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Q1. Explain the mechanism of breathing

Ans:- mechanism of breathing:-

The air which we breathe in and out of the lungs varies in its pressure. So basically when there is a fall in air pressure the alveolar spaces falls and the air enters the lungs (inspiration) and as the pressure of the alveoli within exceeds the atmospheric pressure, the air is blown from the lungs (expiration). The flow rate of air is in proportion to the magnitude of the pressure difference.

The breathing mechanism involves two processes:

Inspiration

Expiration

Inspiration

In the process of inspiration, there would be a contraction of muscles attached to the ribs on the outer side which pulls out the ribs and results in the expansion of the chest cavity.

Later, the diaphragm, contracts, moves downwards and expands the chest cavity resulting in the contraction of the abdominal muscles.

The expansion of the chest cavity produces a partial vacuum which sucks air into the lungs and fills the expanded alveoli.

Mechanism Of Inspiration

- The process of intake of atmospheric air is known as inspiration. It is an active process.
- When the volume of the thoracic cavity increases and the air pressure decreases, inspiration takes place.
- Contraction of external intercostal muscles increases the volume of the thoracic cavity.
- Contraction of the diaphragm further increases the size of the thoracic cavity. Simultaneously, the lungs expand.

- With the expansion of the lungs, the air pressure inside the lungs decreases.
- The pressure equalizes and the atmospheric air rushes inside the lungs.

Expiration

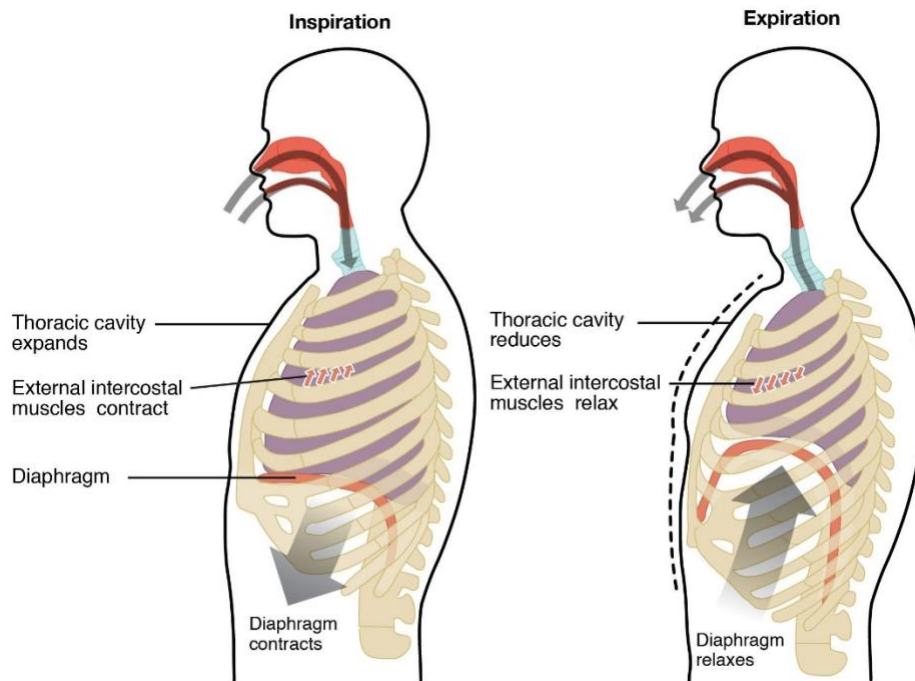
The expiration process is considered once after the gaseous exchange occurs in the lungs and the air is expelled out. This expulsion of air is called expiration.

During this process, muscles attached to the ribs contract, the muscles of the diaphragm and the abdomen relax which leads to a decrease in the volume of the chest cavity and increases the pressure of the lungs, causing the air in the lungs to be pushed out through the nose.

Mechanism Of Expiration

- *The process of exhaling carbon dioxide is called expiration. It is a passive process.*
- *It occurs when the size of the thoracic activity decreases and the air pressure outside increases.*
- *Now the external intercostal muscles relax and the internal intercostal muscles contract.*
- *As a result, the ribs are pulled inwards and the size of the thoracic cavity is reduced.*

- *The diaphragm is relaxed and the lungs get compressed.*
- *Consequently, the pressure increases and the air is forced outside.*



Q2. What do you know about the origin of diaphragm?

Ans:- Origin of Diaphragm

Sternal

The sternal part originates as 2 fleshy slips from the back of the xiphoid process.

Costal

The costal part originates from inner surfaces of the cartilages, adjacent parts of the lower sixth ribs on each side. It interdigitates with transverses abdominis.

Lumbar

The medial lumbocostal arch is a tendinous arch in fascia covering psoas major. Medially, it attaches to the side of the body of vertebra L1. Laterally, it connects to the front of the transverse process of vertebra L1.

The lateral lumbocostal arch is a tendinous arch in fascia covering the upper part of quadratus lumborum.

Medially, attach to the front of the transverse process of vertebra L1. Laterally, it connects to the lower border of the 12th rib.

The right crus arises from the anterolateral surface of the bodies of the upper three lumbar vertebrae and also the intervening intervertebral disc

The left crus arises from the corresponding parts of the upper 2 lumbar vertebrae.

Medial margin of two crura forms a tendinous arc across the front of the aorta called the median arcuate ligament.

Q3: Classify the ribs according to their attachments to the sternum.

ANS:- Sternum

The sternum is the elongated bony structure that anchors the anterior thoracic cage. It consists of three parts: the manubrium, body, and xiphoid process. The manubrium is the wider, superior portion of the sternum. The top of the manubrium has a shallow, U-shaped border called the jugular (suprasternal) notch. This can be easily felt at the anterior base of the neck, between the medial ends of the clavicles. The clavicular notch is the shallow depression located on either side at the superior-lateral margins of the manubrium. This is the site of the sternoclavicular joint, between the sternum and clavicle. The first ribs also attach to the manubrium.

The elongated, central portion of the sternum is the body. The manubrium and body join together at the sternal angle, so called because the junction between these two components is not flat, but forms a slight bend. The second rib attaches to the sternum at the sternal angle. Since the first rib is hidden behind the clavicle, the second rib is the highest rib that can be identified by palpation. Thus, the sternal angle and second rib are important landmarks for the identification and counting of the lower ribs. Ribs 3–7 attach to the sternal body.

When assessing a patient's level of alertness sometimes a sternal rub is performed with the knuckles to see if they respond to pain.

The inferior tip of the sternum is the xiphoid process. This small structure is cartilaginous early in life, but gradually becomes ossified starting during middle age.

Rib Classifications on the basis of sternum

The bony ribs do not extend anteriorly completely around to the sternum. Instead, each rib ends in a

costal cartilage. These cartilages are made of hyaline cartilage and can extend for several inches. Most ribs are then attached, either directly or indirectly, to the sternum via their costal cartilage. The ribs are classified into three groups based on their relationship to the sternum.

Ribs 1–7 are classified as true ribs (vertebrosternal ribs). The costal cartilage from each of these ribs attaches directly to the sternum. Ribs 8–12 are called false ribs (vertebrochondral ribs). The costal cartilages from these ribs do not attach directly to the sternum. For ribs 8–10, the costal cartilages are attached to the cartilage of the next higher rib. Thus, the cartilage of rib 10 attaches to the cartilage of rib 9, rib 9 then attaches to rib 8, and rib 8 is attached to rib 7. The last two false ribs (11–12) are also called floating ribs (vertebral ribs). These are short ribs that do not attach to the sternum at all. Instead, their small costal cartilages terminate

within the musculature of the lateral abdominal wall.

Q4: What do you know about the general features of first rib?

Ans:- The first rib is the most curved and usually the shortest of all the ribs; it is broad and flat, its surfaces looking upward and downward, and its borders inward and outward.

The head is small, rounded, and possesses only a single articular facet, for articulation with the body of the first thoracic vertebra. The neck is narrow and rounded. The tubercle, thick and prominent, is placed on the outer border. There is no angle, but at the tubercle the rib is slightly bent, with the convexity upward, so that the head of the bone is directed downward. The upper surface of the body is marked by two shallow grooves, separated from each other by a slight ridge prolonged internally into a tubercle, the scalene tubercle, for the attachment of the Scalenus anterior; the anterior

groove transmits the subclavian vein, the posterior the subclavian artery and the lowest trunk of the brachial plexus. Behind the posterior groove is a rough area for the attachment of the Scalenus medius. The under surface is smooth, and destitute of a costal groove. The outer border is convex, thick, and rounded, and at its posterior part gives attachment to the first digitation of the Serratus anterior; the inner border is concave, thin, and sharp, and marked about its center by the scalene tubercle. The anterior extremity is larger and thicker than that of any of the other ribs.

Q5. How is the mediastinum divided?

Ans:-The mediastinum is divided compartmentally and consists of subdivisions that house and support vital structures within the thorax. Below are the borders of each region of the mediastinum.

Superior Mediastinum: bordered by the thoracic outlet superiorly, transverse thoracic plane (the plane of

Ludwig) or sternal angle inferiorly, medial border of the pleural sacs laterally, dorsal surface of the sternum anteriorly, and ventral surface of the first four thoracic vertebral bodies posteriorly[1][2][3]

Anterior Mediastinum: bordered by the pericardium posteriorly, medial border of the pleural sacs laterally, and the sternum, transversus thoracis muscles, and fifth, sixth, and seventh left costal cartilages anteriorly[1][2][4][5]

Middle Mediastinum:

Formed by the borders of the pericardial sac anteriorly and posteriorly, reflected to the medial borders of the pleural sacs bilaterally, transverse thoracic plane superiorly, and thoracic surface of the diaphragm inferiorly

Posterior Mediastinum:

bordered by the pericardium anteriorly, the thoracic surface of the diaphragm inferiorly, the transverse thoracic plane superiorly, the bodies of the fifth to the twelfth thoracic vertebrae posteriorly, and the pleural sacs laterally[1][2][5]

Each region of the thoracic mediastinum contains unique structures. Listed below are the different regions of the thoracic mediastinum and a high-level overview of their components.

Superior Mediastinum:

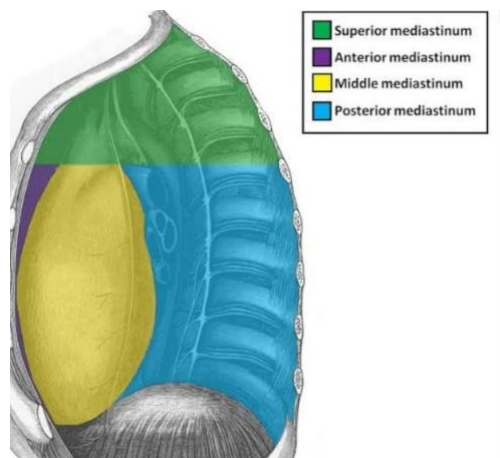
- Organs: thymus, trachea, esophagus
- Arteries: aortic arch, brachiocephalic trunk, left common carotid artery, left subclavian artery
- Veins and lymphatics: superior vena cava, brachiocephalic veins, the arch of the azygos, thoracic duct
- Nerves: left and right vagus, recurrent laryngeal, cardiac, left and right phrenic nerves

Anterior Mediastinum:

- Organs: thymus
- Arteries: internal thoracic branches
- Veins and lymphatics: internal thoracic branches, parasternal lymph nodes
- Nerves: none

Middle Mediastinum:

- Organs: the heart and its great vessel roots, trachea and main bronchi
 - Arteries: ascending aorta, pulmonary trunk, pericardiophrenic arteries
 - Veins and lymphatics: superior vena cava, pulmonary veins, pericardiophrenic veins
 - Nerves: phrenic, vagus, sympathetics
- Posterior Mediastinum:
- Organs: esophagus
 - Arteries: descending thoracic aorta
 - Veins and lymphatics: azygos hemiazygos veins, thoracic duct
 - Nerves: vagus, splanchnic, sympathetic chain



Q6. Briefly discuss the structure of lungs. LUNGS:

The lungs are a pair of spongy, air-filled organs located on either side of the chest (thorax). The trachea (windpipe) conducts inhaled air into the lungs through its tubular branches, called bronchi. The bronchi then divide into smaller and smaller branches (bronchioles), finally becoming microscopic.

The bronchioles eventually end in clusters of microscopic air sacs called alveoli. In the alveoli, oxygen from the air is absorbed into the blood. Carbon dioxide, a waste product of metabolism, travels from the blood to the alveoli, where it can be exhaled. Between the alveoli is a thin layer of cells called the interstitium, which contains blood vessels and cells that help support the alveoli.

The lungs are covered by a thin tissue layer called the pleura. The same kind of thin tissue lines the inside of the chest cavity – also called pleura. A thin layer of fluid acts as a lubricant allowing the lungs to slip smoothly as they expand and contract with each breath.

Bronchi, Bronchial Tree, and Lungs

