

# RS ANATOMY



## DOCTOR NOTES LECTURE NO. 6

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This is an easy lecture, say بسم الله and let's start

## Pleura:

\*Definition: a cavity that contains the lungs

\* There're 2 types:

1- visceral: it is adherent to the lung tissue

=> Its nerve & blood supply, venous drainage & lymphatics are as same as the lung

=> it enters the fissures of the lungs (like the oblique + transverse in right lung)

2- parietal: it lines the thoracic cavity

=> There is **a space** in between them called: **potential pleural space** (cavity).

It contains 5-10 ml of viscous fluid for lubrication of the lung (during inflation & deflation)

\*\* keep in mind this key difference between the 2 layers of pleura (**Innervation**):

- Visceral: sensitive for stretch only (only supplied by ANS; i.e. sympathetic & parasympathetic)
- Parietal: sensitive for pain, touch & temperature (sensory nerve supply)

=> this info has clinical application we will mention them now

## Functions of the pleura:

- Protection
- Production of fluids for lubrication (between the 2 layers) During inspiration & expiration

## Clinical application about pleura:

- In infection or inflammation of the pleura => **the fluid**  $\downarrow$  => **friction** between the 2 layers  $\uparrow$
- In pleuritis => sever pain with breathing => **doesn't** resolve on its own (needs treatment; e.g. if bacteria=give antibiotic)  
=> keep in mind that this pain is **segmental** => if the infection is in the 5<sup>th</sup> intercostal space (which is supplied by the 5<sup>th</sup> intercostal nerve), so the pain will be in this area

!! Recall what we said above about the innervation of pleural 2 layers, based on it, **pain** is sensed if **Parietal pleura** is involved (it has sensory innervation). While in **visceral pleura there's NO pain** (ANS innervation)

## Clinical applications for pleural cavity:

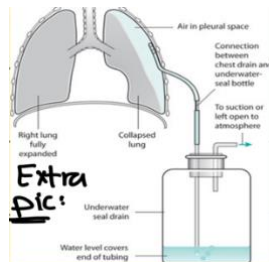
### - Pneumothorax

==> **Air** gets inside the pleural cavity and accumulates

==> usually due to stab wound on the chest leading to lung collapse & shrinkage

==> treatment: underwater seal;

1. fill a bottle with water
2. put a cannula between the bottle & the pleural cavity
3. suction of the air from the cavity



### - Pleural effusion

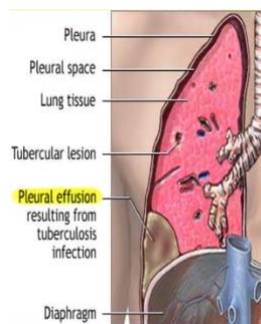
==> **fluid** accumulates

==> after infection, trauma, tumor or spontaneously

==> usually in the lower part of the pleural cavity

==> ↓ lung expansion, ↓ breath sound in stethoscope, dullness in percussion + pain & cough (during breathing)

==> treatment: Aspiration of the fluid



### - Empyema

==> pus accumulation in the pleural cavity after a chronic infection

==> treatment: Aspiration of the pus

### - Hemothorax

==> blood accumulates in the pleural cavity (sac)

==> treatment: Aspiration of the blood

**\*\* Notice that all cases above result in (cause) difficulty in breathing because the sac is filled with other substance than the lubrication fluid impeding lung inflation & deflation**

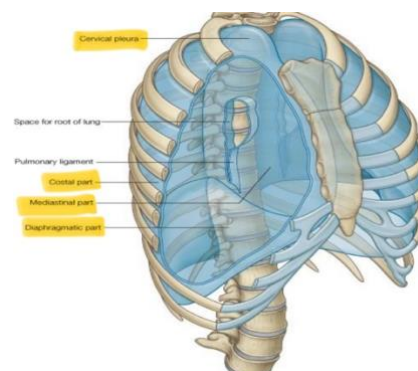
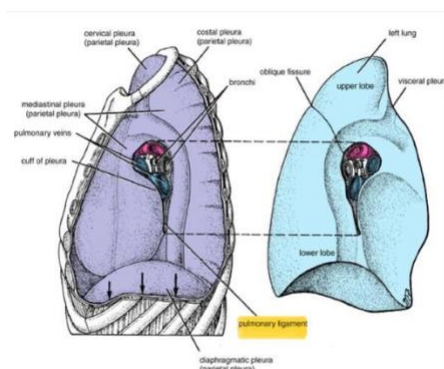
**\*\*Now we will dive deep in parietal pleura with its different types**

## Parietal pleura

It has different types of based on the site

- **Cervical pleura** (surrounding the apex of the lung, which is located 1 inch above the medial 1/3 of clavicle or 3-4cm above the 1<sup>st</sup> costal cartilage)  
**Clinically; here we put a cannula in the subclavian vein in the upper surface of the 1<sup>st</sup> rib => in this area we have a groove containing the artery & vein (vein is anterior to the artery) => if you missed this surface anatomy, you will cut the pleura => lung collapse. So, a lung X-ray should be performed after putting the cannula to make sure that the lung is intact & able to inflate normally**  
  
=> cervical pleura has 3 pleural layers at the apex (dome), **it is important for the sealing of the thoracic cage + induce a pressure inside the thoracic cage:**
  - visceral pleura
  - parietal pleura (cervical)
  - suprapleural membrane
- **Costal pleura** (related to costal cartilages, between the ribs/costal cartilages, Has **the largest surface** starting from 1<sup>st</sup> costal cartilage until 8+9+10<sup>th</sup> costal cartilages)
- **Diaphragmatic pleura** (covering the base/diaphragmatic surface inferiorly)
- **Mediastinal pleura** (covering the medial surface of the lung)

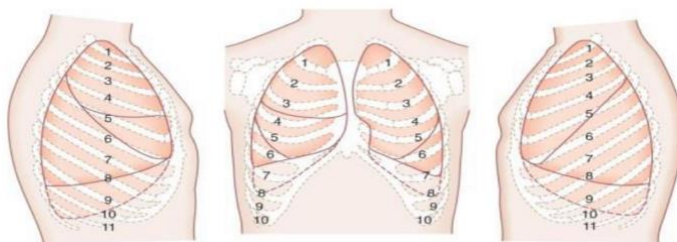
**\*\* keep in mind, around the hilum (which is located between T5 & T7 vertebrae), fusion between the parietal & visceral layers Forming a sleeve around the hilum => to form the pulmonary ligament inferiorly**



## Surface anatomy of pleura

- Superior: 3-4cm above first costal cartilage/1-3 inches above medial 1/3 of clavicle. Same as the surface anatomy of the lung apex
- Anterior border is different between right and left:
  - Right: instead of ending at the 6<sup>th</sup> costal cartilage (like the lung) in the pleura, it ends at the 7<sup>th</sup> cartilage
  - Left: we have the **cardiac notch** between the 4<sup>th</sup> and 6<sup>th</sup> costal cartilage (these are its borders which are related to lung, but generally it can descend below 7<sup>th</sup> costal cartilage)
    - => the same in pleura and lung => 1 cm deviated to the left. **This 1cm is the radius (diameter is 2 cm)**
    - => **importance of the notch: aspiration of fluids in cardiac tamponade (between 4<sup>th</sup> & 6<sup>th</sup> costal cartilage- no pleura, no lung so we avoid the risk of injuring any of both)**
- Posterior border: same as the lung but the pleura descends 2 more intercostal space
- Base/ lower border:

	Lung	Pleura (2 spaces below)
<b>Midclavicular</b>	To 6 <sup>th</sup> costal cartilage	To 8 <sup>th</sup> costal cartilage
<b>Midaxillary</b>	To 8 <sup>th</sup> costal cartilage	To 10 <sup>th</sup> costal cartilage
<b>Scapular line/ paravertebral line (posteriorly) **</b>	To 10 <sup>th</sup> thoracic vertebra	To 12 <sup>th</sup> thoracic vertebra



**\*\* its importance is in inflation of the lung => filling to the 2 spaces**

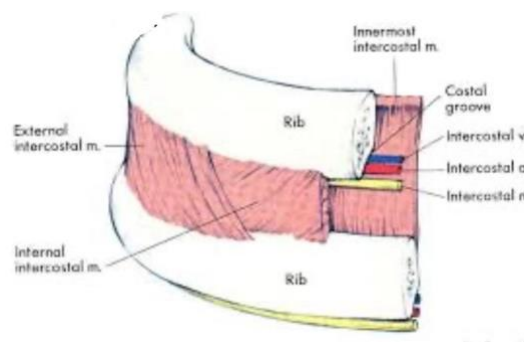
**\*\* so if fluid/ air accumulated in these 2 spaces => no available space for the lung inflation  
=> low ability to breath normally**

=> solution: Aspiration OR underwater seal, but where??

In the costodiaphragmatic recess (in 3 points):

- 1- Midclavicular; 7<sup>th</sup> intercostal space (1 inch) between the lung (6<sup>th</sup> C.C) & pleura (8<sup>th</sup> C.C) TO avoid injury of the lung
- 2- Midaxillary; Best place (because it's wide - 3 inches), 9<sup>th</sup> intercostal space (3 inches) between 8<sup>th</sup> & 10<sup>th</sup> C.C
- 3- Scapular line dorsally; Rare, 11<sup>th</sup> intercostal space (2 inches), where exactly?
  - Insert the needle on **lower border of the intercostal space**
  - OR insert the needle on the **upper border of the rib**, why? Due to the subcostal groove location at the lower border of the rib, it contains BVs & nerves So to avoid injuring them we insert the needle in one of these 2 options

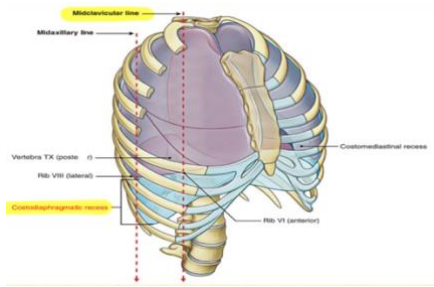
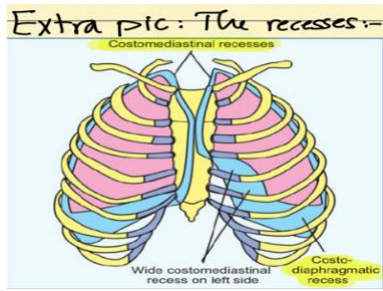
Extra image:



**Recesses/ reflections/ angles:**

The angle between 2 types of parietal pleura (giving a space for inflation of the lung) => once the lung inflates, it will expand downward only

- Custo-diaphragmatic (the most important in inspiration)
  - \*\* Filled with lung tissue during inspiration
  - \*\* In mid-axillary (3 inches in size, widest space) => so it is the preferred site of aspiration (in the 9<sup>th</sup> intercostal space)
  - !! Costo-diaphragmatic is the most common site for accumulation of fluid, blood or pus**
- Costo-mediastinal
- Mediastino-diaphragmatic



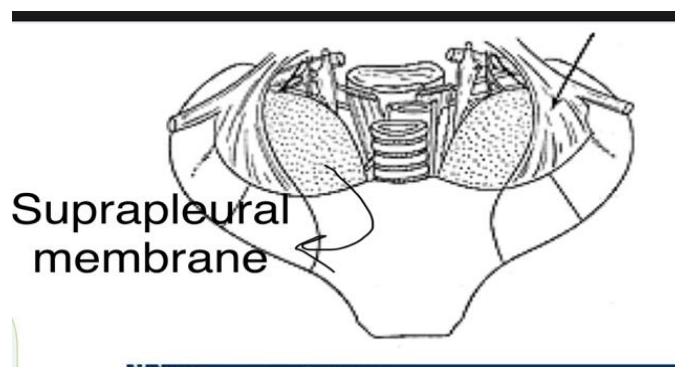
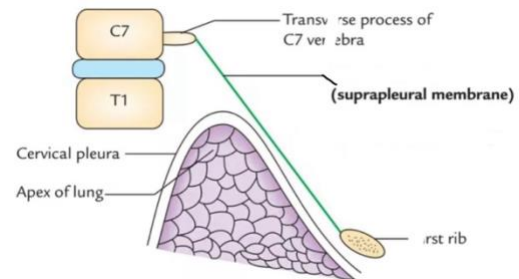
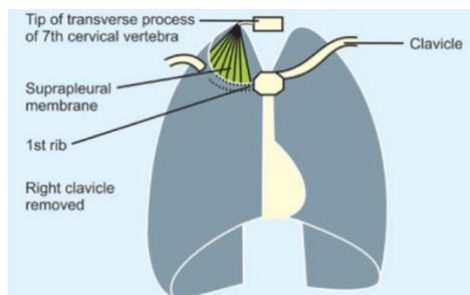
## Suprapleural membrane

It's a fibrous sheath, Above the apex of the lung (above the two layer of pleura)

Attachments:

- Laterally, inner medial border of 1<sup>st</sup> C.C
  - Medially, blends with sibson's fascia (investing, deep fascia at the root of the neck)
  - Apex, tip of the transverse process of the 7<sup>th</sup> cervical vertebra (C7)
- \*\* All these attachments (specially with Sibson's fascia) complete sealing of the thoracic cavity (to maintain intrathoracic pressure)

Extra images:



## Importance of the supra pleural membrane:

- Protection of Apex
- Resists changes in thoracic pressure during respiration

**\*\* Normal person breathes 18 to 24 times per minute**

=> Respiratory centers send impulses to phrenic nerve to diaphragm

So, the diaphragm contracts and descends downward,  $\uparrow$  the intrabdominal pressure and  $\downarrow$  the intrathoracic pressure (below  $P_{atm}$ ), rush of the air through the nose without feeling that => filling the lungs ==> **Inspiration (active process)**

Relaxation of diaphragm => moving upward =>  $\uparrow$  intrathoracic pressure => pressing on the lung ==> **expiration (passive process)**

**\*\* Same as when we perform tracheostomy=> air rushes in and enters the trachea**

Stab at the root of the neck leads to:

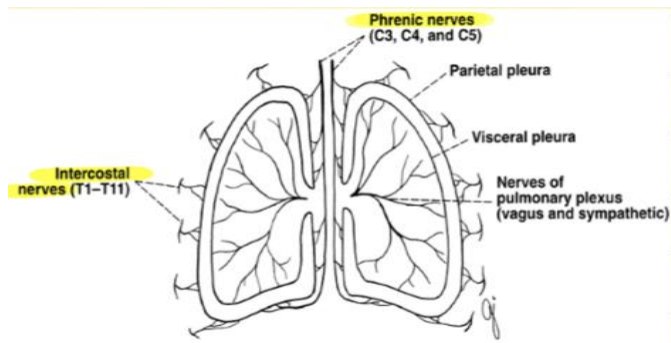
- A- Cut of the pleura, reaching the lung, pneumothorax, lung collapse
- B- Hitting the suprapleural membrane only (without reaching parietal pleura)
  - The breathing is normal (Lung is intact). But **intrathoracic pressure would be affected** so the suprapleural membrane bulges upward with breathing (during changes in the intrathoracic pressure).

## Nerve supply of parietal pleura.

**\*\*Sensitive to pain, touch and temperature.**

- Coastal Pleura, **Intercostal nerves**, Segmentally, e.g. 3rd intercostal space => 3rd intercostal nerve.
- Mediastinal => **phrenic nerve from C3-C5** (Motor to diaphragm & sensory to pleura)
- Diaphragmatic => **phrenic nerve from C3-C5** (Motor to diaphragm & sensory to pleura)
- Cervical pleura => **intercostal nerves**





## Nerve supply of visceral pleura

- \*\* It is ANS (sympathetic & parasympathetic) & pulmonary plexus
- \*\* sensitive for stretch Insensitive to pain, touch & temperature

## Blood supply of pleura

- Visceral => same as the lung, bronchial arteries
- Parietal
  - \*\* Supplied by 1. intercostal arteries (ant. & post.)
  - 2. internal thoracic/ mammary artery
  - 3. Musculophrenic artery (to 6<sup>th</sup>, 7<sup>th</sup> & 8<sup>th</sup> intercostal spaces)

Parietal surfaces:

=> Anterior surface => anterior intercostal arteries (branch of the internal thoracic artery)

=> posterior surface => posterior intercostal arteries (branches of the descending thoracic aorta)

\*\* Subclavian artery => internal thoracic (mammary) artery =>

1. Ant. Intercostal artery
2. musculophrenic artery (end branch)

\*\* Descending thoracic aorta => post. Intercostal arteries from 3<sup>rd</sup> to subcostal (12<sup>th</sup>)

## Venous drainage

- Right side => azygous vein
- **Anteriorly** side => internal mammary (thoracic) vein + subclavian vein

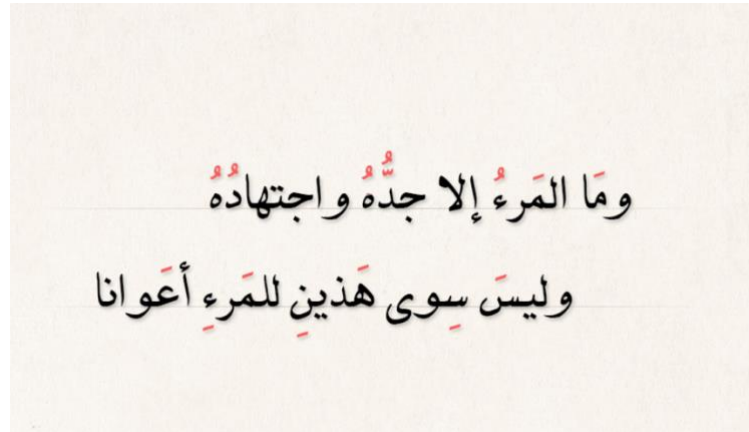
## Lymphatic drainage

- Visceral => with the lung => along the brachial arteries (to bronchopulmonary lymph nodes)
- **Parietal** => mediastinal nodes (on hilum), tracheobronchial, intercostal, **parasternal**, **post. Mediastinal**
  - Grey** => mediastinal pleura
  - Green** => diaphragmatic pleura

### \*\* All lymph nodes above go to:

- 1- Thoracic duct (on left side)
- 2- Right lymphatic (on right side)

==> **Both** drain at the beginning of **brachiocephalic veins** (right & left)



VERSIONS	SLIDE #	BEFORE CORRECTION	AFTER CORRECTION
V1→V2	Page 8 Page 10	Long, trivia (spelling mistake) Left , paratracheal	<b>Lung, trachea</b> <b>Anterior, parasternal</b>
V2→V3			



امسح الرمز و شاركنا بأفكارك لتحسين أدائنا !!