axillaris posterior dextra and sinistra
- The scapular left and right lines – linea scapularis dextra and sinistra
- The paraspinal lines dextra and sinistra – linea paravertebralis dextra and sinistra
- The vertebral line – linea vertebralis – linea mediana posterior


right scapula
seventh
cervical
vertebra
left
scapular line
vertebral line
right
scapular line
right posterior
axillary line
right
mid axillary line
right anterior
axillary line

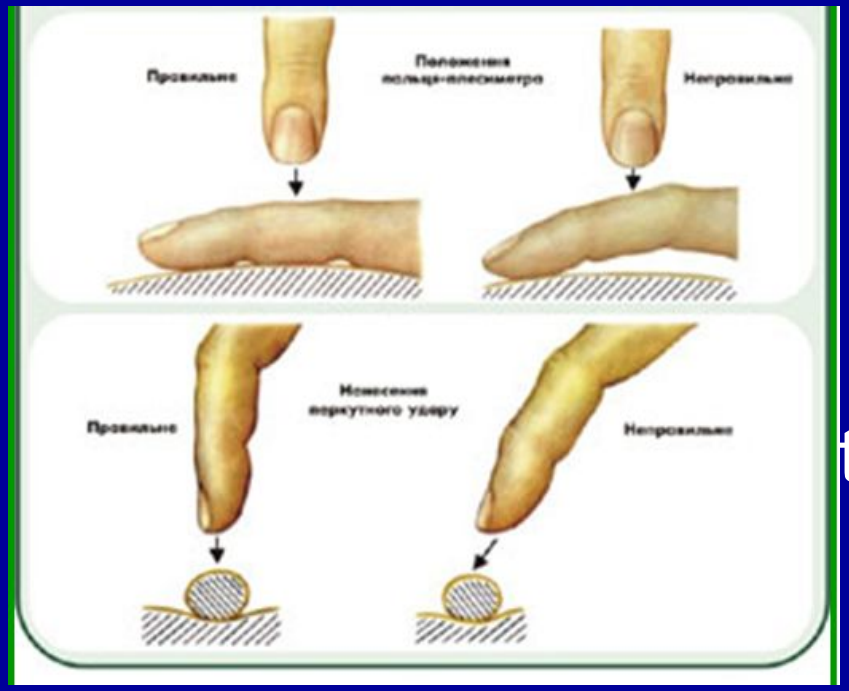
Topographic regions and lines of the chest





Percussion

Press The last 2 phalanges of your left middle finger firmly on on the area to be percussed and raise the second and fourth fingers off the chest surface; otherwise, both sound and tactile vibrations will be blunted



t

Use a two quick, sharp wrist motion

The best percussion site is between the proximal and distal interphalangeal joints.

Percussion of the chest

This is the objective method of examination based on evaluation of sound types during the knocking of the thorax

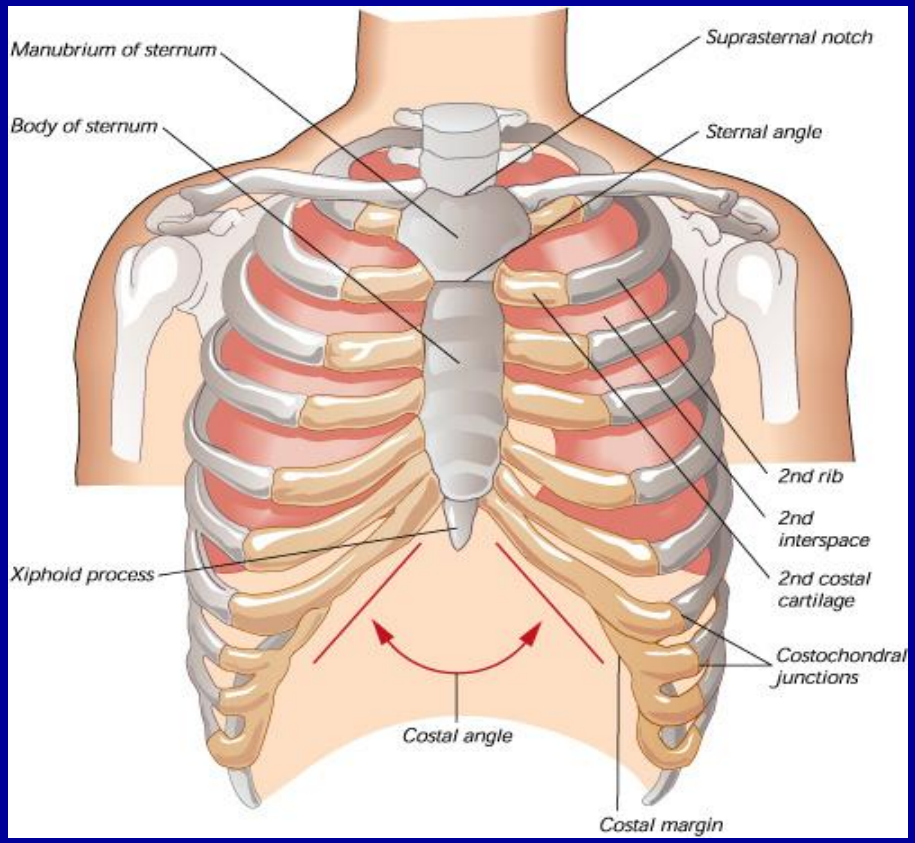
Comparative – revealing of percussion sound features on symmetrical areas of the chest:

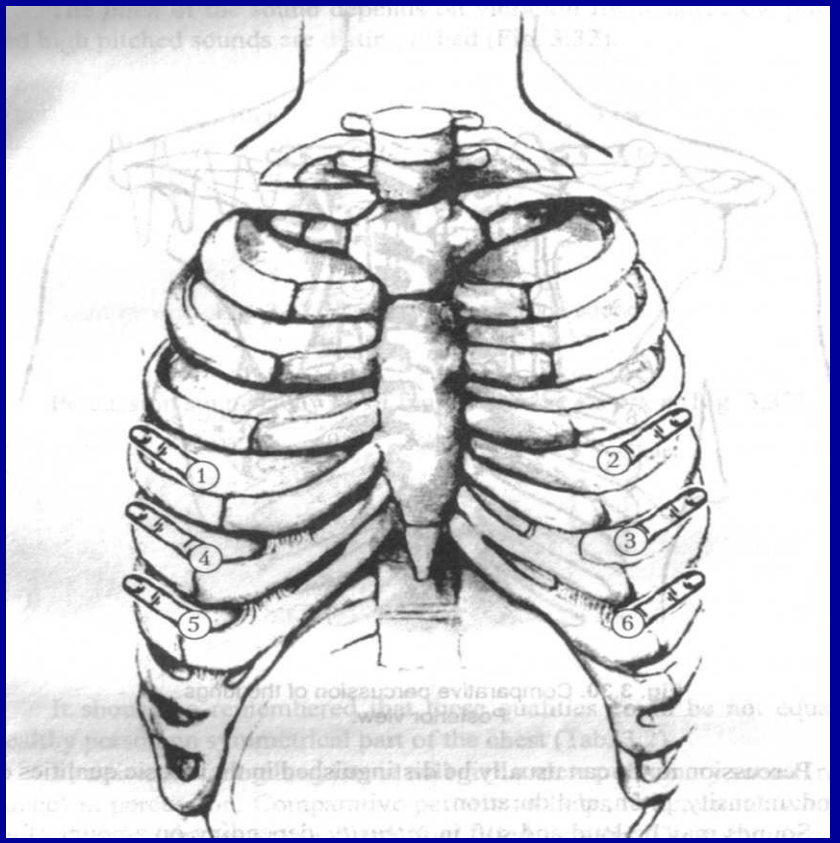
- **Supraclavicularis**
- **Clavicularis**
- **Subclavicularis**
- **Axillaris**
- **Suprascapularis**
- **Interscapularis**
- **Subscapularis**

Topographic - aimed to determining :

- **lower borders of the lungs**
- **upper borders of the lungs**
- **the width of Crenig's area**
- **active and passive mobility of lower borders of the lungs**
- **width of Traube's area**

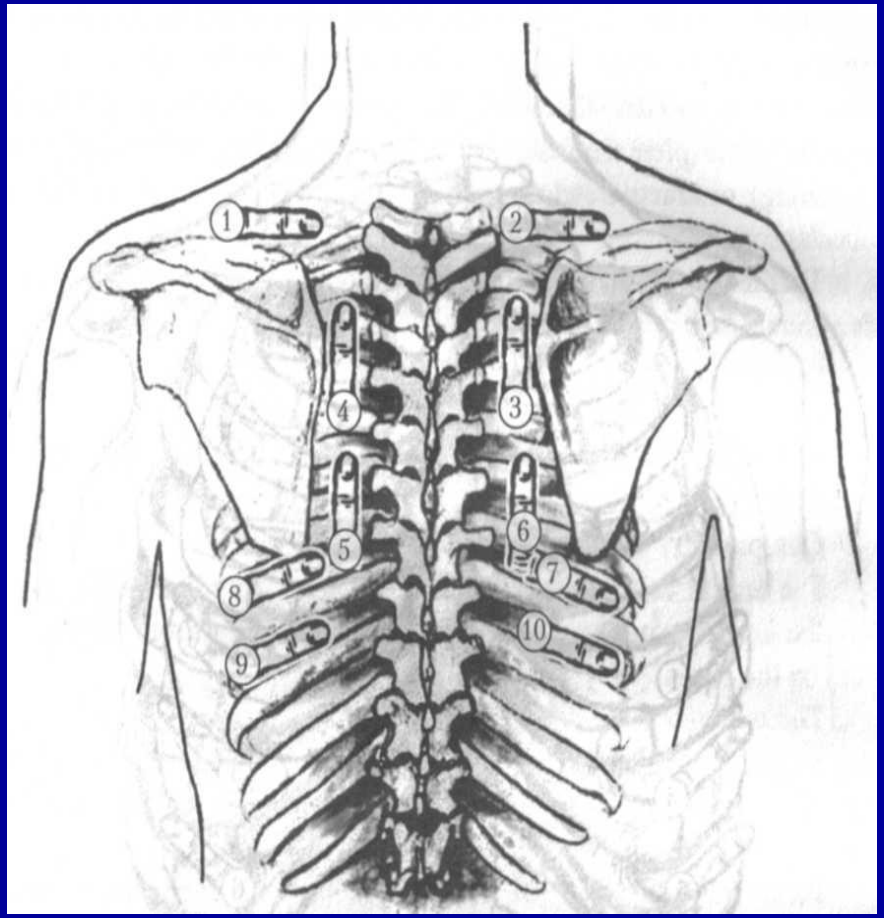
Comparative percussion





Comparative percussion

- **Resonant -** *Clear pulmonary*
- **Intermediate** *- pulmonary sound becomes duller*
- **Dull**
- **Hyperresonant** *– Tympanic*
- **Bandbox sound** *- over the hyper inflated lungs of emphysema*



The main symptoms based on comparative percussion

Percussion sound on the symmetric areas :

Clear pulmonary (in healthy persons)

Dullness (dulling)

- **Infiltration of lung tissue (tuberculosis, pneumonia, pneumosclerosis, lung cancer, abscess, lung gangrene)**
- **Accumulation of liquid in pleural cavity *Stony dull* – large pleural effusion**
- **pleural thickening**

Tympanic

- **Increasing the air capacity of lung tissue (bronchial asthma, lung emphysema)**
- **Formation the cavity with air in lung parenchyma (released form contents caverns, abscess, bronchoectasis)**
- **Accumulation of air in pleural cavity (pneumothorax)**

The main symptoms based on topographic percussion

1.Lower borders:

Removal down **(lung emphysema, bronchial asthma, lower standing of diaphragm)**

Removal upper **(athelectasis, surgical ablation the part of lung, higher standing of diaphragm, subdiaphragmal abscess)**

2.Upper borders:

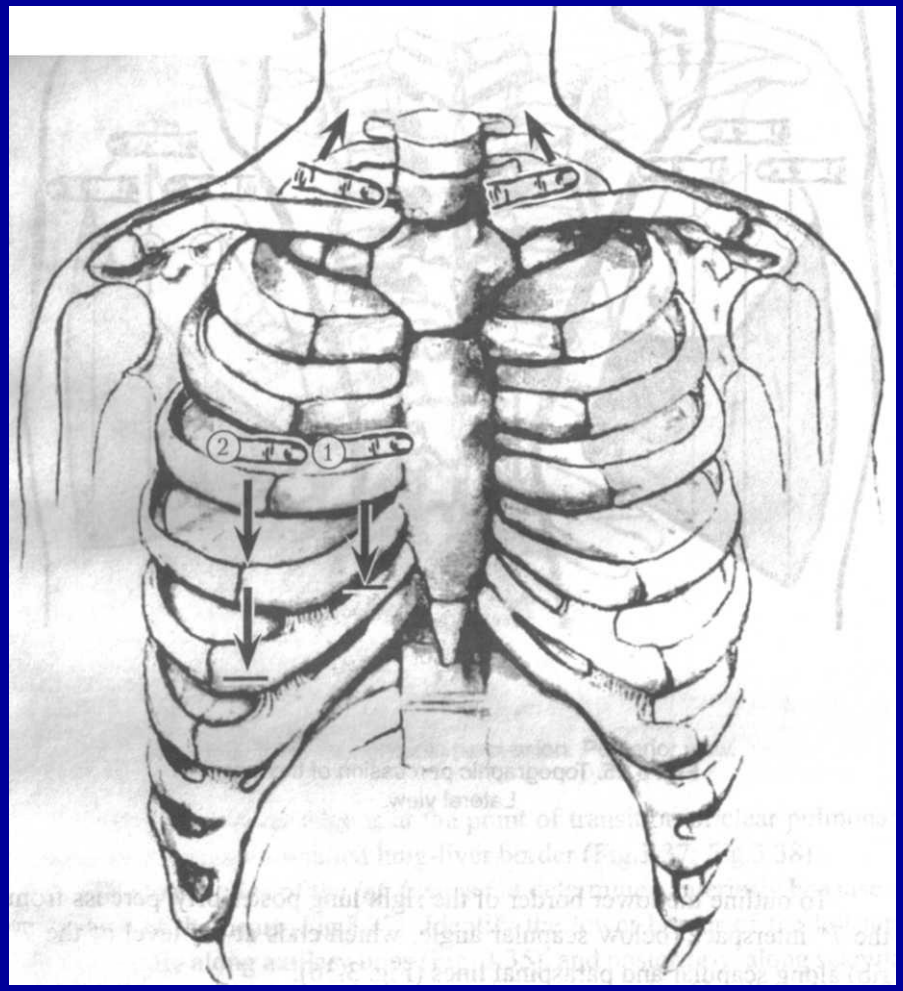
Removal down **(tuberculosis of lung apexes, pneumosclerosis, athelectasis of lung apexes)**

Removal upper **(lung emphysema, bronchial asthma)**

3. Width of Traube's area:

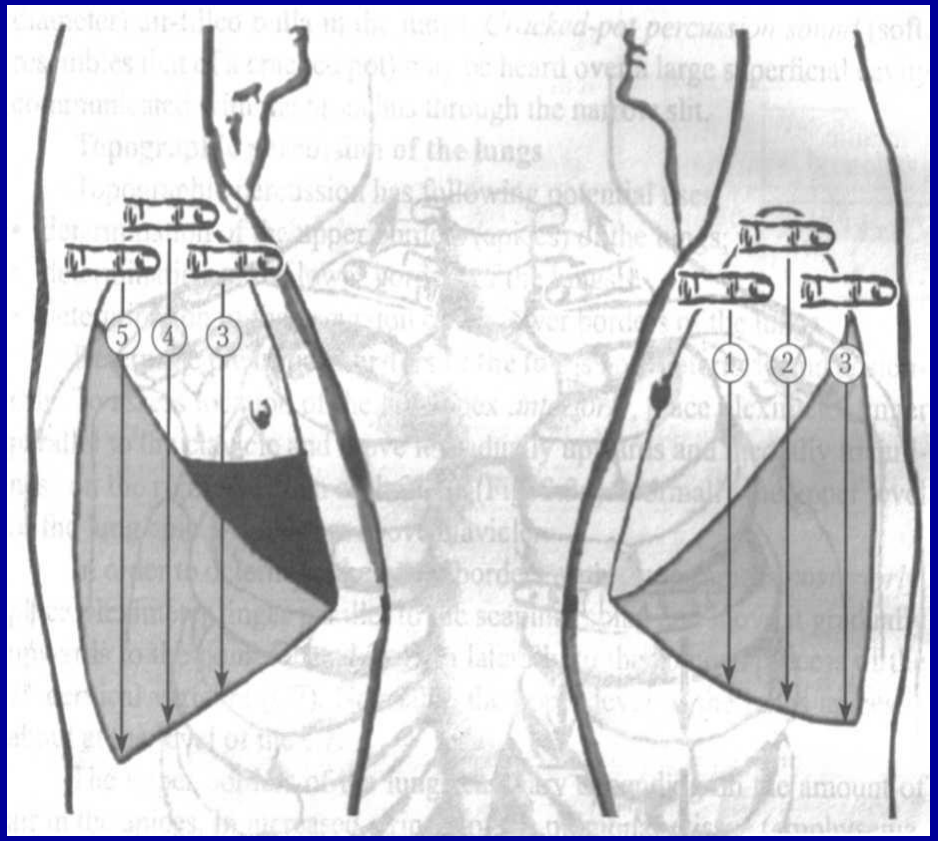
Increasing more than 6 sm **- lung emphysema, bronchial asthma**
Decreasing less than 4 sm **- tuberculosis of lung apexes, pneumosclerosis, athelectasis of lung apexes**

Topographic percussion

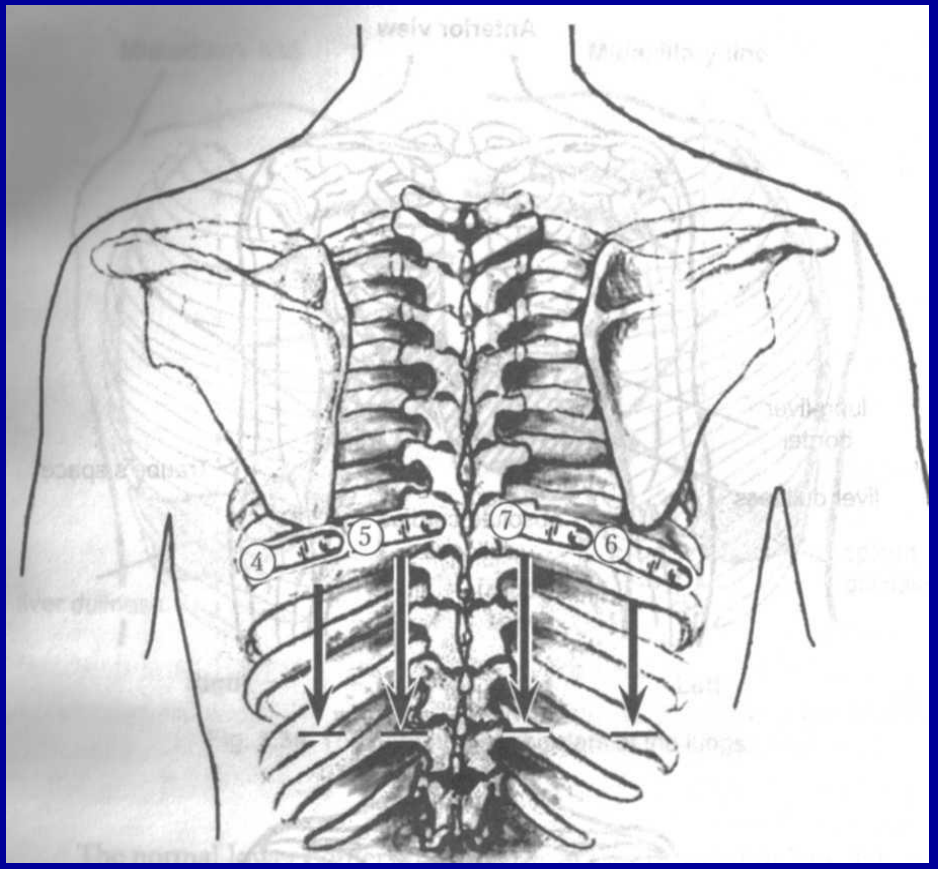


Topographic percussion of the lungs. Anterior view.

Topographic percussion



Topographic percussion of the lungs. Lateral view.



Topographic percussion. Posterior view.

Topographic percussion
lower borders of the lung

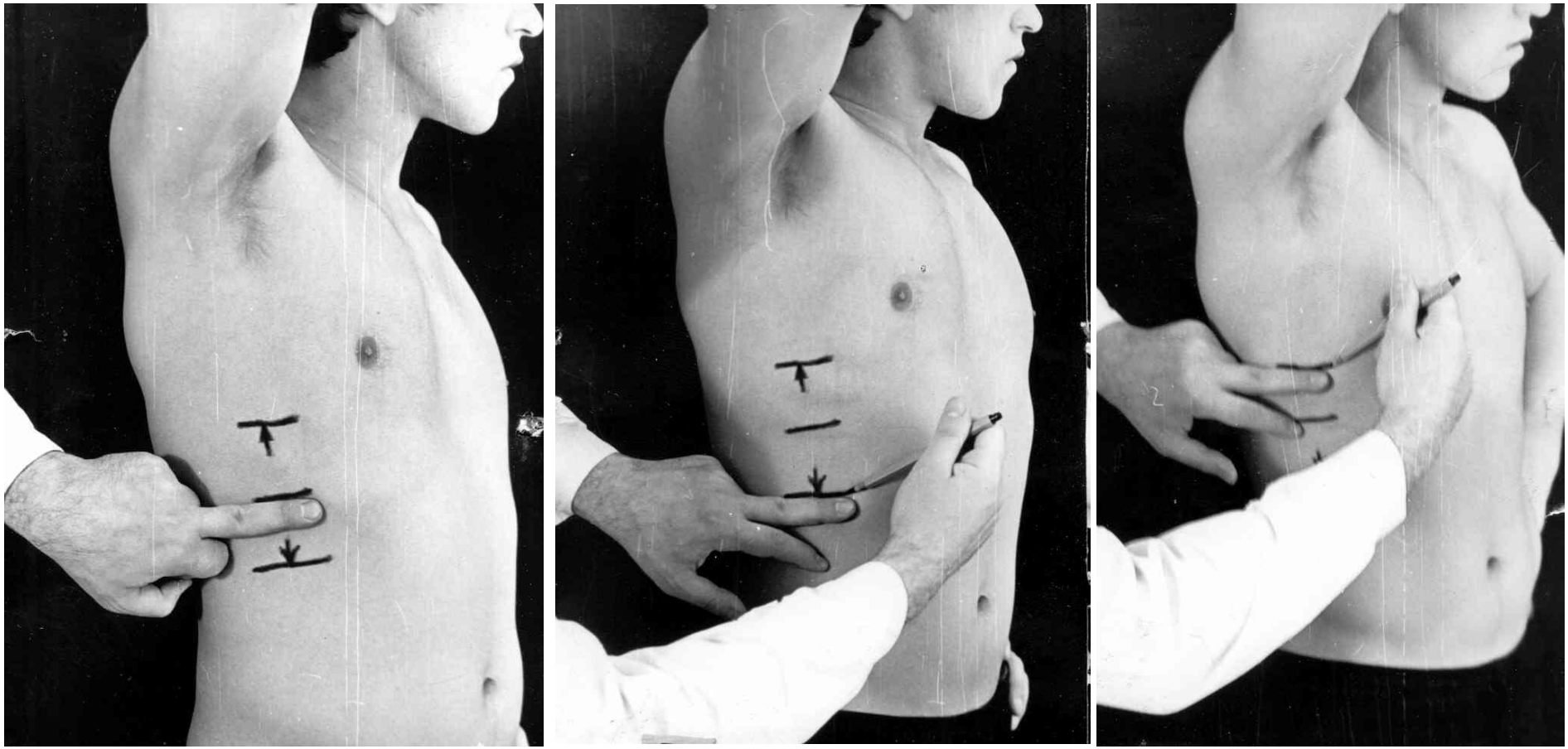
Topographic lines	Right lung	Left lung
Parasternal	5th interspace	-
Midclavicular	6th interspace	-
Anterior axillary	7th interspace	7* interspace
Midaxillary	8th interspace	8th interspace
Posterior axillary	9th interspace	9th interspace
Scapular	10th interspace	10th interspace
Paraspinal	Spinous process of TII	Spinous process ofTII

4. *Active and passive mobility of the lungs* – **the significance of lung tissue elasticity state and the possible mobility of lower lung border:**

- *Enough* **(6-8 sm) by linea axillaris media, scapularis – normal**
- *Decreased* **(less than 6 sm) by linea scapularis - lung emphysema, bronchial asthma, pneumosclerosis, pleural commissural, sweating pleuritis**

5. *The Traube's area* – **the area of tympanic sound under the left ribs arch. Diagnostically impotence –decreasing of area width:**

- **Cancer of cardial part of stomach**
- **Increasing of the liver**
- **Increasing of the spleen**
- **Left side sweating pleuritis**



Determining of the mobility of lower borders of the lungs

Active and passive mobility of the lungs

Topographic lines	Right lung			Left lung		
	Inspira-tion	Expiration	Total	Inspira-tion	Expiration	Total
Midclclavi-cular	2-3	2-3	4-6	-		-
Midaxillary	3-4	3-4	6-8	3-4	3-4	6-8
Scapular	2-3	2-3	4-6		2-3	4-6