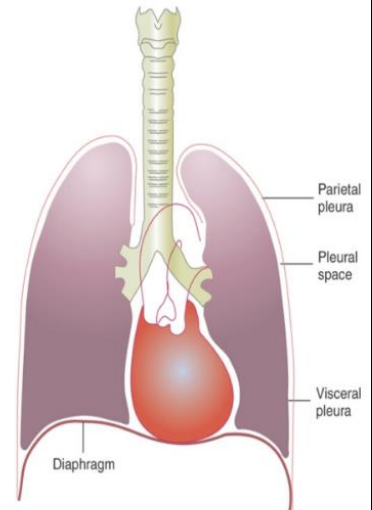


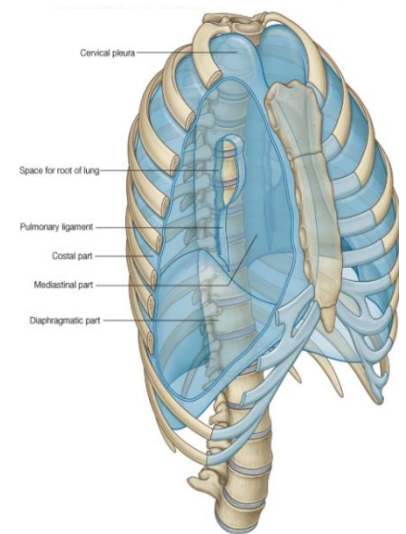
# Pleura

- Pleura is a cavity which has the lungs inside it, it has two membranes, with a potential space between them.
  - Visceral (adheres to the lungs)
  - Parietal (lining the thoracic cage)
- They normally contain only a very thin layer of serous fluid as lubrication. Decreased fluid causes pleuritis.
- **Pneumothorax**: accumulation of air in the pleural cavity.
- **Pleural effusion**: accumulation of fluid in the pleural cavity.
- **Empyema**: accumulation of pus in the pleural cavity.
- **Hemothorax**: accumulation of blood in the pleural cavity.



## Pleura parts:

- **Cervical pleura**: related to the apex.
  - Clinical point: in emergency situations, when inserting a cannula into the subclavian vein (above the first rib), caution is needed to avoid pleural puncture. X-rays may be used to assess lung inflation or collapse during cannula placement.
  - The apex (dome) has three membranes: suprapleural, visceral, and parietal.
- **Diaphragmatic pleura**: related to the base of the lung.
- **Mediastinal pleura**: Covers the mediastinal surface of the lung. This part contributes to the formation of a sleeve-like structure (from blending of parietal and visceral layers) around the hilum, known as the **pulmonary ligament**.
- **Costal pleura**: between the ribs and costal cartilages.
- The hilum exists between T5 and T7.



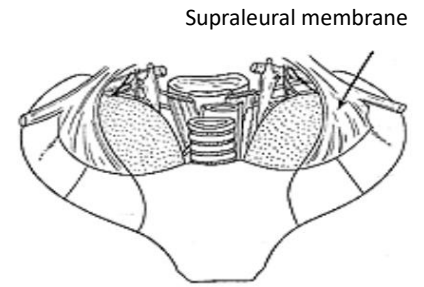
## Surface anatomy of pleura:

- **Apex**: 1 inch above the medial third of the clavicle, or 2-3 cm above the 1<sup>st</sup> rib.
- **Anterior border**: apex → sternoclavicular joint → angle of Louis → 7<sup>th</sup> costal cartilage.
  - The left pleura also has a cardiac notch between 4<sup>th</sup> and 6<sup>th</sup> costal cartilages. In cardiac tamponade, we insert the needle inside the notch to avoid lung damage.
- **Posterior border**: the same as lungs' but descends down by two spaces (T12).
- **Inferior border**:
  - In midclavicular line, it crosses the 8<sup>th</sup> costal cartilage.
  - In midaxillary line, it crosses the 10<sup>th</sup> rib.

- Surface anatomy of the lungs and pleurae assists in conditions like pleural effusion. For instance, when inserting a needle in the midaxillary line, it is done between the lung and pleura. In this very example, it is in the 9<sup>th</sup> intercostal space.

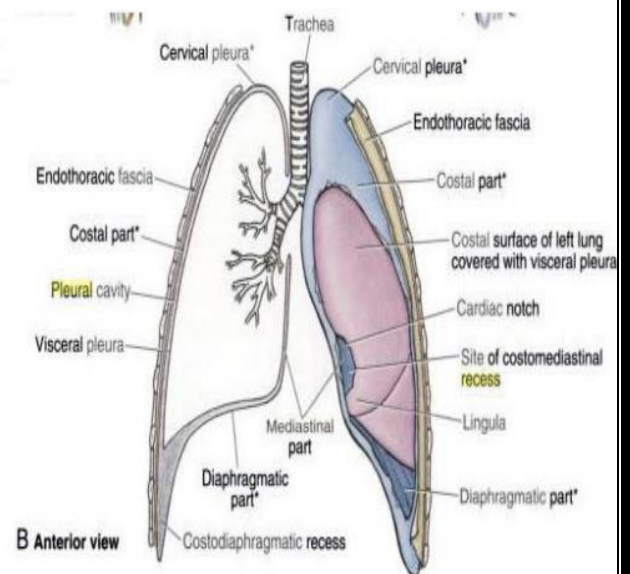
### Suprapleural membrane:

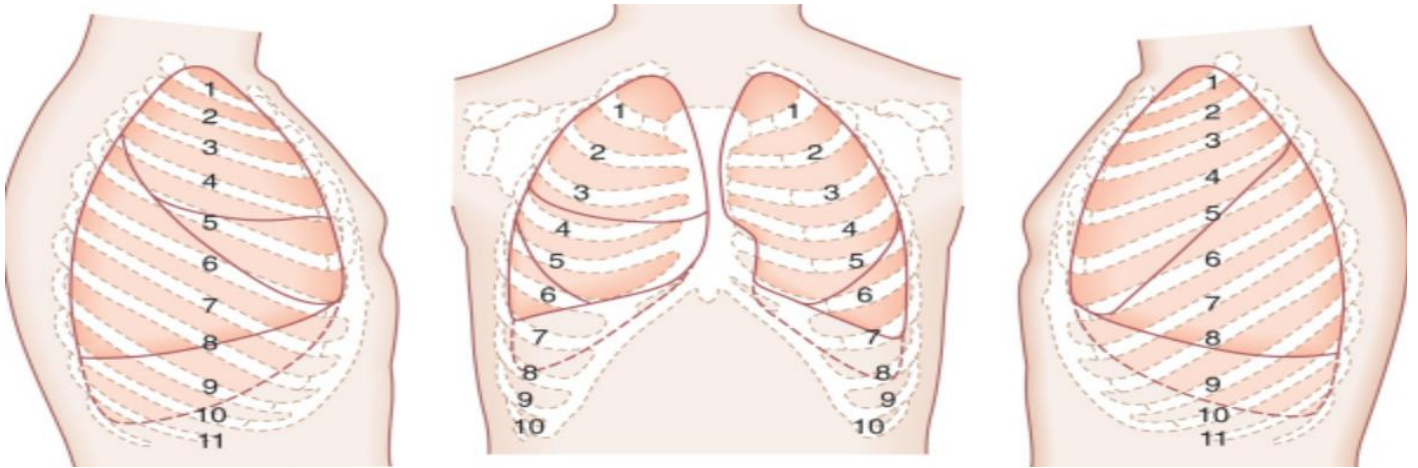
- Suprapleural membrane is a fibrous sheath attached to:
  - **Laterally:** medial border of 1st rib and costal cartilage
  - **Medially:** blend with Sibson's fascia investing the structure that pass from thorax to neck
  - **Apex:** to the tip of the transverse process of the 7<sup>th</sup> cervical vertebra
  - **Action:** protect the cervical pleura and lung, and resists changes in the intrathoracic pressure during respiratory movements
  - So, this membrane works as a ceiling for the pleural cavity.
- The visceral pleura extends into fissures that divide the lungs into lobes.



### Pleural recesses:

- **Costodiaphragmatic recess:** reflection of costal and diaphragmatic pleurae.
  - Inflation of the lungs leads to the expansion of the recess **downward**.
  - The most important recess; it can be filled with fluid.
- **Costomediastinal recess:** reflection of costal and mediastinal pleurae.
- The inferior margin of the lung can be approximated by a line running between the 6<sup>th</sup> rib, the 8<sup>th</sup> rib, and the 10<sup>th</sup> thoracic vertebra.
- The inferior margin of the pleural cavity at the same points is the 8<sup>th</sup> rib, the 10<sup>th</sup> rib, and the 12<sup>th</sup> thoracic vertebra.





- When approaching to insert the needle (underwater seal procedure) to treat pleural effusion, we insert it in:
  - At the midclavicular line, the recess is located between rib spaces 6 and 8.
  - At the midaxillary line, the recess is situated between rib spaces 8 and 10.
  - At the paravertebral line, the recess is found between rib spaces 10 and 12 (inserting here is rare).
- Costodiaphragmatic recess dimensions:
  - 1 inch in the midclavicular line
  - 2 inches in the scapular line posteriorly
  - 3 inches in the midaxillary line, it is often preferred for procedures involving the costodiaphragmatic recess due to its larger dimension, making it more suitable for the drainage of accumulated air.
- The needle is inserted in the lower border of the space, or at the upper border of the rib to avoid injuring the intercostal nerve, veins, and arteries.
- In the normal pleural space, fluid is approximately 5-10 ml. If it reaches 300 ml, it may lead to:
  - Decrease in lung expansion
  - Decreased breath sounds
  - Dullness in percussion (putting fingers on intercostal space, it normally results in drum-like sound)
  - Pain
  - Cough

## Nerve supply of pleura:

- Visceral:
  - SNS and PSNS (pulmonary plexus)
  - Sensitive to stretch
  - Insensitive to pain, temperature and touch
- Parietal:
  - Sensitive to pain, temperature and touch
  - **Intercostal nerves** innervate the costal pleura segmentally (3<sup>rd</sup> intercostal space from 3<sup>rd</sup> intercostal nerve and so on).
  - **Phrenic nerve** innervates the mediastinal pleura and diaphragmatic pleura.
    - Motor to the diaphragm and sensory to the pleura.
  - Lower 6 **intercostal nerves** innervate the costal (peripheral) pleura.

## Arterial supply of pleura:

- Visceral:
  - Bronchial arteries
- Parietal:
  - Intercostal arteries (anterior and posterior)
    - Posterior from descending thoracic aorta
    - Anterior from internal thoracic (mammary) artery, a branch of the subclavian artery
  - Musculophrenic artery

## Venous drainage of pleura:

- Drains into azygous vein and internal thoracic vein then to subclavian vein.

## Lymphatic drainage of pleura:

- Parietal:
  - Mediastinal pleura by:
    - Mediastinal nodes
    - Tracheobronchial nodes
    - Intercostal nodes
  - Diaphragmatic pleura by:
    - Parasternal nodes
    - Post. mediastinal nodes
  - All of them drain to the thoracic duct and right lymphatic duct
- Visceral (pulmonary):
  - Along bronchial arteries → bronchopulmonary nodes