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Q1. Write a detail note on Diaphragm.

Ans: *Diaphragm*

The diaphragm is an unpaired, dome shaped skeletal muscle that is located in the trunk. It separates the thoracic and abdominal cavities from each other by closing the inferior thoracic aperture. The diaphragm is the primary muscle that is active in inspiration.

Contraction of the muscle facilitates expansion of the thoracic cavity. This increases volume of the the cavity, which in turn decreases the intrathoracic pressure allowing the lungs to expand and inspiration to occur.

The diaphragm is much more than just a sheath separating your thoracic and abdominal cavities. This article will examine this intricate and crucial muscle in detail, looking at its anatomy, function and structures which pass through it.

Diaphragm Shape:

The diaphragm curves up into **right** and **left dome** (cupulae). The right dome reaches as high as the upper

border of the fifth rib. And the left dome may reaches the lower border of the fifth rib.

Diaphragm Action:

The diaphragm is the **primary muscle** of respiration. During inspiration, it contracts and **flattens**, increasing the vertical diameter of the thoracic cavity. This produces lung expansion, and air is drawn in. During expiration, the diaphragm passively relaxes and returns to its original dome shape. This reduces the volume of the thoracic cavity.

Origin and insertion

The diaphragm is a musculotendinous structure with a peripheral attachment to a number of bony structures. It is attached anteriorly to the xiphoid process and costal margin, laterally to the 11th and 12th ribs, and posteriorly to the lumbar vertebrae. The posterior attachment to the vertebrae is by tendinous bands called crura. The crura are attached to the anterior aspect of the bodies of the 1st, 2nd and 3rd lumbar vertebrae. The muscle fibres, extending from their bony attachments, converge on a central tendon.

Structure and relations

The diaphragm is a musculotendinous sheet. It has three muscular parts (sternal, costal, and lumbar), each have their own origin and all insert into the central tendon of diaphragm. The diaphragm is shaped as 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 pericardium slightly depressing the diaphragm.

The diaphragm has two surfaces: thoracic and abdominal. The thoracic diaphragm is in direct contact with the lungs and pericardium, while the abdominal diaphragm is in direct contact with the liver, stomach, and spleen.

Since one function of the diaphragm is to provide passageway for structures from the thorax to the abdomen, its surface has several openings: caval opening (vena caval foramen), esophageal hiatus, and aortic hiatus.

Diaphragm Openings

Aortic hiatus (aorta, azygos vein, thoracic duct),
esophageal hiatus (esophagus, vagus nerve), caval hiatus (inferior vena cava).

Caval opening (vena caval foramen)

Inferior vena cava

Branches of the right phrenic nerve.

Esophageal hiatus

Anterior and posterior vagal trunks, esophagus

Aortic hiatus

Descending aorta, Azygos vein, Thoracic duct

Blood supply

The respiratory diaphragm is a large complex muscle and thus its blood supply comes from various arteries. The costal margin of the diaphragm are supplied by the subcostal arteries and the five most inferior pairs of intercostal arteries.

Inferior phrenic arteries are closely related to the diaphragm and give off a few branches to supply it. They are the main source of vascular supply to the diaphragm. The left inferior phrenic artery ascends toward the left diaphragmatic crus associated with the inferior surface of the diaphragm. From here it passes posterior to the esophagus and runs anteriorly along the edge of the esophageal hiatus. The right passes behind the IVC and anteriorly along the vena cava hiatus.

The final source of blood supply are **superior phrenic arteries**. They supply the superior surface of the diaphragm.

Function:

The diaphragm is one of the main muscles of respiration. When the muscle fibers contract, the diaphragm is flattened. This increases the volume of the thoracic cavity vertically, which decreases intrapulmonary pressure, and air enters the lungs.

When the diaphragm relaxes, thoracic volume decreases, intrapulmonary pressure increases, and air flows out of the lungs.

Q2. Write about Pericardium and its types.

Ans. ***Pericardium:***

The pericardium, also called pericardial sac, is a double-walled sac containing the heart and the roots of the great vessels. The pericardial sac has two layers, a serous layer and a fibrous layer. It encloses the pericardial cavity which contains pericardial fluid.

The pericardium fixes the heart to the mediastinum, gives protection against infection and provides the lubrication for the heart.

Position of pericardium:

The pericardium is present within the middle mediastinum, posterior to the body of the sternum and the 2nd to the 6th costal cartilage and anterior to the 5th to the 8th thoracic vertebra.

Layers of Pericardium:

(1) Fibrous Pericardium:

Fibrous layer of the pericardium is a dense irregular connective tissue sac. Its base lays over the diaphragm and is attached to the central tendon of the diaphragm by the pericardiophrenic ligament. The apex of the fibrous pericardium is continuous with the tunica adventitia (perivascular connective tissue) of the great vessels that leave the heart. The posterior border is related by loose connective tissue to the structures of the posterior mediastinum, whereas the anterior border lays directly on the posterior surface of the sternum to which it is attached by the sternopericardial ligaments.

(2) Serous pericardium:

The thin serous pericardium is a serous membrane, or serosa. Like all serous membranes, it consists of two layers:

Parietal Pericarium:

The outer parietal layer that lays directly on the cavity wall, that is, onto the inner surface of the fibrous pericardium.

Visceral Pericardium:

The inner visceral layer that directly covers the organs in the cavity, that is, the heart. It is also called the epicardium as it is the outer covering of the heart.

Nerve Supply of the Pericardium:

The fibrous pericardium and the parietal layer of the serous pericardium are supplied by the phrenic nerves.

The visceral layer of the serous pericardium is supplied by branches of the sympathetic trunks and the vagus nerves.

Blood Supply of the Pericardium:

Blood supply to the pericardium occurs mainly through the pericardiophrenic artery, although a few minor contributions also occur via the musculophrenic artery, esophageal artery, bronchial artery, and superior phrenic

artery. The coronary artery is also involved, but it supplies blood only to the visceral layer. Draining of blood from the pericardium involves the pericardiophrenic veins as well as the azygos venous system.

Q3. Write a detail note on Pleura.

Ans. Pleura:

The pleura is a doubled layered membrane which covers the thoracic cavity.

Structure of the Pleurae:

There are two pleurae in the body: one associated with each lung. They consist of a **serous membrane** – a layer of simple squamous cells supported by connective tissue. This simple squamous epithelial layer is also known as the mesothelium.

Each pleura can be divided into two parts:

- **Visceral pleura** – covers the lungs.
- **Parietal pleura** – covers the internal surface of the thoracic cavity.

These two parts are continuous with each other at the **hilum** of each lung. There is a potential space

between the viscera and parietal pleura, known as the pleural cavity.

We shall now consider the structures of the pleurae in more detail.

Parietal Pleura

The parietal pleura covers the internal surface of the thoracic cavity. It is thicker than the visceral pleura, and can be subdivided according to the part of the body that it is contact with:

- **Mediastinal pleura** – Covers the lateral aspect of the mediastinum (the central component of the thoracic cavity, containing a number of organ).
- **Cervical pleura** – Lines the extension of the pleural cavity into the neck.
- **Costal pleura** – Covers the inner aspect of the ribs, costal cartilages, and intercostal muscles.
- **Diaphragmatic pleura** – Covers the thoracic (superior) surface of the diaphragm.

Visceral Pleura:

The visceral pleura covers the outer surface of the lungs, and extends into the interlobar fissures. It is continuous with the parietal pleura at the hilum of each lung (this is where structures enter and leave the lung).

Pleural Cavity:

The pleural cavity is a potential space between the parietal and visceral pleura. It contains a small volume of serous fluid, which has two major functions.

It lubricates the surfaces of the pleurae, allowing them to slide over each other. The serous fluid also produces a surface tension, pulling the parietal and visceral pleura together. This ensures that when the thorax expands, the lung also expands, filling with air.

Nerve Supply of the Pleura:

The two parts of the pleurae receive a different neurovascular supply:

Parietal Pleura:

The parietal pleura is sensitive to pressure, pain, and temperature. It produces a well localised pain, and is innervated by the **phrenic** and **intercostal nerves**.

The blood supply is derived from the **intercostal arteries**.

Visceral Pleura:

The visceral pleura is not sensitive to pain, temperature or touch. Its sensory fibres only detect stretch. It also receives autonomic innervation from the **pulmonary**

plexus (a network of nerves derived from the sympathetic trunk and vagus nerve).

Arterial supply is via the **bronchial arteries** (branches of the descending aorta), which also supply the parenchyma of the lungs.