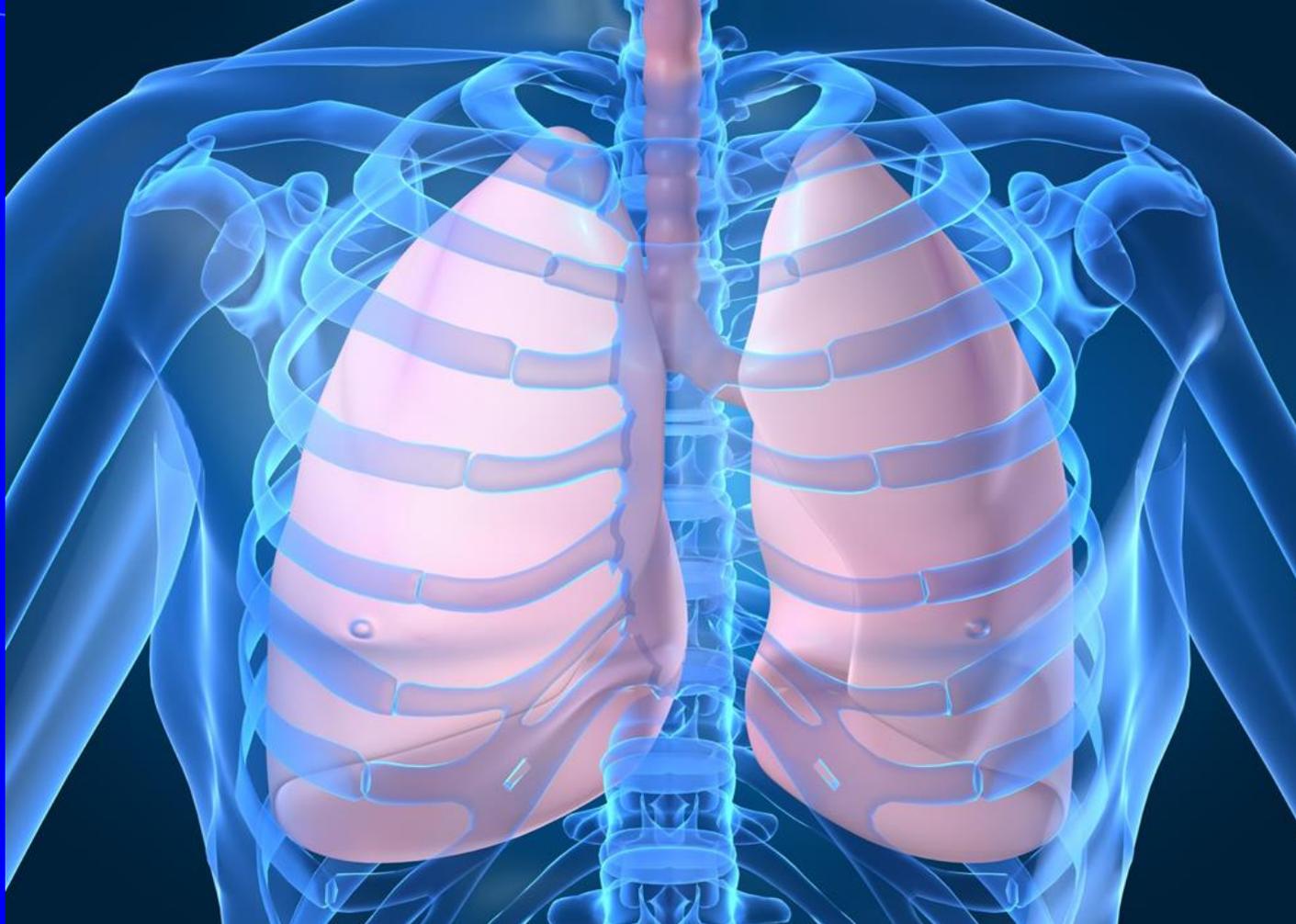


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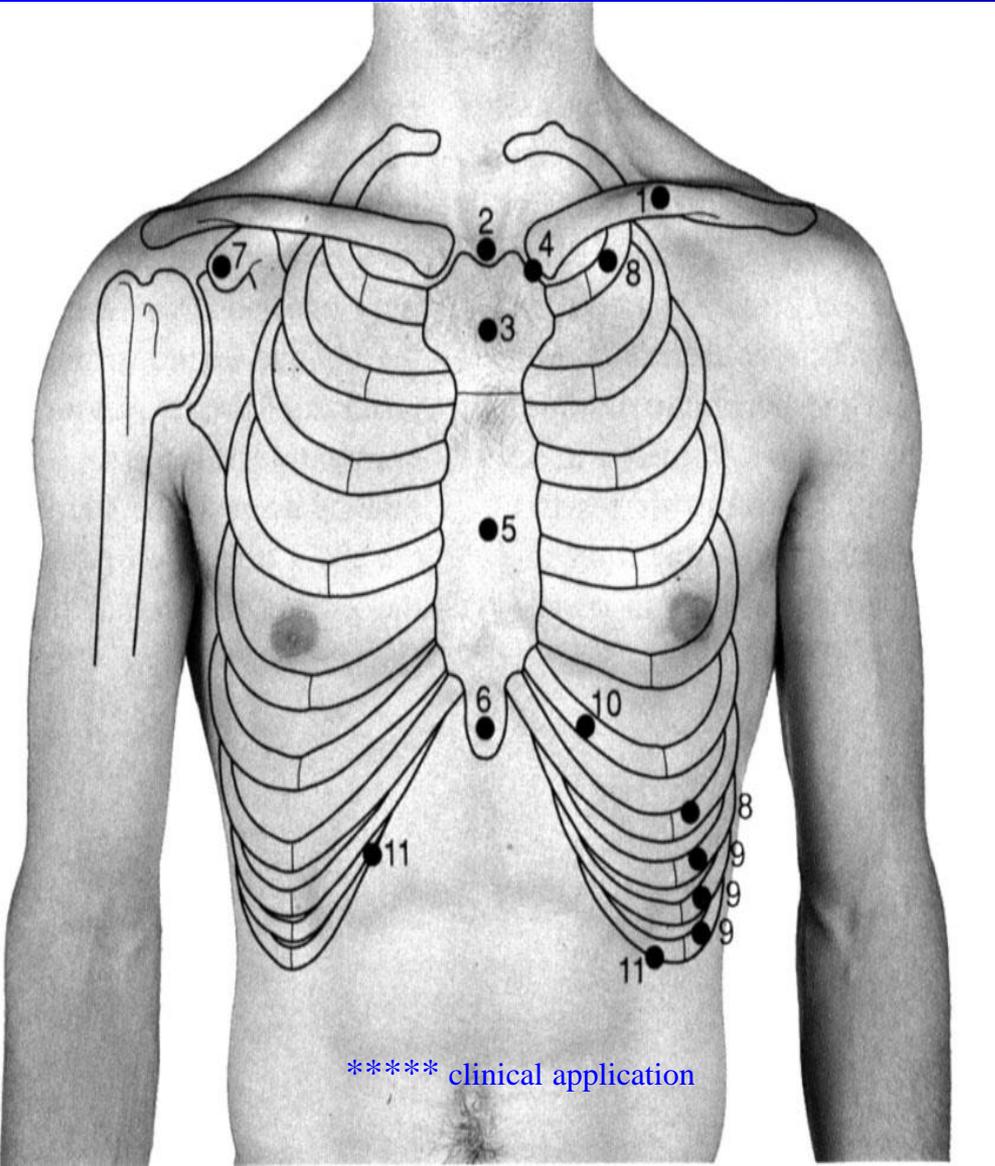
# **Chest Examination**

**Dr.Samah Shehata**

**Associate Prof. of Chest Diseases**

**Zagazig university**

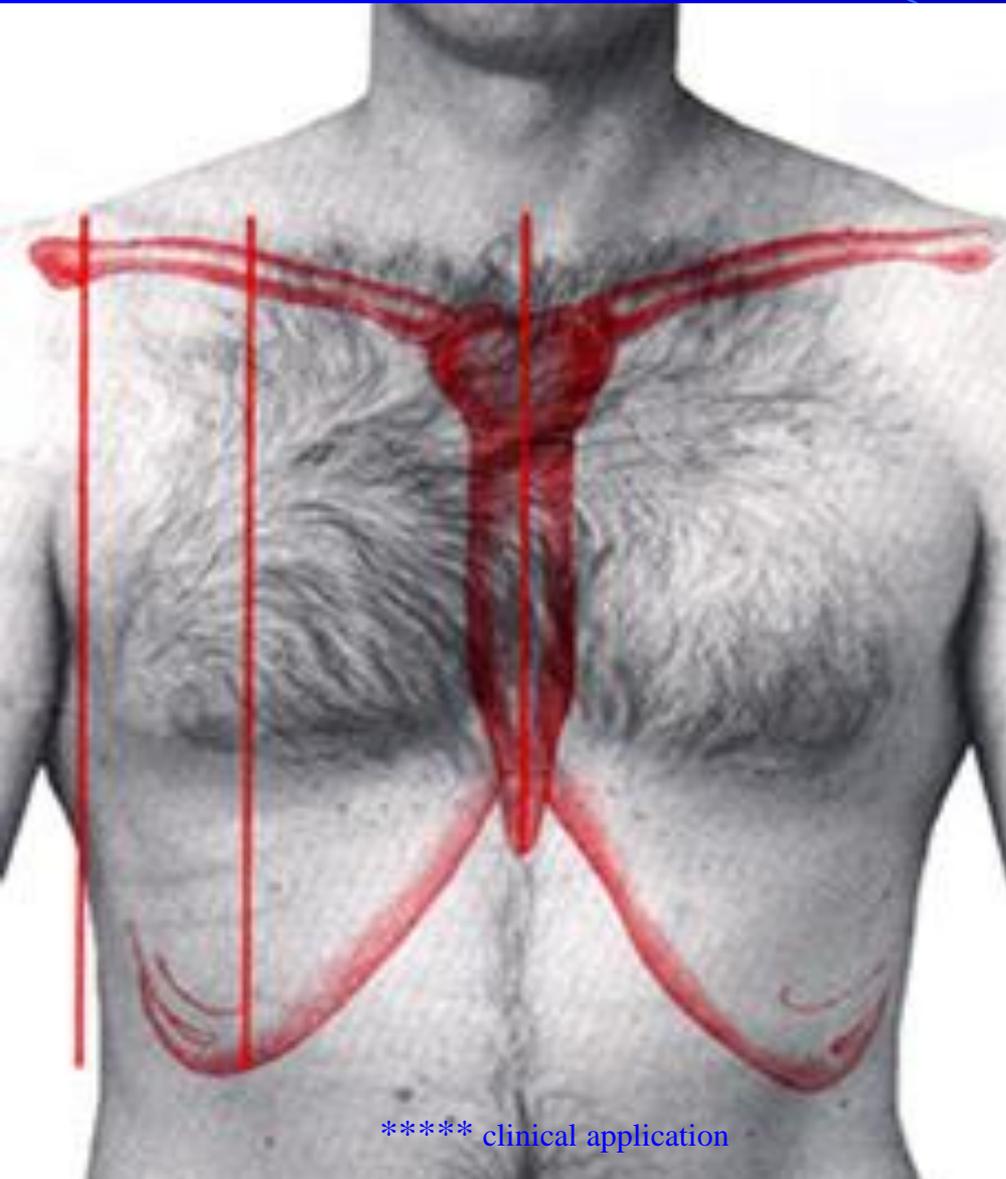
# Thoracic cage - bony landmarks



\*\*\*\*\* clinical application

- clavicle; A-C joint; S-C joint
- sternal angle; xiphisternum; sternal notch
- Rib counting using sternal angle (2<sup>nd</sup> costal cartilage) as key landmark \*\*\*\*\*

# Vertical lines of chest



\*\*\*\*\* clinical application

- midline
- *mid-clavicular line\*\*\*\*\**
  - midway between sternoclavicular joint & acromioclavicular joint
- anterior axillary line

- anterior axillary line
  - anterior fold of pectoralis major
- mid-axillary line
- posterior axillary line
  - posterior fold of latissimus dorsi



- midline
- paravertebral line
- medial scapular line

# lung markings - anterior

- during quiet respiration  
**lungs inferior border**  
at:

rib 6 (mid-clavicular line)

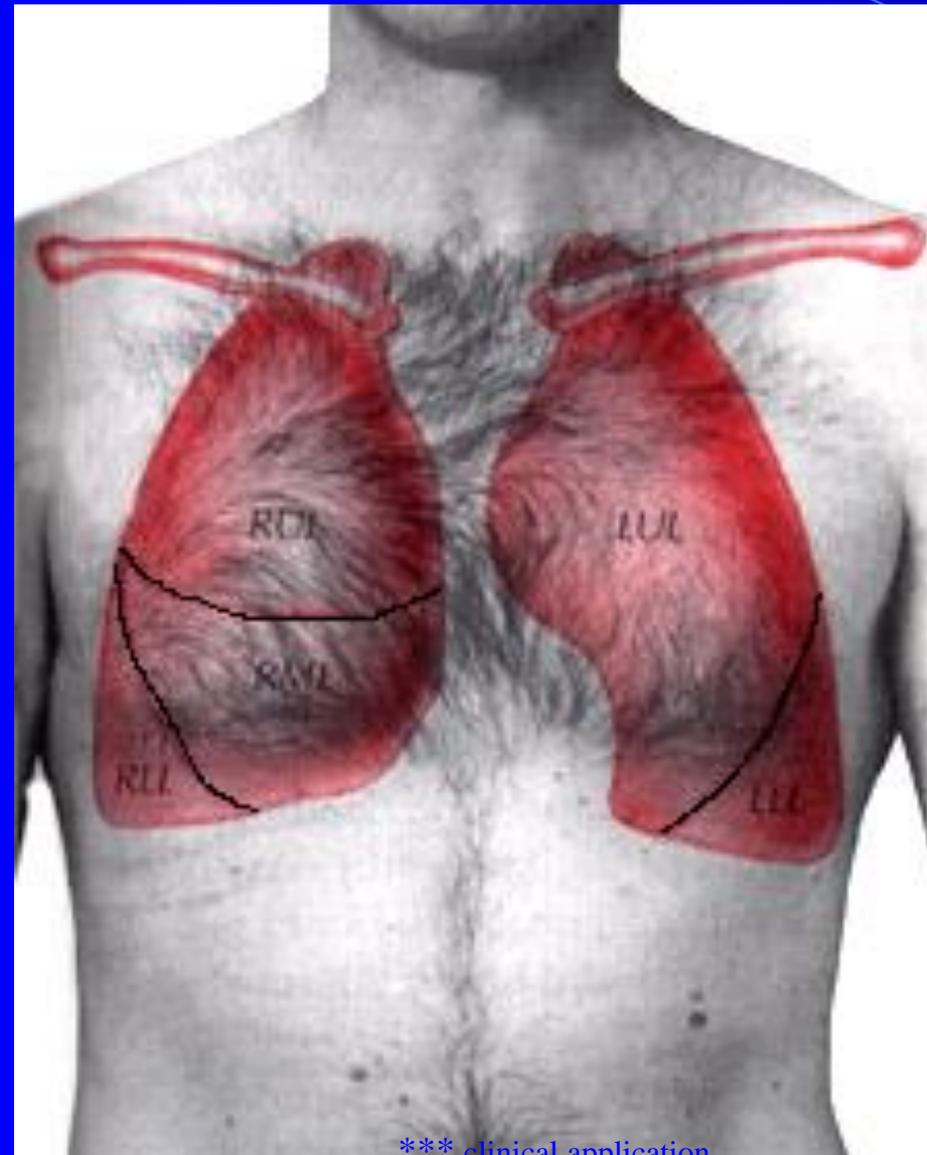
rib 8 (mid-axillary line)

rib 10 (paravertebral line)

- **pleural reflections** 2 ribs  
below at ribs 8, 10 & 12

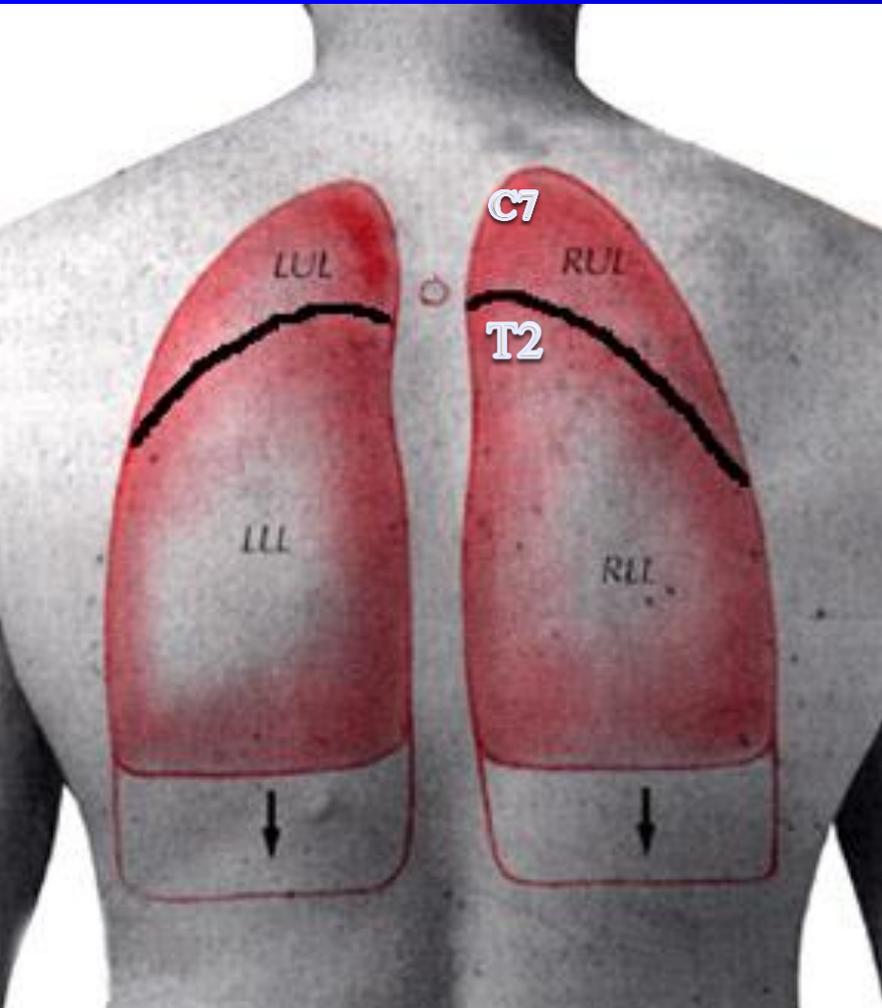
- **horizontal fissure** to 4th  
costal cartilage

- **oblique fissure** to 6th  
costal cartilage



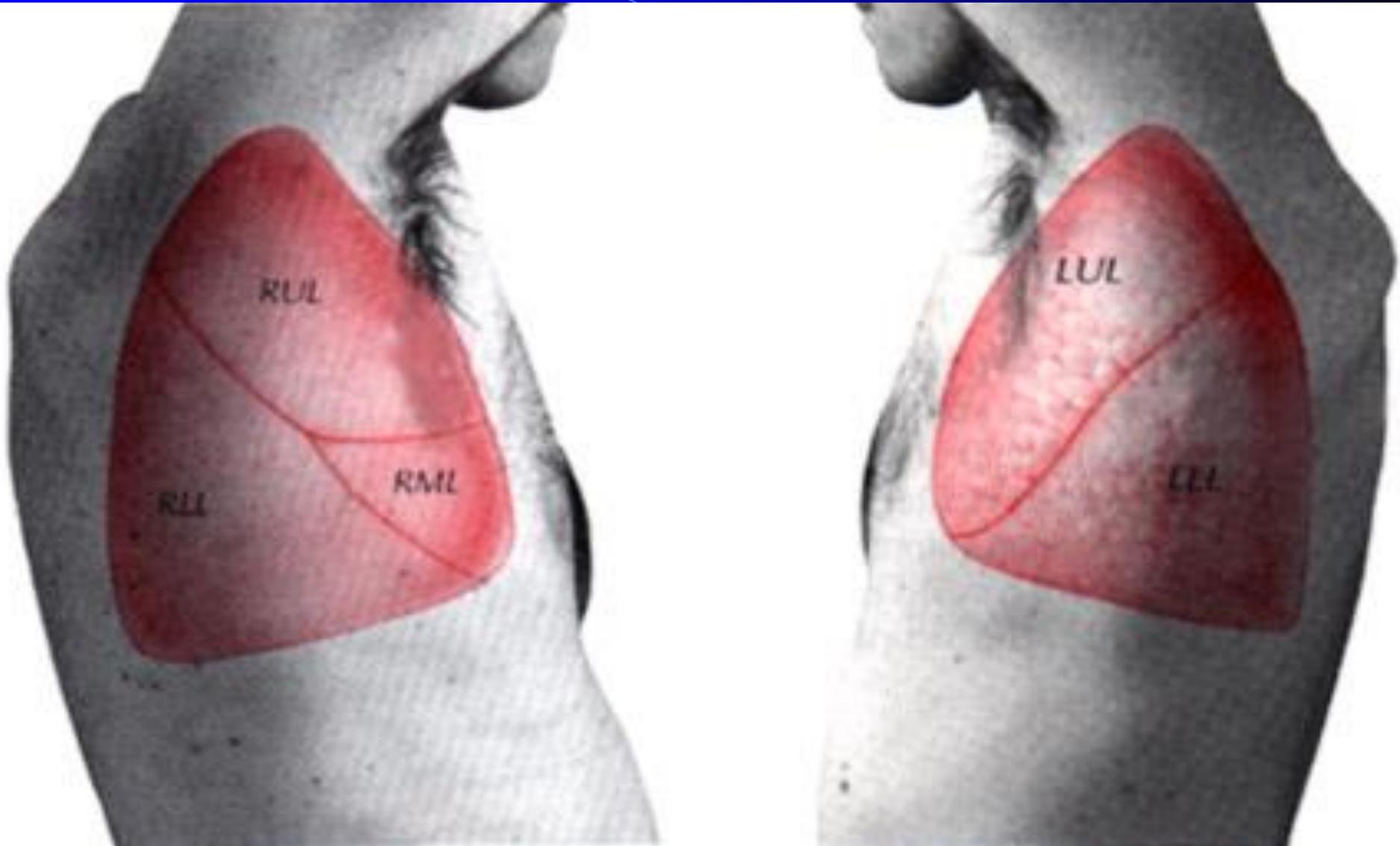
\*\*\* clinical application

# lung markings - posterior



- **oblique fissure** begins posteriorly opposite 2nd thoracic spinous process (*T2*)
- oblique fissure divides lungs into upper and lower lobes
- note how high the lower lobe of each lung extends!

# lung surface projections - lateral



clinical application

\*\*\* clinical application

# Respiratory examination

## Inspection

Resp.rate  
Movement  
Shape  
Trachea  
Pulsations  
Skin  
Back

## Palpation

Movement  
TVF  
Trachea  
Pulsations

## Percussion

- 1.Percussion of special areas
2. Percussion of the lung proper

## Auscultation

1. Breath sounds
2. Vocal resonance
- 3.Adventitious sounds

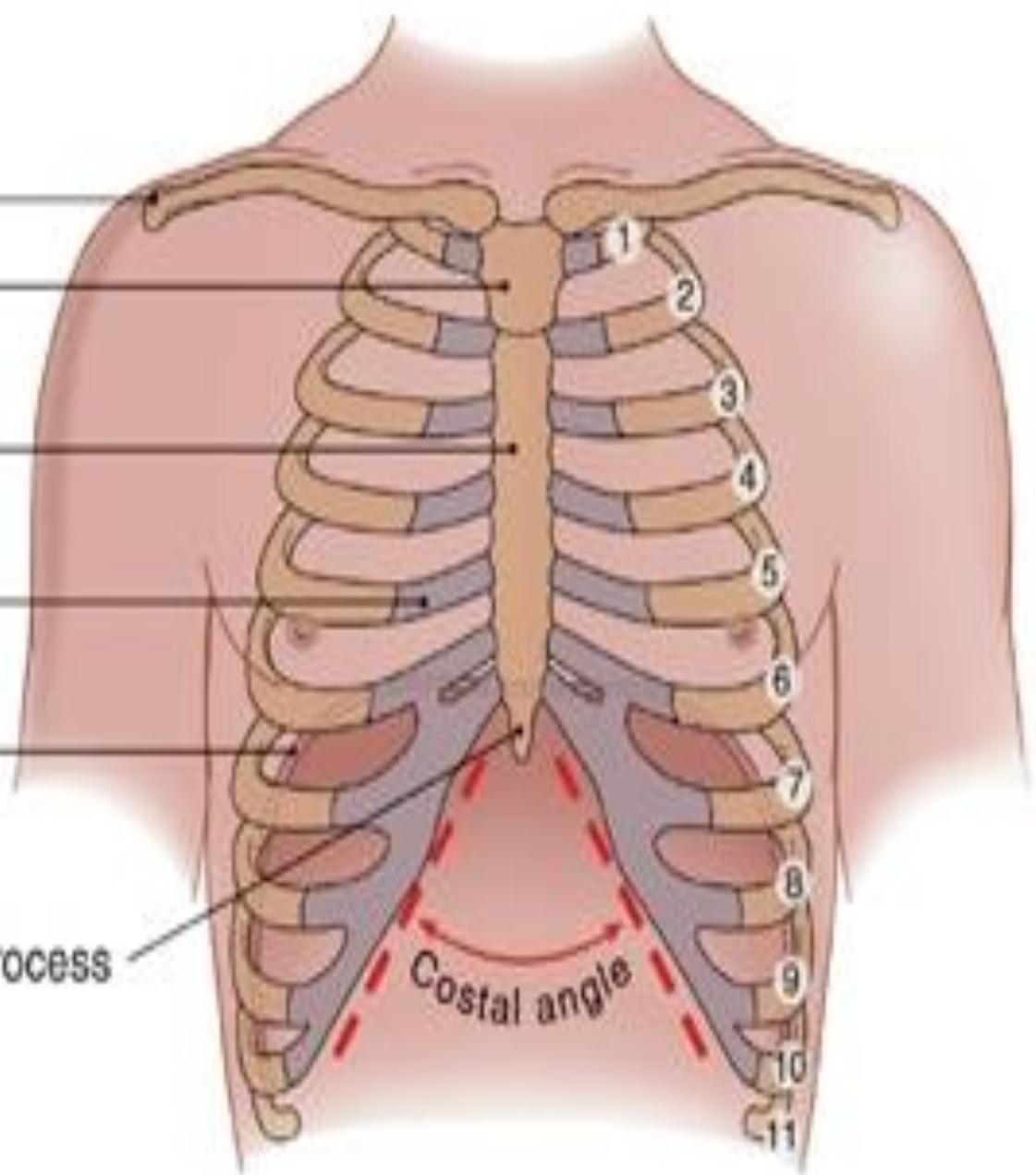
# Inspection

- **First, stands at the foot of the patient AND look tangential.**
- **Respiratory rate, rhythm, pattern**
- **movement, shape, and symmetry of chest**
- **AP:Transverse ratio (normal from 1:2 to 5:7)**
- **Costal angle (normal < 90 degrees)**

# Inspection

- Muscles for breathing
- Condition of skin
- Spinal deformities
- Pulsations
- Tracheal inspection

- Clavicle
- Manubrium of sternum
- Body of sternum
- Costal cartilage
- Diaphragm
- Xiphoid process



A

# INSPECTION

## the rate and depth of quiet breathing

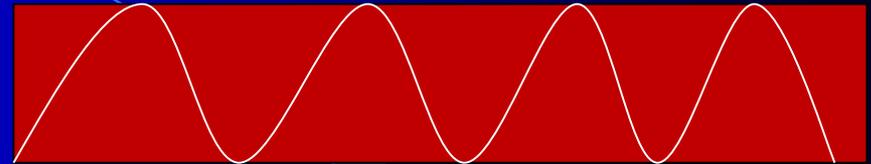
- in the adult at rest the normal respiratory rate is approximately 12 to 20 breaths per minute and is quite regular in depth and rhythm
- describe any abnormalities

# Inspection: Breathing patterns

## Rate

- **Eupnea**

- Normal
- 12-20 / min



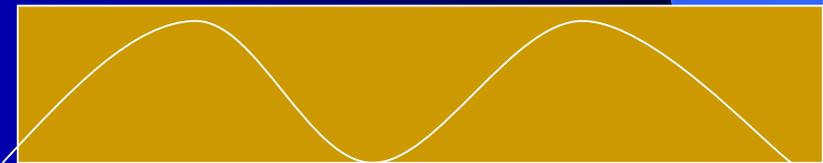
- **Tachypnea**

- ➔ ↑ rate rate greater than 25 per minute
- Pneumonia, pulm edema, acidosis, septicemia, pain



- **Bradypnea**

- ➔ ↓ rate rate less than 8 per minute
- ➔ ↑ ICP, drug OD



LOOK at Chest  
**Movement**

Before

The **Shape** of the Chest

● During normal respiration, the chest and abdomen move synchronously: both out during inspiration and both in during expiration .

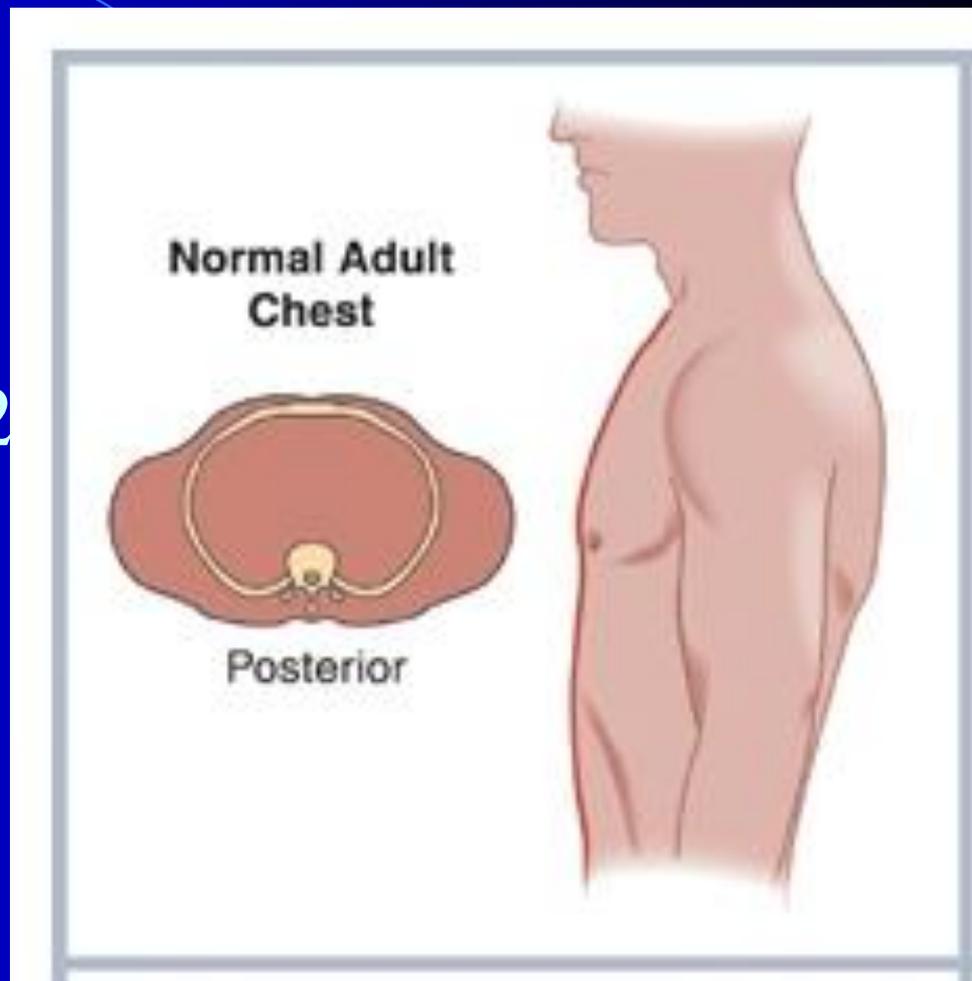
● The chest wall moves more when the person is upright, and the abdomen moves more when the person is supine.

● The chest wall mov. Is symmetrical throughout the respiratory cycle.

# Inspection

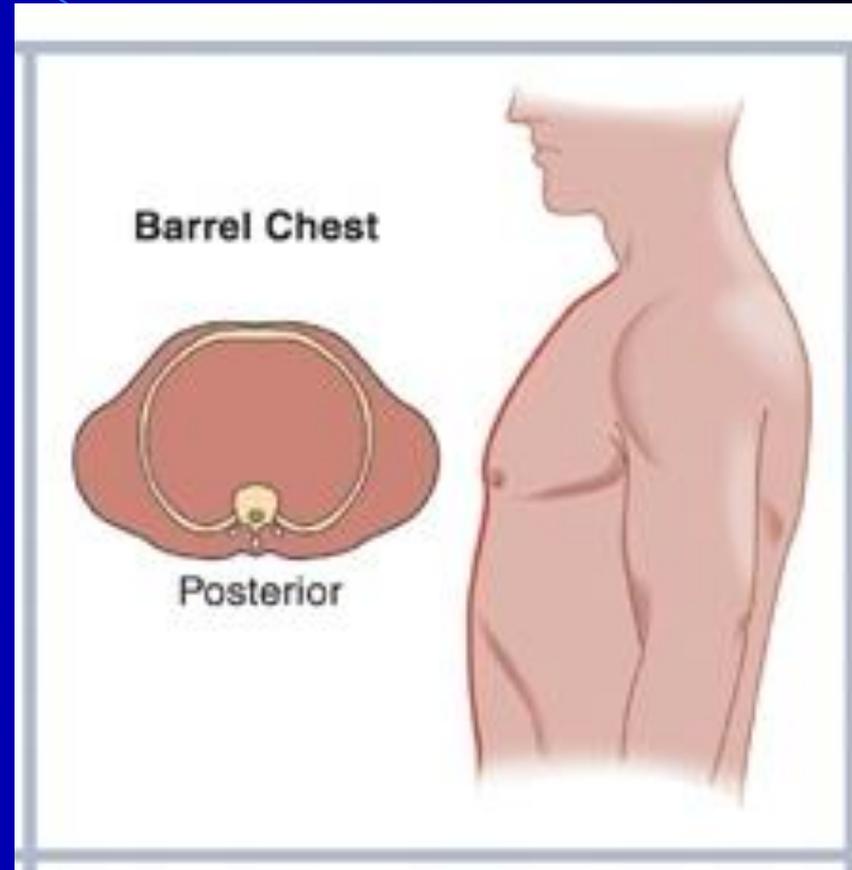
- **Normal chest**

- Symmetrical and elliptical in cross-section.
- Anterior/posterior to transverse diameter 1:2
- the two sides of the chest move synchronously and expand equally
- **Slight retraction of intercostal spaces during inspiration.**



## ● Barrel chest

- over inflation of lungs, their inferior borders at lower level than normal.
- anterior-posterior to transverse diameter 2:2
- Transverse ribs, wide intercostal spaces and subcostal angle.



## ● **Scoliosis**

- Lateral curvature of thoracic spine
- Idiopathic or secondary to TB spine or unilat.chronic chest disease.

## **Kyphosis**

- Hunchback

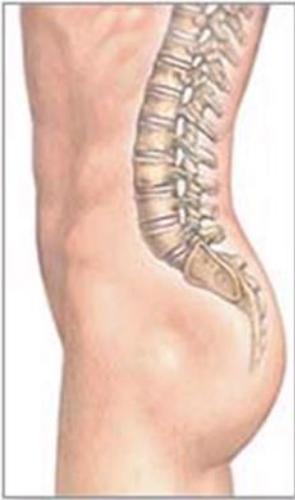
Abnormal curvature of the thoracic spine

## **Kyphoscoliosis**

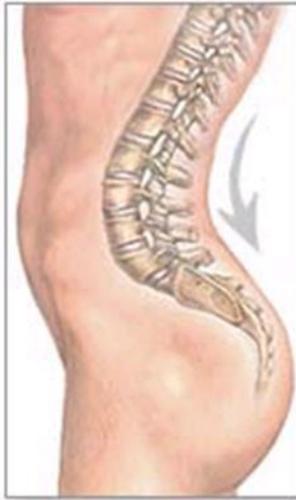
## **Lordosis**

Abnormal curvature of the lumbar spine

Normal spine

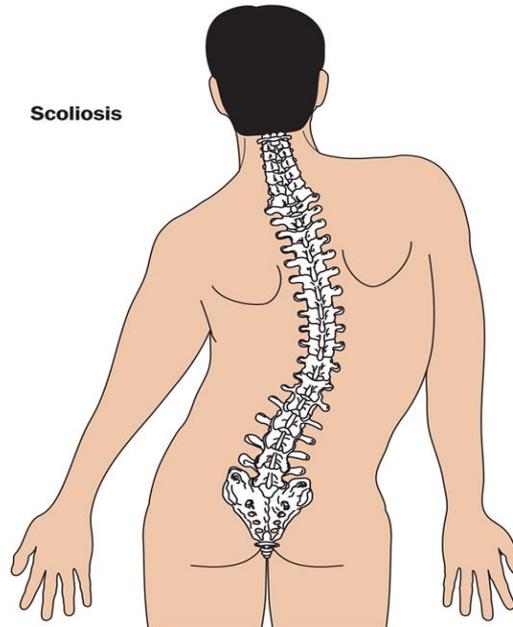


Lordosis of the spine

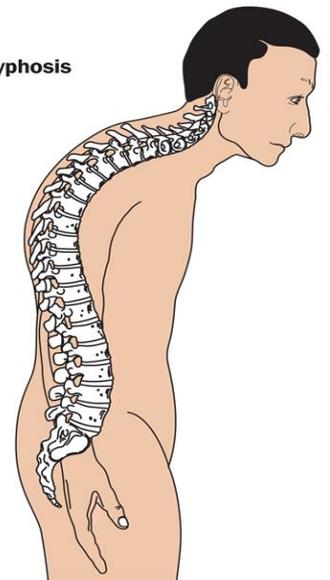


Exaggerated  
lumbar  
curve

Scoliosis



Kyphosis



# retraction or bulging of interspaces

- **Retraction of the interspaces:**

1. Unilateral: collapse, fibrosis, resection

- **Bulging of interspaces :**

- chest wall lesion, pleural( a massive pleural effusion, tension pneumothorax), lung lesion or mediastinal lesion.

# Palpation

- Tracheal examination
- Chest expansion
- Tactile vocal fremitus
- Pulsations
- Points of tenderness, palpable adventitious sounds

# Tracheal examination

1-Tracheal position

2-Tracheal tug

3-Tracheal length

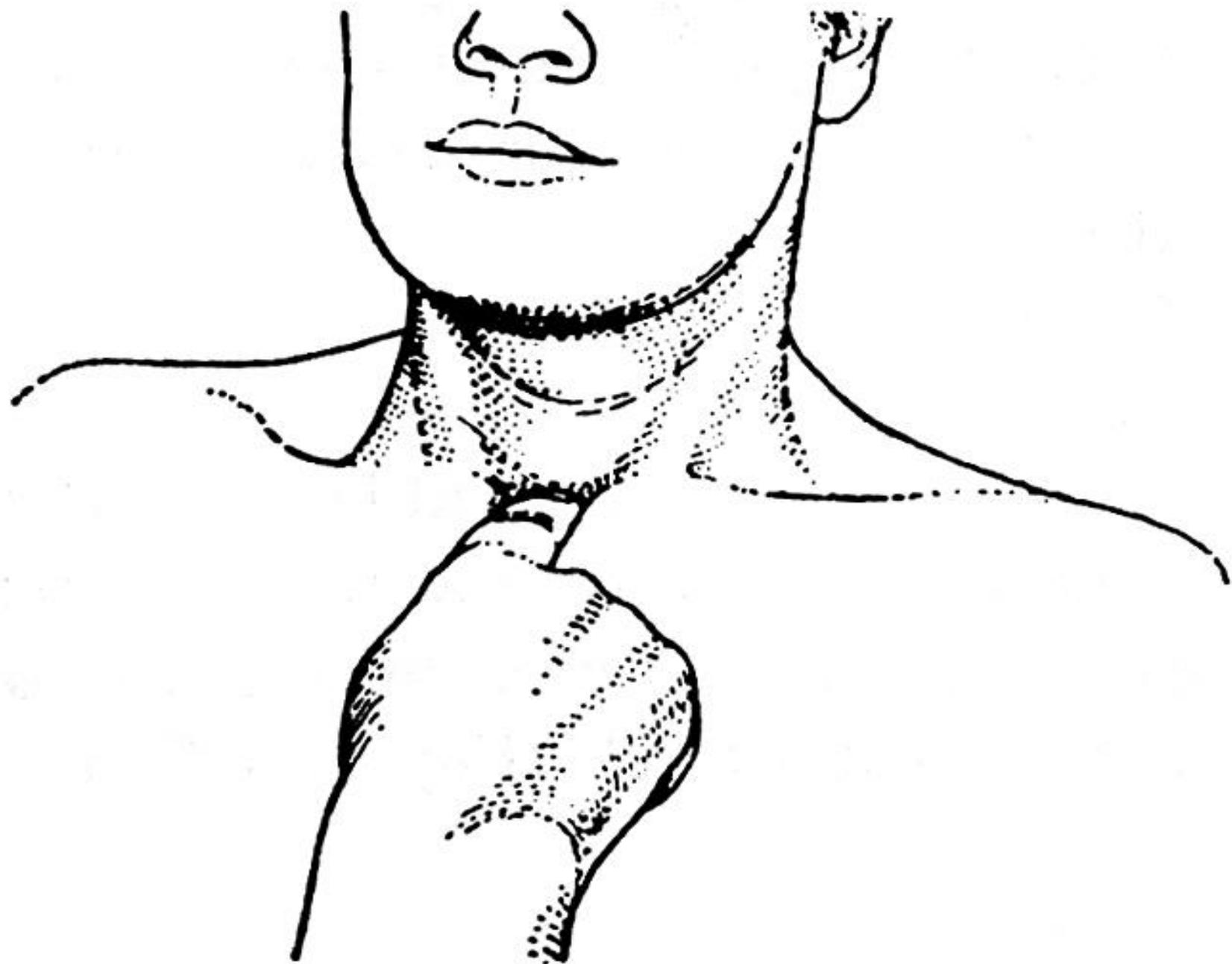
4-Tracheal displacement

# 1-Tracheal position

## Method Of Exam

- Position yourself in front of the patient and note the position of the thyroid cartilage.
- Inspect for the symmetry of clavicular insertion of both sternomastoids.
- Tracheal Position: Gently bend the head to relax the sternomastoids. By inserting your finger between the trachea and sternomastoid, assess and compare the space on either side.

-Normal: Trachea is slightly tilted to right.  
As a result, the clavicular insertion of right Sternomastoid is slightly more prominent and the space between trachea and sternomastoid is smaller compared to left.





**Tracheal shift to left**



## Common causes of tracheal deviation

Towards the side of the lung lesion

- Upper lobe or lung collapse
- Upper lobe fibrosis
- Pneumonectomy

Away from the side of the lung lesion

- Tension pneumothorax
- Massive pleural effusion

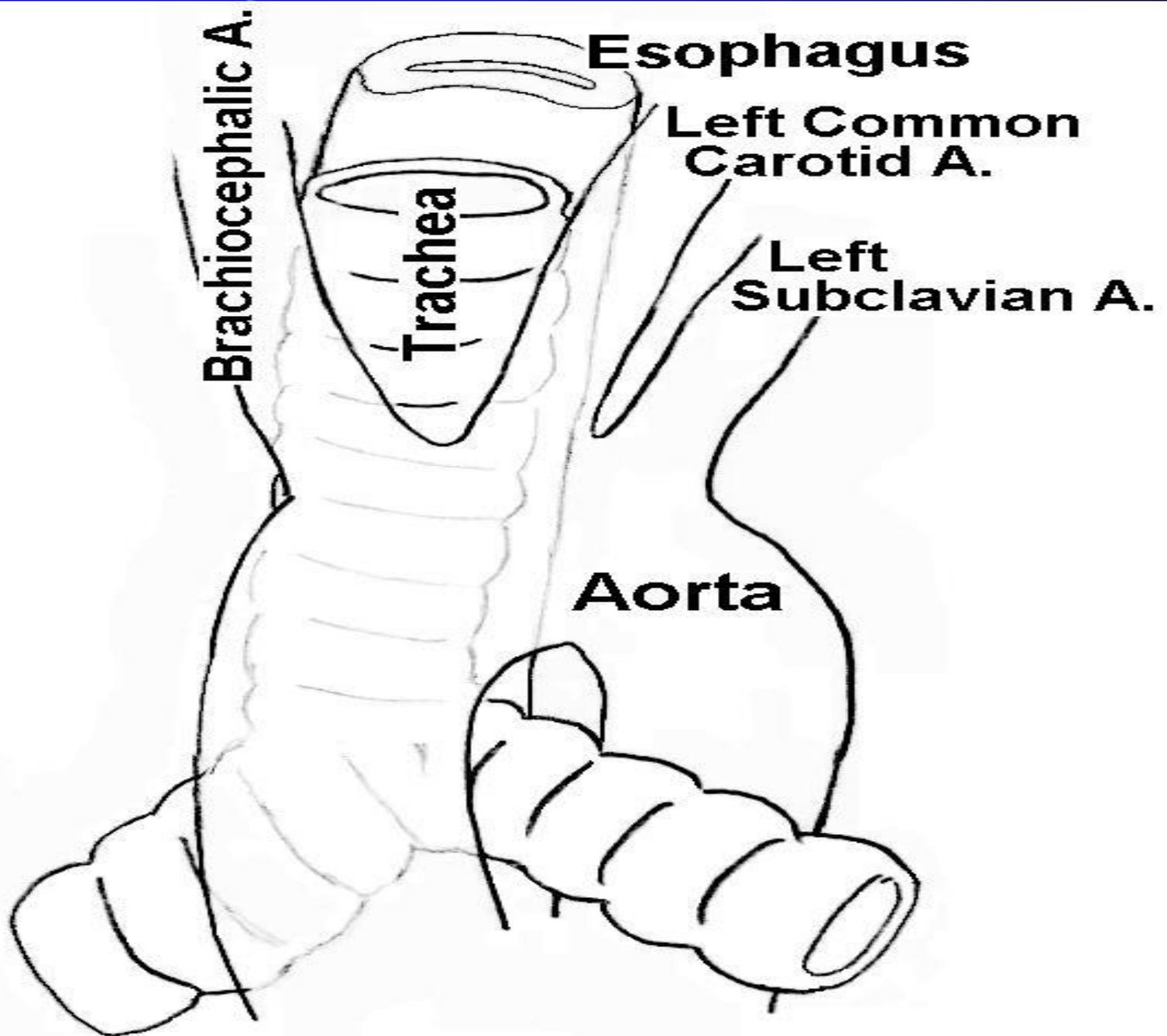
Upper mediastinal mass

- Retrosternal goitre
- Lymphoma
- Lung cancer

## 2-Tracheal tug

### 1. OLIVER'S SIGN:

- DOWNWARD displacement of the Cricoid Cartilage with ventricular contraction, observed in patients with an **AORTIC ARCH ANEURYSM**.
- the sign is elicited most easily by drawing the cricoid cartilage upward with the thumb and forefinger while the patient sits with head thrown back and mouth closed;

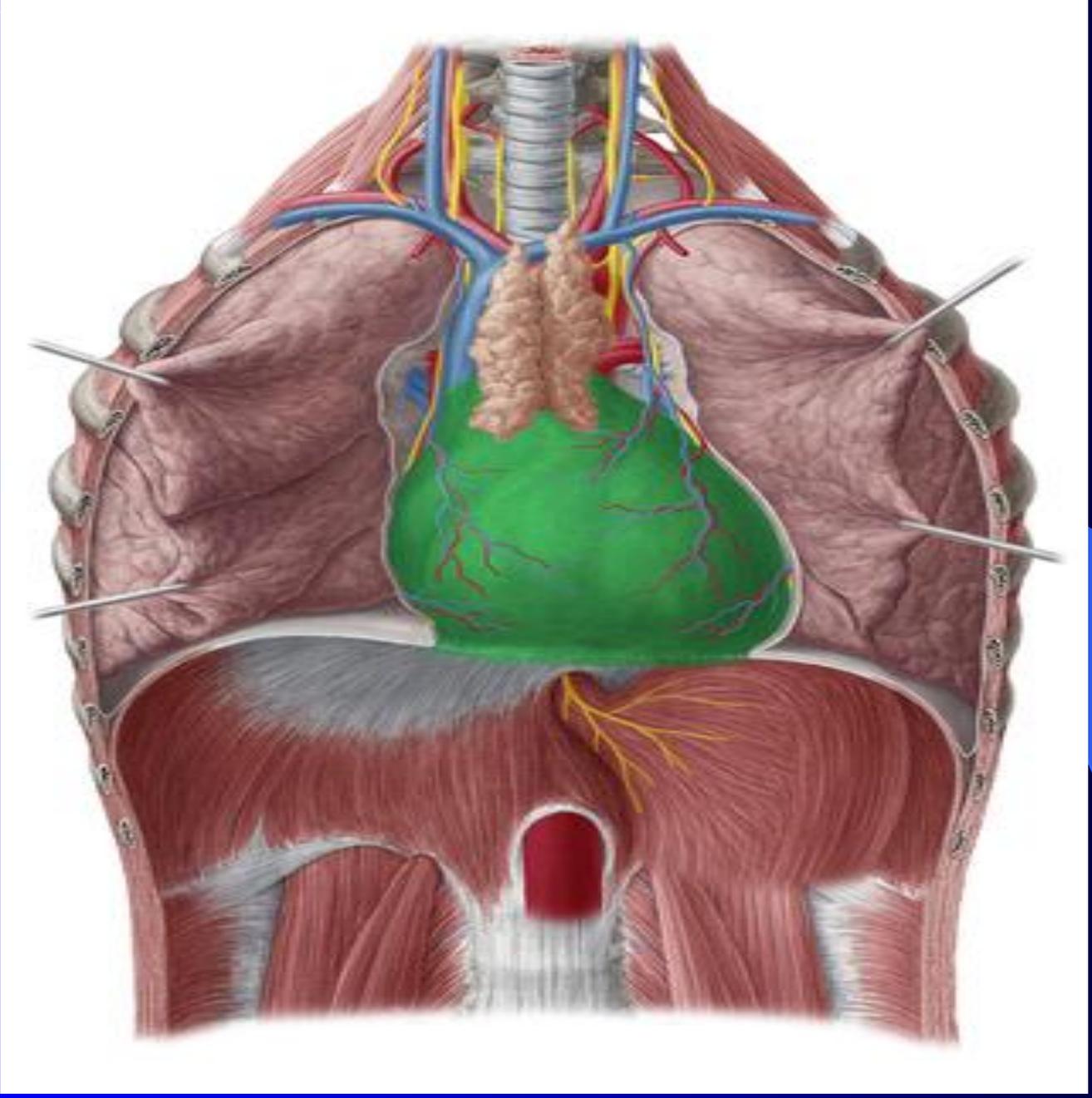


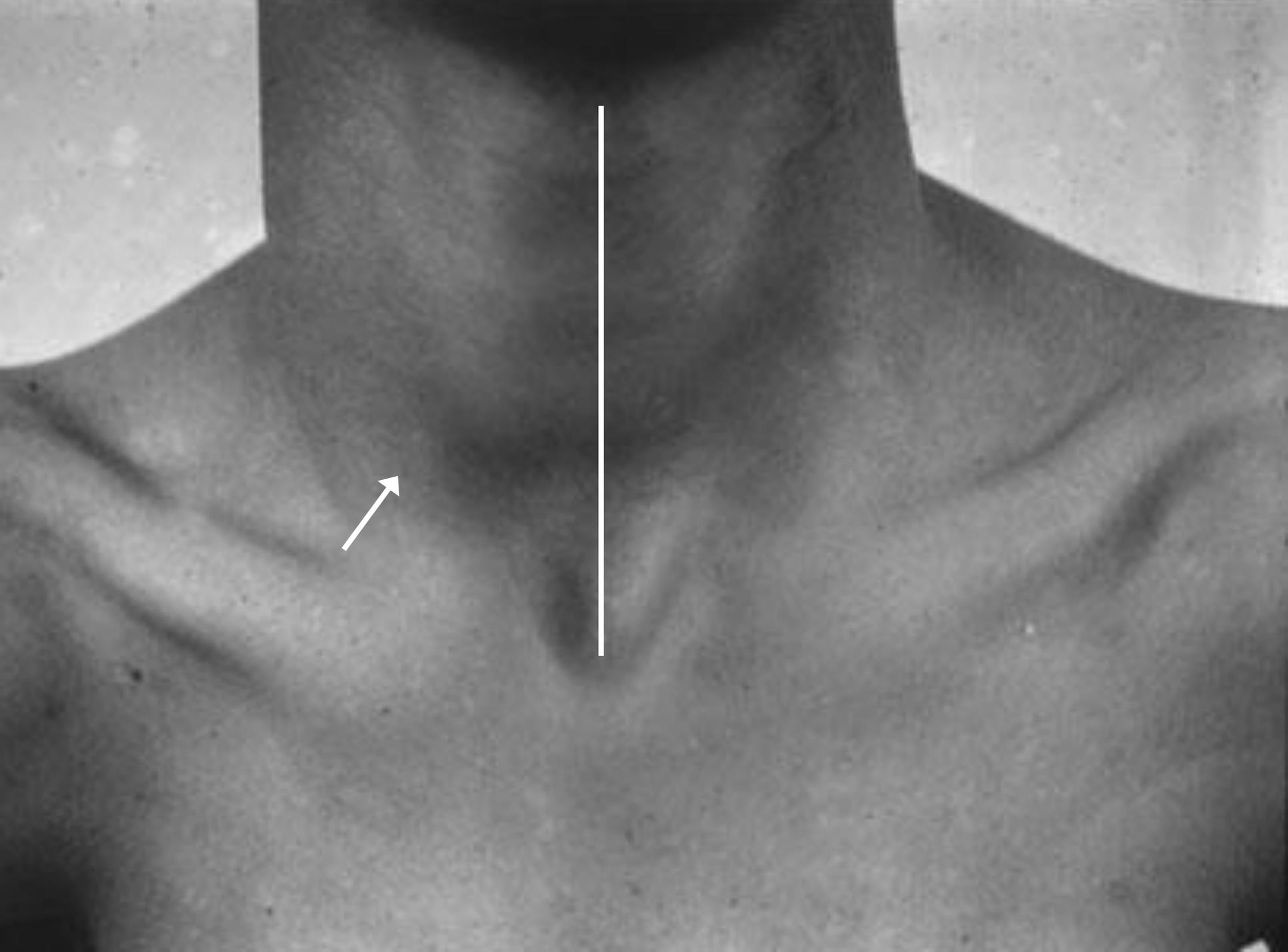
## CAMPBELL'S SIGN:

A jerky downwards movement of the Thyroid Cartilage during inspiration, seen in patients with COPD

3-Tracheal length

4-Tracheal displacement

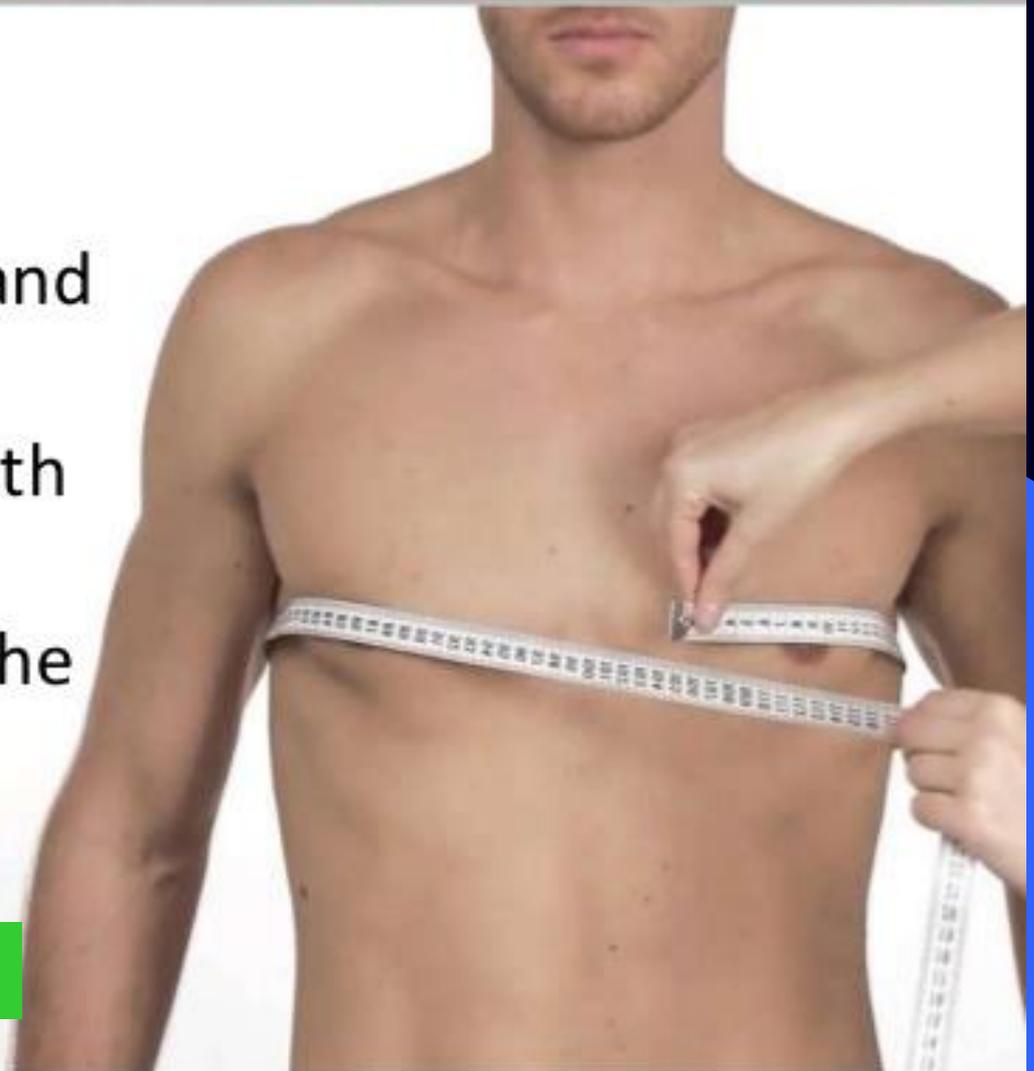




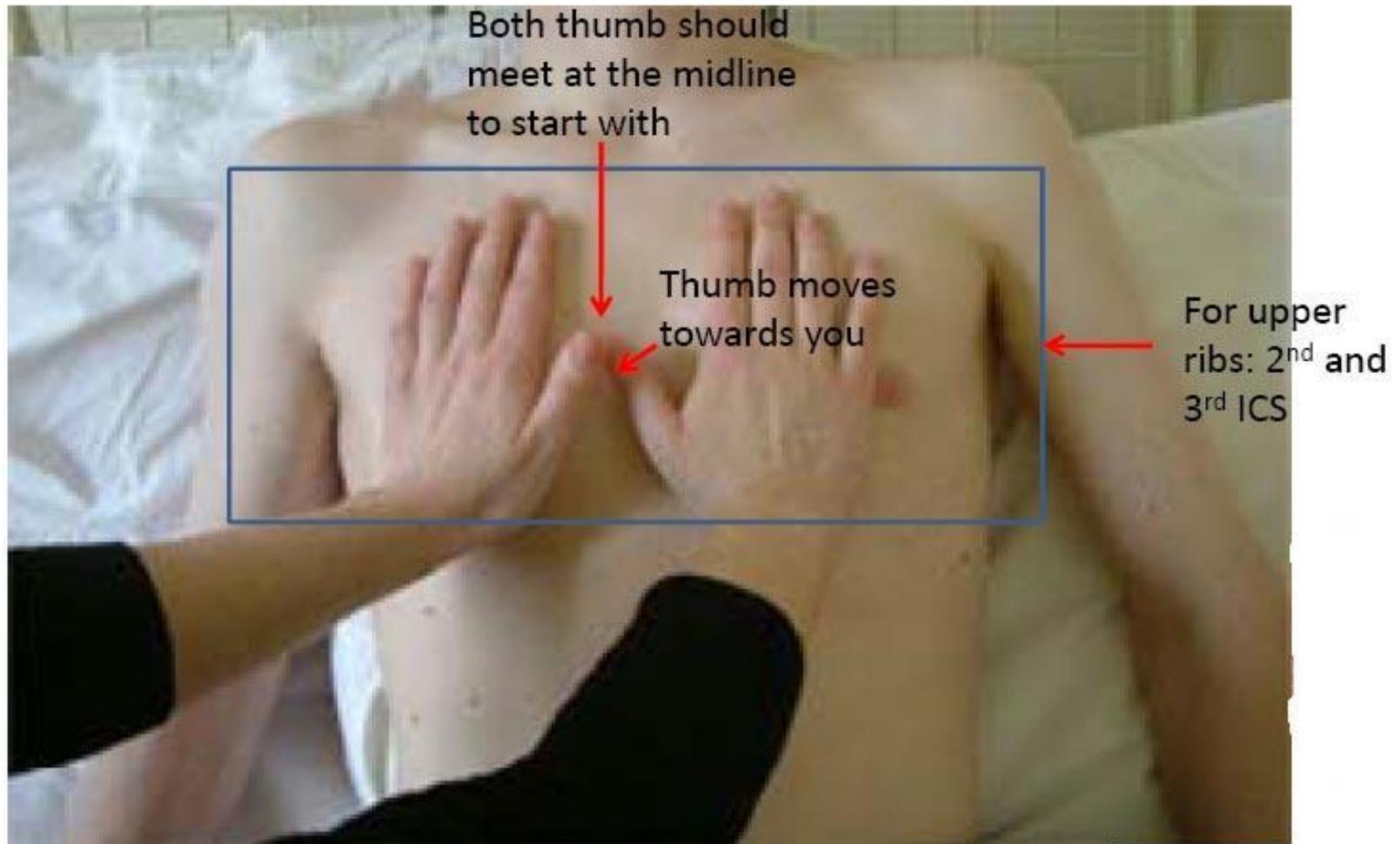
# Chest expansion



- Measured as the difference between maximal inspiration and maximal forced expiration in the fourth intercostal space in males or just below the breasts in females
- Normal chest expansion is **3-5 cm**



# AP Chest Expansion for upper zone



# Lateral Chest Expansion

for middle and lower zone





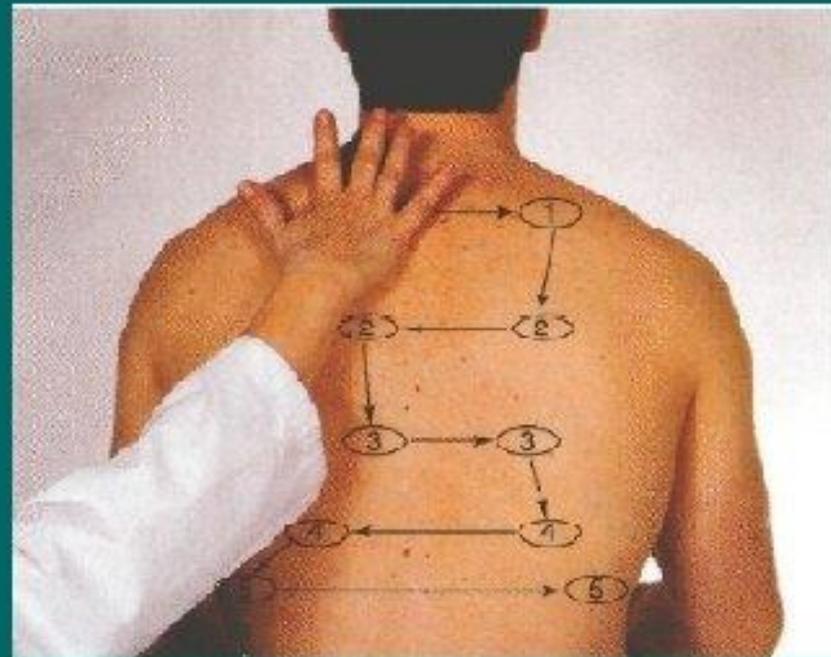
# Chest Expansion

- **Asymmetrical chest expansion is abnormal**
  - The abnormal side expands less and lags behind the normal side
  - Any form of unilateral lung or pleural disease can cause asymmetry of chest expansion
- **Global expansion decrease**  
(Emphysema, pulmonary fibrosis)



# Tactile Fremitus

- Fremitus is a palpable vibration transmitted through patent bronchi and lung parenchyma to the chest wall where they can be felt as vibrations
- Place either the palmar base **OR** ulnar edge of one of the hands on the person's back and ask to repeat "ninety-nine." Start at lung apices and palpate from one side to another
- Symmetry is most important
- Normally, fremitus most prominent between scapulae and decreases as you progress down





# Tactile fremitus (TF)

- Locate the area where TF increased, decreased or absent.
- Increased TF in
  - Lung consolidation
  - Lung fibrosis
- Decreased to absent TF when transmission of vibrations from the larynx to the surface of the chest is impeded by:
  - Obstructed bronchus
    - Chronic obstructive pulmonary disease (COPD)
  - Separation of the lung from chest wall by:
    - Pleural air e.g. Pneumothorax
    - Pleural fluid e.g. pleural effusion, hemothorax
    - Pleura thickening

# Causes of chest tenderness:

1-Teitz sign

2-Rib inflammation, malignancy or fracture

3-empyema

# Percussion

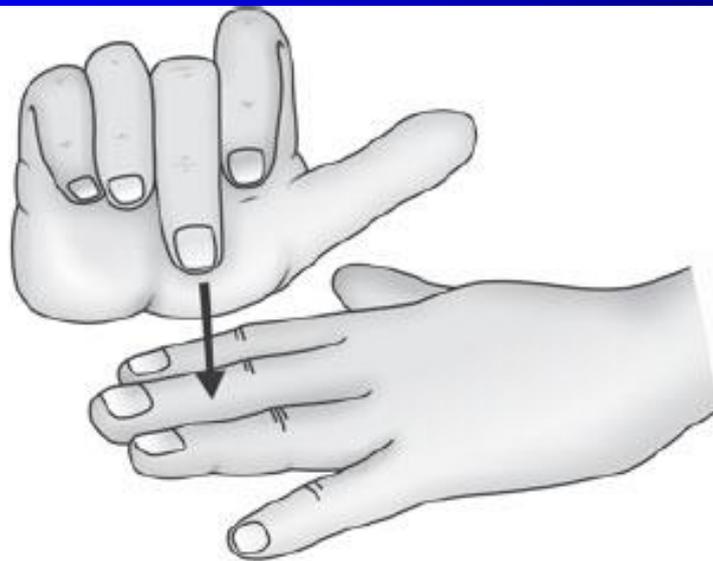


# Objectives

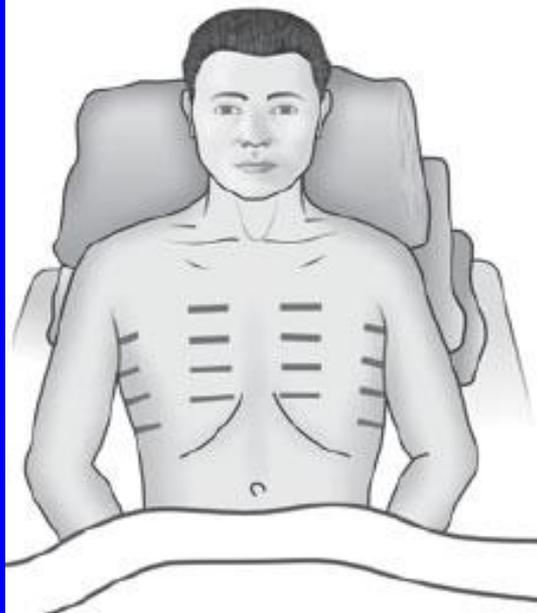
- What is percussion and its aim?
- Rules of percussion
- Types of percussion
- Notes of percussion
- Technique :Lung –Special areas

# PERCUSSION

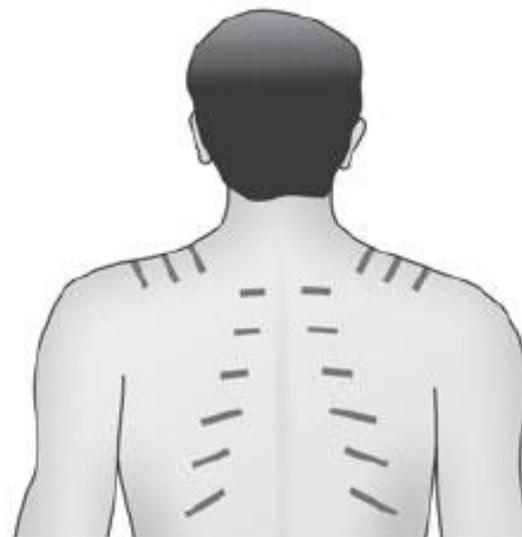
- Percussion is art of tapping on a surface in order to evaluate the underlying structures 
- Percussion of chest wall generates sound and leads to production of standing waves on the chest wall
- The sound waves produced on the chest wall can travel down to a depth of 5-7cm



Techniques of percussion



Sites for percussion—  
anterior  
and  
lateral chest wall



Sites for percussion—  
posterior  
chest wall



# Rules of percussion.

- **Sitting/ standing/ recumbent.**
- **Pleximeter** (middle finger of left hand) should be firmly placed on the chest wall along an **interspace**, with no interposed airpockets.
- **Other fingers must be held away from the chest wall.**
- The **plessor** (middle finger of the right hand) should hit the **middle phalanx** at 90 degree, with the pad of the finger.
- **Movement of the plessor should be at the wrist.**

# Percussion Notes

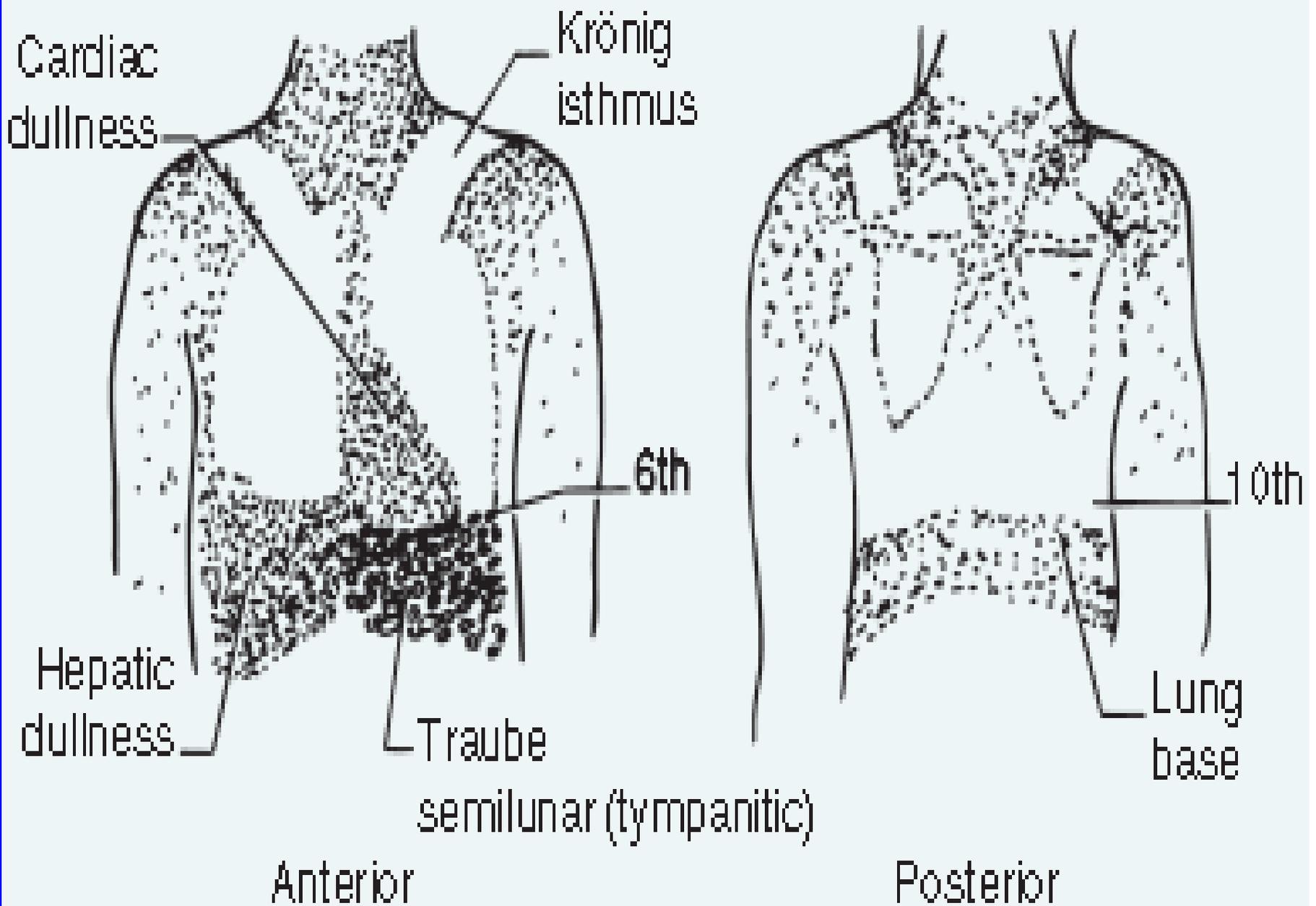
Flatness	Thigh	large pleural effusion
Dullness	liver	lobar pneumonia
Resonance	lung	simple chronic bronchitis
Hyper-resonance	None	Emphysema, pneumothorax
Tympany	Gastric bubble	large pneumothorax

WHERE

DO

START?





# PERCUSSION

- Direct percussion over clavicles
- Indirect percussion --
- Anterior- supra clavicular KRONIGS ISTHMUS
- infraclavicular
- mammary
- infra mammary
- Lateral— axillary, infra axillary
- Posterior— supra scapular
- inter scapular
- infra scapular areas
- Liver dullness.

# Kronig's isthmus

---

- 1- Stand to the right of the patient.
- 2- Ask the patient to sit and stand behind him.
- 3- Use light percussion.
- 4- Percuss both areas right and left from dullness to resonance with comparison.
- 5- Comment on dullness found.



# Upper border of the liver

---

- 1- Stand to the right of the patient.
- 2- Ask the patient to lie supine.
- 3- Use heavy percussion.
- 4- Start in the right midclavicular line from second space down to the first dullness.
- 5- Decide the upper border of the liver.



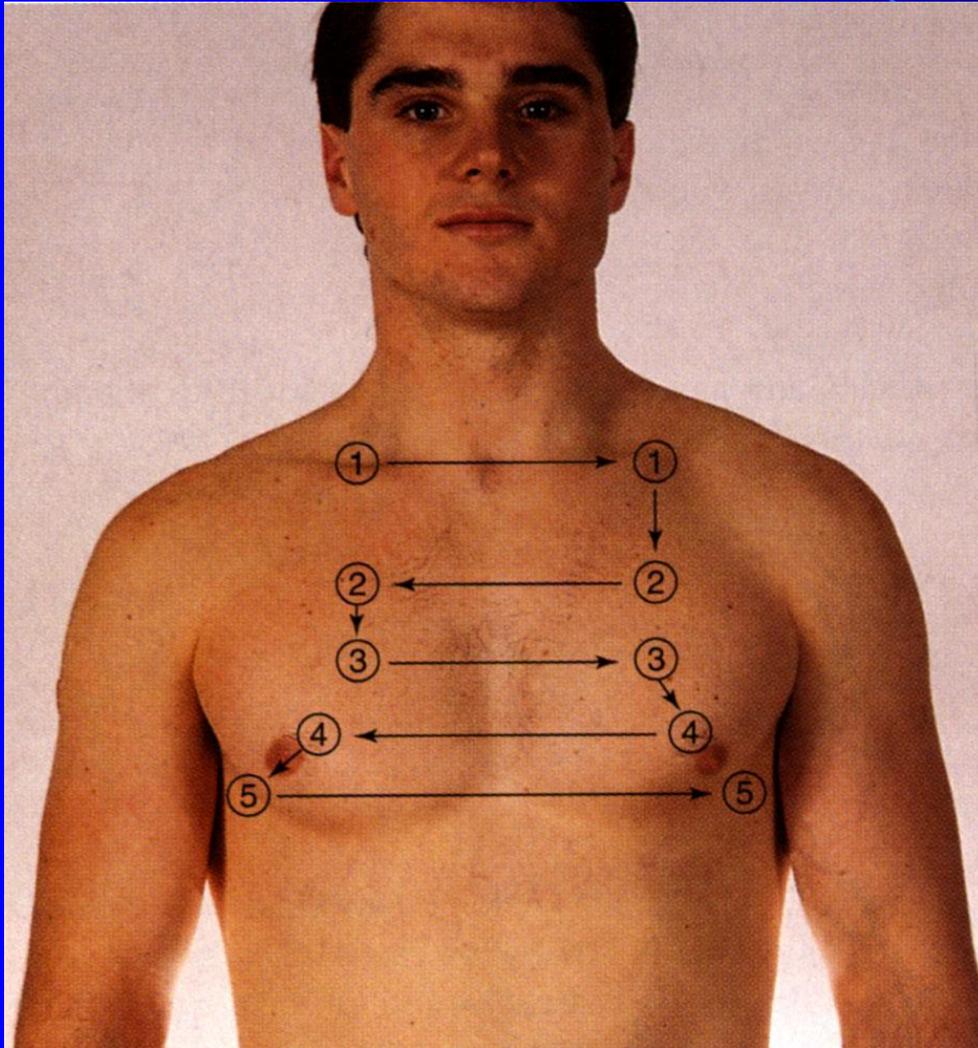
# Lung proper

Start from healthy side

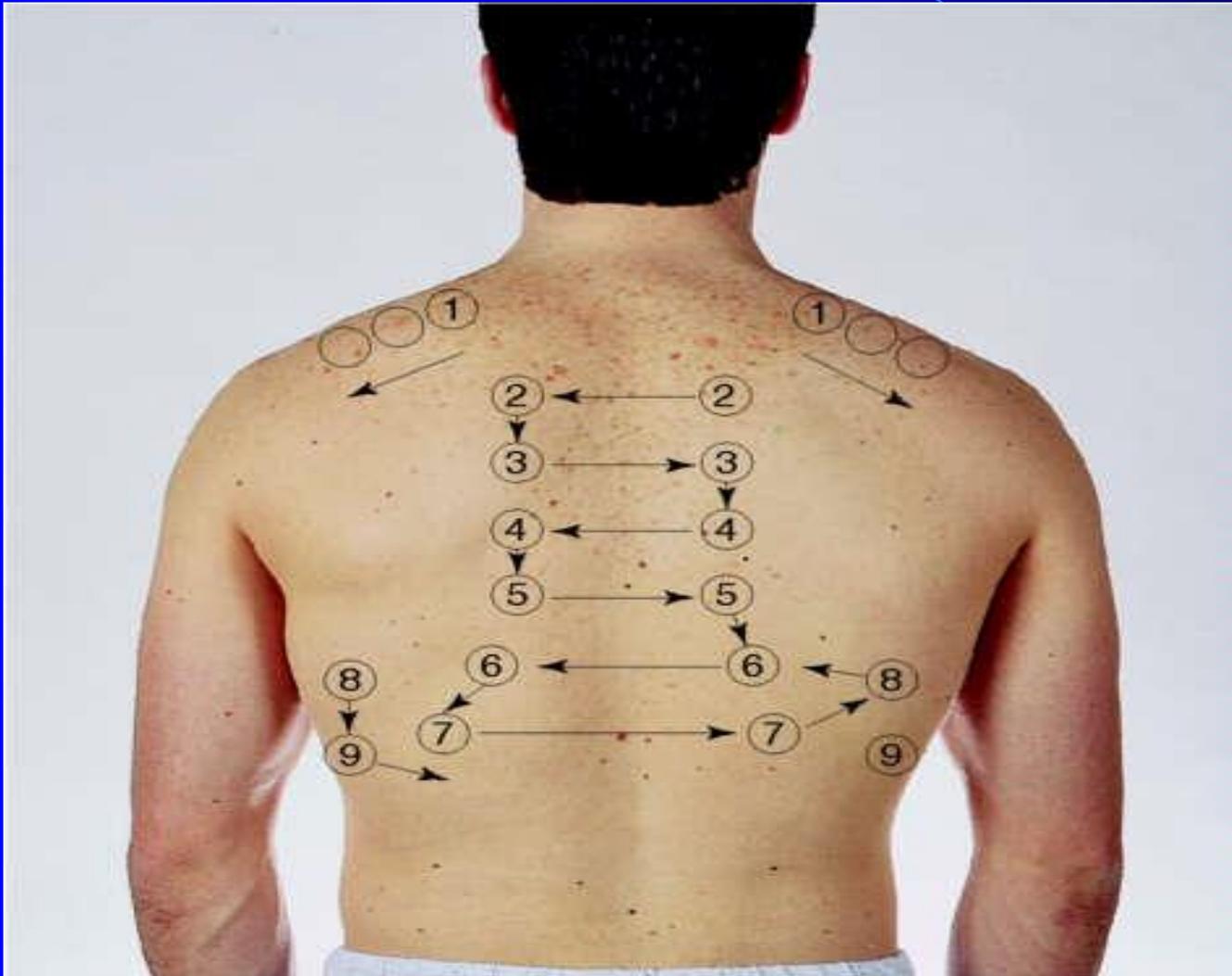
- PERCUSSION

AREA	RIGHT LUNG	LEFT LUNG
Supra clavicular		
Infra clavicular		
Mammary		
Infra Mammary		
Supra scapular		
Infra scapular		
Inter scapular		
Axillary		
Infra Axillary		

# Sequence for Percussion



# Sequence for Percussion



# Expected Percussion Notes

Resonance

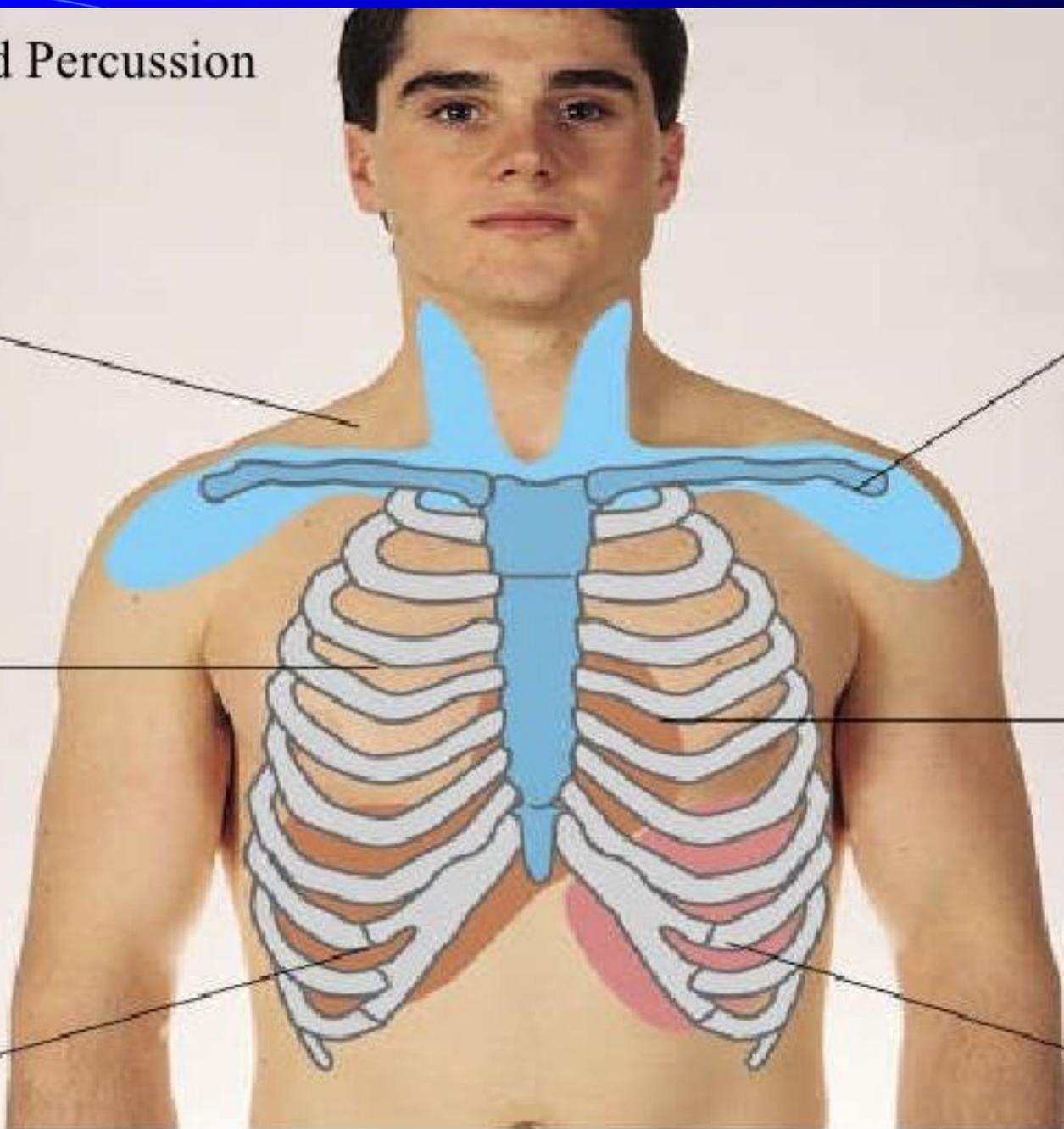
Flat over muscle and bone

Resonance

Cardiac dullness

Liver dullness

Stomach tympany



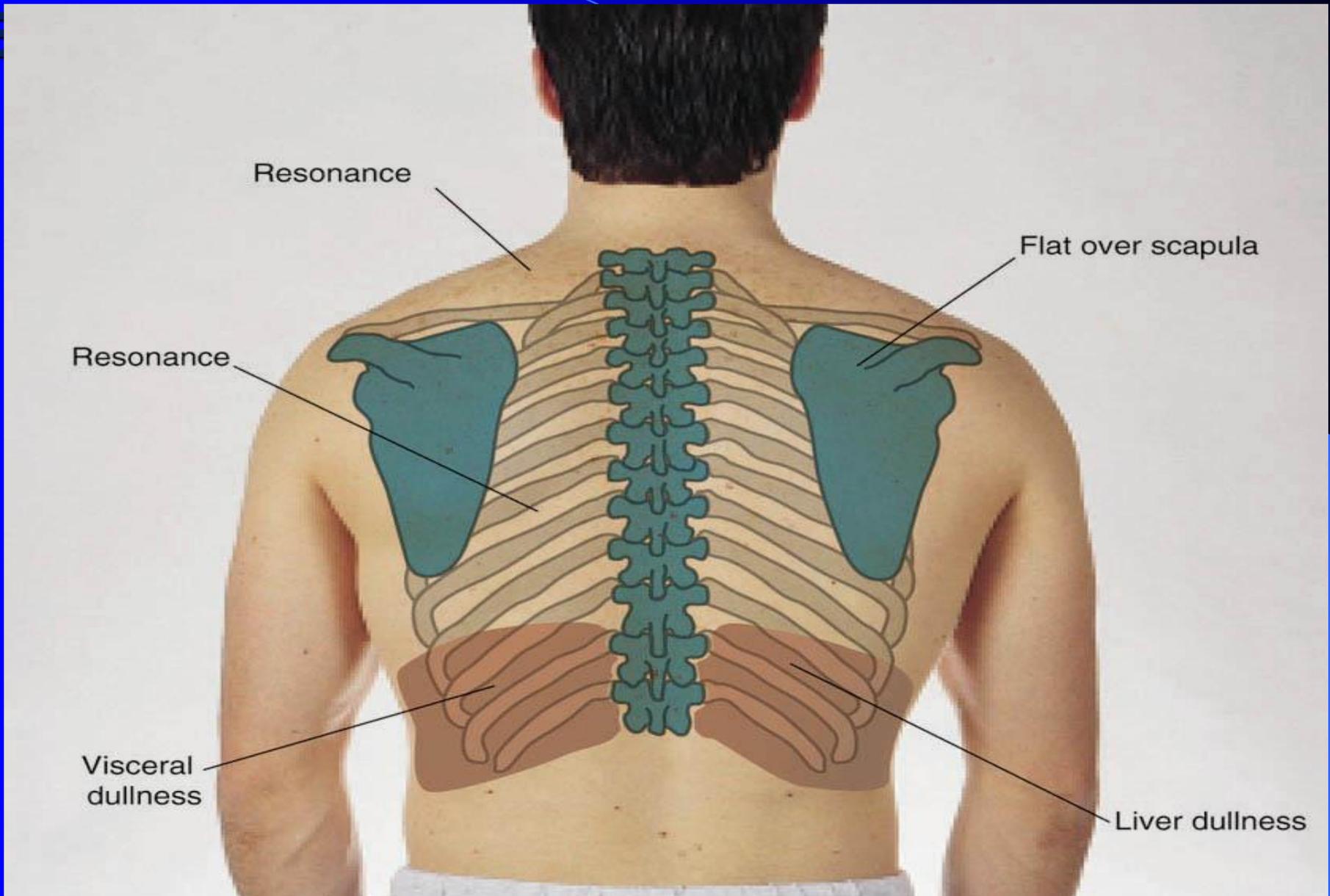


Figure 16-16. p. 463.

# AUSCULTATION



# AUSCULTATION

- The patient should be instructed to **breathe a little deeper than usual** with his mouth open. Breathing through the open mouth minimizes the sounds produced in the nose and throat.
- **Corresponding areas of each side are auscultated as the examiner goes from top to bottom**, just as in percussion.

The three categories of auscultatory findings of the lungs are :

- **breath sounds**,
- **vocal resonance** (i.e., the sound of the patient's voice through the stethoscope),
- **adventitious sounds** (i.e., sounds other than breath sounds or vocal resonance).

➤ Vesicular and bronchovesicular are the two types of breath sounds heard normally over the lungs.

➤ Bronchial breath sounds are normally heard over the trachea and right apex.

# Comparison of Vesicular and Bronchial Breath Sounds

	Vesicular	Bronchial
Timing*	Inspiration longer than expiration: 	Expiration longer than inspiration: 
Intensity	Soft, breathy	Loud, harsh, tubular
Pitch	Low (100 Hz)	High (300–400 Hz)
Location they normally are heard	Posterior bases	Trachea, right apex

# AUSCULTATION

**Breath sounds--abnormal**

# Bronchial breathing

- Bronchial breathing is not normally heard over the lungs. Therefore, its presence over the lungs always indicates disease.
- It occurs only with pulmonary consolidation

# Decreased or absent breath sounds

- ❖ One of the most common causes is pleural effusion or pneumothorax.
- ❖ Breath sounds are commonly decreased in **emphysema** because of the decreased air velocity and sound conduction.
- ❖ Breath sounds are markedly diminished or absent in **complete bronchial obstruction**.

# AUSCULTATION

voice sounds--normal

# Vocal resonance

- Vocal resonance is produced in the same fashion as vocal fremitus. The spoken voice as heard over the normal lung is termed vocal resonance.
- Vocal resonance varies in exactly the same fashion as does vocal fremitus. It is heard loudest near the trachea and major bronchi and is less intense at the bases.

# AUSCULTATION

**Voice sounds--abnormal**

# Vocal Fremitus/Resonance

---

## Bronchophony

- Auscultate posterior chest. 99 should be soft and muffled, if loud and clear, consider lung consolidation.

## Egophony

- Evaluates intensity of spoken voice. Have pt. say eee, should hear soft, muffled eee, if aaa heard, consider lung consolidation.

## Whispered Pectoriloquy

- Performed when a (+) bronchophony is auscultated. Have pt. whisper 1,2,3. Sound should be faint and muffled. Clear with lung consolidation.
-

➤ the pathogenesis for all three voice sounds (bronchophony, pectoriloquy and egophony) is the same and all may appear simultaneously in the same patient

Bronchial breath sounds often accompany abnormal vocal resonance.

# Decreased vocal resonance

- Vocal resonance is decreased under the same circumstances that the vocal fremitus and the breath sounds are decreased or absent-where there is interference in the conduction of vibrations produced in the thorax, such as is found with **pleural thickening , pleural fluid , pneumothorax, adiposity, or complete bronchial obstruction.**

# AUSCULTATION

*Adventitious sounds*

❖ The most common adventitious sounds are the various types of **Crackles (crepitations) (rales)** , **Rhonchi (Wheezes)** and **the pleural friction rub**

❖ **Comment**

1. Timing
2. Intensity “loud or soft”,pitch “ high or low”
3. Effect of deep breathing, coughing



## Adventitious (Added) breath sounds

➤ abnormal sounds that are heard over a patient's lungs and airways

1. Crackles .... ( discontinuous sounds )Indicates air passing over fluid in **small** airways (Atelectasis or fluid congestion)
2. Rhonchi .... ( low-pitched )Air moving through **large** air ways containing secretions
3. Wheezing .... ( high-pitched )Air moving through **narrowed** airway



# Pleural friction rub

- Description:
  - Coarse and low pitched superficial sound. Both inspiratory and expiratory.
- Mechanism:
  - Caused when pleurae become inflamed and lose normal lubricating fluid. Pleural surfaces rub together during respiration. Heard best in anterolateral wall.
- Clinical example:
  - Pleuritis

A photograph of a red, textured card with the words "Thank you!" written in black cursive. The card is placed on a wooden surface, surrounded by vibrant autumn leaves in shades of yellow and orange. A small hole on the left side of the card has a piece of dark twine tied through it. The background is softly blurred, showing more foliage and a warm, golden light.

Thank  
you!