

وسهلا

أهلا



الأستاذ الدكتور / يوسف حسين

أستاذ التشريح وعلم الأجنة - كلية الطب - جامعة الزقازيق - مصر

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دكتورة من جامعة كولونيا المانيا

جروب الفيس د. يوسف حسين (استاذ التشريح)



Diaphragm

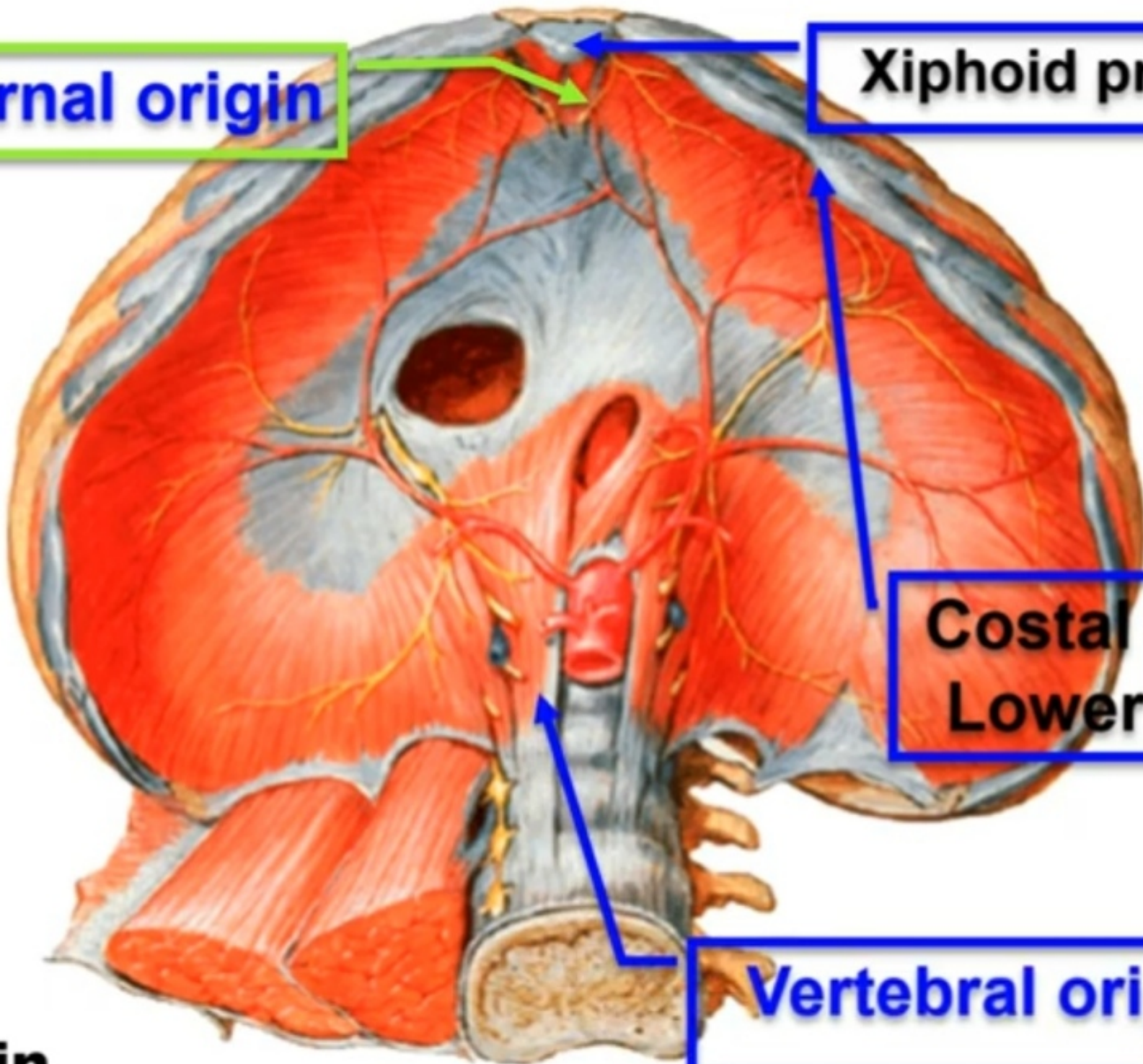
sternal origin

Xiphoid process

**Costal origin
Lower 6 CC**

Vertebral origin

Origin



Lateral arcuate ligament

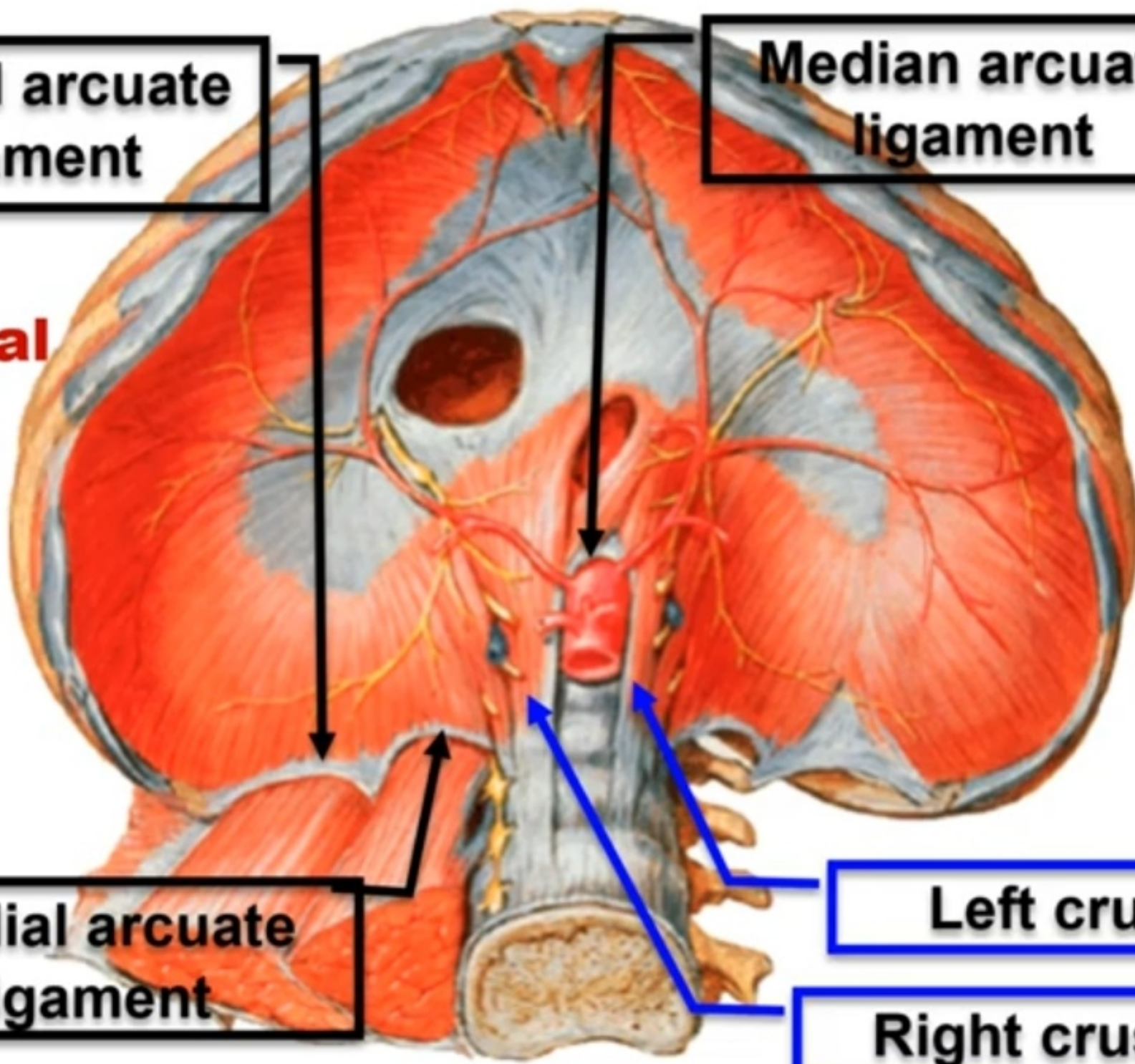
Median arcuate ligament

Vertebral Origin

Medial arcuate ligament

Left crus

Right crus



- **Origin of Diaphragm**

1- Sternal origin from the back of the xiphoid process.

2- Costal origin: from the lower 6 costal cartilages.

3- Vertebral origin:

a- Right crus: from bodies of **upper 3** lumbar vertebrae.

b- Left Crus: from bodies of **upper 2** lumbar vertebrae.

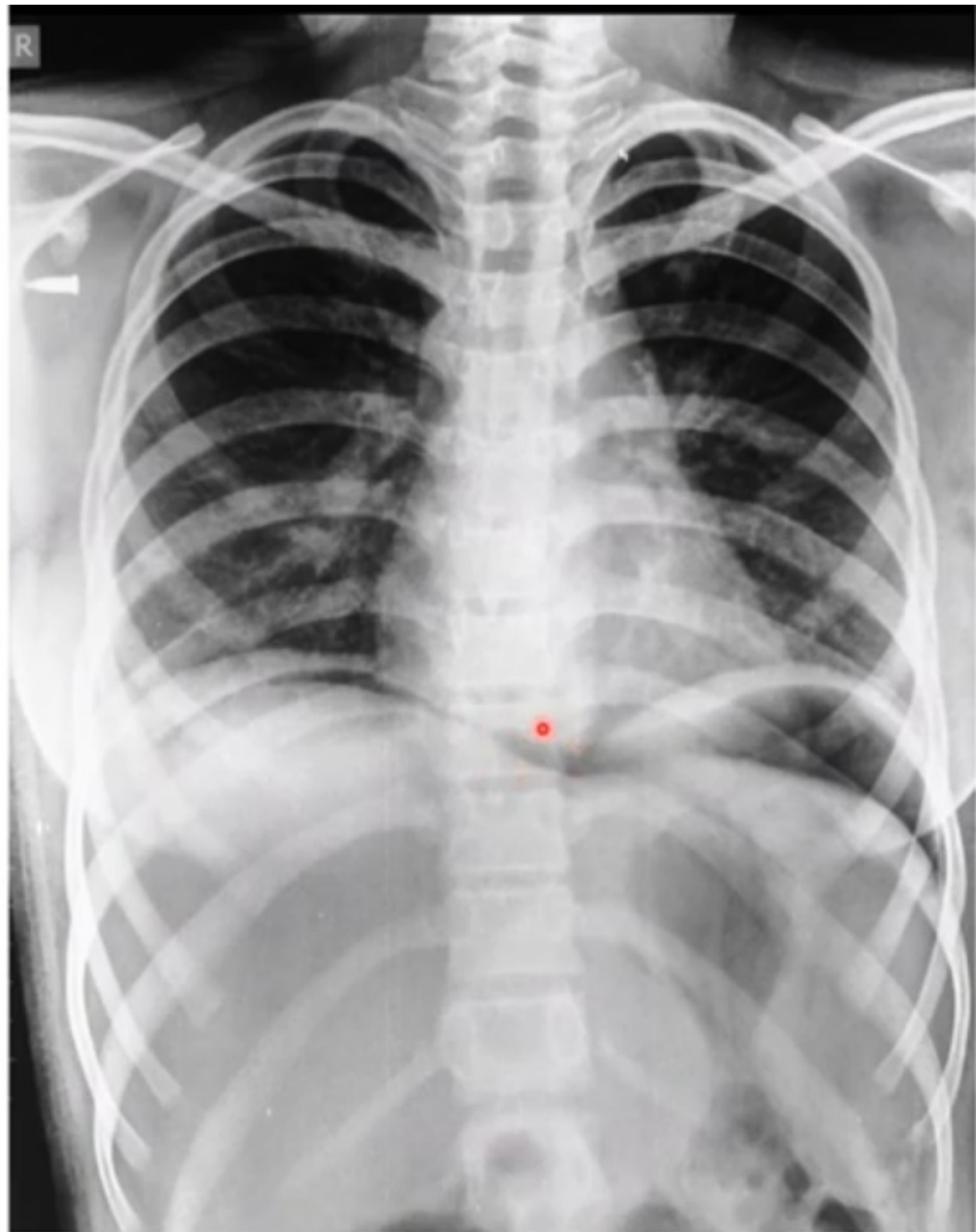
c- Median arcuate ligament: connecting the two crura.

d- Medial arcuate ligaments one on each side connecting crus with the tip of the transverse process of **L1 vertebra.**

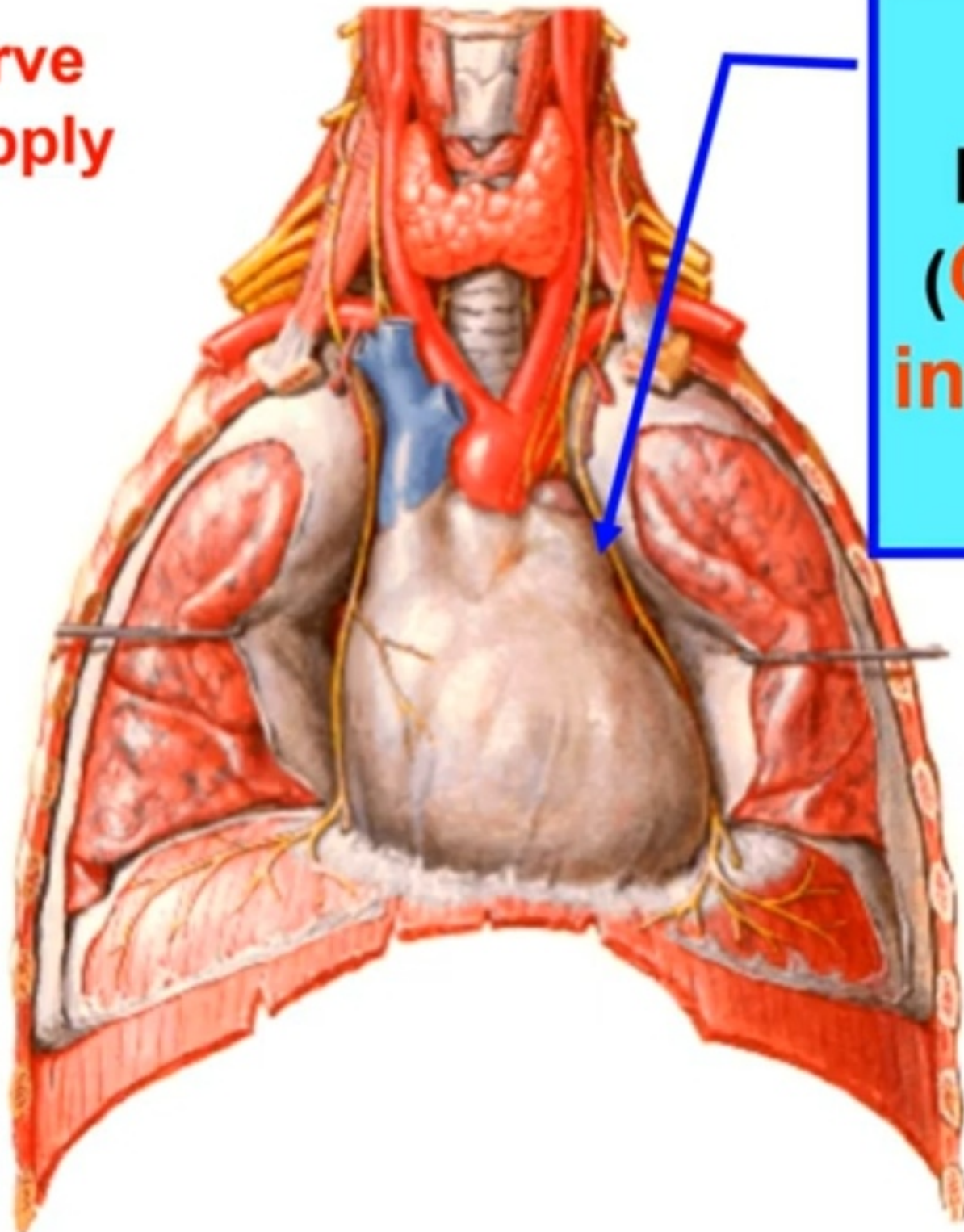
e- Lateral arcuate ligaments, one on each side, connecting tip of the transverse process of **L1** with the last rib.

Shape of the diaphragm

- The **central part** of the diaphragm is **depressed inferiorly** while its **lateral parts** are **raised** to form the right and left **cupola**.
- The **right** cupola is slightly **higher** than the left due to the right lobe of the liver.



**Nerve
supply**



Motor

**Phrenic nerve
(C3,4,5) to the
inferior surface**

Sensory

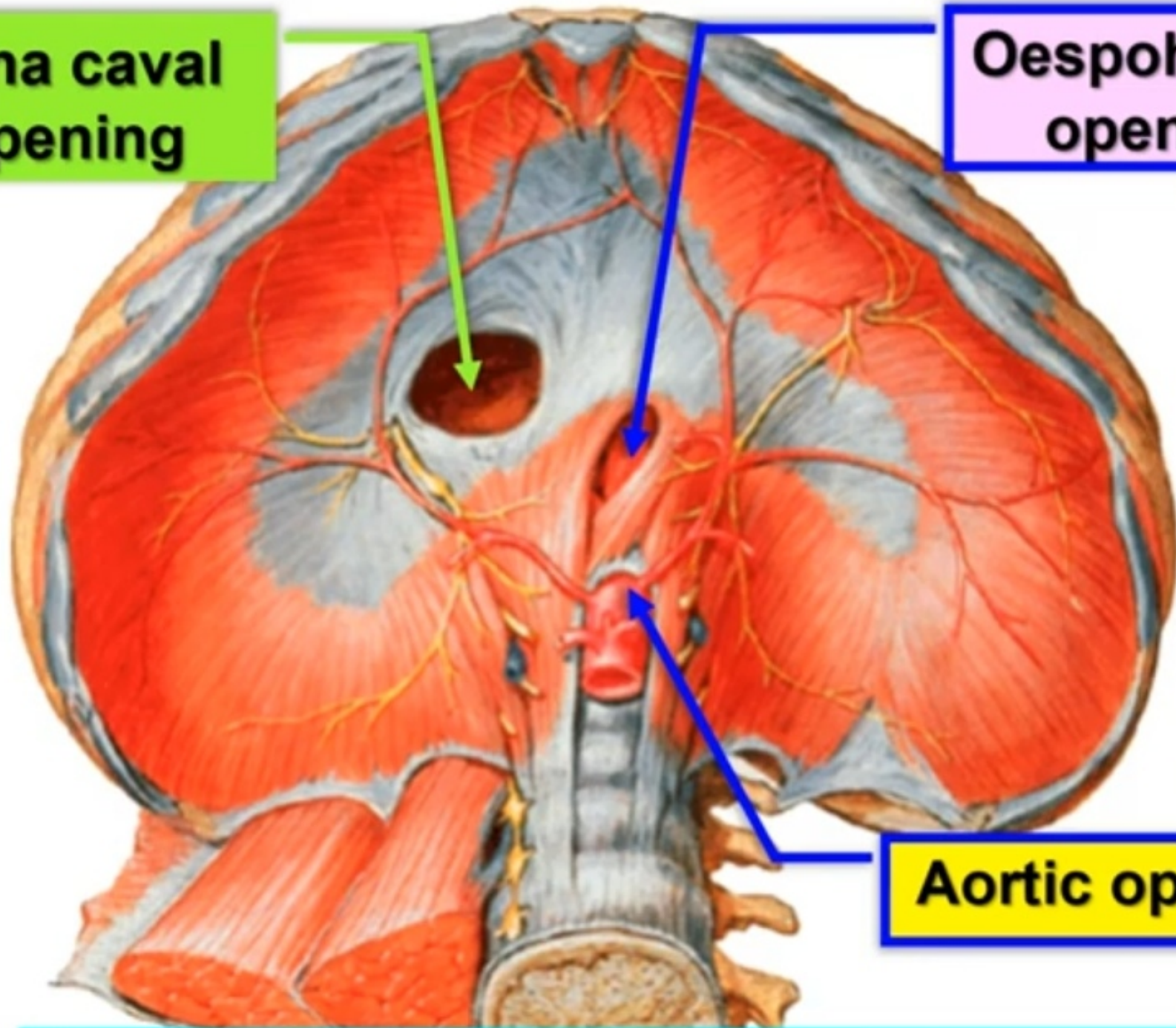
**Lower 5
intercostal and
subcostal
nerves**

• **Actions of the Diaphragm**

- 1- It is the **main muscle of inspiration**.
 - 2- It **increases** the intra-abdominal pressure.
 - 3- Right crus acts as a **sphincter** for oesophagus.
- **Injury of the phrenic nerve in one side** leading to **paradox movement** (diaphragm ascends during inspiration and descends during expiration)
 - Injury of **both sides** leading to **death**.
 - Irritation of diaphragm causes **referred pain** to the shoulder tip.
 - **Hiccough** is the result of repeated **spasmodic contraction of the diaphragm**.
 - **Vertebrocostal triangle**: a triangular gap between the vertebral and costal origins of the diaphragm. Abdominal contents may be herniated through this gap into the thorax (**congenital diaphragmatic hernia** of Bochdalek).

Vena caval opening

Oesophageal opening

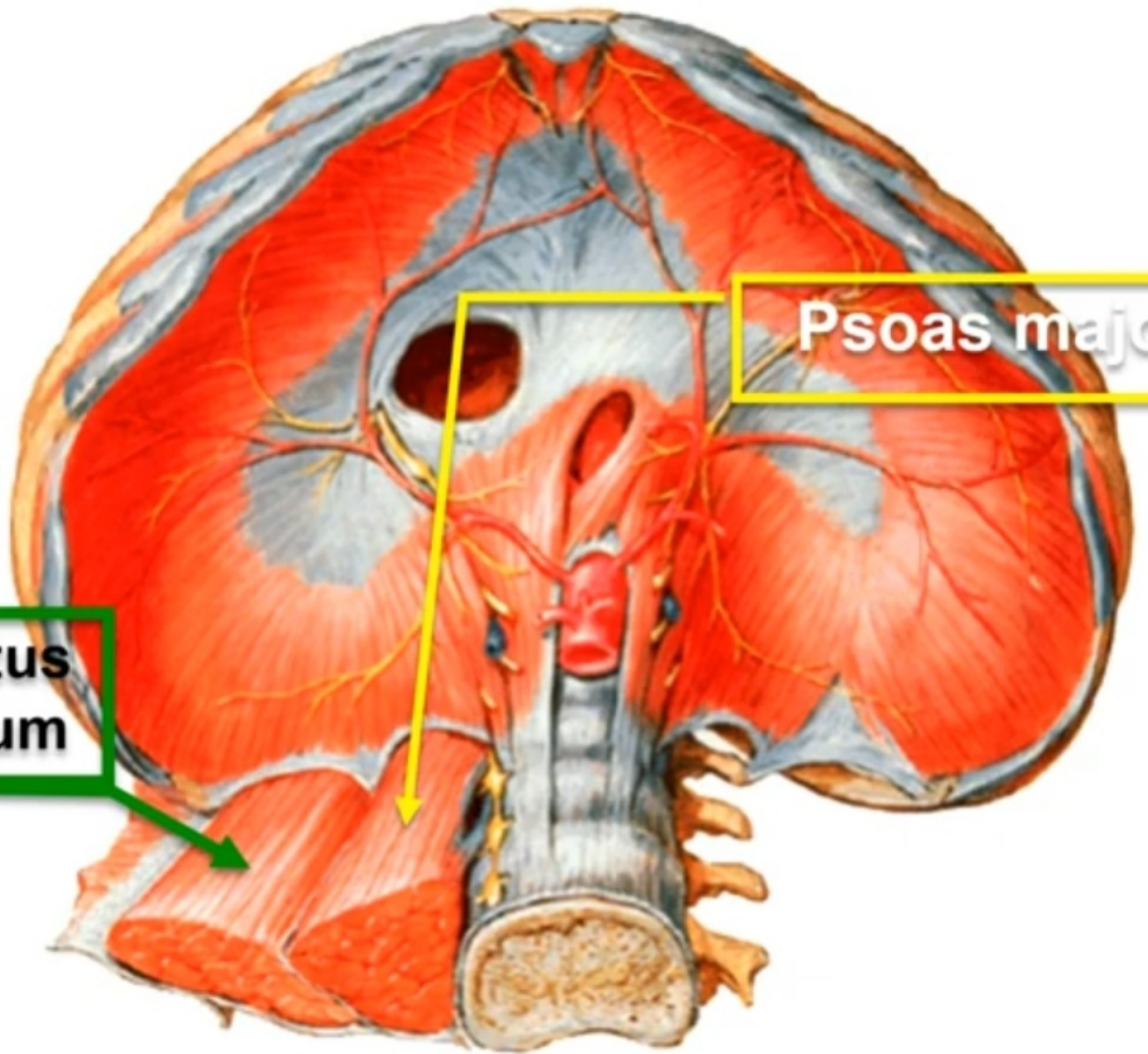


Aortic opening

Major openings == Voice Of America

Major openings in the diaphragm (Voice Of America)

	Vena caval opening	Oesophageal opening	Aortic opening
Vertebral level	Opposite T8	Opposite T10	Opposite T12
Site	- One inch right to median plane.	- One inch left to median plane.	In median plane
Contents	a- Inferior vena cava. b- Right phrenic nerve. c- Lymph vessels.	a- Oesophagus b- Oesophageal branches of left gastric vessels. c- Anterior & posterior gastric nerves.	a- Aorta b- Thoracic duct c- Azygos vein



Psoas major

Quadratus lumborum

**** Minor openings of the diaphragm**

- 1- Superior epigastric vessels:** descend between the sternal and costal origins.
- 2- Musculophrenic vessels:** pass between the slips of the costal origin.
- 3- Lower 5 Intercostal nerves and vessels:** between the slips of the costal origin.
- 4- Subcostal nerves and vessels:** pass behind the lateral arcuate ligament.
- 5- Sympathetic trunk:** descends behind the medial arcuate ligament.
- 6- Splanchnic nerves** pierce the corresponding crus.
- 7- Hemiazygos vein:** pierces the left crus of the diaphragm
- 8- Left phrenic nerve** pierces the left cupola of the diaphragm.

**** Relations:**

A- Superiorly:

- 1- The right cupola** related to right pleura and right lung.
- 2- The left cupola** related to left pleura and left lung.
- 3- Median lobe** related to the pericardium and heart.

B- Inferiorly:

-The right cupola is related to the

- 1) Right lobe of the liver.
- 2) Right kidney.
- 3) Right suprarenal gland.

-The left cupola is related to the

- 1) Left lobe of the liver.
- 2) Left kidney.
- 3) Left suprarenal gland.
- 4) Fundus of the stomach.
- 5) Spleen.

Movements of respiration

2nd-6th ribs

**Pump Handle movement
Elevation of ribs**



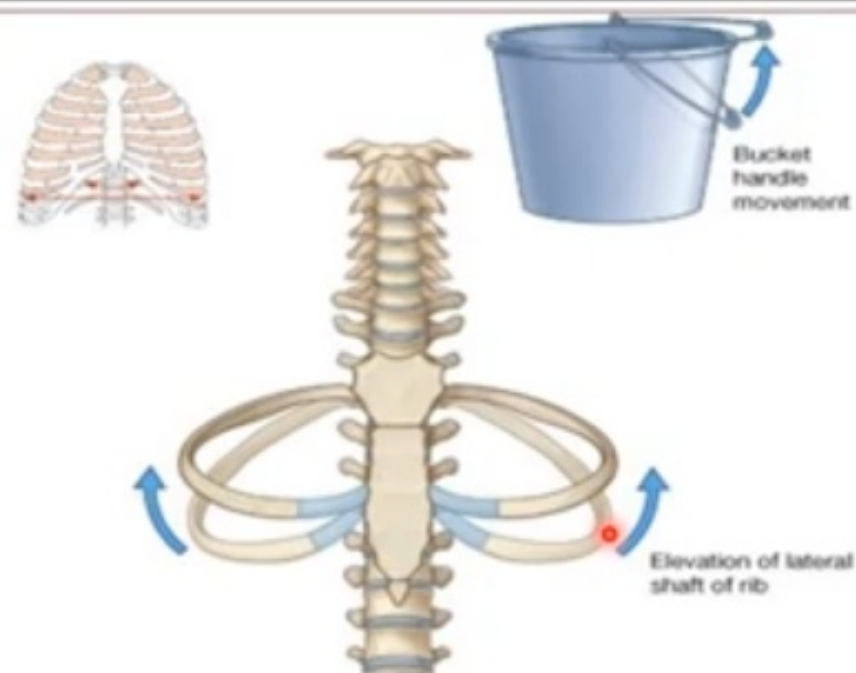
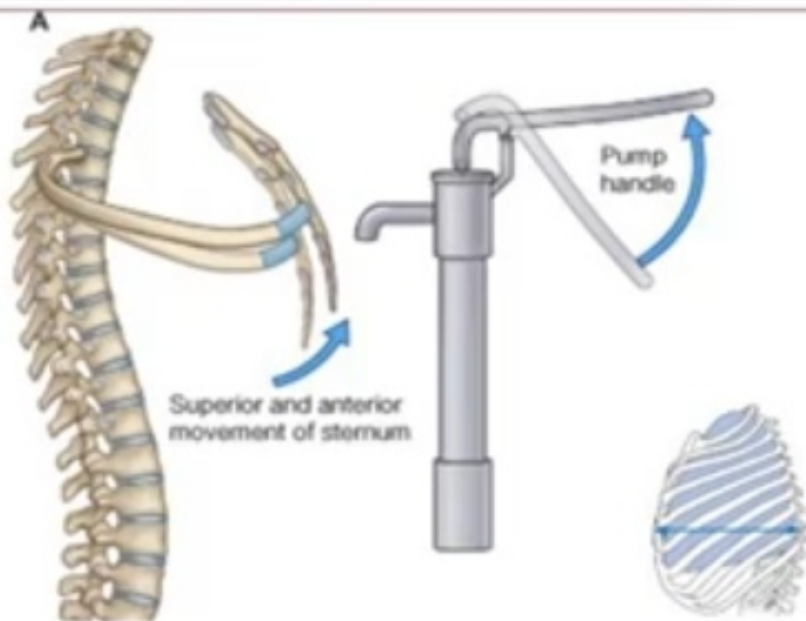
Increase **antero-posterior** diameter of thoracic cavity

7th-10th ribs

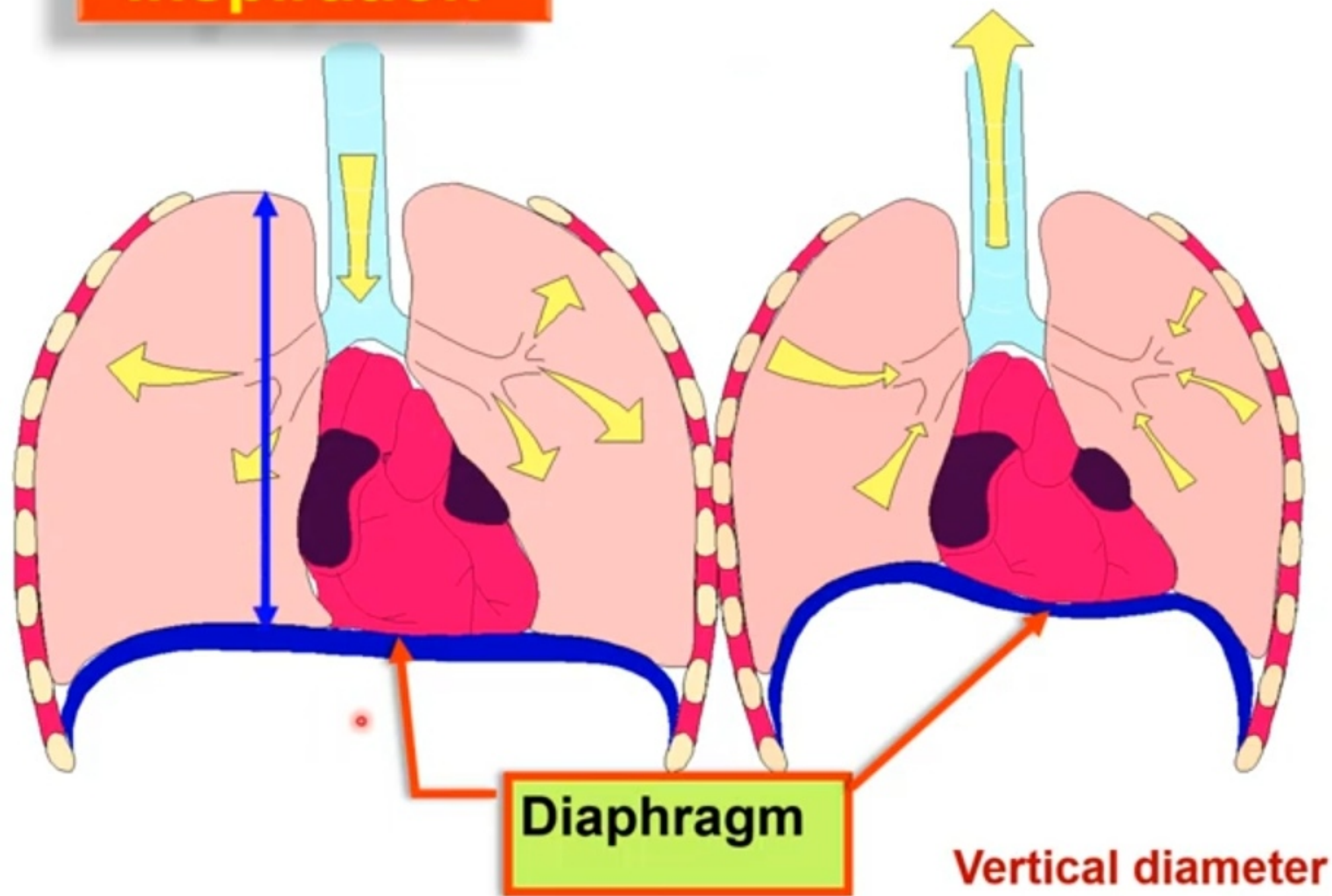
**Bucket Handle movement
Elevation of ribs**



Increase **transverse** diameter of thoracic cavity



Inspiration



- **Movements of respiration**

- **During Inspiration**, increased of 3 diameters of the thoracic cavity

1- Anteroposterior diameter

- The **anterior** end of the rib is **lower** than the posterior end.
- Elevation of the ribs called **pump-handle movement**, **move** the body of the sternum forward leading to increase of antero-posterior diameter.
- It occurs mainly in the upper ribs (2nd-6th).

2- Transverse diameter

- The middle of the shaft of ribs lies at a lower level than the 2 ends.
- During elevation of the ribs, the shaft moves upward and outward, **bucket handle movement**.
- It occurs mainly in the lower ribs (7th-10th).

3- Vertical diameter

- Contraction of the diaphragm leading to descent of its cupola.