بسم الله الرحمن الرحيم

ANATOMY

MID | Lecture 6

Anatomy of The Pleura

Written by: Mas Nafoukh
Raya Al Weshah

Reviewed by: Leen Mamoon

﴿وَلَقَدْ نَعْلَمُ أَنَّكَ يَضِيقُ صَدْرُكَ بِمَا يَقُولُونَ ﴿٩٧﴾ فَسَبِّحْ بِحَمْدِ رَبِّكَ وَكُن مِّنَ السَّاجِدِينَ﴾

سبحان الله وبحمده، سبحان الله العظيم

وَلِلَّهِ الْأَسْمَاءُ الْحُسْنَى فَادْعُوهُ بِهَا

المعنى: الذي له القوة والقدرة التامة، لا يغلبه غالب ولا يرد قضاءه راد، يَنفُذ أمرُه، ويَمضي قضاؤه في خلقه، ناصرٌ عباده المؤمنين، شديدٌ عقابه لمن كفر بآياته وجحد توحيده.

الورود: ورد في القرآن (٩) مرات.

الشاهد: ﴿وَهُوَ ٱلْقَوِيُّ ٱلْعَزِيزُ﴾ [الشورى:١٩].

٥٧

اضغط هنا لشرحٍ أكثر تفصيلًا

Anatomy of The Pleura

"اللهم إني أسألك فهم النبيين، وحفظ المرسلين، وإلهام الملائكة المقربين، اللهم اجعلنا من الذين يستمعون القول فيتبعون أحسنه، ويسّر علينا حفظ ما نتعلمه وفهمه والعمل به"

1- The Pleura

The pleural cavity encloses **both lungs** and is lined by **the pleura**.

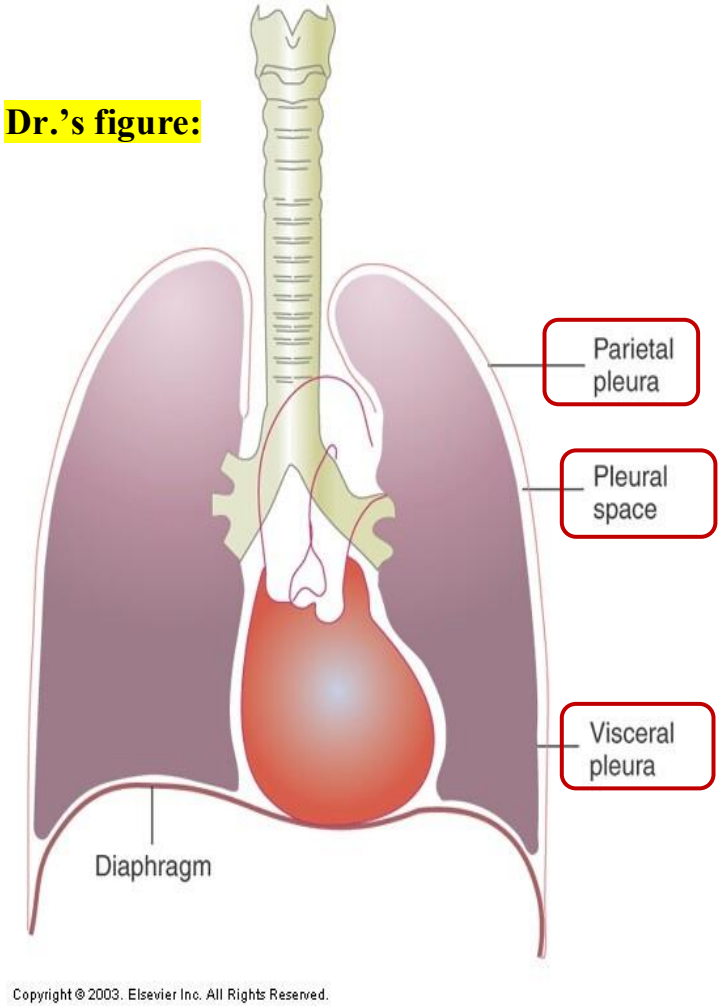
The Pleura consists of **two** membranes:

- **Visceral:** which **adheres** to the **lung** tissue.
- **Parietal**: **lining** the **thoracic** cage.

In between the two layers, there's a potential space called **the pleural space** which contains serous fluid for lubrication during respiration.

The term potential suggests that the two pleural membranes are directly adherent with no intervening space; however, in reality, a narrow pleural space exists between them, which can accumulate fluid and separate the two layers.

Dr.'s figure:



Copyright © 2003. Elsevier Inc. All Rights Reserved.

- **Functions of the Pleura :**

1- **Protection**

2- Contains a fluid that allows for **lubrication** during expiration and inspiration.

1- The Pleura

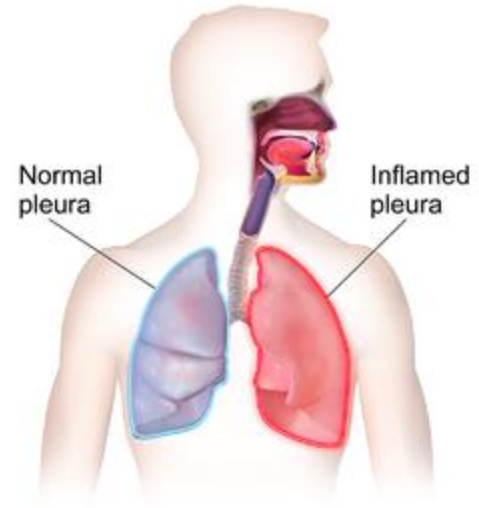
➢ Related to CLINICAL:

Pleuritis: A reduction in pleural fluid leads to increased friction between the pleural layers, resulting in Pleuritis, which is inflammation of the pleura.

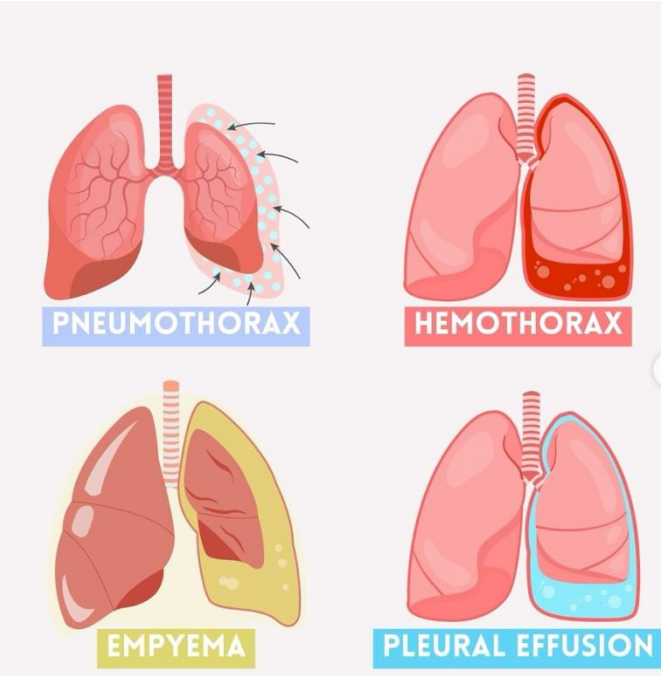
It's extremely painful, where every breath is accompanied by severe pain between the ribs = **painful breathing**.

Normally, the potential space contains a small amount of fluid (**5–10 mL**), which is not perceived and serves only a lubricating function. However, in **pathological conditions**, this space may become involved, leading to difficulty in breathing and other associated signs and symptoms, such conditions includes:

- **Pneumothorax**: accumulation of **air** in the pleural sac.
- **Pleural effusion**: accumulation of **fluid** in the pleural sac.
- **Empyema**: accumulation of **pus** in the pleural sac after chronic infection.
- **Haemothorax**: accumulation of **blood** in the pleural sac.



Pleurisy



2- Parts of the pleura

Parts of the pleura depending on its location (the wall which they are associated with):

- **Cervical pleura** (pleural cupola): dome-shaped pleura covering the **apex** of the lung (which is located in the cervical region, 1 inch above the medial 1/3 of clavicle, 3-4 cm above the 1st rib) *clinically important* *slide 8*

- It consists of **three** membranes which ceils the apex:

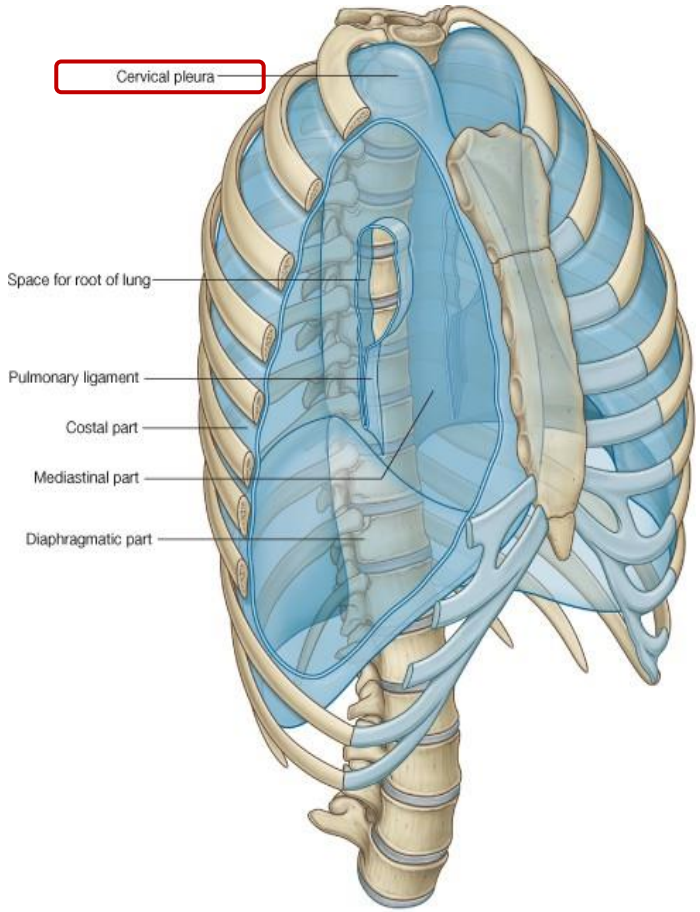
1- **Suprapleural membrane**: adherent with **Sibson's fascia,** which is investing deep fascia of the neck that descends downwards to blend with the suprapleural membrane.

2- **Parietal pleura**

3- **Visceral pleura**

Function: the ceiling of the thoracic cage, forming pressure on the thoracic cage that is crucial for breathing (intra-thoracic pressure, which increases and decreases for inspiration and expiration to occur) *(Recall physio - lec 2)*

Dr.'s figure:

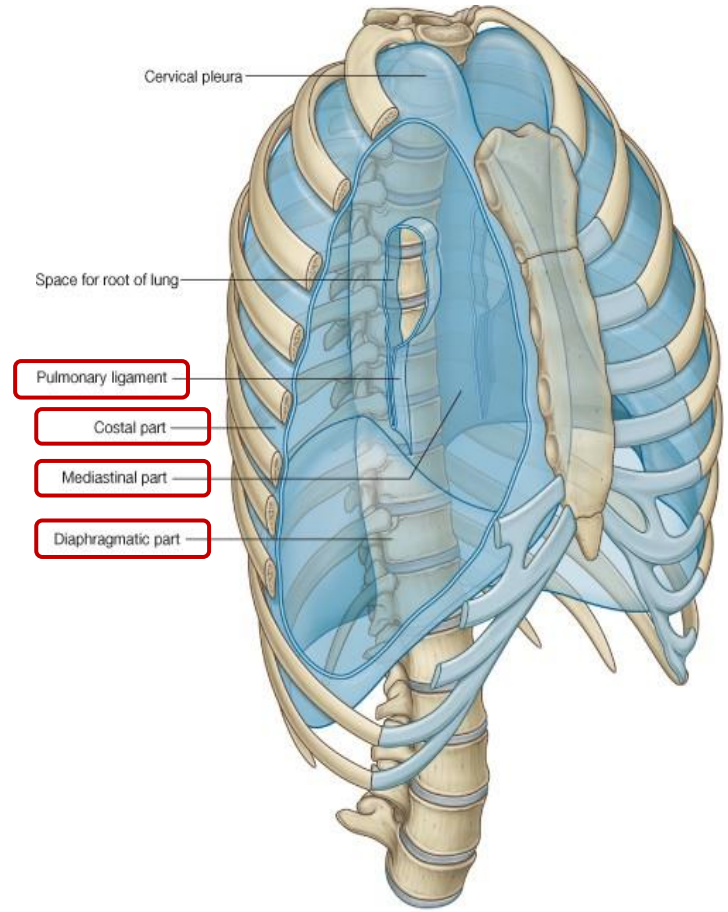


© Elsevier. Drake et al: Gray's Anatomy for Students - www.studentconsult.com

2- Parts of the pleura

- **Diaphragmatic pleura**: covering the base of the lung, located above the **diaphragm**
- **Mediastinal pleura** : covering the **mediastinal** surface of the lung, where the parietal and visceral layers adhere to each other forming a sleeve around the hilum giving rise for the **pulmonary ligament** (lower part)
- **Costal pleura**: between the **ribs** and the **costal** cartilages

Dr.'s figure:



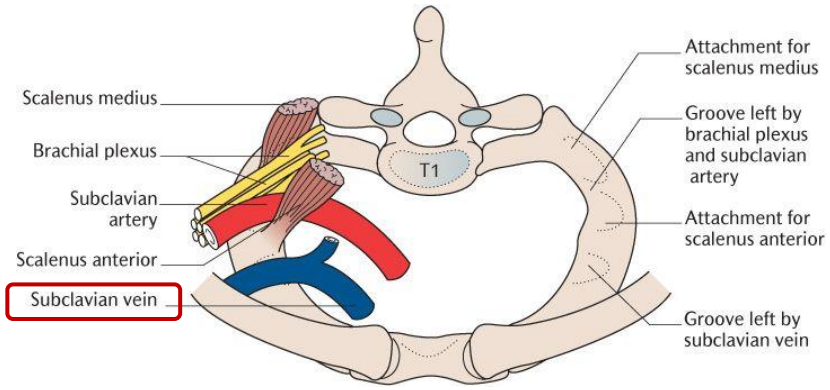
© Elsevier. Drake et al: Gray's Anatomy for Students - www.studentconsult.com

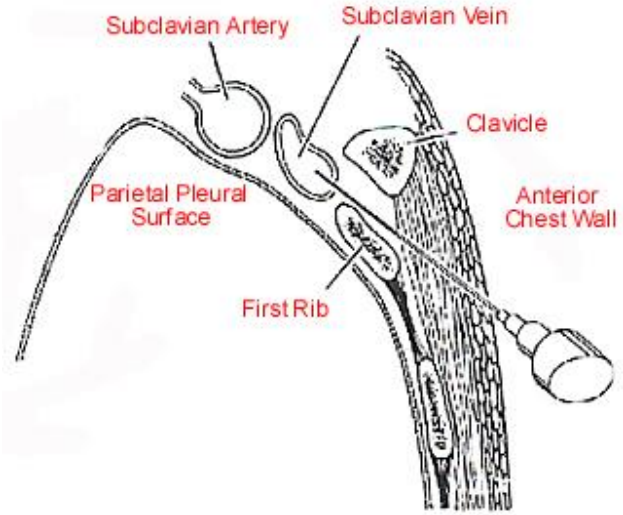
2- Parts of the pleura

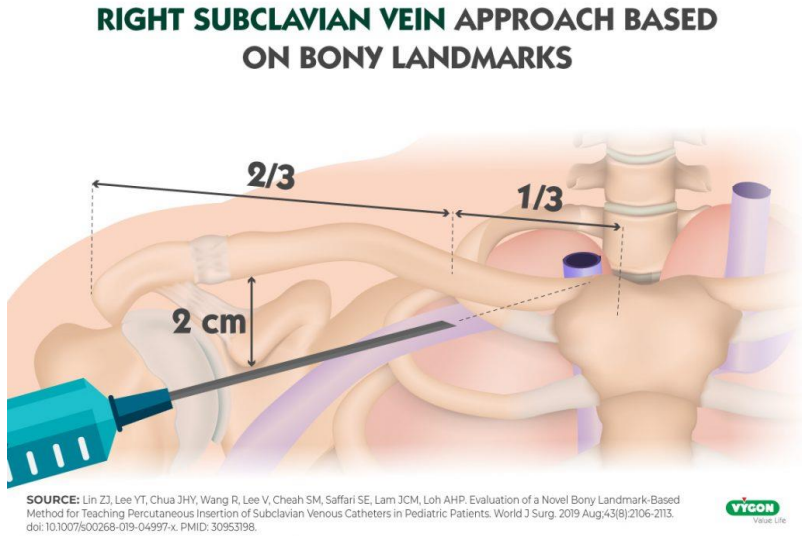
➢ Related to CLINICAL:

Clinical importance of cervical pleura: A cannula is inserted in the **subclavian vein**, which forms a groove on the upper surface of the first rib, you should be aware of its exact location as any mistake can rupture the pleura resulting in the collapse of the lung.

Routinely, after inserting the cannula a Chest X-ray is done to make sure that the lung is still inflated and not collapsed, if its collapsed an intervention should be done.

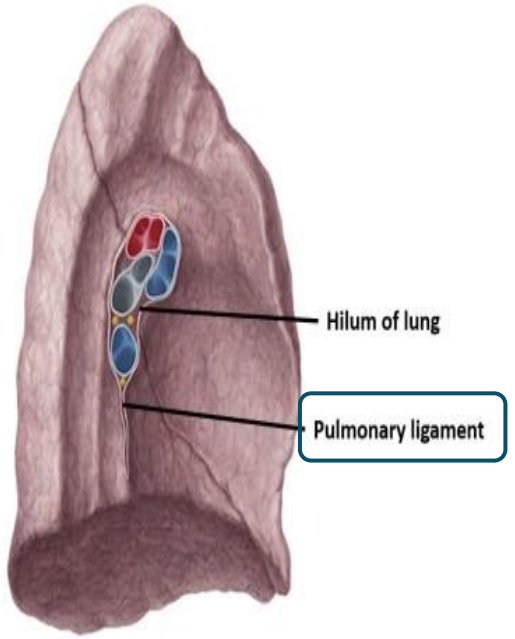


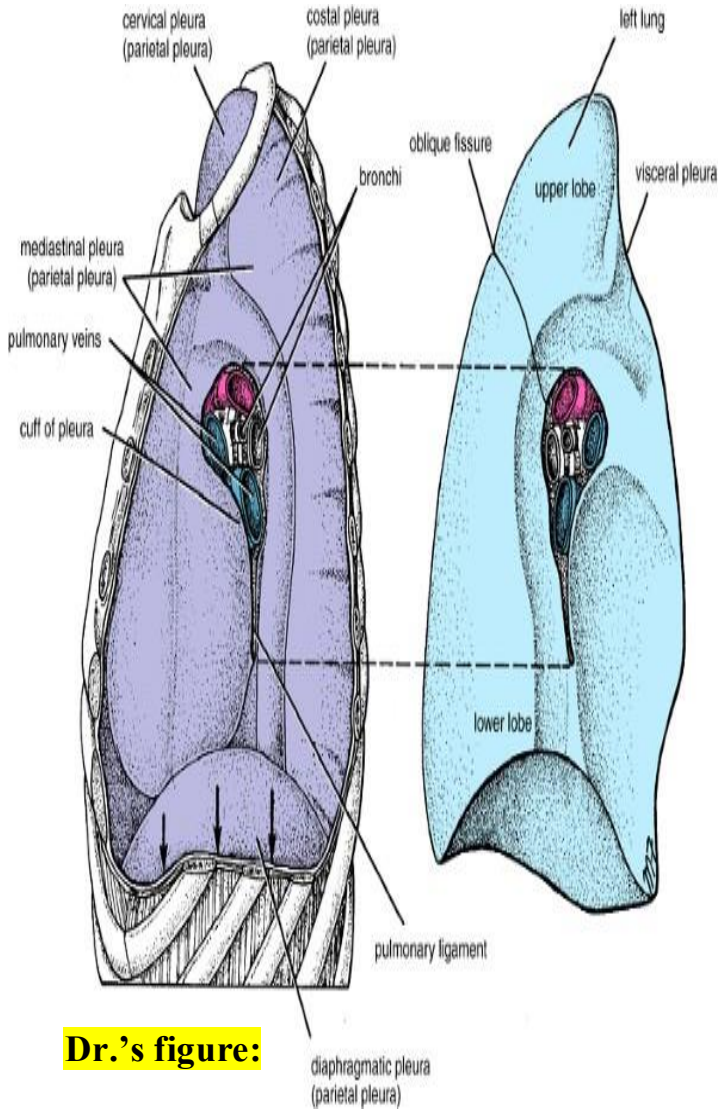




3- Hilum of lung

- **Anatomical Location:** between **TV** and **TVII** (5th and 7th thoracic vertebra)
- At the hilum, parietal and visceral layers blend together surrounding the hilum ending as **pulmonary ligament** (root of the pleura)





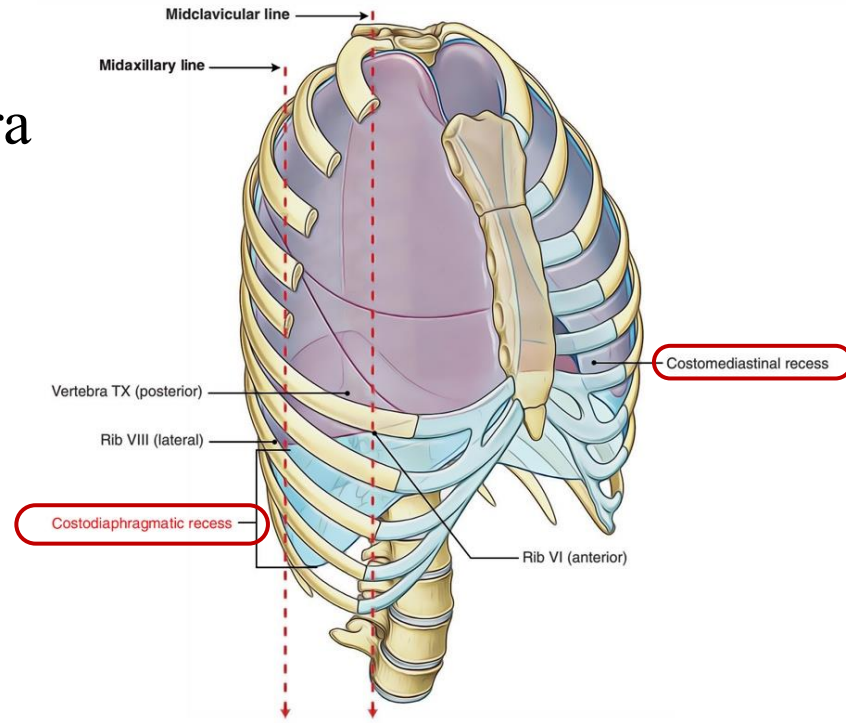
Dr.'s figure:

4- Reflections of the pleura

Mark the extent of the pleural cavities.

- **Costodiaphragmatic recess**: the angle where the **costal** pleura meets the **diaphragmatic** pleura.
- **Costomediastinal recess**: the angle where the **costal** pleura meets the **mediastinal** pleura.

✓**Recess** : reflection between 2 types of pleura



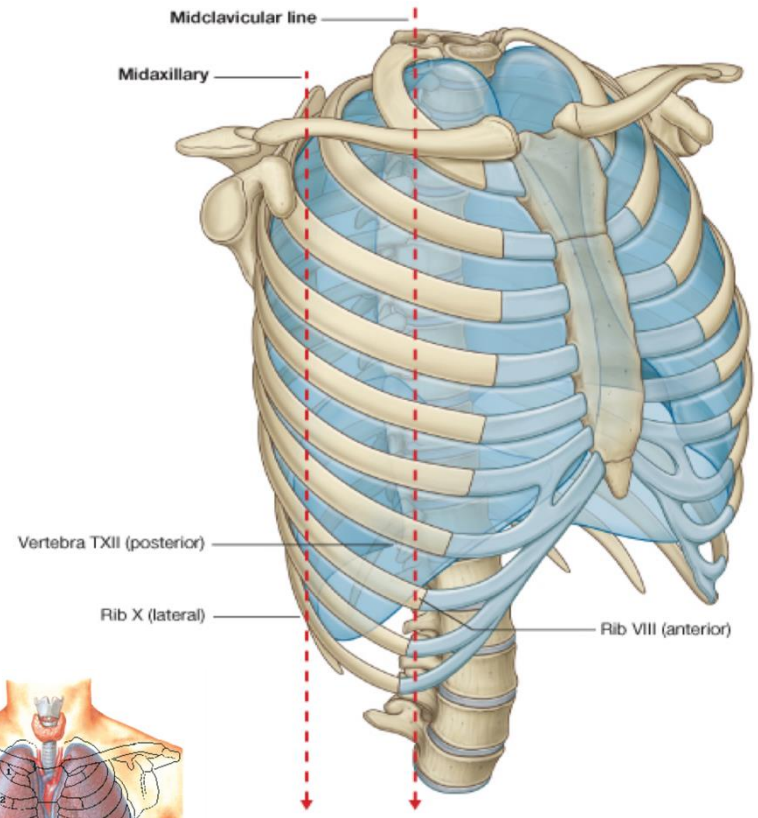
5- Surface Anatomy of the Pleura

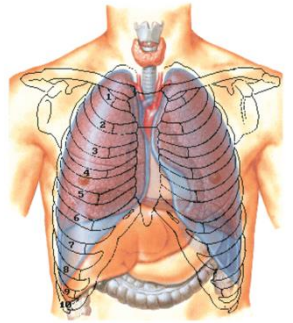
- **Apex**: 1 inch above the medial 1/3 of clavicle (same as the lung)
- **Anterior border**: from the **apex** to **sternoclavicular joint** downward to the level of the **7th** costal cartilage (instead of 6th in the lung).

  On the **left side**, between the 4th and 6th costal cartilage there's a **cardiac notch** (also present in the lung).

- **Posterior border**: the same as the lung.
- **Lower border**: main difference between the lung and pleura.

(Details in the upcoming slide)





Dr.'s figure:

5- Surface anatomy of the pleura

➢ **Lower border in lung and pleura :**

	Lung	**Pleura** (descends 2 spaces below surface anatomy of the lung)	**Needle placement in pleural effusion**
Mid clavicular	6th costal cartilage	**8th** costal cartilage	7th intercostal space
Mid axillary	8th rib	**10th** rib	**9th intercostal space**
Posteriorly	10th dorsal spine of thoracic vertebra	**12th** dorsal spine of thoracic vertebra	11th intercostal space

➢ **Clinical importance** of lung and pleura surface anatomy:

In the case of **pleural effusion**, the needle is inserted for ex. in the **mid axillary line**
Between the lung and pleura = between **8th** and **10th** = at level of the **9th intercostal space**

➢ **Clinical importance** of cardiac notch:

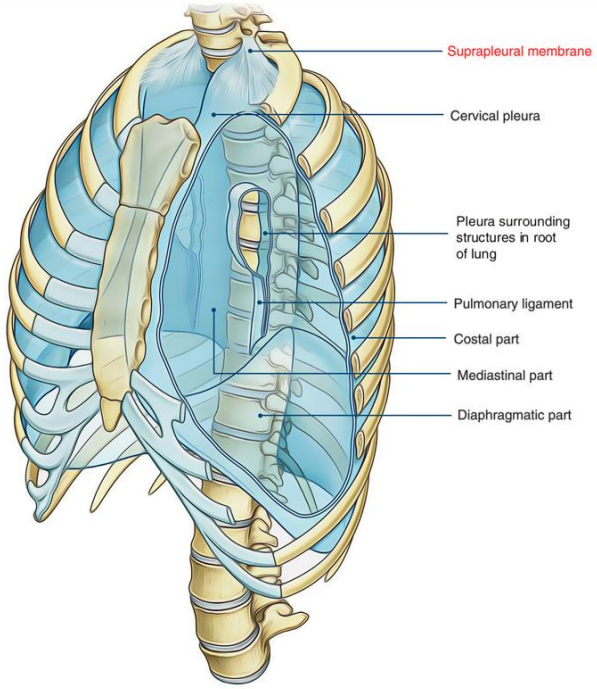
In the case of **cardiac tamponade** (fluid in the pericardium around the heart), the needle is inserted in the cardiac notch to aspire fluid avoiding the injury of the lung.

6- Suprapleural Membrane

- The **suprapleural membrane** is a **fibrous sheath** that lies just above the **apex** of the lungs, It functions to protect the cervical pleura and the lungs, while also resisting changes in intra-thoracic pressure during respiration.

- Anatomic boundaries include:

- **Laterally: medial** border of the **1st rib and costal cartilage.**
- **Medially:** blends with **Sibson's fascia.**
- **Apex:** attaches to the tip of the **transverse process** of the **7th cervical vertebra**, where seals the apex of the thoracic cage, this preserves the intra-thoracic pressure in the thoracic cavity.

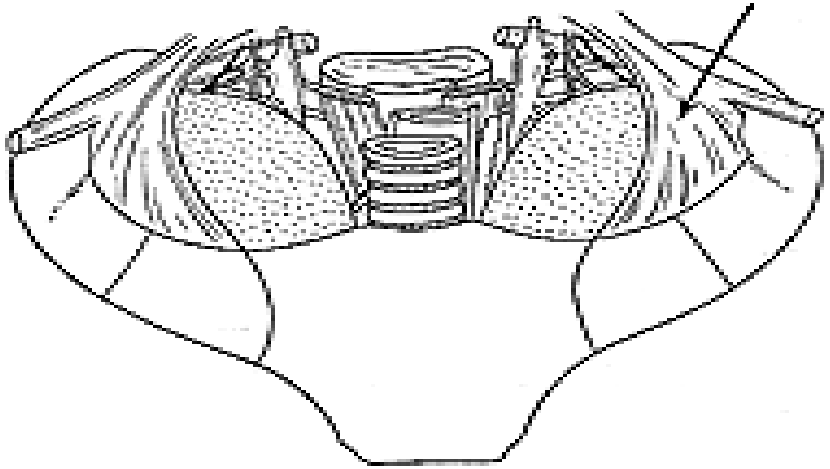


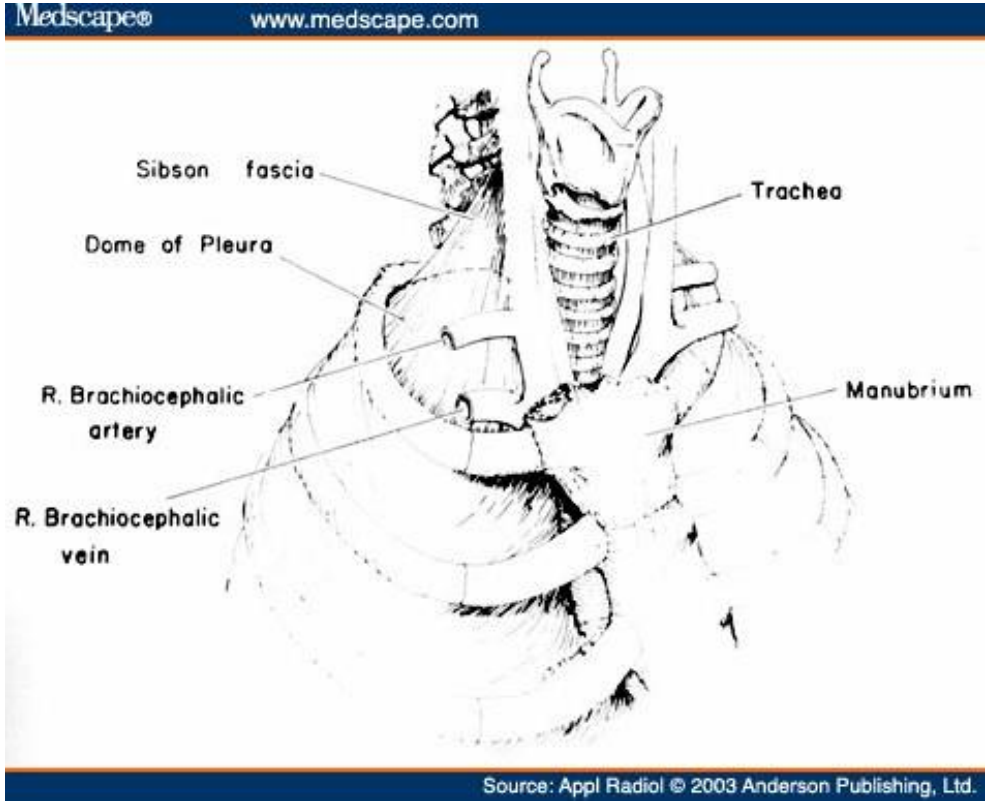
- **Related to PHYSIOLOGY:**

- During respiration, the **diaphragm contracts** and **moves downward**, **increasing the volume of the thoracic cavity** and **allowing air to flow into the lungs** as the **intra-thoracic pressure** becomes *lower* than **atmospheric pressure**
- **Inspiration** is an **active** process, whereas **expiration** is **passive**: the **diaphragm relaxes** and **moves upward**, **decreasing thoracic volume** and **increasing intra-thoracic pressure** *above* **atmospheric pressure,** resulting in **airflow out of the lungs.**

Dr.’s figure:

6- Suprapleural Membrane

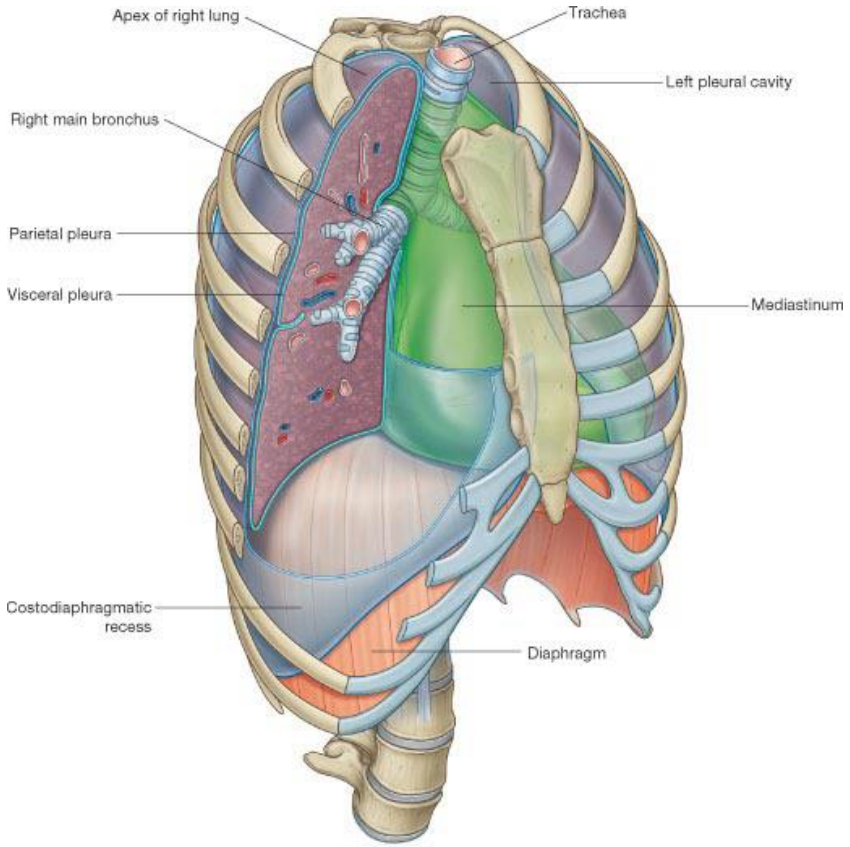




وَمَن يَتَوَكَّلْ عَلَى اللَّهِ فَهُوَ حَسْبُهُ

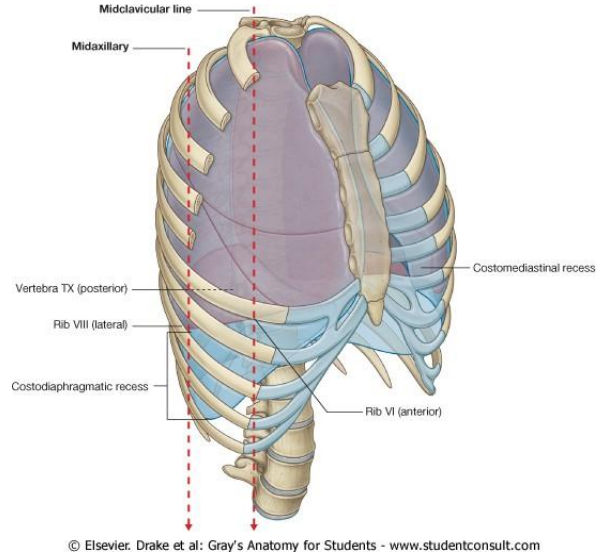
7- Visceral Pleura

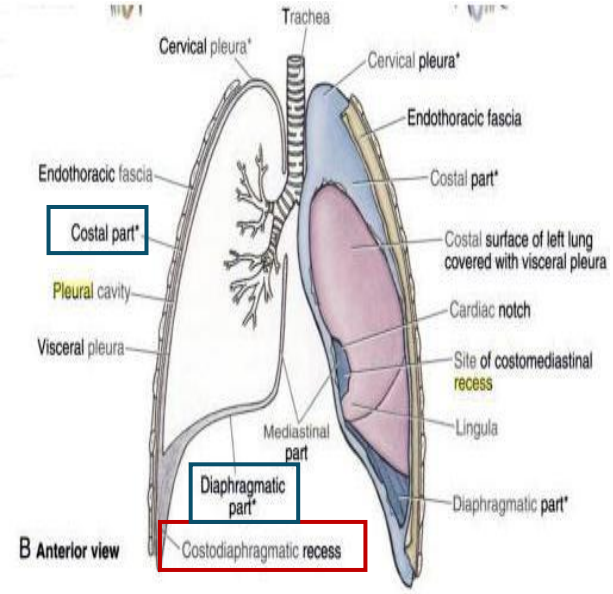
- Visceral pleura tightly adheres to the **lung tissue surface** and extends into the **lung fissures,** including the *oblique fissures* on both lungs and *transverse fissure* on the right lung.
- The visceral pleura is continuous with the parietal pleura at the hilum of each lung where structures, such as pulmonary arteries, veins, and bronchi, enter and leave the lungs.
- At the hilum, the visceral pleura reflects onto the mediastinum and fuses with the parietal pleura, forming the pulmonary root pleura.



8- Pleural Recess

- Recesses are hollow spaces or cavities within an organ that are clinically significant because they serve as sited for fluid accumulation, such as blood or pus.
- The most important recess is the **costodiaphragmatic recess**, located between the **costal** and **diaphragmatic pleura**, forming a sharp angle
- During deep inspiration, the lungs expand *downward* into this recess rather than anteriorly or posteriorly.
- The **costodiaphragmatic recess** is the most accessible and largest recess in the lung. It extends about **1** inch in the **midclavicular line**, **2** inches in the **posterior scapular line**, and **3** inches in the **midaxillary line.**





Dr.'s figure:

8- Pleural Recess

➢ Related to CLINICAL:

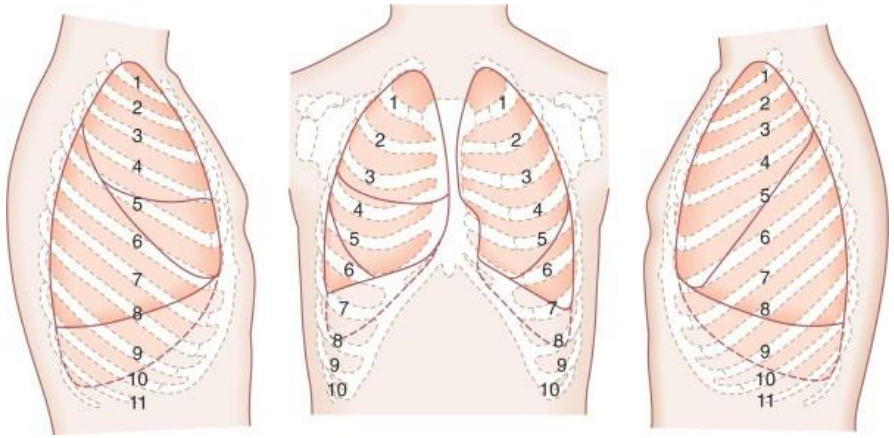
➢ In cases of pneumothorax or pleural effusion, drainage is performed using an underwater seal system (bottle with water and tube).

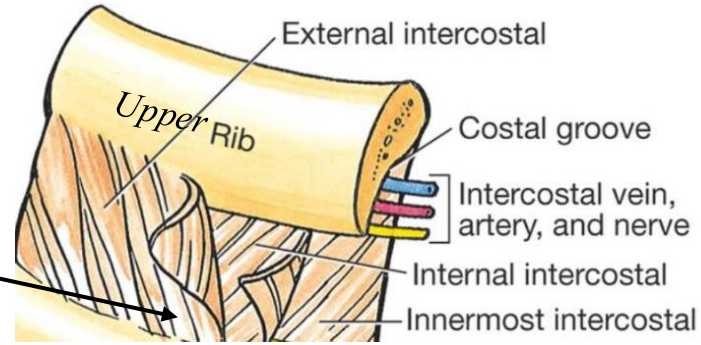
➢ Common sites for insertion:

- Mid-clavicular line: between the 6th and 8th ribs
- Mid-axillary line: between the 8th and 10th ribs (most common)
- Posteriorly (paravertebral line): between the 10th and 12th ribs (rarely used)
- The mid-axillary line is the preferred site for chest drainage as it contains the largest pleural recess, where air and fluid accumulate most.
- The needle is inserted in the **lower border of the intercostal space.**
- This is because the intercostal nerve, artery, and vein run in the intercostal groove, which is located on the upper rib.

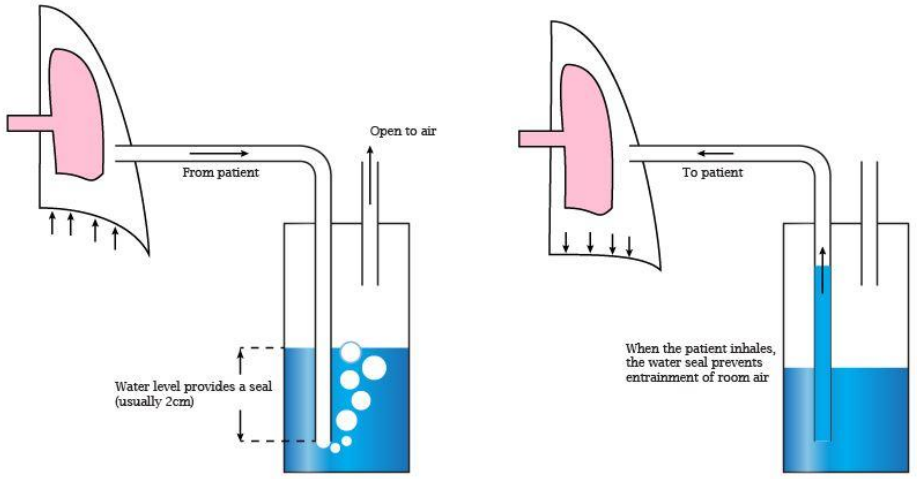
Upper border of the intercostal space (groove of upper rib) = danger

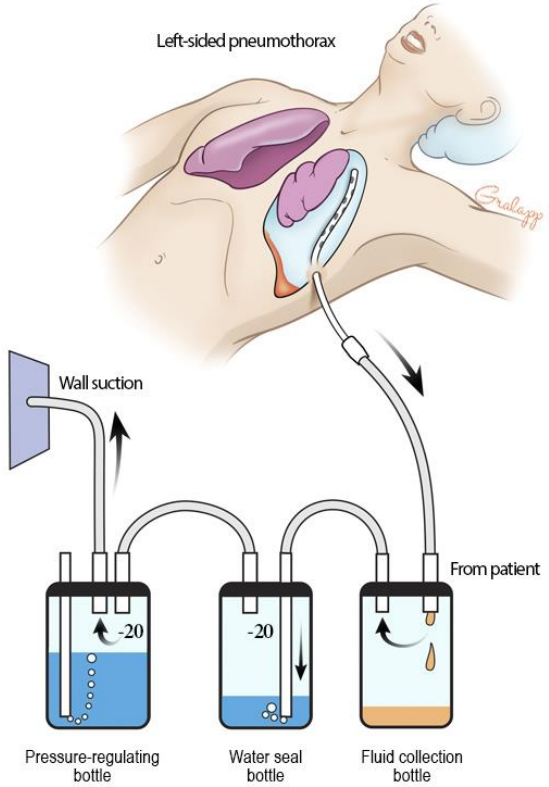
Dr.'s figure:





Underwater Seal System



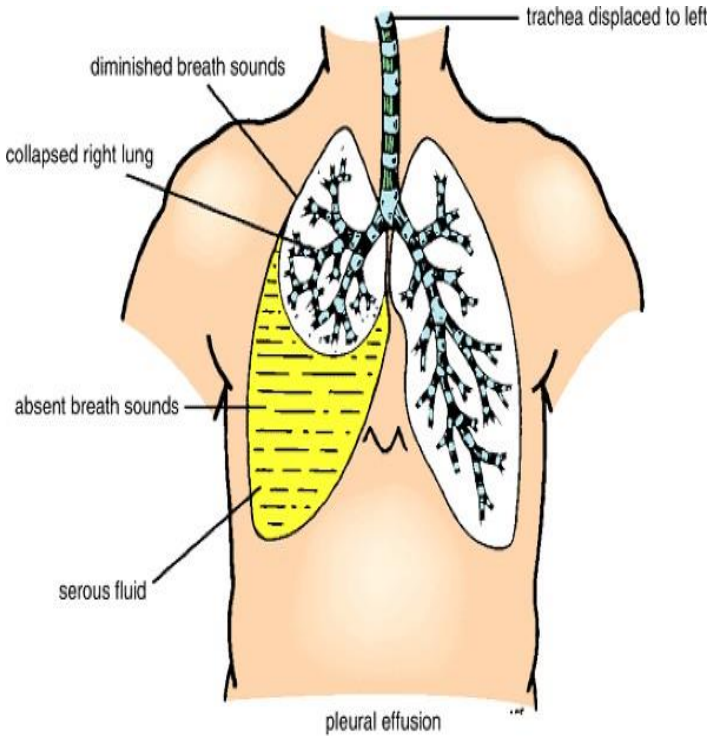


The underwater seal system is a chest tube inserted into the midaxillary line (most commonly), connected to a water-filled chamber. It drains the fluid or the air from the pleural cavity.

9- Pleural Effusion

- The pleural space normally contains a small amount of fluid, around **5-10 mL,** when the fluid volume increases to **300 mL**, it can cause clinical symptoms.
- **Symptoms of pleural effusion include:**
  - ✓Decreased or quieter breath sounds on auscultation
  - ✓Dullness to percussion *next slide*
  - ✓Reduced lung expansion
  - ✓Chest pain and cough
- **Causes:** commonly infection or injury.

Dr.'s figure:

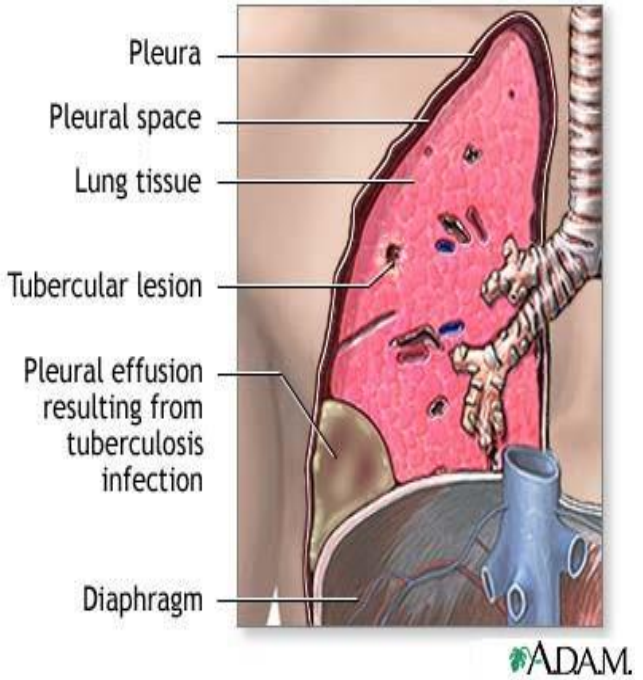


✓ *the yellow area represents fluid accumulation in the costodiaphragmatic recess*

9- Pleural Effusion

- **Percussion:** placing fingers on patient's intercostal space and tapping. When **air** is present, the percussion will sound like a drum, when **fluid** is present, it gives a dull sound instead.
- **Pleural fluid aspiration** is done at the *lower* border of the 7th intercostal space (midclavicular line) or upper border of the lower rib.
- This avoids injury to the intercostal neurovascular bundle (VAN: vein, artery, nerve).

Dr.'s figure:



10- Pleural Nerve Supply

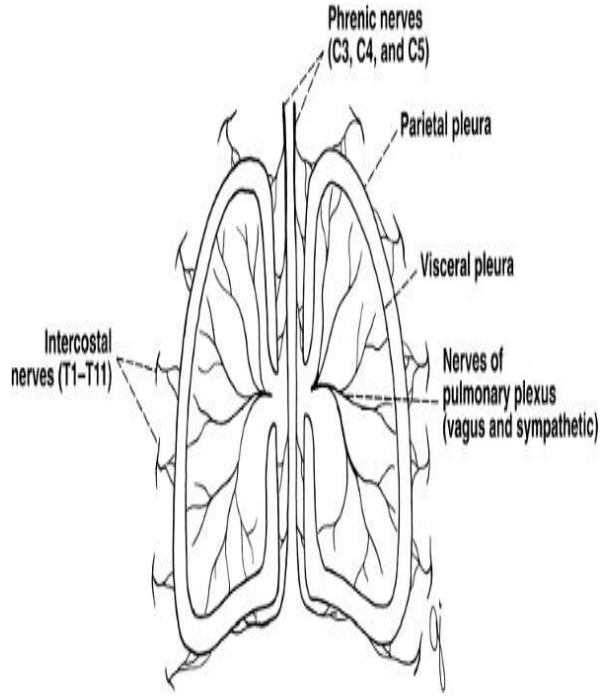
➢ Visceral pleura

- Autonomic (sympathetic & parasympathetic) via pulmonary plexus; same as the lungs
- Sensitive to stretch only, insensitive to pain, temp, or touch.

➢ Parietal pleura

- Sensitive to pain, touch, and temperature
  - **Costal pleura** → supplied segmentally by intercostal nerves (3rd intercostal space → 3rd intercostal nerve)
  - **Mediastinal & diaphragmatic pleura** → supplied by phrenic nerve
- Phrenic nerve is motor to diaphragm and sensory to mediastinal & diaphragmatic pleura
  - **Peripheral costal pleura** → contribution from lower six intercostal nerves

Dr.'s figure:



11- Arterial supply of the Pleura

- **Visceral pleura** is arterially supplied by the **bronchial artery** (same as the lung tissue).
- **Parietal pleura** receives blood from the arteries supplying the thoracic wall: **anterior intercostal arteries** (from the internal thoracic artery), **posterior intercostal arteries** (from the descending thoracic aorta), as well as branches of **the internal thoracic (mammary) and musculophrenic arteries.**

- **Venous drainage of the pleura is through the right side of the azygous vein and the internal thoracic and subclavian veins anteriorly.**

12- Pleural Lymphatic Drainage

- **Parietal pleura:**
- **Mediastinal pleura** drains to mediastinal lymph nodes, tracheobronchial nods and intercostal nodes.

- **Diaphragmatic pleura** drains to parastrenal and posterior mediastinal nodes.

- **Ultimately, lymph from both drains into the right and left side of the thoracic duct, which empties at the beginning of the brachiocephalic vein.**

- **Pulmonary (visceral) pleura** drains along the bronchial arteries to the bronchopulmonary nodes.

ANATOMY
QUIZ
LECTURE 6

رسالة من الفريق العلمي

﴿ وَهُوَ مَعَكُمْ أَيْنَ مَا كُنْتُمْ ﴾

"And He is with you wherever you are."

رفيق، لطيف، قريب، يسمعك، يَراك، يراقبك، يحرسك، يتولاك
يدبّر أمرك ، يُحبك كُلّما إقتربت إليه.. معك دون أن نشعر
تطلبه تجدهُ تجاهك، لا يخفى عليه شيءٌ من أمرك
يُعطيك ما تطلب دوُن أن تطلب..
إذا كان اللّه معك فمن عليك ؟

A companion, gentle, near — He hears you, He sees you, watches over you, protects you, and cares for you.
He arranges your affairs, and He loves you the closer you come to Him.
He is with you even when you do not feel it.
When you call upon Him, you find Him before you; nothing about you is hidden from Him. He gives you even before you ask.
So if Allah is with you… who can be against you?

سورة الحديد , اية 4
Surah Al-Hadid , verse 4

For any feedback, scan the code or click on

Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1	Slide #13	**6th cervical vertebra**	**7th cervical vertebra**
V1 → V2			