Human Anatomy -1st year 2020-2021

Anatomy Of Diaphragm

Lecture (11)

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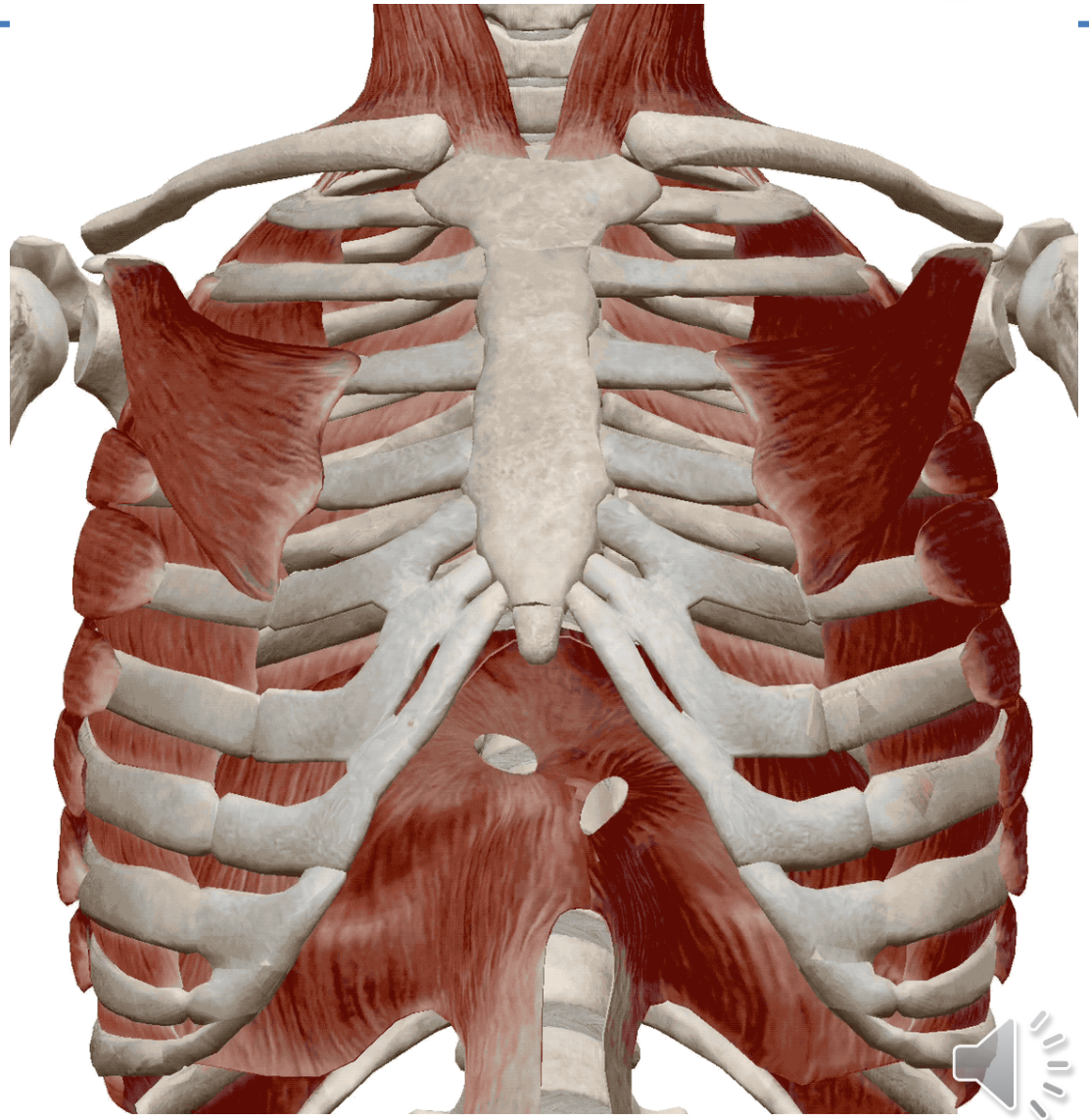
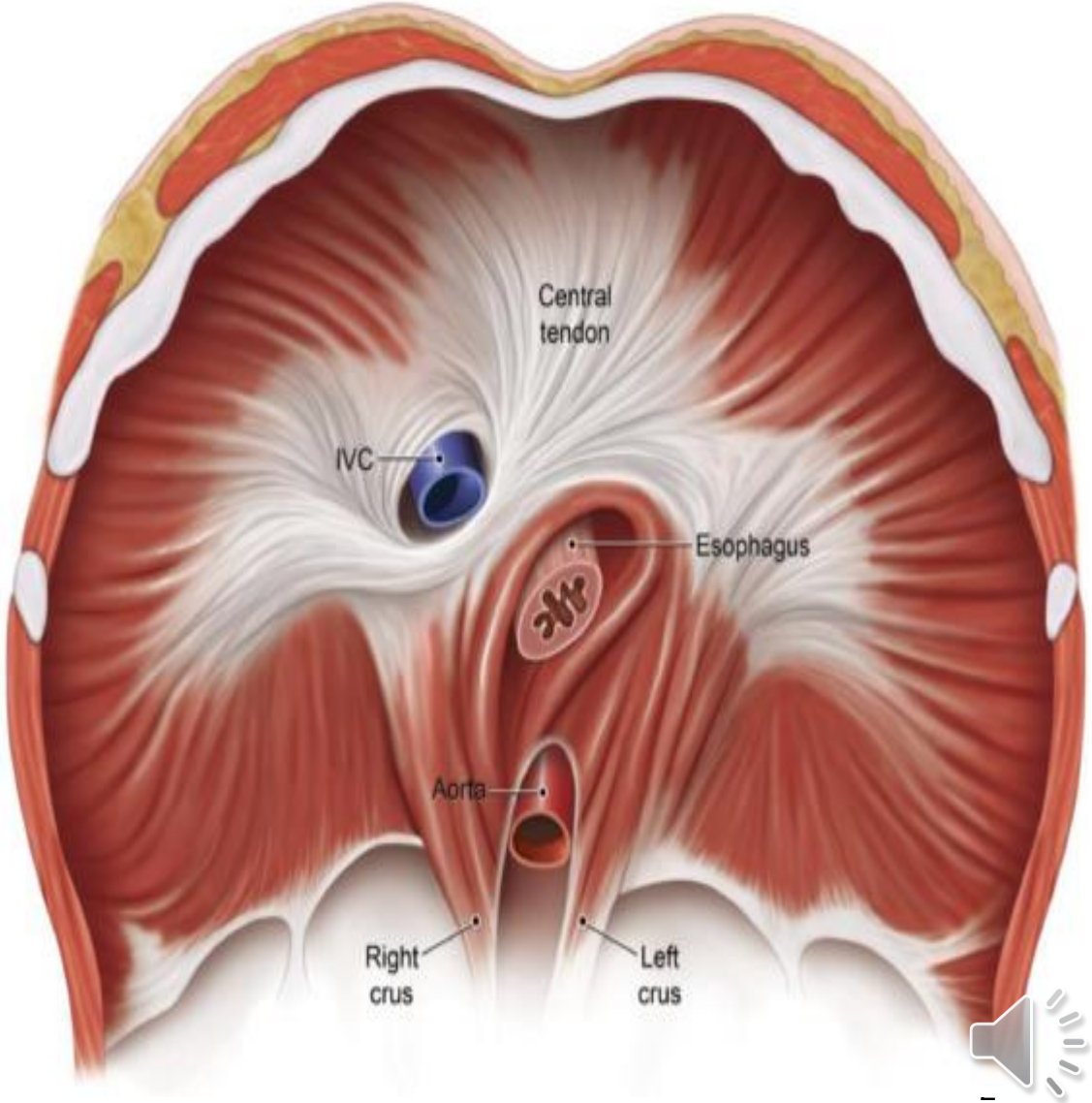


OBJECTIVES

- Define the diaphragm
- Describe its parts (Crura and ligaments) , origin ,insertion , functions ,blood supply, innervation .



Diaphragm

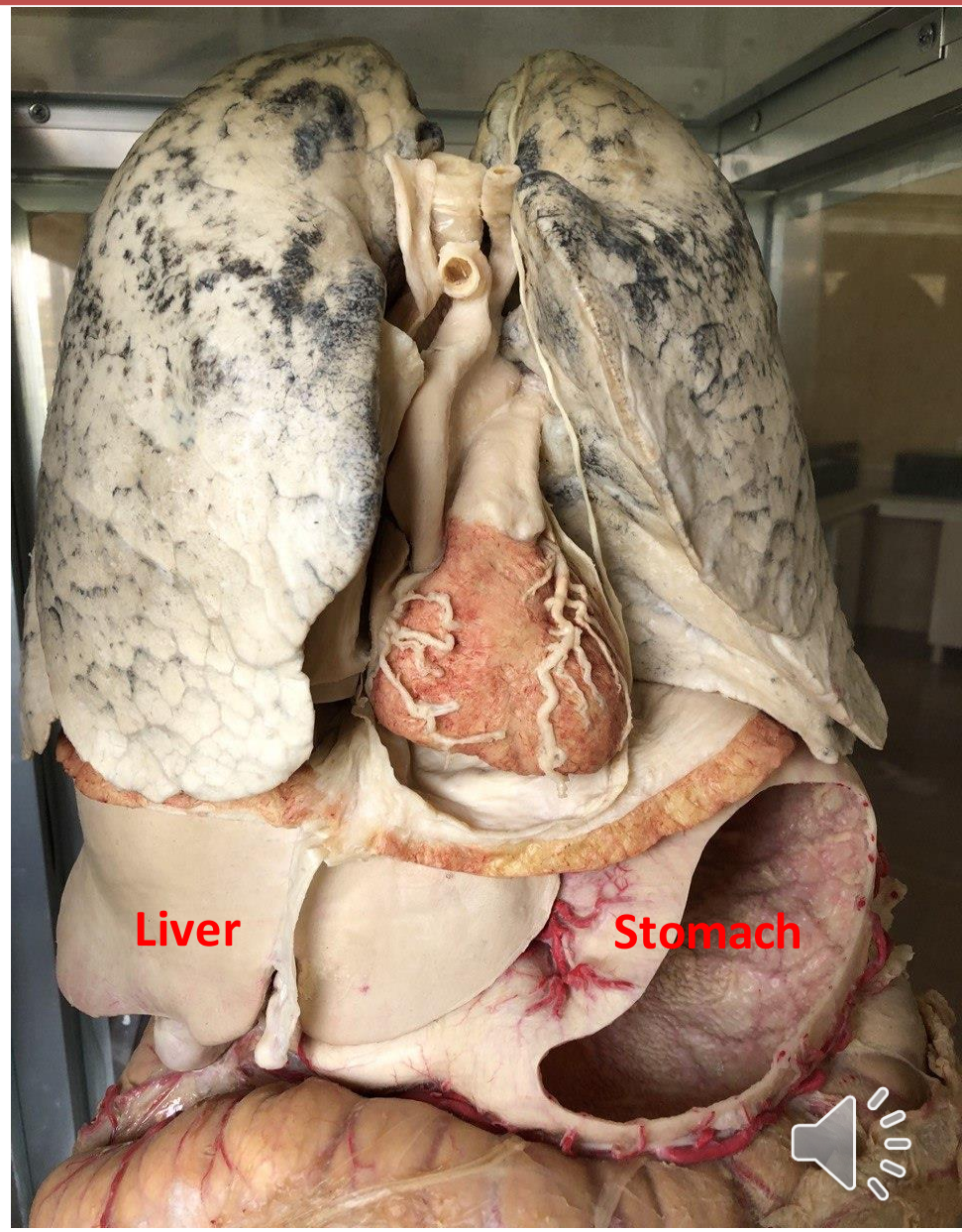
✍ The diaphragm is a thin muscular and tendinous septum that separates thorax & abdominal cavities.

✍ **Has two domes,** with the right dome positioned slightly higher than the left because of the liver. The depression between the two domes is due to the heart and pericardium .

✍ **Has two surfaces:**

1.Thoracic surface is in contacts with the pericardium and pleura.

2. The abdominal surface is in contact with the liver, stomach, and spleen.



Parts of the diaphragm

Its domes like parachute consists of:

1. Peripheral muscular part, which arises from the margins of the inferior thoracic opening.
2. Centrally placed tendon.

✍ The origin of the diaphragm can be divided into three parts:

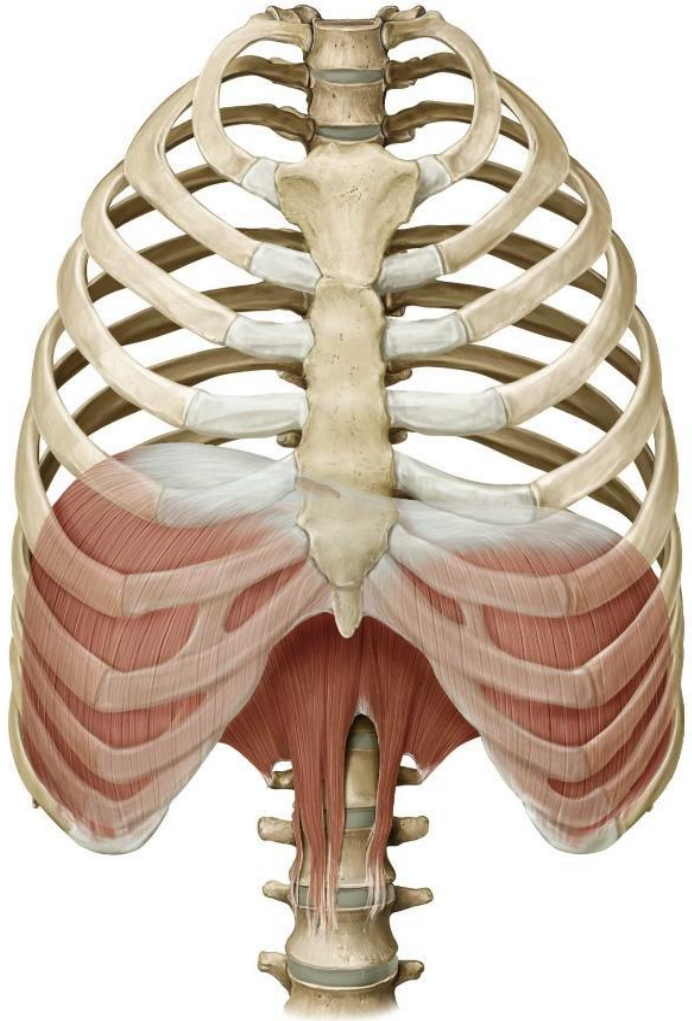
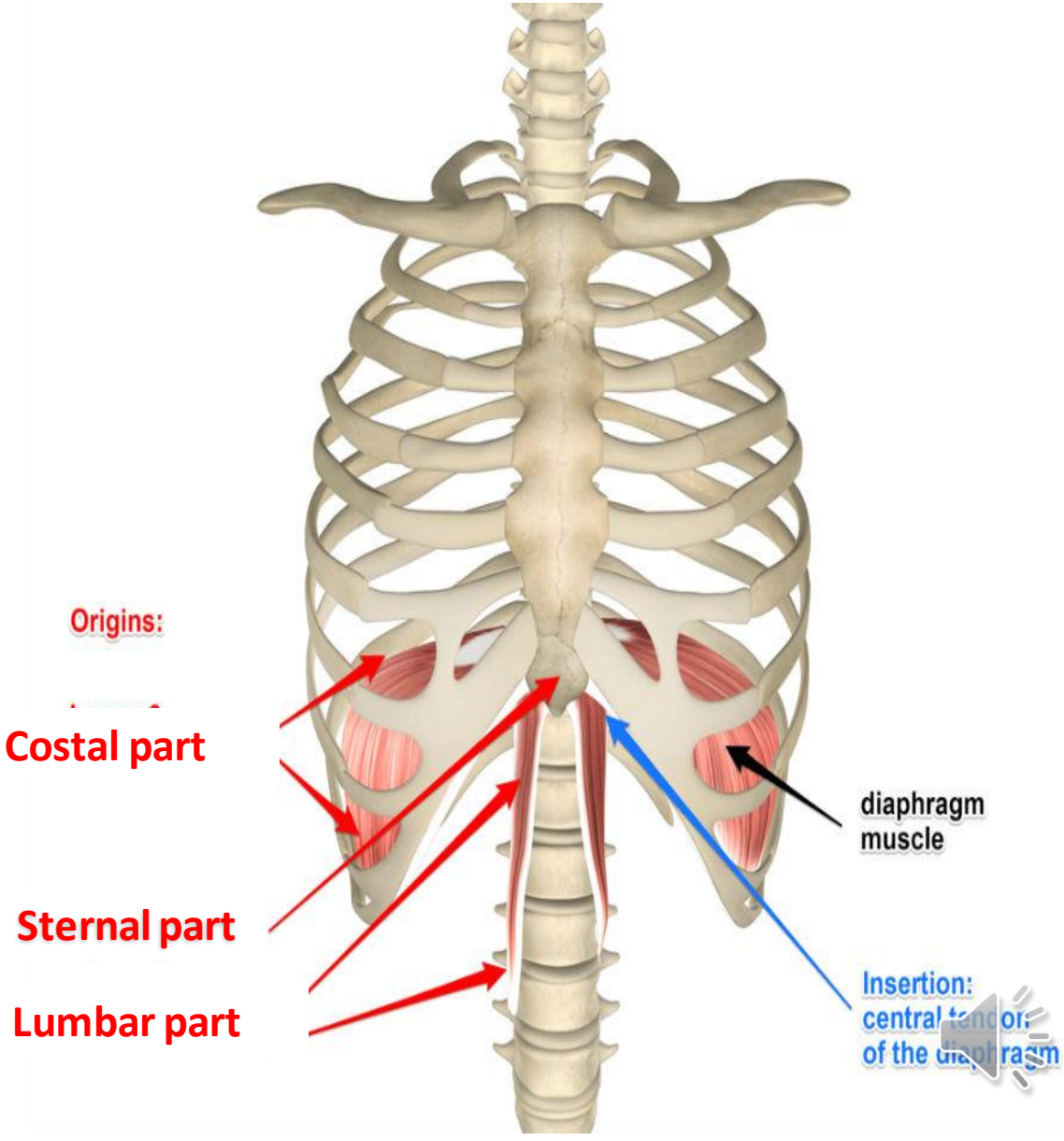


Fig. 5.12 A

Illustrator: Karl Wesker

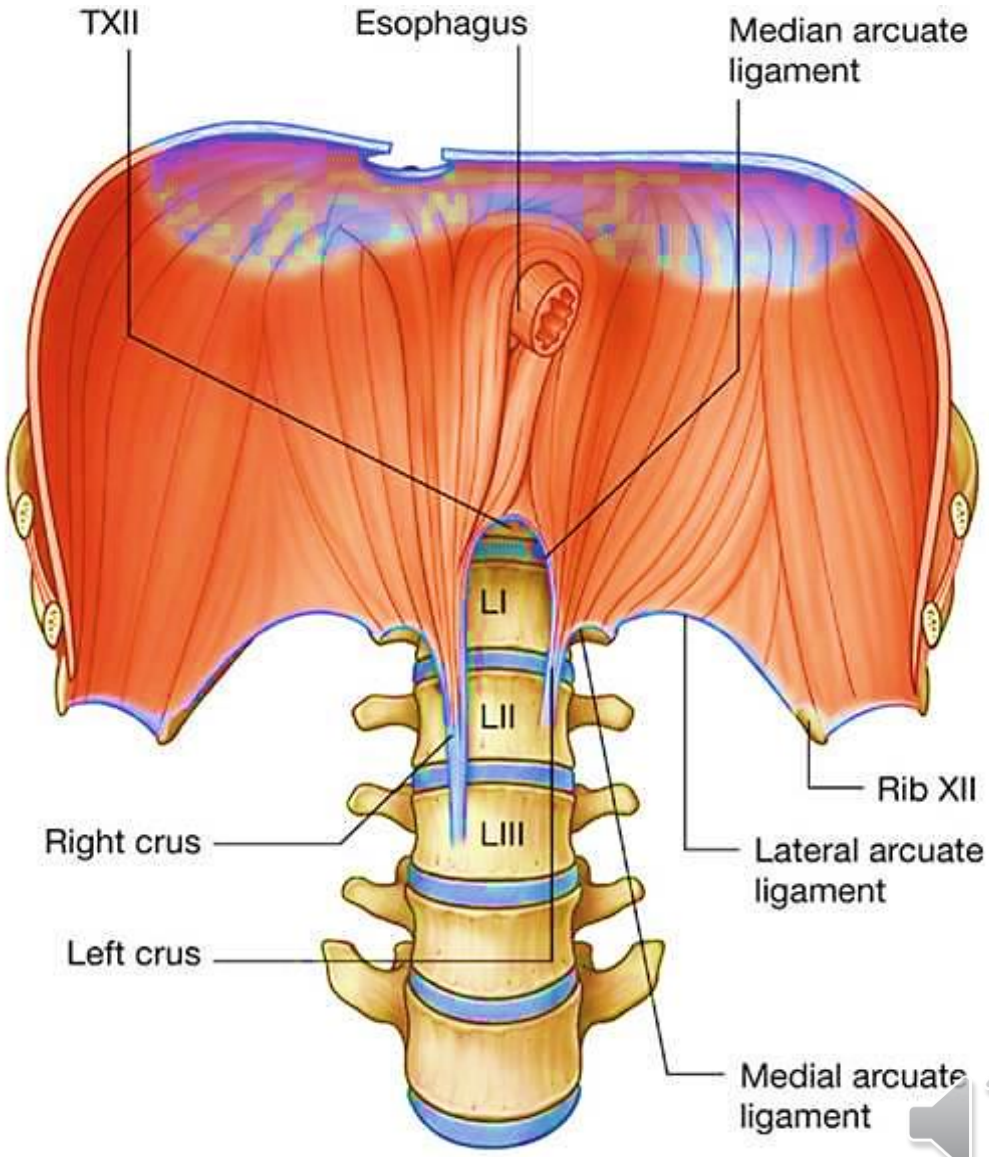
Origin Of Diaphragm

- **Sternal part** arising from the posterior surface of the xiphoid process..
- **Costal part** arising from the internal surfaces of the lower six ribs and their costal cartilages (7-12) to forms the right & left domes
- **Vertebral/lumbar** part arising from upper three lumbar vertebrae to forms the right & left crura & the arcuate ligaments.



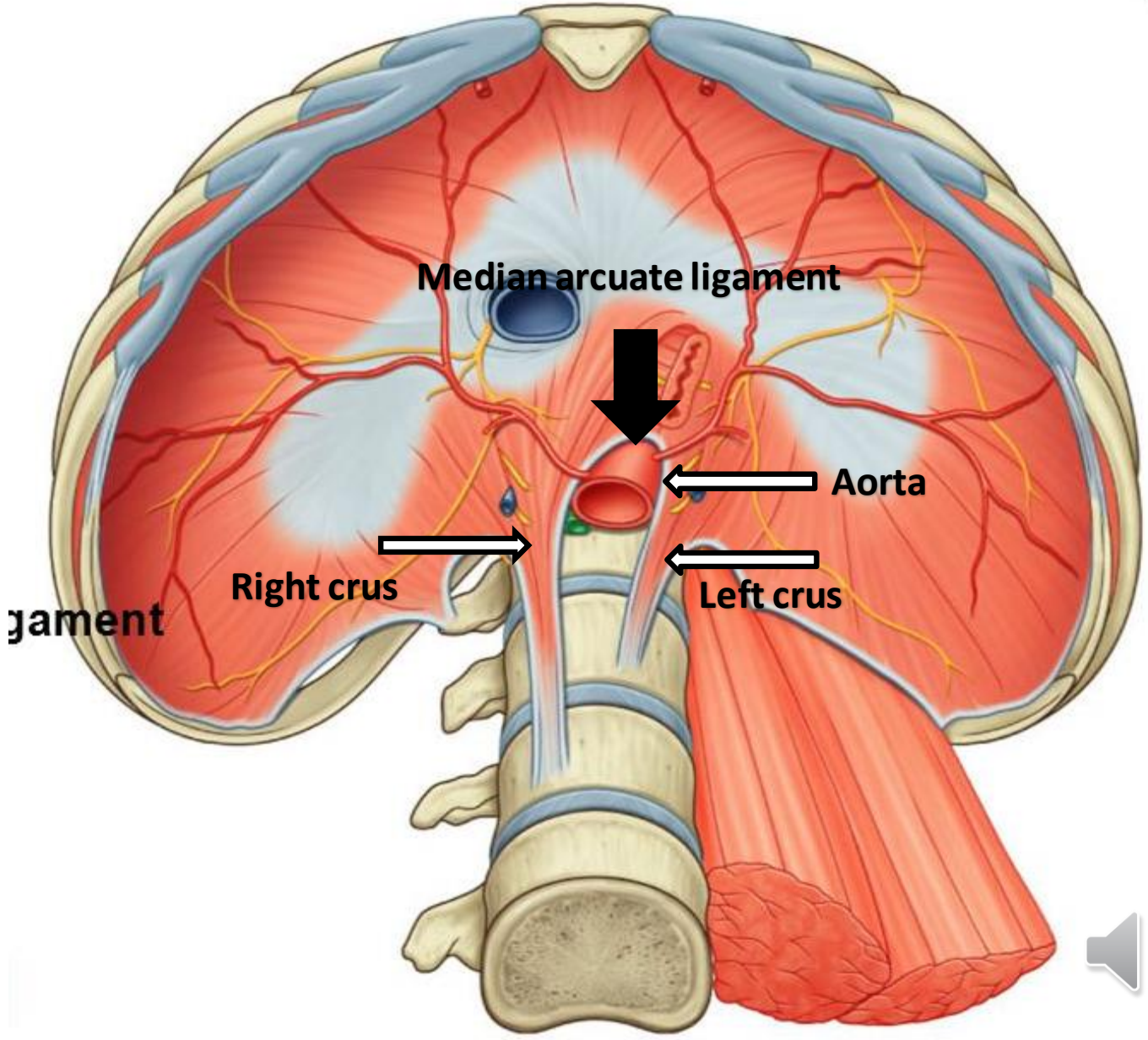
Crura & Arcuate Ligaments

- **The right crus** arises from the sides of the bodies of the L 1-3 & intervertebral discs in between .
- **The left crus** arises from the sides of the bodies of the L 1-2 &intervertebral disc.
- **The medial arcuate ligament** extends from the side of the body of the L2 vertebra to the tip of the transverse process of the L1 vertebra.
- **The lateral arcuate ligament** extends from the tip of the transverse process of the L1 vertebra to the lower border of the 12th rib.



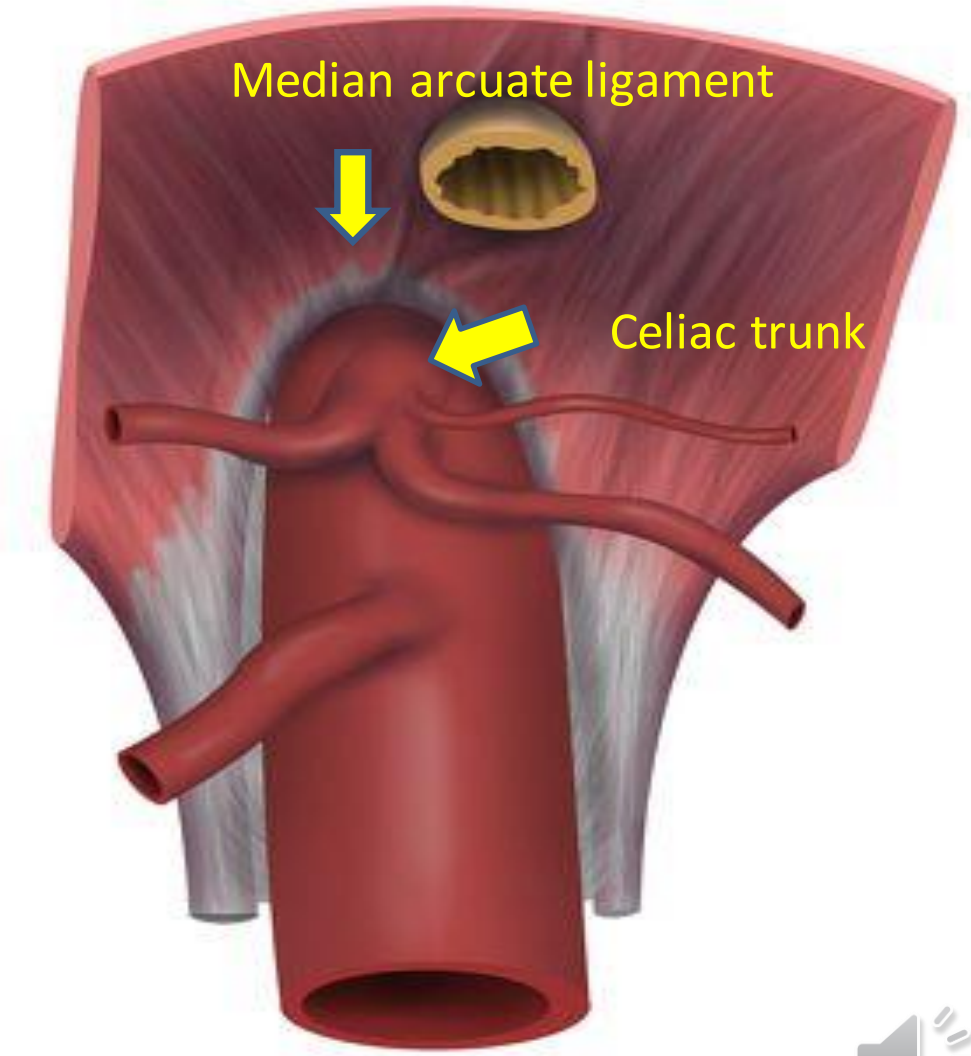
Median arcuate ligament

✍ The medial borders of the two crura are connected by a median arcuate ligament which crosses over the anterior surface of the aorta.

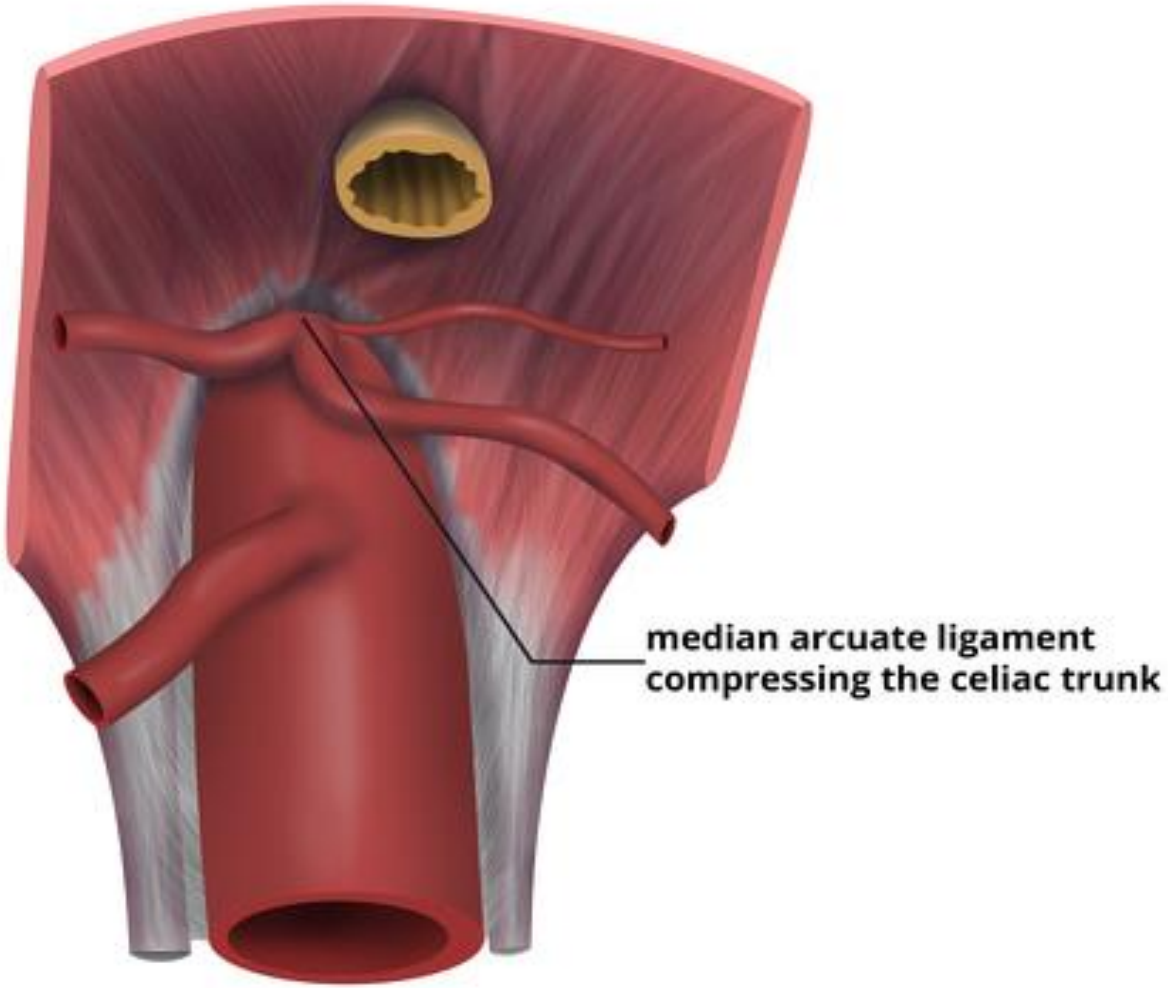


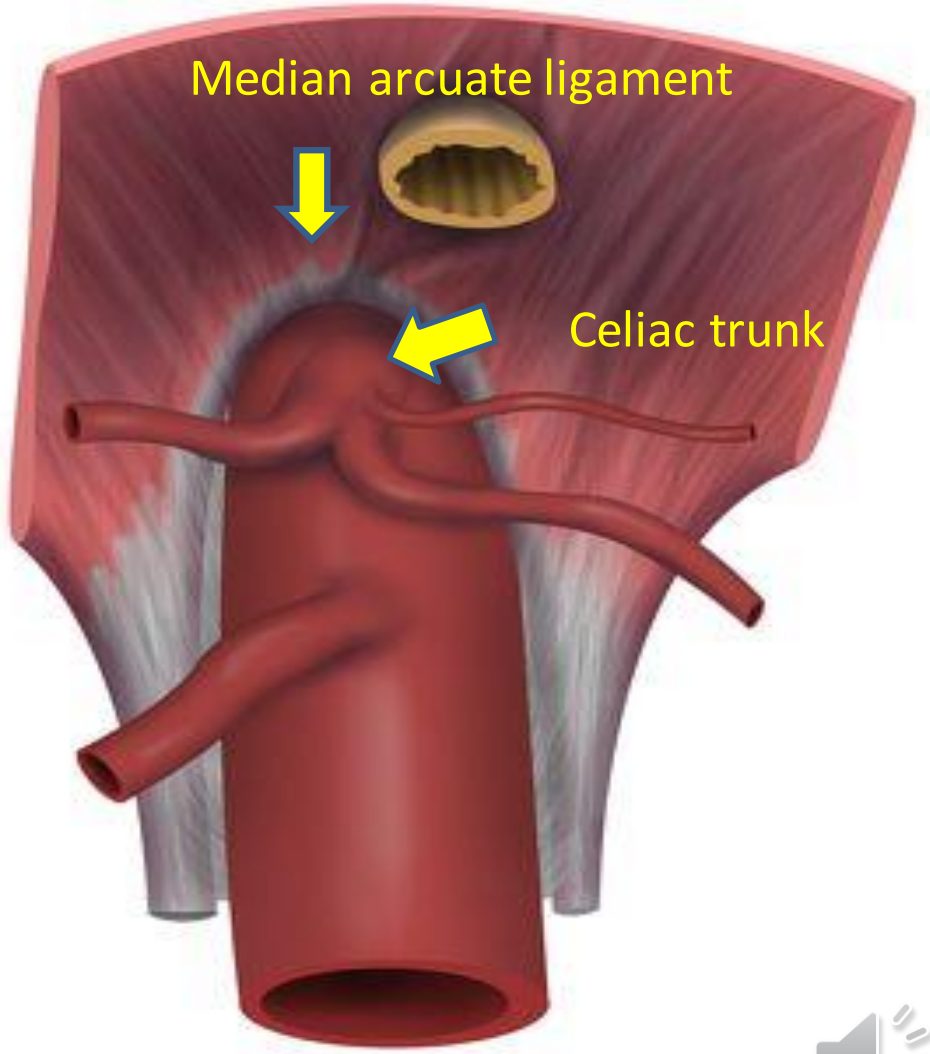
Median arcuate syndrome (MALS)

It is a condition in which the median arcuate ligament presses too tightly on the celiac artery (a major branch of the aorta that delivers blood to the stomach, liver, and other organs) and the nerves in the area (celiac plexus).



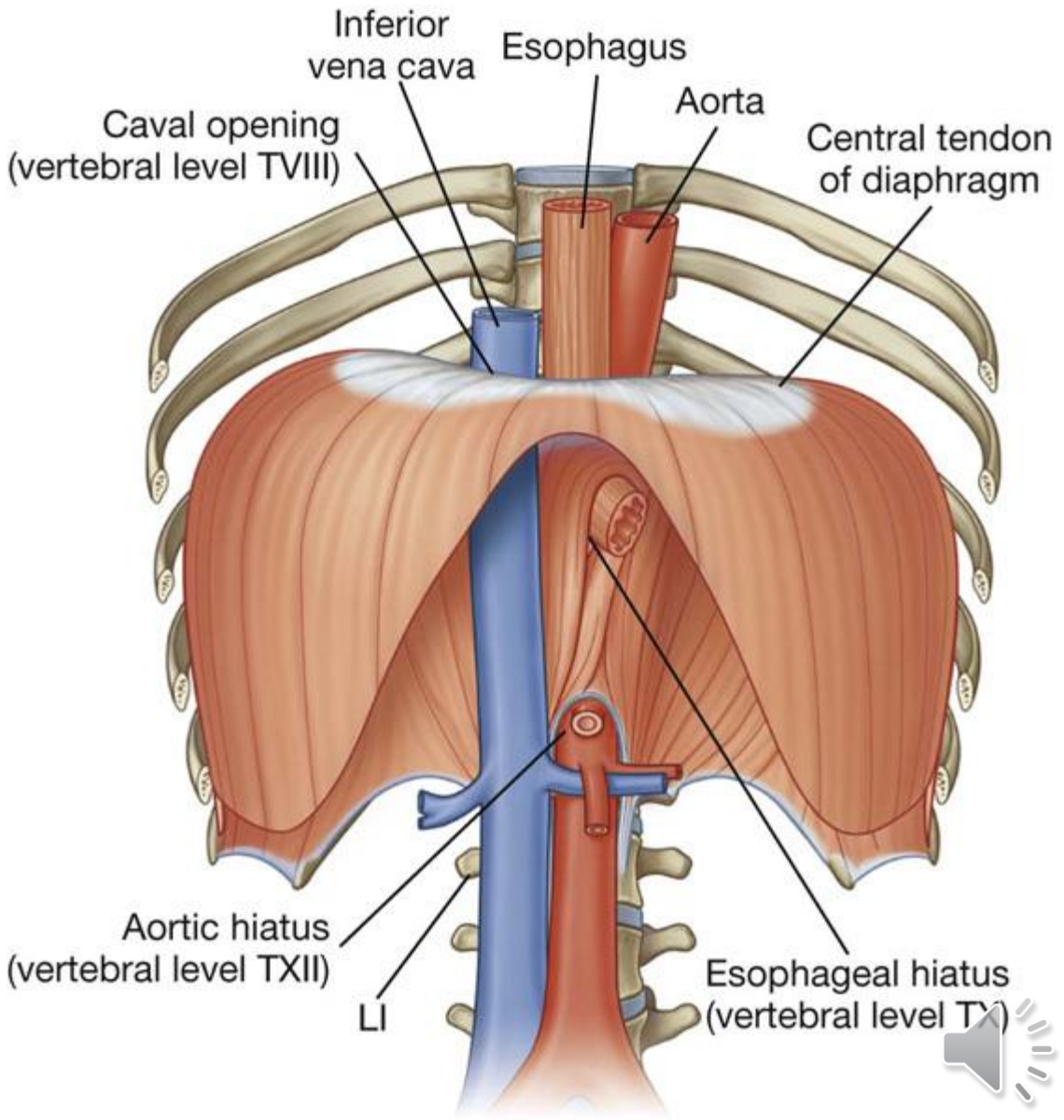
Median arcuate syndrome (MALS)





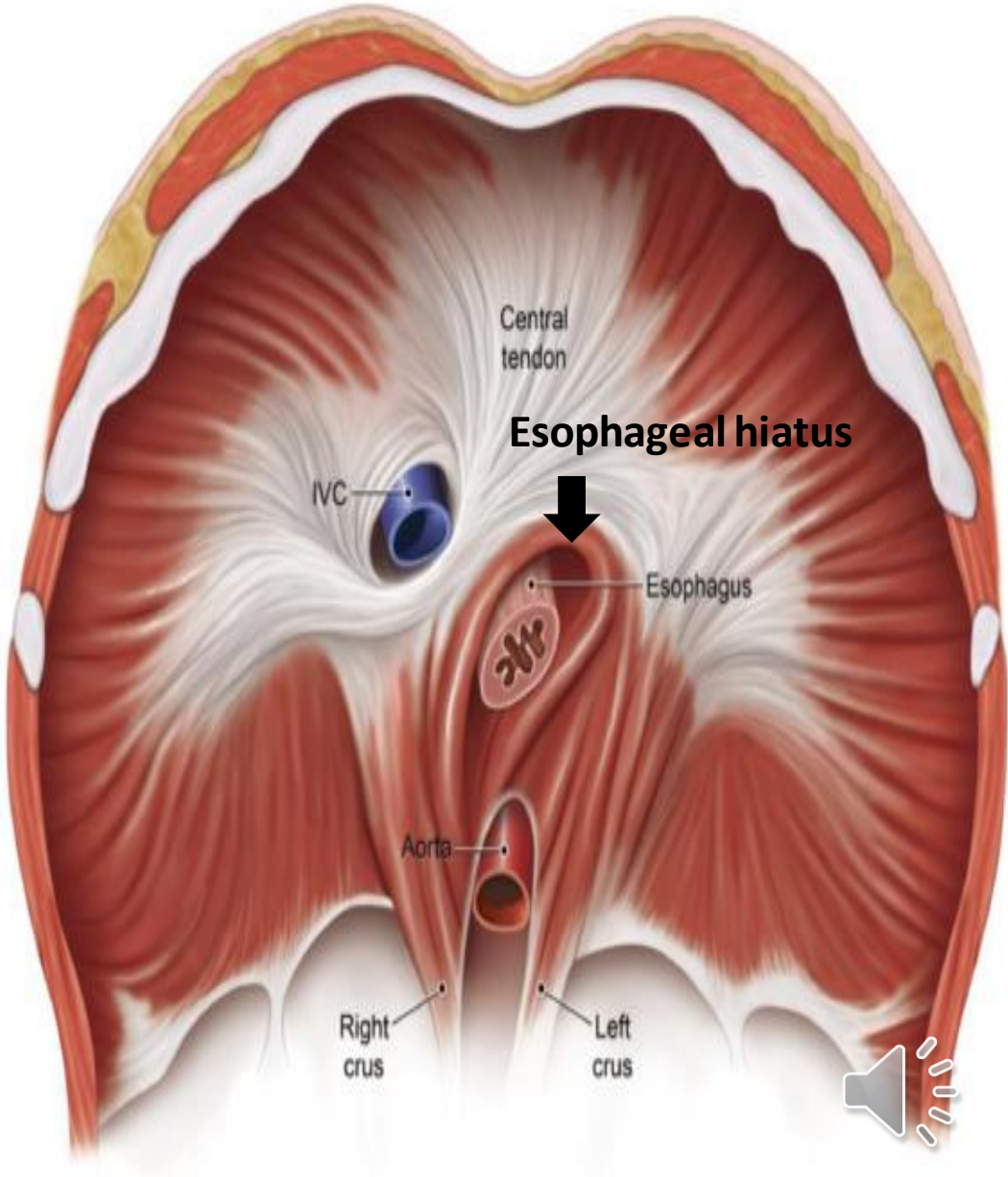
Insertion Of Diaphragm

- The muscle fibers of the diaphragm combine to form a central tendon.
- This tendon ascends to fuse with the inferior surface of the fibrous pericardium.



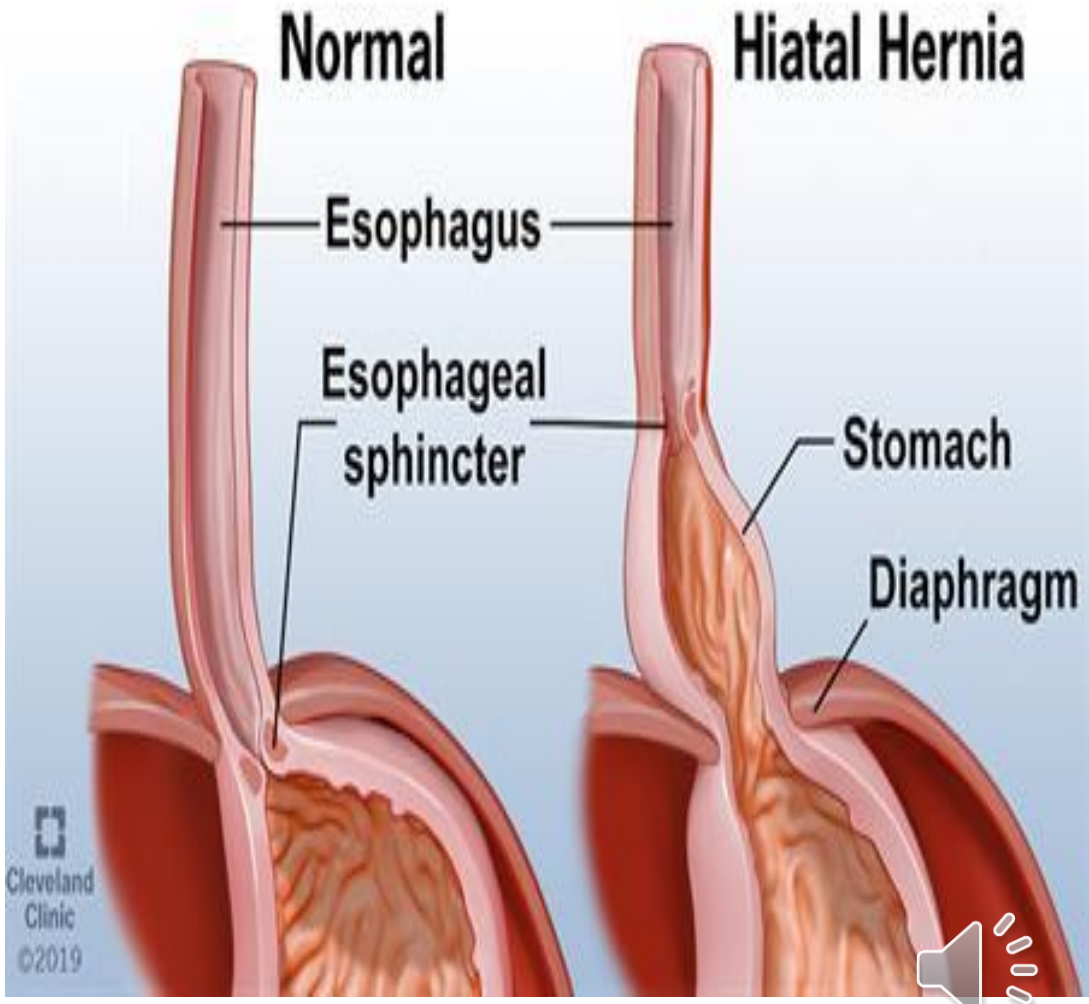
Esophageal hiatus

- Some of the muscle fibers of the right crus pass up to the left and surround the esophageal orifice in a sling like loop (esophageal hiatus).
- These fibers appear to act as a sphincter and possibly assist in the prevention of regurgitation of the stomach contents into the thoracic part of the esophagus.



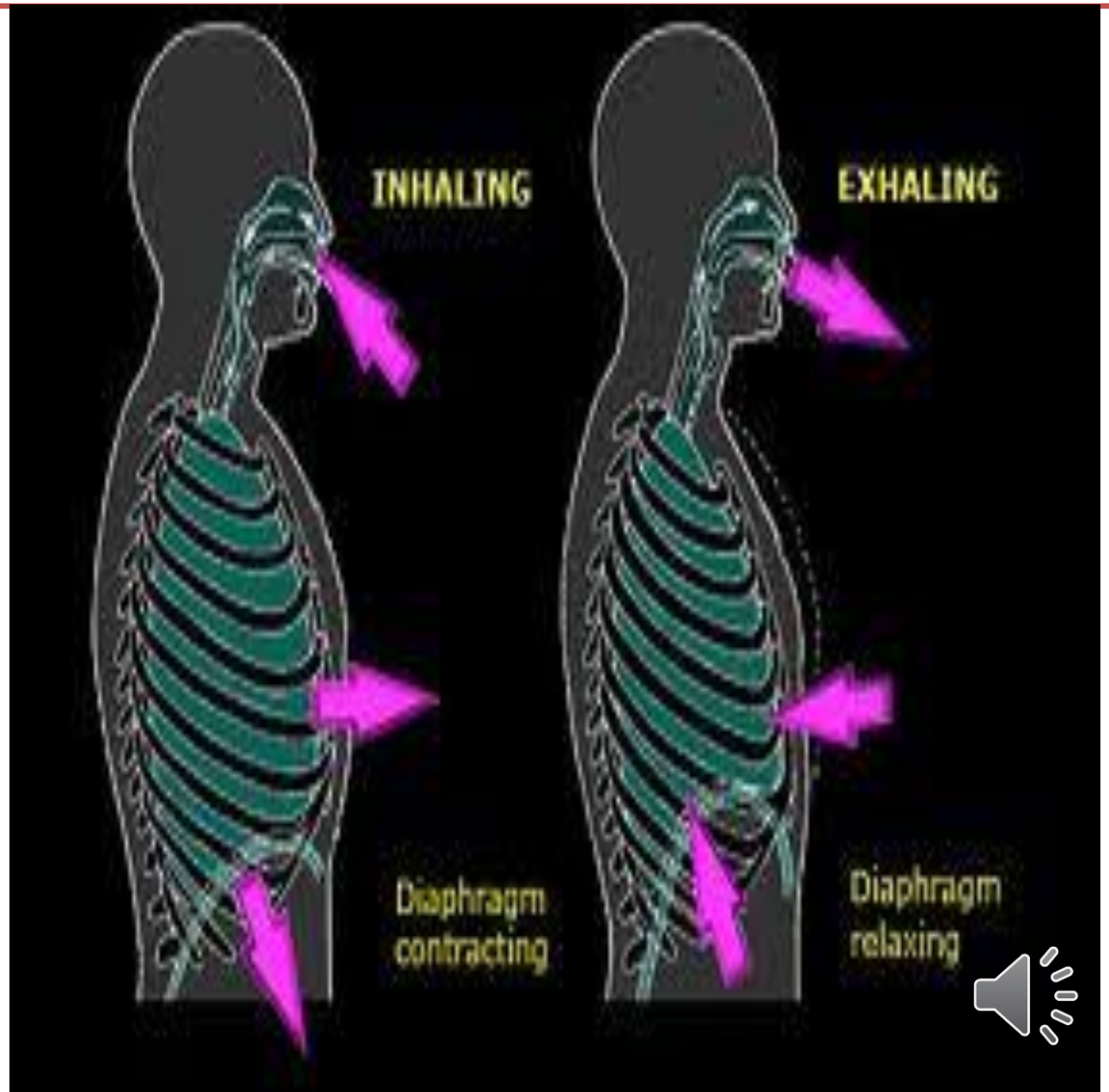
Hiatal hernia

- A hiatal hernia is a protrusion of the abdominal contents into the thorax through an enlarged esophageal hiatus caused by a weakness or opening in the diaphragm.
- The upper part of the stomach usually protrudes upwards but it can also be the small intestine, transverse colon or omentum.



Functions of the Diaphragm

- **Muscle of inspiration**: On contraction the diaphragm pulls its central tendon down and increases the vertical diameter of the thorax.
- **Muscle of abdominal straining:** The contraction of the diaphragm assists the contraction of the muscles of the anterior abdominal wall in raising the intra-abdominal pressure. It helps to expel vomit, feces, and urine from the body, aids in childbirth.



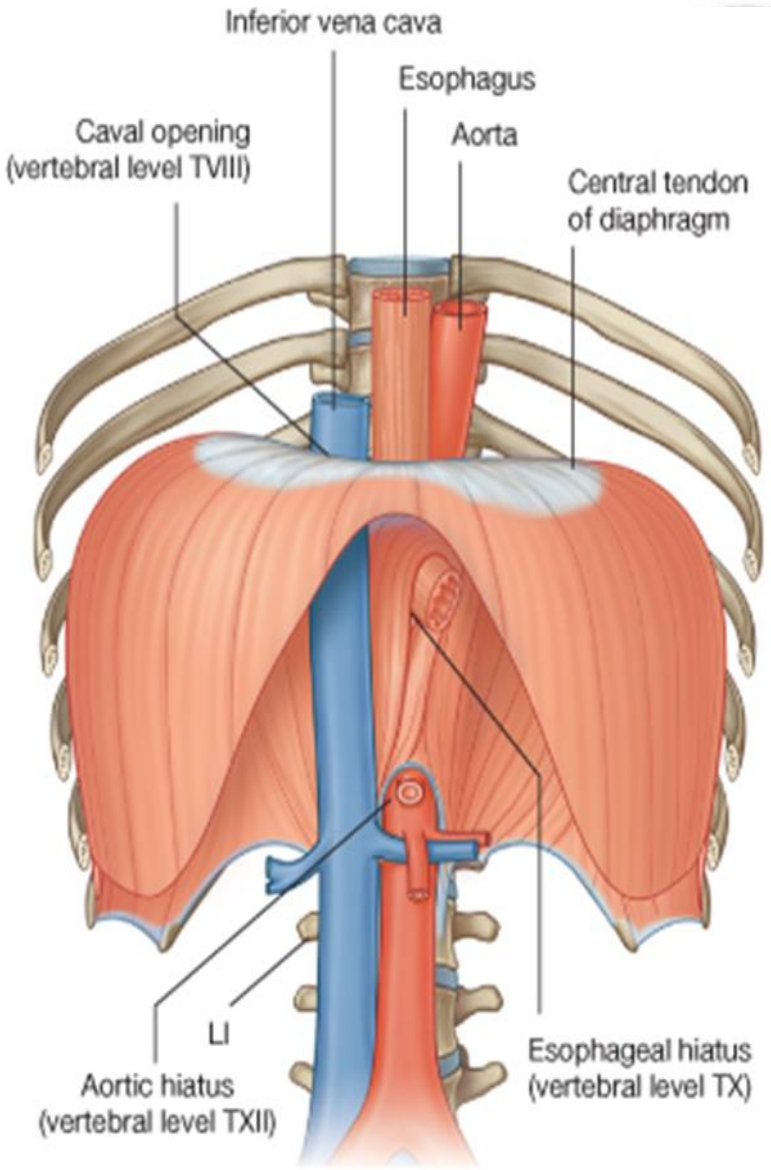
Functions of the Diaphragm

Weight lifting muscle:

Contraction of diaphragm assists the muscles of the anterior abdominal wall in raising the intra-abdominal pressure. This lead to support the posterior abdominal wall and help in lifting heavy things .

Thoracoabdominal pump:

The descent of the diaphragm decreases the intra-thoracic pressure & increases the intra-abdominal pressure. This variation in pressure affects the fluids that are in the main veins and lymph vessels. The contents of vessels will be moved up ward to thoracic.

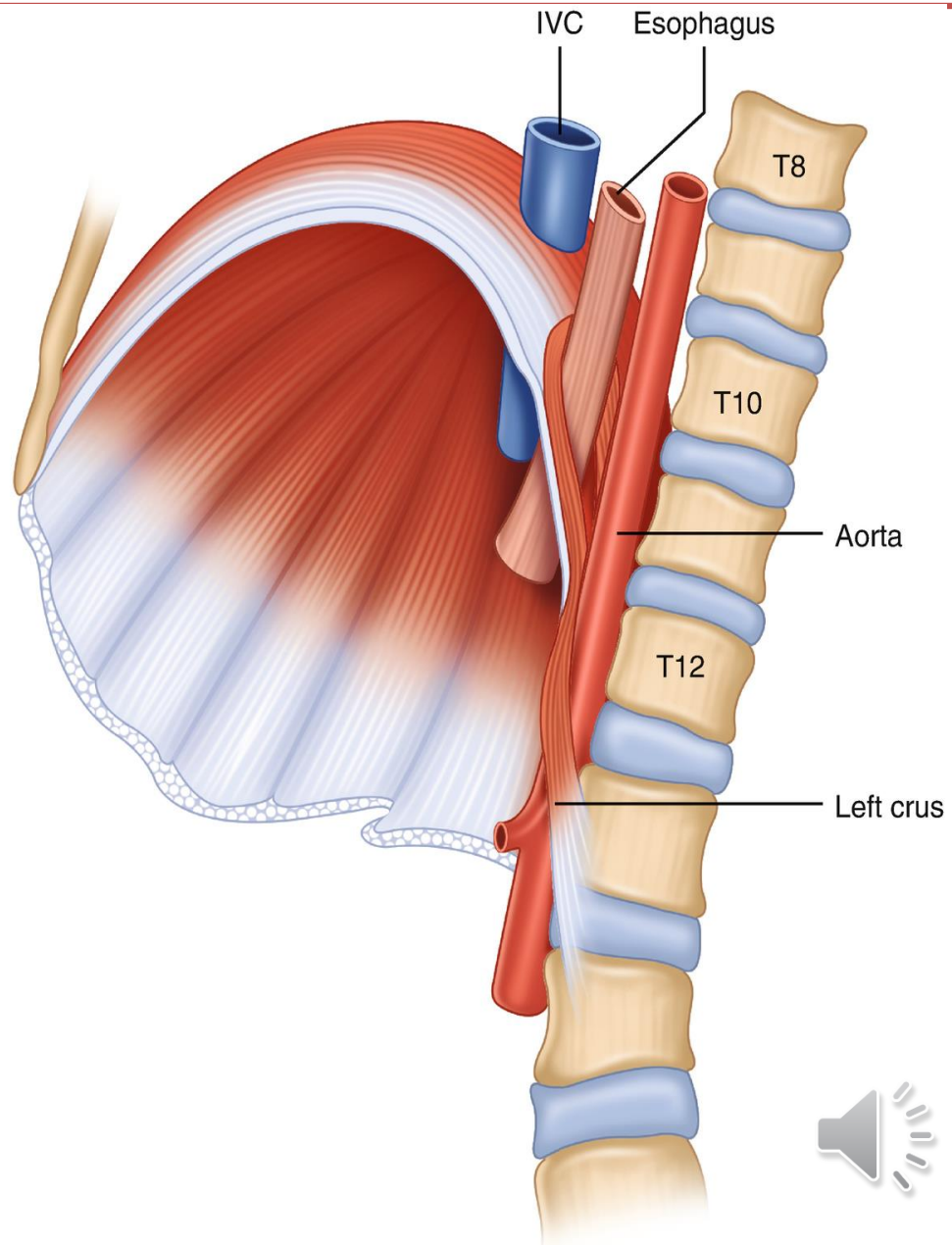


Openings in the Diaphragm

- **The caval opening** lies at the level of the lower border of T 8 vertebra in the central tendon. It transmits the Inferior vena cava & branches of the right phrenic nerve.

- **The esophageal opening** lies at the level of the T 10 .It transmits esophagus the right and left vagus nerves, the esophageal branches of the left gastric vessels, & the lymph vessels.

- **The aortic opening lies** anterior to the body of the T 12 vertebra between the two crura.
It transmits the aorta, thoracic duct, & azygos vein.



Nerve Supply of the Diaphragm

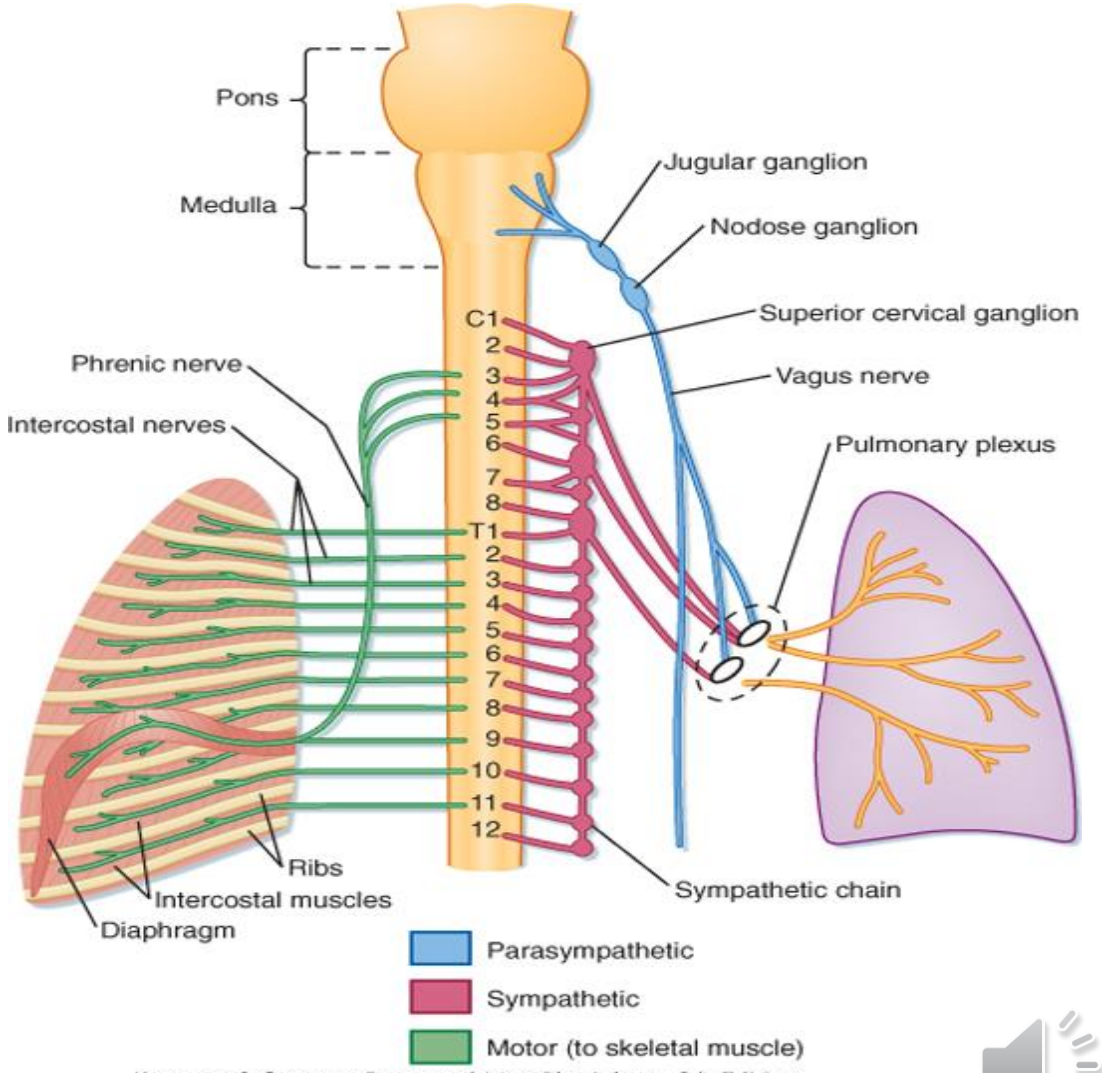
Motor nerve supply:

The right and left phrenic nerves (C3, 4, 5).

Sensory nerve supply:

*Central surfaces of the diaphragm supplied by the phrenic nerve .

*Periphery of the diaphragm is from the lower six intercostal nerves.



Blood Supply of the Diaphragm

🔔 **1. The costal margin of the diaphragm supplied by : Lower five intercostal and subcostal arteries.**

🔔 **2. The rest of diaphragm**

A. From above, receives blood from :

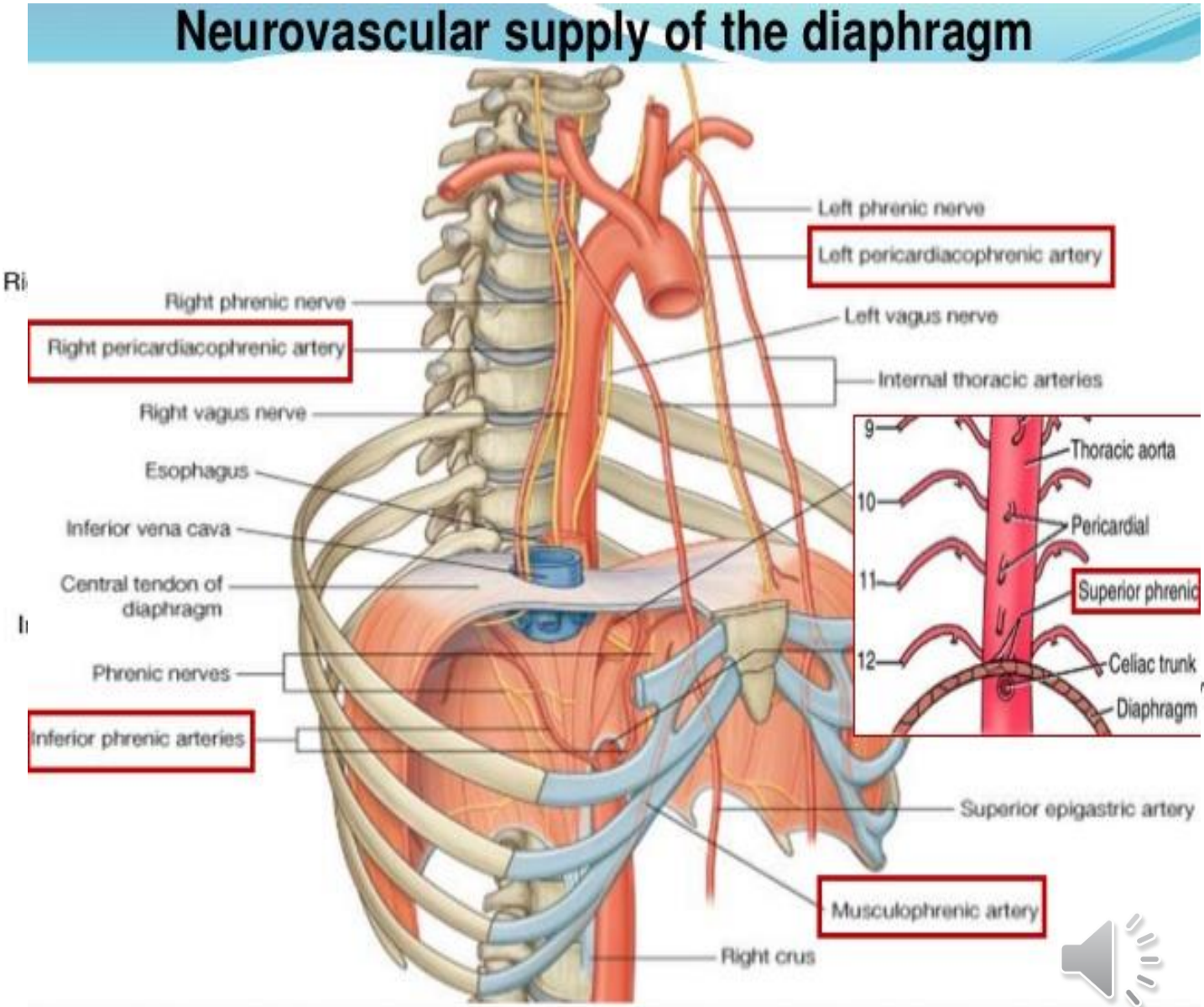
❶. Internal thoracic artery branches through :

*** Pericardiophrenic artery**

***Musculophrenic artery**

❷ Aorta through Superior phrenic arteries .

B. From below, supplied by inferior phrenic arteries.



Venous drainage of the Diaphragm

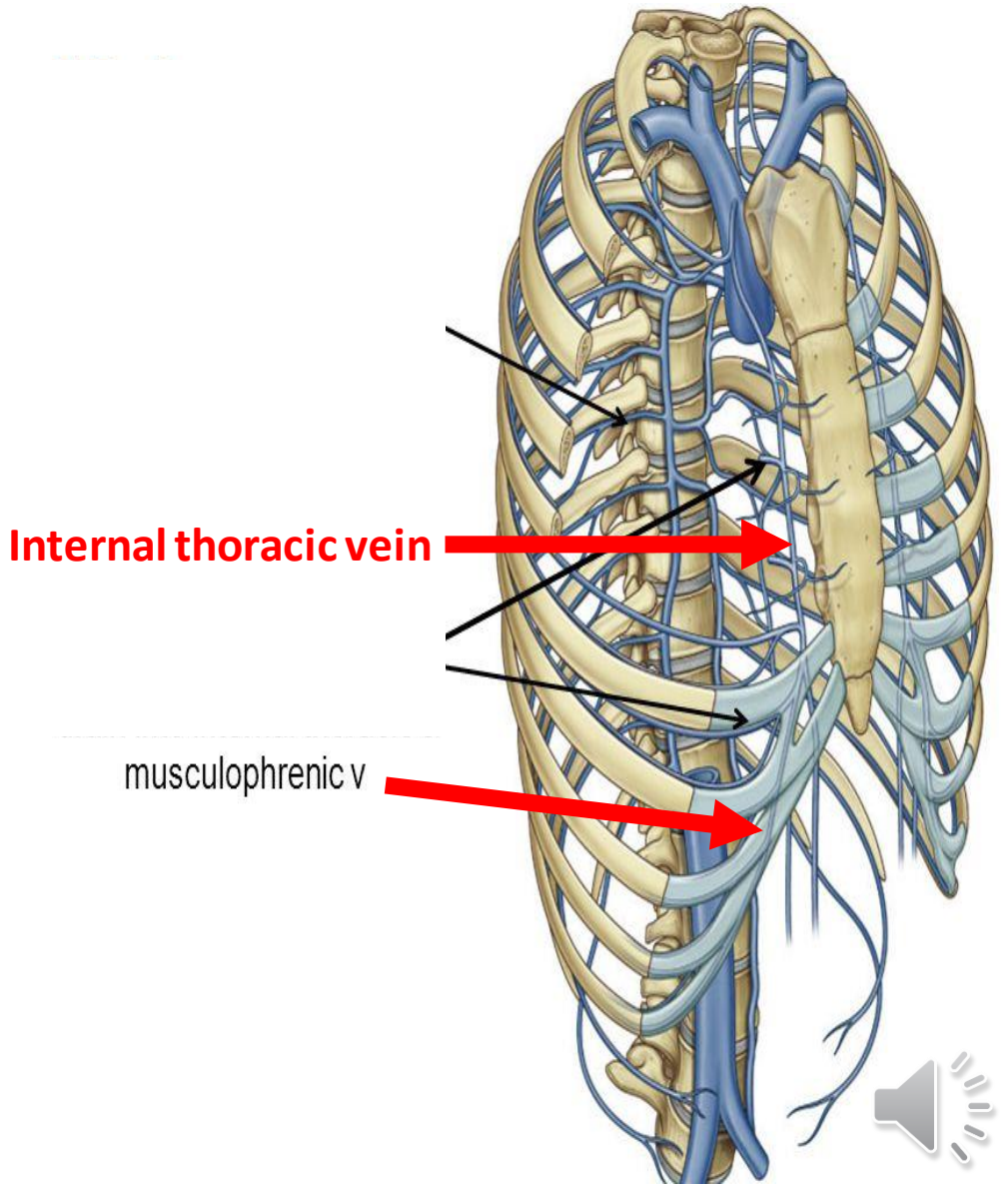
Superior surface (Thoracic surface)

Pericardiophrenic and musculophrenic veins, which drain into the internal thoracic vein.

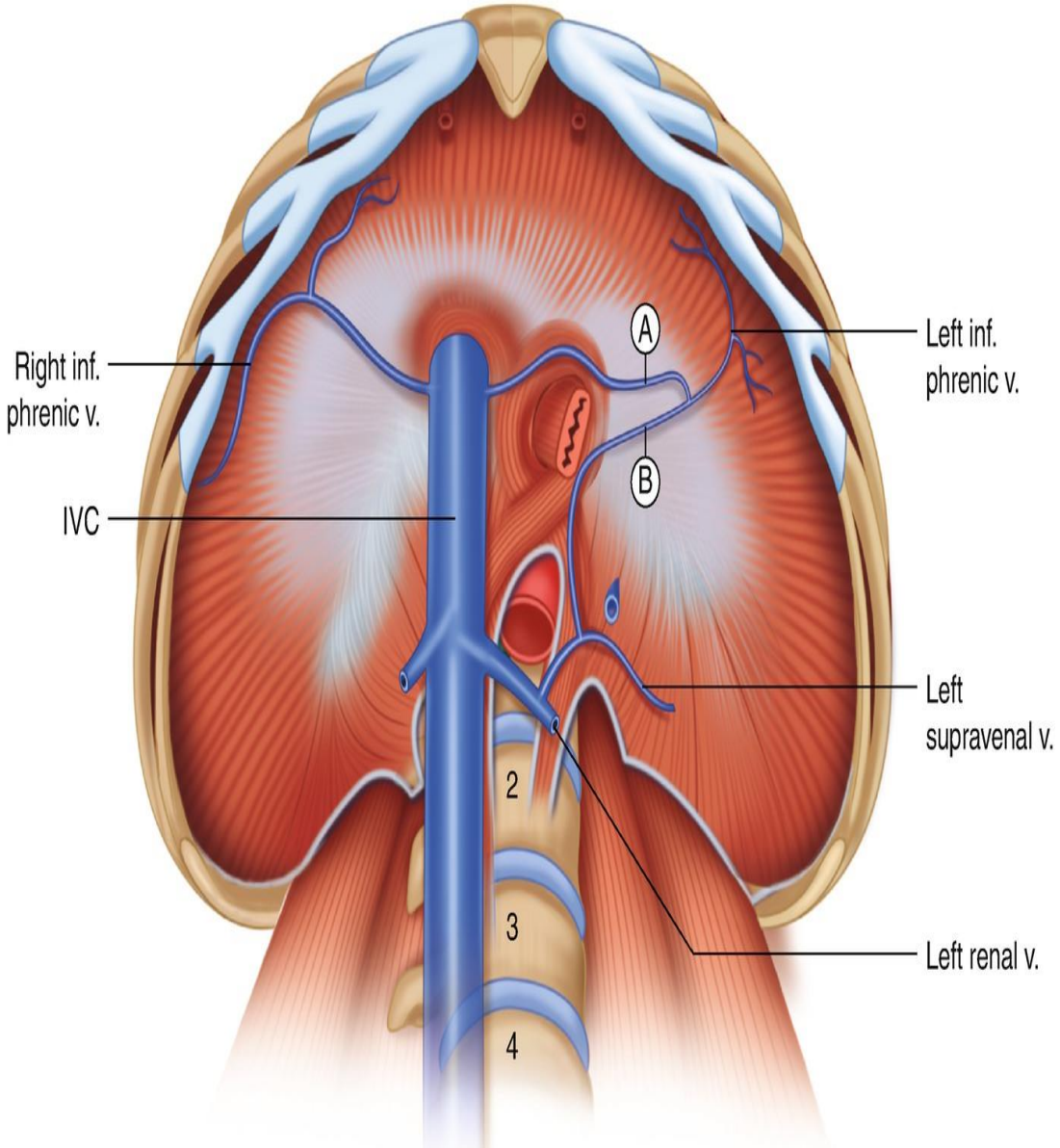
Inferior surface(Abdominal surface)

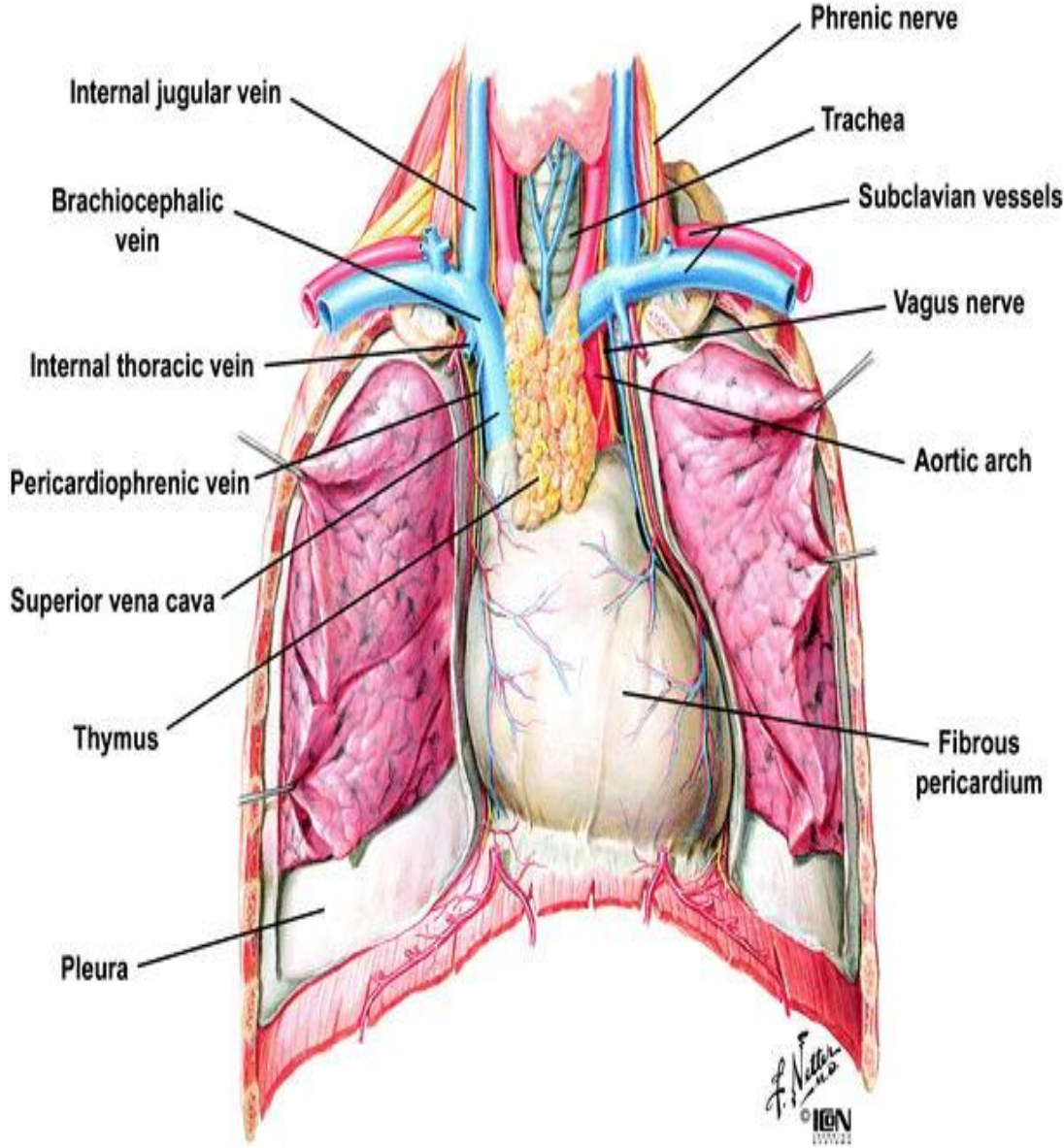
By right and left inferior phrenic veins.

- The right inferior phrenic vein usually drains into the inferior vena cava,
- The left drain to either to (left renal or suprarenal vein) or directly to inferior vena cava.



Venous drainage of the Diaphragm






Thank you
Very
Much