

## THE CHEST

### Diaphragm

- The diaphragm is a thin muscular and tendinous septum that separates the chest cavity above from the abdominal cavity below.
- It is pierced by the structures that pass between the chest and the abdomen.
- The diaphragm is the most important muscle of respiration.
- It is dome shaped and consists of a peripheral muscular part, which arises from the margins of the thoracic opening, and a centrally placed tendon.

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

1. A **sternal part** arising from the posterior surface of the xiphoid process.
  2. A **costal part** arising from the deep surfaces of the lower six ribs and their costal cartilages.
  3. A **vertebral part** arising by vertical columns or crura and from the arcuate ligaments.
- The **right crus** arise from the sides of the bodies of the first three lumbar vertebrae and the intervertebral discs.
  - The **left crus** arise from the sides of the bodies of the first two lumbar vertebrae and the intervertebral disc.
  - Lateral to the crura the diaphragm arises from the **medial** and **lateral arcuate ligaments**.

The medial arcuate ligament extends from the side of the body of the second lumbar vertebra to the tip of the transverse process of the first lumbar vertebra. The lateral arcuate ligament extends from the tip of the transverse process of the first lumbar vertebra to the lower border of the 12th rib.

The diaphragm is inserted into a **central tendon**, which is shaped like three leaves. The superior surface of the tendon is partially fused with the inferior surface of the fibrous pericardium.

Some of the muscle fibers of the right crus pass up to the left and surround the esophageal orifice in a slinglike loop.

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.

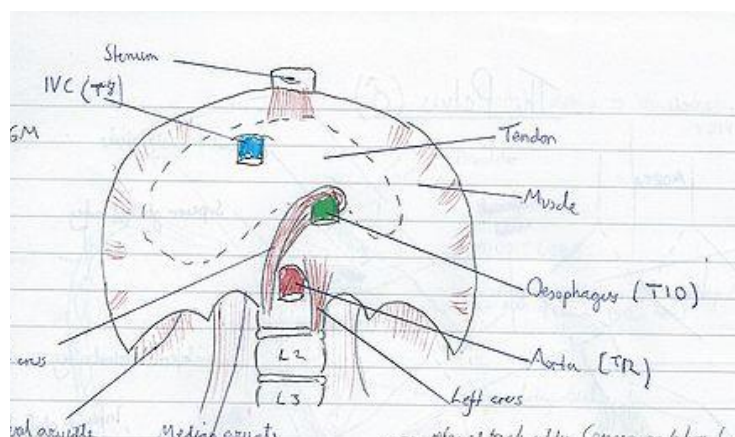
### Shape of the Diaphragm:

- As seen from in front, the diaphragm curves up into **right and left domes**.
- The right dome reaches as high as the upper border of the 5th rib, and the left dome may reach the lower border of the 5th rib.
- (The right dome lies at a higher level, because of the large size of the right lobe of the liver.)
- The central tendon lies at the level of the xiphisternal joint.
- The domes support the right and left lungs, whereas the central tendon supports the heart.
- The levels of the diaphragm vary with the phase of respiration, the posture, and the degree of distention of the abdominal viscera.

### Nerve Supply of the Diaphragm:

**Motor nerve supply:** The right and left phrenic nerves (C3, 4, 5).

**Sensory nerve supply:** The parietal pleura and peritoneum covering the central surfaces of the diaphragm are from the phrenic nerve and the periphery of the diaphragm is from the lower six intercostal nerves.



## Openings in the Diaphragm:

❖ The diaphragm has three **main openings**:

1. The **aortic opening** lies anterior to the body of the 12<sup>th</sup> thoracic vertebra between the crura. It transmits:
  1. The aorta.
  2. The thoracic duct.
  3. The azygos vein.
2. The **esophageal opening** lies at the level of the 10th thoracic vertebra in a sling of muscle fibers derived from the right crus. It transmits:
  - 1) The esophagus.
  - 2) The right and left vagus nerves.
  - 3) The esophageal branches of the left gastric vessels.
  - 4) The lymphatics from the lower third of the esophagus.
3. The **caval opening** lies at the level of the 8th thoracic vertebra in the central tendon.  
It transmits:
  - 1) The inferior vena cava.
  - 2) Terminal branches of the right phrenic nerve.

❖ The diaphragm also has **minor openings**:

- a. The sympathetic splanchnic nerves pierce the crura; the sympathetic trunks pass posterior to the medial arcuate ligament on each side.
- b. The superior epigastric vessels pass between the sternal and costal origins of the diaphragm on each side.

## Internal Thoracic Artery:

- The internal thoracic artery supplies the anterior wall of the body from the clavicle to the umbilicus.
- It is a branch of the first part of the subclavian artery in the neck.

- It descends vertically on the pleura behind the costal cartilages, a fingerbreadth lateral to the sternum, and ends in the sixth intercostal space by dividing into the superior epigastric and musculophrenic arteries.

### Branches of Internal Thoracic Artery:

1. Two **anterior intercostal arteries** for the upper six intercostal spaces.
2. **Perforating arteries**, which accompany the terminal branches of the corresponding intercostal nerves
3. The **pericardiophrenic artery**, which accompanies the phrenic nerve and supplies the pericardium
4. **Mediastinal arteries** to the contents of the anterior mediastinum (e.g., the thymus)
5. The **superior epigastric artery**, which enters the rectus sheath of the anterior abdominal wall and supplies the rectus muscle as far as the umbilicus
6. The **musculophrenic artery**, which runs around the costal margin of the diaphragm and supplies the lower intercostal spaces and the diaphragm

### Nerves of the Thorax

#### ❖ Vagus Nerves:

The **right vagus** & The **left vagus nerve** :: they form **pulmonary plexus** & **esophageal plexus**

#### Branches

Both vagi supply the lungs and esophagus. The right vagus gives off cardiac branches, and the left vagus gives origin to the left recurrent laryngeal nerve. (The right recurrent laryngeal nerve arises from the right vagus in the neck)

#### ❖ Phrenic Nerves:

The phrenic nerves arise from the neck from the anterior rami of the 3rd, 4th, and 5th cervical nerve.

