

Pleura space anatomy

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Abstract: The pleural cavity is the potential space between the two pleurae (visceral and parietal) of the lungs. The pleurae are serous membranes which fold back onto themselves to form a two-layered membranous structure. The thin space between the two pleural layers is known as the pleural cavity and normally contains a small amount of pleural fluid. There are two layers; the outer pleura (parietal pleura) is attached to the chest wall and the inner pleura (visceral pleura) covers the lungs and adjoining structures, via blood vessels, bronchi and nerves. The parietal pleurae are highly sensitive to pain, while the visceral pleura are not, due to its lack of sensory innervation. In the current review we will present the anatomy of the pleural space.

Keywords: Pneumothorax; anatomy; pleural space

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The pleural cavity is the potential space between the two pleurae (visceral-parietal) of the lungs. The pleura is a serous membrane which folds back onto itself to form a two-layered membrane structure. The thin space is known as the pleural cavity and contains a small amount of pleural fluid (few milliliters in a normal human). The outer pleura is attached to the chest wall (1-9).

The pleural cavity aids optimal functioning of the lungs during breathing. It transmits movements of the chest wall to the lungs, particularly during heavy breathing. The closely approximated chest wall transmits pressures to the visceral pleural surface and hence to the lung (10-19).

In human, there is no anatomical connection between the pleural cavities. The visceral pleura receives its blood supply from the bronchial circulation and the parietal

pleura receives its blood supply from the intercostal arteries. Only in cases of pneumothorax (tension-simultaneous) may collapse the contralateral parenchyma and blood vessels. Normally visceral pleura glides on parietal without sound or pain, but when the pleura are in action sounds can be auscultated. If fluid then distends cavity, the sounds disappear and the lung gradually the heart and mediastinum being displaced towards the lung. Air in the cavity, rupture of the lung as the elastic tissue of the lung recoils. The pleura crosses the rib at the region is above the reflexion.

The thoracic structures (inlet) consist of two groups. Those in the median plane and those on each side closely related to the cervical parts of pleurae and lungs.

- (I) Near the midline, the lowest parts of the sternohyoid muscles enter the thorax, thymic

vestiges and inferior thyroid veins. Posteriorly, trachea and oesophagus, with the recurrent laryngeal nerves. Anterior to the vertebral column are the prevertebral longus colli muscles (20-29);

- (II) On each side, the upper part of the pleura and pulmonary apex occupy the inlet. Between the pleura and neck of the first rib are the sympathetic trunk, superior intercostal artery and ventral ramus of the first thoracic nerve. The internal thoracic artery enters the thorax between pleura and first costal cartilage;
- (III) On the right, the brachiocephalic artery leaves the thorax between the trachea and pleura. The vagus nerve is between the pleura and brachiocephalic artery at the inlet;
- (IV) On the left, the left common carotid and subclavian arteries leave the thorax between the pleura and trachea. The left phrenic nerve crosses the internal thoracic artery at a higher level, because it is between the left brachiocephalic vein and common carotid arteries.

The thoracic outlet is wider transversely and slopes down, so the vertical extend of the cavity is longer. The diaphragm closes the opening and forms a convex floor for the cavity. Centrally, it is flatter. The diaphragm slopes down to the costal and vertebral attachments, so the thoracic wall narrows rapidly inferiorly (29-39).

The thoracic cavity is divided by the mediastinum. The heart is in the mediastinum, enclosed by the pericardium. The lungs occupy the left-right regions and the pleura lines the corresponding half of the thorax and forms the lateral mediastinal boundary.

The superior part extends from the thoracic inlet passing through the lower edge of manubrium sterni. The inferior part is subdivided into an anterior part of the pericardium. The pericardium contains the heart and juxta-cardiac parts. It is posterior to corpus sterni and anterior to the 5-8 thoracic vertebrae. It consists of two opposed surfaces of serous membrane (fibrous pericardium-serous pericardium). The fibrous pericardium is compacted of collagenous fibrous tissue. The serous pericardium is a thin layer of flat mesothelial cells which blends with the fibrous pericardium and myocardial tissue.

The mediastinum is the partition between the lungs and includes the mediastinal pleura. It is commonly applied to the interval between the two pleural sacs, the sternum and

the thoracic vertebral column extending to the diaphragm.

The superior mediastinum is lying between the manubrium sterni and the upper four thoracic vertebrae. It contains the ends of the sternohyoid, colli muscles, left common carotid, the brachiocephalic artery and the aortic arch (32,39-48).

The anterior mediastinum lying between the sternal body and pericardium. It contains loose areolar tissue, the sternopericardial ligaments, sometimes part of thymous gland and the mediastinal branches of the internal thoracic artery.

The middle mediastinum contains pericardium, ascending aorta, the terminal azygos vein, both pulmonary veins, the phrenic nerves and tracheal bifurcation.

The posterior mediastinum is bounded in front by the tracheal bifurcation, pericardium and the upper surface of diaphragm, behind by the vertebral column. It contains the thoracic aorta, the vagus, the azygos-hemiazygos vein and the thoracic duct.

Each lung is invested by a delicate serous membrane and the pleura, which is arranged in the investigated sac. A portion of the serous membrane dips into the fissures between its lobes—the pulmonary pleura. The rest of the membrane lines cover the diaphragm—the parietal pleura. The two layers are continuous with one another around and below the root of the lung—the pleural cavity. The right and left pleural sacs are entirely separate and they touch each other for a short distance in front, opposite the 2nd-3rd pieces of the sternum the interval between the two sacs—the mediastinum.

In the front of the chest, where the parietal pleura is reflected backward to the pericardium, the two pleural sacs are in contact. At the upper part of the chest they are separated by an angular interval. From this point the two pleurae descend in close contact to the level of the fourth costal cartilages. The inferior limit of the pleura is on a considerably lower level than the corresponding limit of the lung but does not extend to the attachment of the diaphragm. So, the thin inferior margin of the lung doesn't extend as low as the line of the pleural reflection—the phrenicocostal sinus.

Between the two layers of pleura forms—the costomediastinal sinus.

The line along which the right pleura is reflected from the chest-wall to the diaphragm starts in front and runs behind the seventh costal cartilage. The reflection of the left pleura follows the ascending part of the sixth cartilage and it's lower than the right side. The right sac is shorter, wider and reaches higher in the neck (*Figures 1-12*).

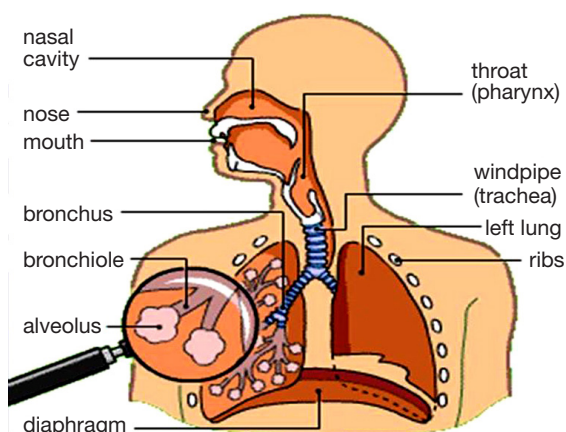


Figure 1 Anatomy of the respiratory system.

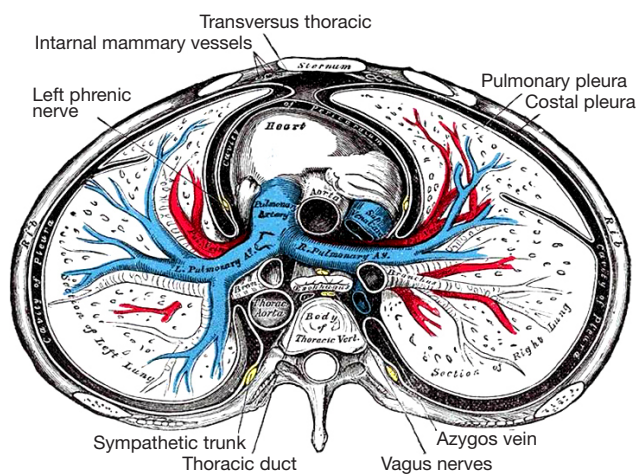


Figure 2 Anatomy of the respiratory system within the thorax region.

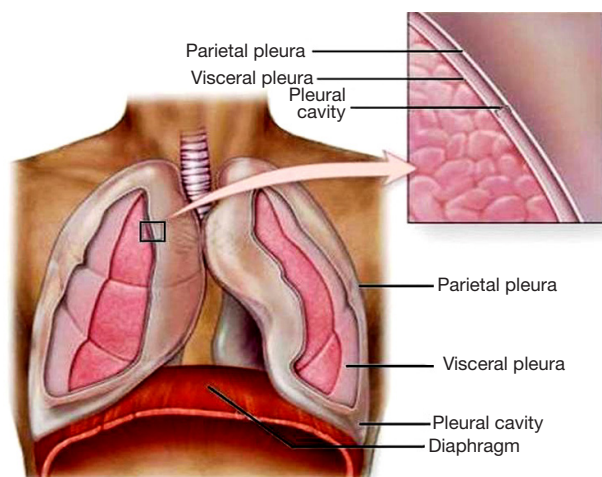


Figure 3 Anatomy of the pleura cavity.

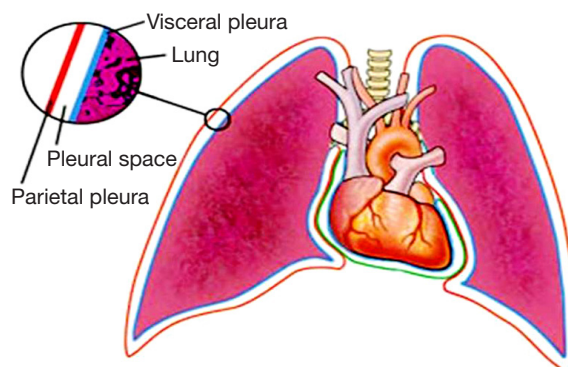


Figure 4 Two pleural layers continue with each other at root of the lung forming a closed potential cavity: pleural cavity.

Two pleural layers continue with each other at root of lung forming a closed potential space-pleural cavity

- Contains a small amount pleural fluid
- Subatmospheric pressure in it

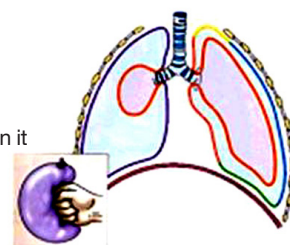


Figure 5 Anatomy of the pleura cavity (mechanism detail).

the pleura

- parietal pleura: attaches internal walls of the thoracic cavity
- contains pain receptors
- covers the diaphragm, and mediastinum

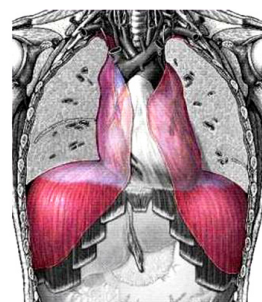


Figure 6 Anatomy of the pleura cavity (muscles).

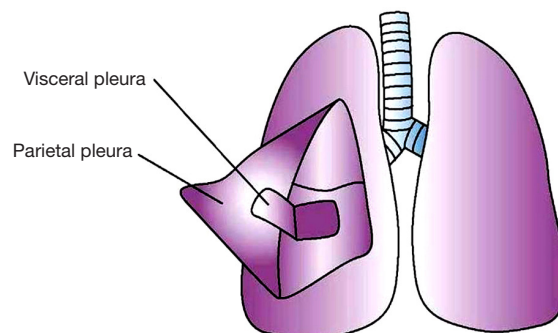


Figure 7 Anatomy of the pleura cavity (pleural layers).

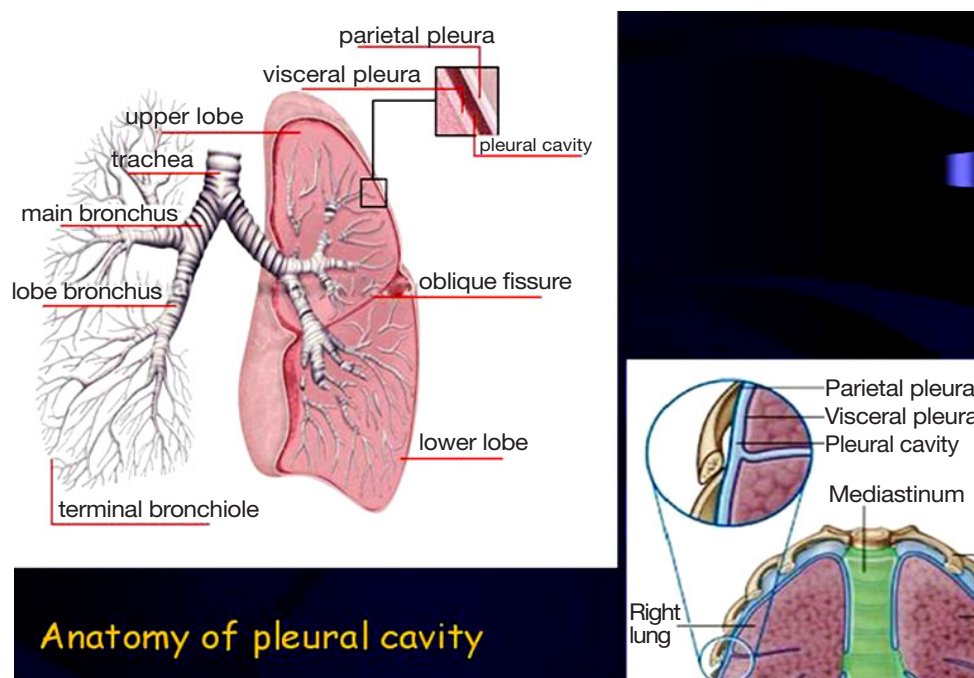


Figure 8 Anatomy of the pleura cavity (respiratory system).

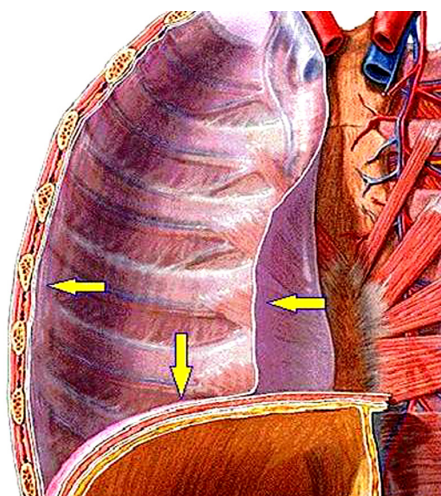


Figure 9 The parietal pleura lines the thoracic wall and superior surface of the diaphragm. It continues around the heart forming the lateral walls of the mediastinum. The pleura extends over the surface of the lungs as the visceral pleura. The surface tension of the fluid in the pleural cavity secures the pleura together. They can slide from side to side but it is hard to separate them.

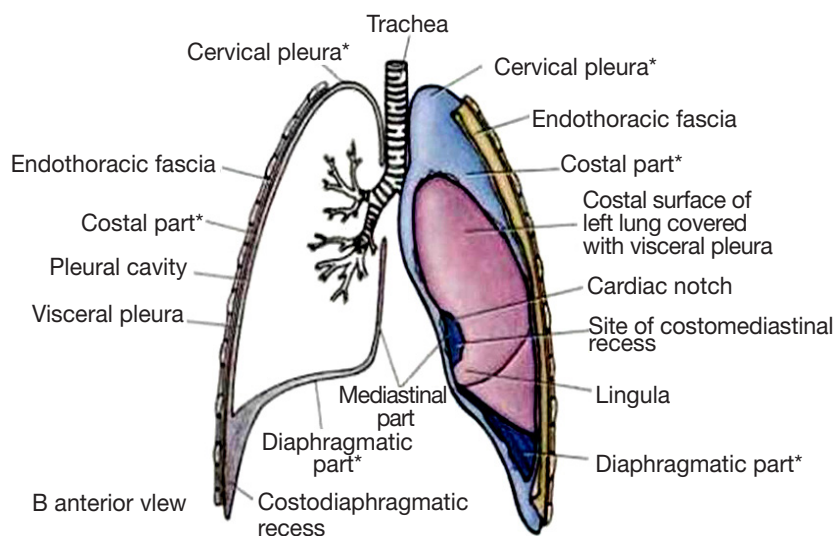


Figure 10 Anatomy of pleural cavity-pleural recesses.

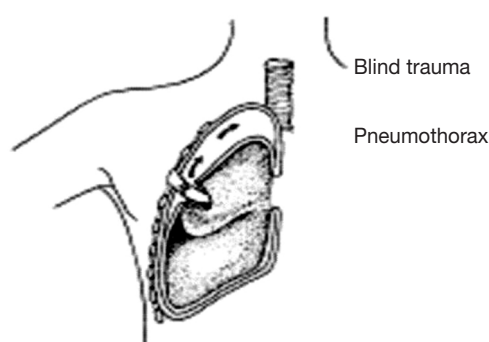


Figure 11 Types of pneumothorax.

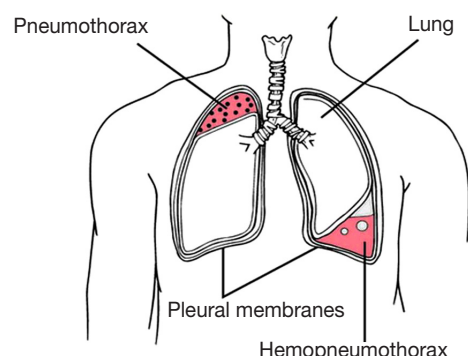


Figure 12 Pneumothorax.

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