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# RS ANATOMY



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# Pleura

- Each pleural cavity is lined by a single layer of flat cells, mesothelium, and an associated layer of supporting connective tissue; together, they form the pleura

- the pleura is composed of 2 layers, visceral and parietal, the visceral adheres and covers the lung tissue internally, the parietal covers and lines the thoracic cage externally.

- The pleura is divided into two major types, based on location:

- pleura associated with the walls of a pleural cavity is parietal pleura;
- visceral pleura which adheres to and covers the lung.

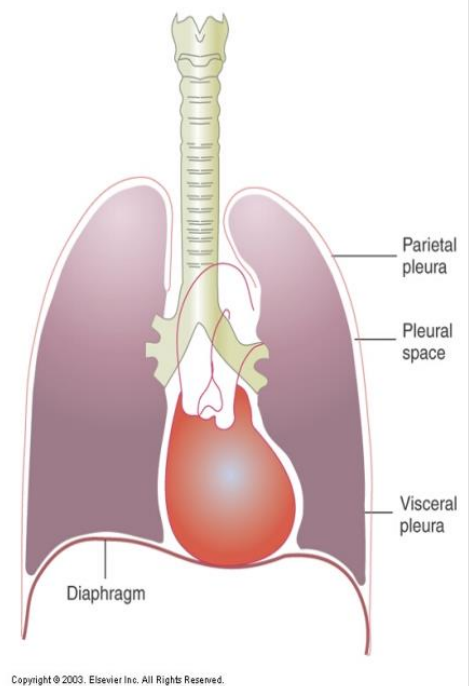
- Each pleural cavity is the potential space enclosed between the visceral and parietal pleurae. They normally contain only a very thin layer of serous fluid

- the evidence of the presence of this space is the potential of fluid to collect inside this space, this fluid helps in lubrication during respiration.

- As a result, the surface of the lung, which is covered by visceral pleura, directly opposes and freely slides over the parietal pleura attached to the wall.

**Function:**

- 1- protection
- 2- Produces fluid that allows for lubrication
- Failure to function results in difficult painful breathing
  - if the fluid becomes less, friction may develop and subsequent pleuritis – it is very painful, the patient feels pain between ribs and painful breathing



- The pleural cavity is a site for—pneumothorax, pleural effusion, Empyema & haemothorax.

- normally, only lubricated fluid found in that space

- pneumothorax: accumulation of air in the pleural sac, pleural effusion: accumulation of fluid in the pleural sac, empyema: accumulation of the pus in the pleural sac after chronic infection, haemothorax: blood collection in the sac.

• The names given to the parietal pleura correspond to the parts of the wall with which they are associated

• pleura related to the ribs and intercostal spaces is termed the costal part;

• pleura covering the diaphragm is the diaphragmatic part;

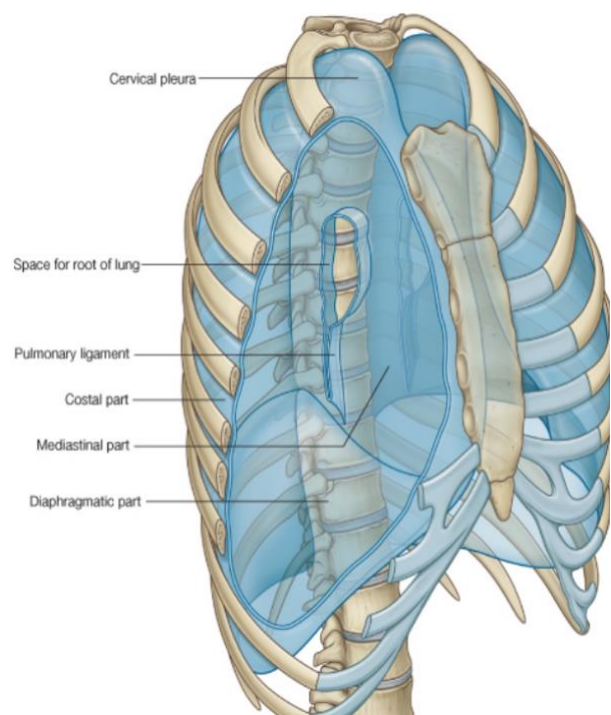
-above the diaphragm and associated with the base of the lung.

• pleura covering the mediastinum is the mediastinal part;

- the parietal and visceral layer adhere together forming a sleeve around the hilum and then form what is called pulmonary ligament.

• the dome-shaped layer of parietal pleura lining the cervical extension is cervical pleura (dome of pleura or pleural cupola) and is covered by suprapleural membrane (sibson's fascia – investing deep fascia of the neck, descent downward from its attachment at the superior thoracic aperture and becomes continuous with the outer covering of the apex of the lung).

• The cervical pleura is related to the apex of the lung located 1 inch above the medial 3<sup>rd</sup> of the clavicle, or 3-5 cm above the 1<sup>st</sup>

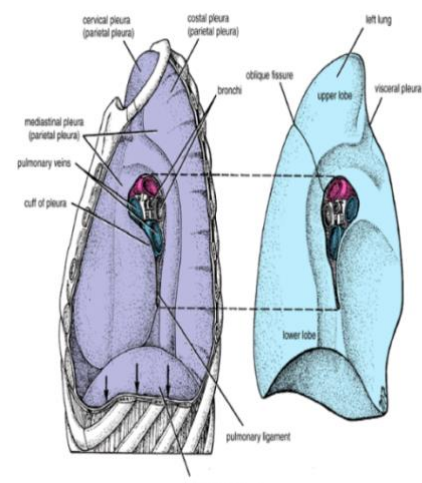


rib, it has a clinical correlation, when you want to put canula in the subclavian vein at the upper surface of the 1<sup>st</sup> rib, if you don't understand the anatomy of pleura clearly, you may pierce the pleura, so every time you put a canula, you should do x-ray imaging to check pleura

- Cervical pleura has 3 membranes: suprapleural membrane, parietal and visceral membranes (these membranes are important for sealing the thoracic cage and to maintain the pressure inside the cage.)

**in the region of vertebrae TV to TVII, the mediastinal pleura reflects, forms the root of the lung -hilum-**

- The root joins the medial surface of the lung at the hilum, and the mediastinal pleura becomes continuous with the visceral pleura.

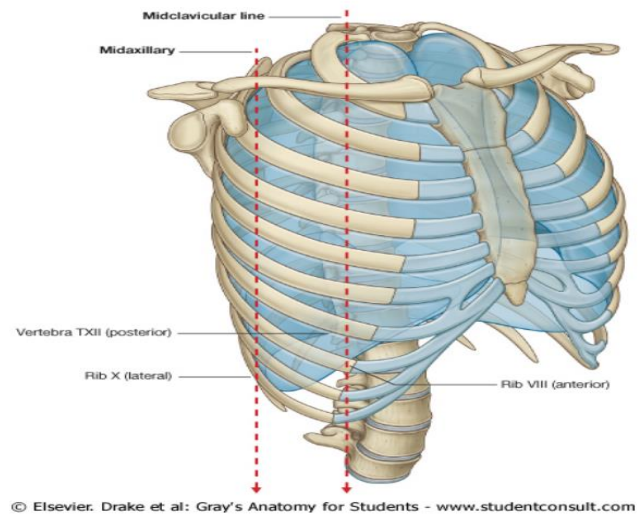


**The peripheral reflections of parietal pleura mark the extent of the pleural cavities**

- Superiorly, the pleural cavity can project as much as 3-4 cm above the first costal cartilage, but does not extend above the neck of rib I.
- This limitation is caused by the inferior slope of rib I to its articulation with the manubrium.
- Anteriorly, the pleural cavities approach each other posterior to the upper part of the sternum.
- posterior to the lower part of the sternum, the parietal pleura does not come as close to the midline on the left side as it does on the right because the heart bulges to the left.
- When the costal pleura meets the diaphragmatic or the mediastinal pleura, it reflects forming recess.

Inferiorly, the costal pleura reflects onto the diaphragm above the costal margin. In the midclavicular line, the pleural cavity extends inferiorly to approximately rib VIII.

- In the midaxillary line, it extends to rib X.
- From this point, the inferior margin courses somewhat horizontally, crossing ribs XI and XII to reach vertebra TXII.
- From the midclavicular line to the vertebral column, the inferior boundary of the pleura can be approximated by a line that runs between the rib VIII, rib X, and vertebra TXII.



- Now let's talk about the anatomic surfaces of the pleura, the apex is located the same as lungs, 1 inch above the medial 3<sup>rd</sup> of the clavicle.
- The anterior border of the pleura extends from the apex to the sternoclavicular joint, then to the angle of Louis, then descends downwards till the level of the 7<sup>th</sup> costal cartilage, the cardiac notch lies at the left between the 4<sup>th</sup> and 6<sup>th</sup> costal cartilage, in cases like cardiac tamponade, the needle should be inserted in this notch.
- The posterior border also follows the posterior border of the lung, but it descends two spaces below
- From an anatomical surface perspective, a notable distinction between the pleura and the lungs lies in their lower borders. Specifically, at the mid-clavicular line, the pleura intersects with the 8<sup>th</sup> costal cartilage, at the mid-axillary line it intersects with the 10<sup>th</sup> rib, and posteriorly it extends to the 12<sup>th</sup> dorsal spine of the thoracic vertebra.

## Suprapleural membrane:

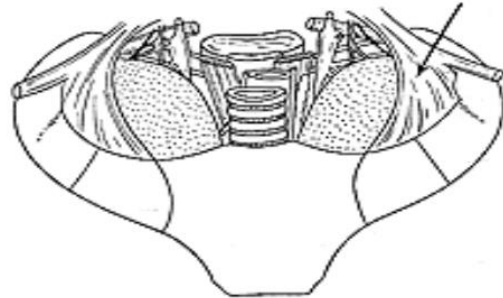
- A fibrous sheath attached to
- Laterally: medial border of 1st rib and costal cartilage
- Medially: blend with fascia

investing the structure that pass from thorax to neck

- Apex: to the tip of the transverse process of the 7th cervical vertebra

• Action: protect the cervical pleura and lung a

- Also resist changes in the intrathoracic pressure during respiratory movements



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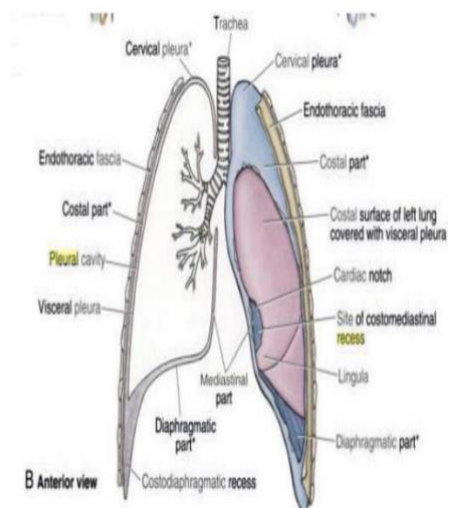
## Visceral pleura

- Visceral pleura is continuous with parietal pleura at the hilum of each lung where structures enter and leave the organ
- The visceral pleura is firmly attached to the surface of the lung, including both opposed surfaces of the fissures that divide the lungs into lobes

## Pleural recesses

- As we said the recess is formed due to meeting between 2 different pleural membranes.
- During inflation of the lungs, the lungs move downward filling the costodiaphragmatic recess

- The lungs do not completely fill the anterior or posterior inferior regions of the pleural cavities
- This results in recesses in which two layers of parietal pleura become opposed.



- Expansion of the lungs into these spaces usually occurs only during forced inspiration
- the recesses also provide potential spaces in which fluids can collect and from which fluids can be aspirated.

Costomediastinal recesses occurs on each side where costal pleura is opposed to mediastinal pleura. The largest is on the left side in the region overlying the heart.

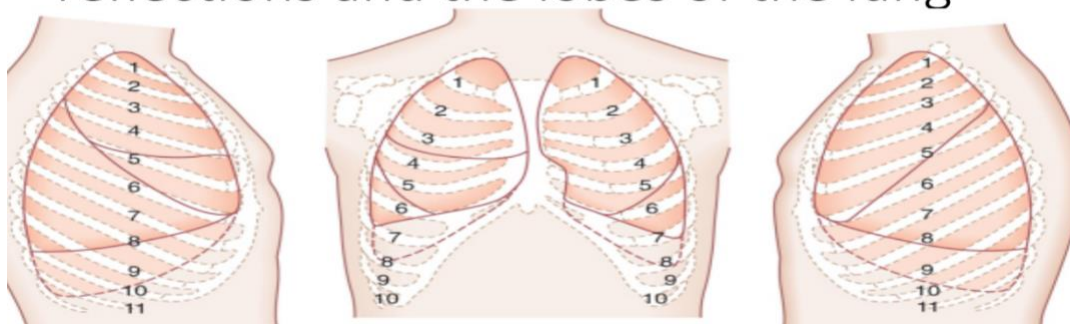
- The largest and clinically most important recesses are the costodiaphragmatic recesses,
  - which occur in each pleural cavity between the costal pleura and diaphragmatic pleura
  - The costodiaphragmatic recesses are the regions between the inferior margin of the lungs and inferior margin of the pleural cavities

They are deepest after forced expiration and shallowest after forced inspiration.

- During quiet respiration, the inferior margin of the lung crosses rib VI in the midclavicular line, rib VIII in the midaxillary line, and then courses somewhat horizontally to reach the vertebral column at vertebral level T10
- the inferior margin of the lung can be approximated by a line running between rib VI, rib VIII, and vertebra T10.
- The inferior margin of the pleural cavity at the same points is rib VIII, rib X, and vertebra T12.

The costodiaphragmatic recess is the region between the two margins.

The relationships of the pleural reflections and the lobes of the lung



at the midclavicular line, the recess is between rib spaces 6 and 8,

- at the midaxillary line between 8 and 10
- at the paravertebral line between 10 and 12

These points are important for suction, suction of air for example at the mid axillary line, put the needle between the two points -9<sup>th</sup> rib-

### Costodiaphragmatic recess

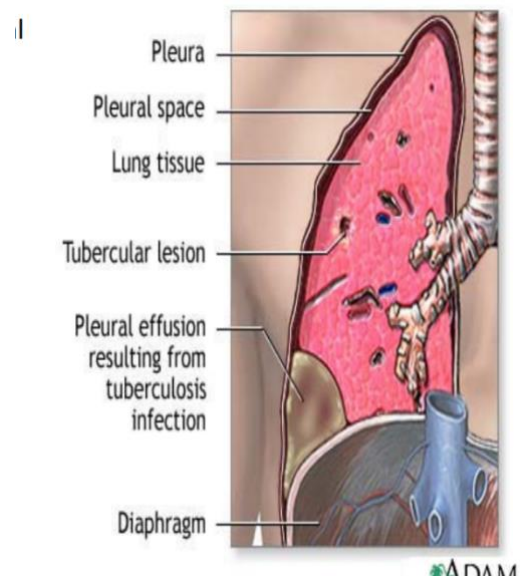
- it is 1 inch in the midclavicular line
- 2 inches in the scapular line post
- 3 inches in the midaxillary line (the preferred space for aspiration because it is the longest and the most common site of fluid and pus accumulation)

### Clinical note

- Aspiration of fluid (pneumothorax) from the pleural cavity by putting a needle through the 7th intercostal space in the midclavicular line or in any other recesses
- The needle is put in the lower border to avoid the injury of VAN vessels of the space.

### Pleural effusion

- Pleural space normally contain 5- 10 ml of clear fluid
- Absorbed normally by visceral pleura by hydrostatic and osmotic pressure
- Pleural effusion: is accumulation of excess fluid within the pleural cavity, pleural fluid increases more than 300 (ml) in costodiaphragmatic recess
- Main causes 1- Infection 2- Injury



### Clinical Manifestations

- Decrease in lung expansion (the fluid impedes the expansion of the lungs)
- Decrease breath sound



- **In Percussion → Dullness**

if you place your fingers in the intercostal spaces and there is fluid present, the resulting sound can be described as dullness.

- Pain
- Cough

### **Nerve supply of the pleura**

**Parietal pleura: - It is sensitive to pain Temp Touch & pressure**

**1- Intercostal nerves à Costal pleura (segmentally)**

- Segmentally means the parietal pleura in the 3<sup>rd</sup> intercostal space innervates by the 3<sup>rd</sup> intercostal nerve.

**2- Phrenic nerve: Mediastinal pleura + diaphragmatic pleura**

- Motor for diaphragm and sensory for pleura (diaphragmatic and mediastinal)

**3- lower 6 intercostal: peripheral pleura**

**Visceral pleura**

- Sensitive to stretch
- Insensitive to pain, temp or touch
- Supplied by pulmonary plexus & autonomic.N.S

### **Arterial Supply of the Pleura**

- The arterial supply of the parietal pleura is from the arteries that supply the thoracic wall Intercostal arteries (ant& post)

**Internal thoracic**

**Musculophrenic arteries.**

- The arterial supply of the visceral pleura is from the - Bronchial arteries, which are branches of the thoracic aorta.

Veins drain into azygos & internal thoracic veins.

### **Lymphatic drainage of pleura parietal pleura Mediastinal pleura by**

- 1- mediastinal nodes
  - 2- Tracheobronchial nodes
  - 3- Intercostal nodes
- Diaphragmatic pleura**

## **1- Parasternal nodes**

## **2- Post.mediastinal nodes**

- Ultimately, on the left side, they conclude in the left thoracic duct, while on the right side, their termination is within the right thoracic duct, ultimately merging with the brachiocephalic vein.
  - Pulmonary pleura(visceral): along bronchial arteries  
→bronchopulmonary nodes