Thorax

The thorax (or chest) is the region of the body between the neck and the abdomen.

The walls of the thorax is referred to as the thoracic cage, is formed by the vertebral column behind, the ribs and intercostal spaces on either side, and the sternum and costal cartilages in front.

The thoracic cage protects the lungs and heart and affords attachment for the muscles of the thorax, upper extremity, abdomen, and back.

The cavity of the thorax can be divided into a median partition, called the mediastinum, and the laterally placed pleurae and lungs.

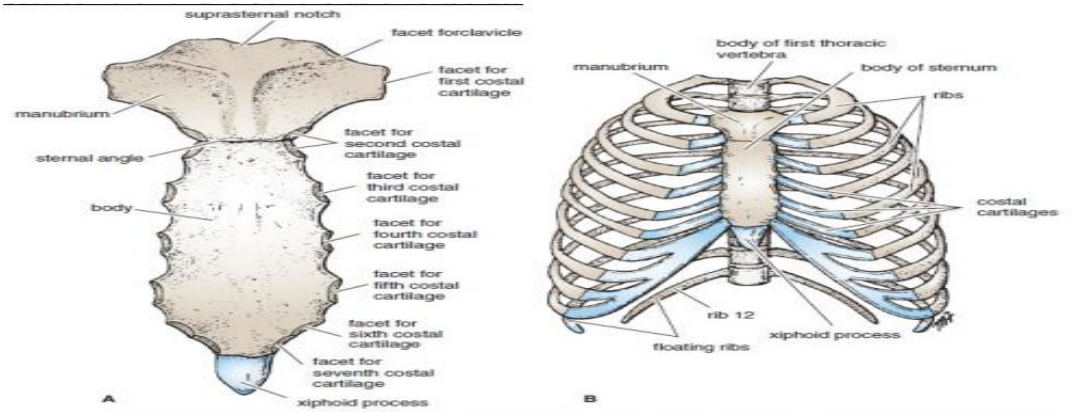
Sternum

The sternum lies in the midline of the anterior chest wall. It is a flat bone that can be divided into three parts: manubrium sterni, body of the sternum, and xiphoid process.

The manubrium is the upper part of the sternum. It articulates with the body of the sternum at the manubriosternal joint, and it also articulates with the clavicles and with the 1st costal cartilage and the upper part of the 2nd costal cartilages on each side.

The body of the sternum articulates above with the manubrium at the manubriosternal joint and below with the xiphoid process at the xiphisternal joint. On each side, it articulates with the 2nd to the 7th costal cartilages.

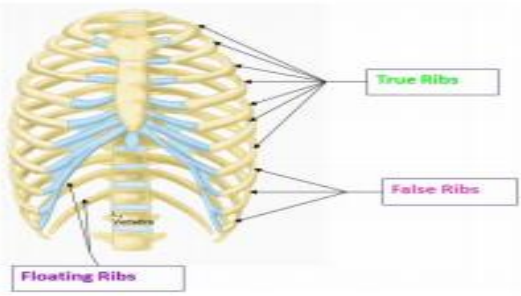
The xiphoid process is a thin plate of cartilage that becomes ossified at its proximal end during adult life. No ribs or costal cartilages are attached to it. The sternal angle (angle of Louis), formed by the articulation of the manubrium with the body of the sternum.



A. Anterior view of the sternum. B. Sternum, ribs, and costal cartilages forming the thoracic skeleton.

Ribs

There are 12 pairs of ribs, all of which are attached posteriorly to the thoracic vertebrae. The ribs are divided into three categories:
True ribs: The upper seven pairs are attached anteriorly to the sternum by their costal cartilages.
False ribs: The 8th, 9th, and 10th pairs of ribs are attached anteriorly to each other and to the 7th rib by means of their costal cartilages and small synovial joints.
Floating ribs: The 11th and 12th pairs have no anterior attachment.



Costal Cartilages

Costal cartilages are bars of cartilage connecting the upper seven ribs to the lateral edge of the sternum and the 8th, 9th, and 10th ribs to the cartilage immediately above. The cartilages of the 11th and 12th ribs end in the abdominal musculature.
The costal cartilages contribute significantly to the elasticity and mobility of the thoracic walls. In old age, the costal cartilages tend to lose some of their flexibility as the result of superficial calcification.

Joints of the Chest Wall

1/ Joints of the Sternum

The manubriosternal joint and the xiphisternal joint

2/ Joints of the Heads of the Ribs

The 1st rib and the three lowest ribs have a single synovial joint with their corresponding vertebral body. For the 2nd to 9th ribs, the head articulates by means of a synovial joint with the corresponding vertebral body and that of the vertebra above it.

3/ Joints of the Tubercles of the Ribs

The tubercle of a rib articulates by a synovial joint with the transverse process of the corresponding vertebra. (It's absent on 11th & 12th ribs.)

4/ Joints of the Ribs and Costal Cartilages

These joints are cartilaginous joints. No movement is possible.

5/ Joints of the Costal Cartilages with the Sternum

The 1st costal cartilages articulate with the manubrium, by cartilaginous joints that permit no movement.

Suprapleural Membrane

Superiorly, the thorax opens into the root of the neck by a narrow aperture, the thoracic outlet. The outlet transmits structures that pass between the thorax and the neck (esophagus, trachea, blood vessels, etc.) and for the most part lie close to the midline.

Diaphragm

The diaphragm is a thin muscular and tendinous septum that separates the chest cavity above from the abdominal cavity below. The diaphragm is the most important muscle of respiration. It is dome shaped .

Action of the Diaphragm

On contraction, the diaphragm pulls down its central tendon and increases the vertical diameter of the thorax.

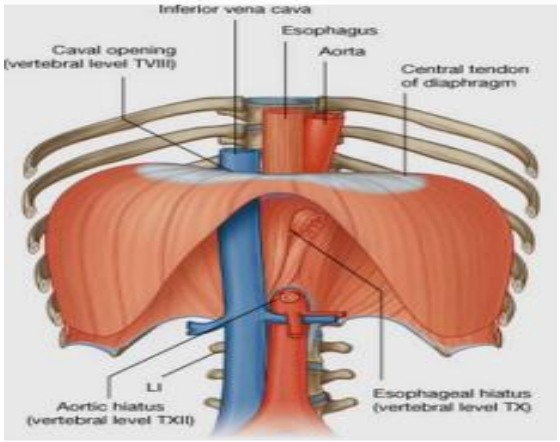
Openings in the Diaphragm

The diaphragm has three main openings:

1) The aortic opening lies anterior to the body of the 12th thoracic vertebra. It transmits the aorta, the thoracic duct, and the azygos vein.

2) The esophageal opening lies at the level of the 10th thoracic vertebra. It transmits the esophagus, the right and left vagus nerves.

3) The caval opening lies at the level of the 8th thoracic vertebra in the central tendon. It transmits the inferior vena cava and terminal branches of the right phrenic nerve.



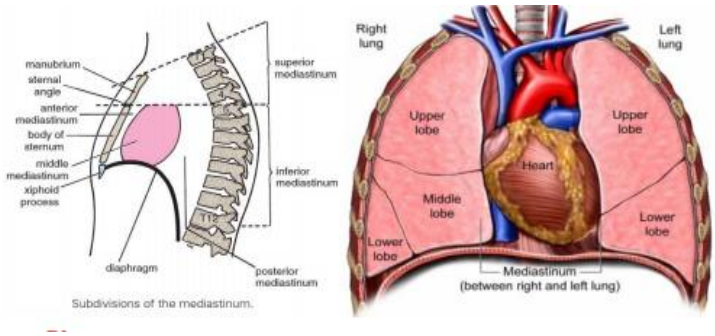
Mediastinum

The mediastinum, though thick, is a movable partition that extends superiorly to the thoracic outlet and the root of the neck and inferiorly to the diaphragm.

It contains the remains of the thymus, the heart and large blood vessels, the trachea and esophagus, the thoracic duct and lymph nodes, the vagus and phrenic nerves, and the sympathetic trunks.

The mediastinum is divided into superior and inferior mediastina .

The inferior mediastinum is subdivided into the middle mediastinum, which consists of the pericardium and heart; the anterior mediastinum, which is a space between the pericardium and the sternum; and the posterior mediastinum, which lies between the pericardium and the vertebral column.



Pleurae

The pleurae and lungs lie on either side of the mediastinum within the chest cavity.

Each pleura has two parts: a **parietal layer** and a **visceral layer.**

Parietal layer which lines the thoracic wall, divided according to the region in which it lies or the surface that it covers:

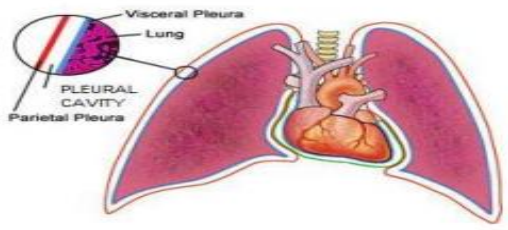
1. **Cervical pleura**
2. **Costal pleura**
3. **Diaphragmatic pleura**
4. **Mediastinal pleura**

Visceral layer which completely covers the outer surfaces of the lungs and extends into the depths of the interlobar fissures.

The two layers become continuous with one another by means of a cuff of pleura that surrounds the structures entering and leaving the lung .

The parietal and visceral layers of pleura are separated from one another by a space, the **pleural cavity or pleural space**.

The pleural cavity normally contains a small amount of tissue fluid, the **pleural fluid,** which permits the two layers to move on each other with the minimum of friction.



Trachea

The trachea is a mobile cartilaginous and membranous tube. It begins in the neck as a continuation of the larynx at the level of the 6th cervical vertebra.

In the thorax, the trachea ends below at the **carina** by dividing into right and left principal (main) bronchi at the level of the sternal angle .

In adults, the trachea is about (11.25 cm) long and (2.5 cm) in diameter. The fibroelastic tube is kept patent by the presence of U-shaped bars (rings) of hyaline cartilage embedded in its wall.

Blood Supply of the Trachea

Upper two thirds : the inferior thyroid arteries

Lower third: the bronchial arteries.

Nerve Supply of the Trachea

Sensory nerve supply : from the vagi and the recurrent laryngeal nerves.

Sympathetic nerves : supply the trachealis muscle.

The Bronchi

The trachea bifurcates behind the arch of the aorta into the **right and left principal (primary or main) bronchi**. The bronchi divide dichotomously, giving rise to several million terminal bronchioles that terminate in one or more respiratory bronchioles.

The **right principal (main) bronchus** is wider, shorter, and more vertical than the left and is about (2.5 cm) long.

The **left principal (main) bronchus** is narrower, longer, and more horizontal than the right and is about (5 cm) long.