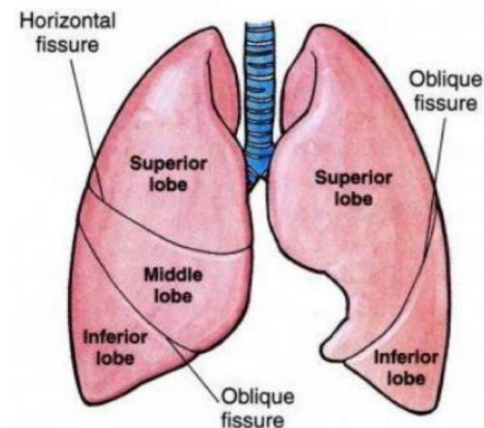


# Lungs

- There are two lungs, one right and one left. Each lung has an apex and a base. The base sits on the diaphragm, Covered by pleura. We know that the diaphragm has two copulas, and these copulas are shaped like a dome. So, the right lung has its base on the right copula and the left lung has its base on the left copula.
  - ✓ The lung is spongy organ.
  - ✓ The colour of the lungs is reddish in normal people, while in smokers it becomes black, with black dots found due to the presence of nicotine.
  - ✓ Lungs are filled with **elastic tissue**. This elastic tissue surrounds the alveoli.

- **Differences between the right and left lungs:**

1. Dimensions: the right lung is shorter and wider than the left. This is because the liver pushes the diaphragm upwards on the right side, causing the right lung to be shorter and wider. The left lung is longer and narrower than the right lung.
2. Lobes: the right lung has three lobes; upper, middle and lower lobes. The left lung has two lobes, upper and lower lobes.
3. Fissures: the left lung has an oblique fissure only. The right lung has oblique and horizontal fissures.
4. The left lung contains a structure called lingula, as well as a cardiac notch.

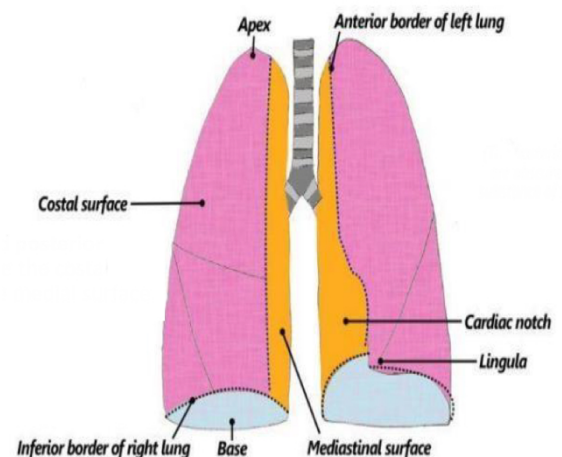


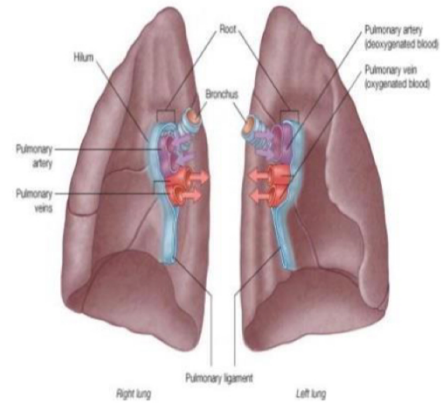
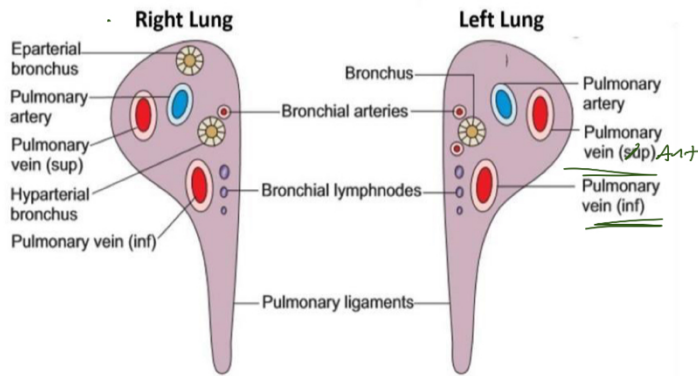
- **Notes:**

- ✓ The apexes of the lungs extend above the clavicles and the first ribs. They are usually 1 inch above the medial third of the clavicle. This could be dangerous when encountering a stab wound at the root of the neck. The apex may be damaged, and air will go inside the lung, which leads to lung **deflation and collapse**.
- ✓ The lungs weigh about 600-800gm, 90% air & 10% tissue.

- **Borders and surfaces**

- ✓ Lungs have anterior (sharp), posterior (rounded) and inferior borders.
- ✓ The anterior border isn't the same in both lungs. The left lung has the cardiac notch on its anterior border between the 4th and 6th costal cartilages.
- ✓ The inferior border is sharp, with the diaphragm located beneath it.
- ✓ Lungs have a costal surface (lateral) and a mediastinal surface (medial).
- ✓ The costal surface lies immediately adjacent to the ribs and intercostal spaces.
- ✓ the mediastinum is the space between the lungs which contains the hilum.
- ✓ above the right copula is the right pleura and lung. The same for left.





- **The hilum:** located between **T5-T7**, as a sleeve between parietal and visceral pleura.
  - ✓ **Components of the right hilum:**
    1. One pulmonary artery
    2. two pulmonary veins
    3. the right bronchus.
  - ✓ The Bronchus that passes through the right hilum separate into **ap- arterial** bronchus (above the pulmonary artery) which gives branch to upper lobe and **hyp-arterial** bronchus (below the pulmonary artery) which gives branches to middle and lower lobe.
  - ✓ **Components of the left hilum:**
    1. One pulmonary artery
    2. two pulmonary veins (anterior and inferior)
    3. the left bronchus.
  - ✓ The difference in the left lung is that the bronchus does not separate into ap-arterial and hyp-arterial bronchi. It **remains as one bronchus** in the hilum, after entering the lungs it gives two branches, one for the upper lobe and the other for the lower lobe.
  - ✓ The most superior structure is the pulmonary artery.
  - ✓ It has 1 bronchus.
- Within each root, and located in the hilum are:
  1. Pulmonary artery. (deoxygenated blood)
  2. Two pulmonary veins (oxygenated blood).
  3. Lymph nodes and vessels.
  4. Nerves (sympathetic and parasympathetic “vagus”).
  5. Bronchial vessels.
  6. Bronchus.
  7. Ligaments.
  - ✓ The **bronchial vessels** (main blood supply of the lung and pleura) are the vessels that supply the lung tissue with oxygen.

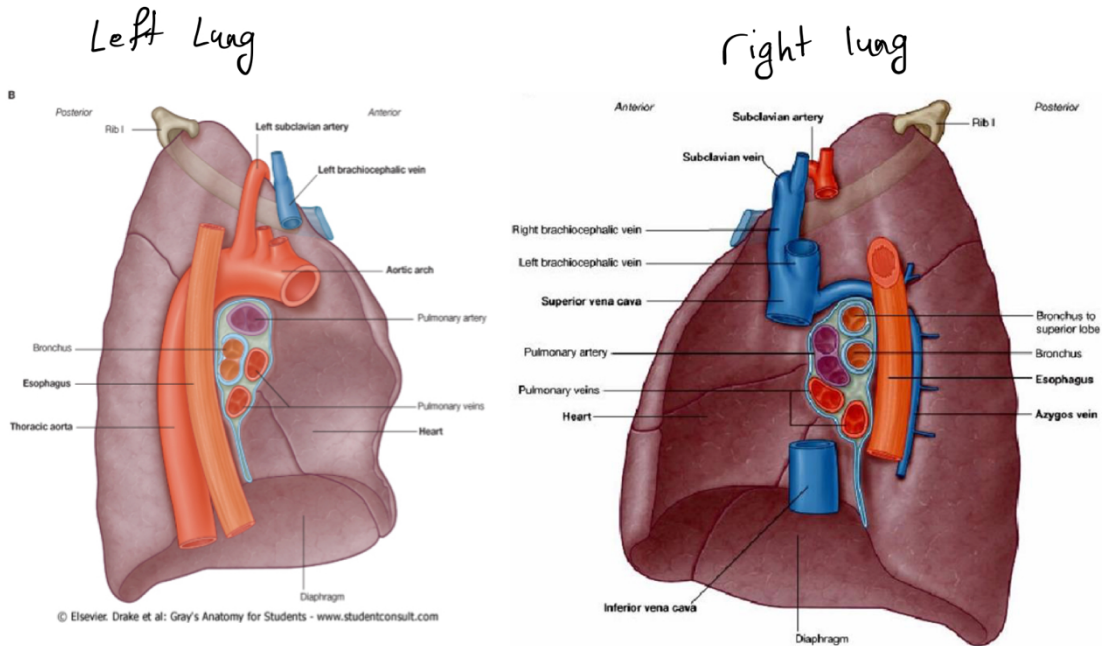
- **The pleura:**

- ✓ The pleura has two layers, visceral (which goes inside the fissure) and parietal.
- ✓ The two layers are adherent at the apex of the lung and have a space between them at the base.
- ✓ The visceral and parietal layers of the pleura on the mediastinal surface around the hilum are pledged together to form one membrane.
- ✓ at the apex of the lung, the parietal pleura here is adherent to the visceral pleura and the lungs, which means there's no pleural space. This pleura is covered by a **suprapleural membrane also called Sibson's fascia** between 1st cc and the fascia of the neck, It acts like a roof of the thorax which has a role in elevating of the apex.
- ✓ They surround the content of the hilum.
- ✓ Below the hilum, they converge (fuse) they form the pulmonary ligament: extension of the fused visceral and parietal pleura around the hilum.
- ✓ There is a potential space between visceral and parietal layers, which has serous fluid for lubrication of the lungs to avoid friction injury during respiration.
- ✓ Pleuritis: infection of the parietal pleura which causes severe pain in the chest during respiration.
- ✓ **Pneumothorax** (air filling the pleural cavity because of injury like a stab wound that penetrates the pleura or by a catheter in the subclavian vein at the apex), which causes the lungs to collapse.

- **Surface anatomy of the lung (VERY IMPORTANT):**

- ✓ **How to identify the apex:** the apex is found 1 inch (3-4cm) above the **medial third of the clavicle** (the apex reaches the root of the neck). This is important clinically; when inserting a cannula into the subclavian vein (which is found on the upper surface of the first rib), to administer drugs to the patient. Common mistake: The cannula is inserted into the apex instead of the vein, and this could lead to lung collapse. To make sure the cannula did not go through the apex, an X-ray is taken after the cannula is inserted to make sure the lung is okay.
- ✓ **How to identify the anterior border:** It starts from the apex—>to the sternoclavicular joint —> to the middle of the sternal angle. It descends until it reaches the 6th costal cartilage in the midline on the right. “To the xiphoid process”
- ✓ in case of cardiac tamponade, you must insert the needle in the cardiac notch between 4<sup>th</sup> and 6th cc to avoid injury to the lung or pleura.
  - There's a difference between the right & left lungs' anterior border:
  - In the left lung: Between the 4th and 6th costal cartilage 0.5-1 inch (2cm) to the left, there is a **semicircle cardiac notch** at the anterior border.
- ✓ **How to identify the base:** (from 3 lines) the base crosses the midclavicular line at the 6th cc, crosses the midaxillary line at the 8th rib, then posteriorly at the level of T10 (4cm away from midline).
- ✓ **How to identify the oblique fissure:** begins roughly at the spinous process of vertebra T4 or 3, 4 cm away from dorsal spine, crosses the fifth interspace laterally, and then follows the contour of 6th rib anteriorly.

- ✓ **How to identify the horizontal fissure:** start from the 4th intercostal space anteriorly crossing 5th rib and then go along with 6th rib.



- **Impressions on the visceral surface of the right lung - Deoxygenated blood (vein)-**
  1. Impression formed by the right atrium and the associated superior vena cava and inferior vena cava and azygos vein (arch).
  2. The esophagus has an impression posterior to the hilum, and it reaches the apex.
  3. Trachea has an impression anterior to the esophagus, only present in right lung because trachea is deviated to the right.
  4. Impressions caused by the contents of the hilum (2 pulmonary veins, pulmonary artery, ap-arterial hyp-arterial bronchi).
  - ✓ The right subclavian artery and vein have an impression in the border.
- **Impressions on the visceral surface of the left lung -Oxygenated blood-**
  1. Impression for the pericardium covering left ventricle.
  2. Impression for the descending aorta and the arch of the aorta with its branches.
  3. The esophagus has an impression anterior to the descending aorta in the lower part of the lung because it goes through the diaphragm one inch to the left, so it crosses the descending aorta.
  - ✓ The trachea doesn't have an impression on the left lung.
  - ✓ Brachiocephalic artery has no impression on the left lung (it is over thoracic aorta)

- **General notes about fissures:**

- ✓ on the right lung oblique f. Separates inferior and middle lobe, the transverse f. separates upper and middle lobe.
- ✓ on the left lung the transverse f. separates upper and lower lobes.

- **Pulmonary vessels**

- ✓ The pulmonary trunk starts from the pulmonary valve in the right ventricle, then it divides to right and left pulmonary arteries (sternal angle is at T4) Those arteries carry deoxygenated blood to the lungs.
- ✓ Pulmonary arteries have **no role** in nutrition supply of the lung tissue.

1. **The right pulmonary artery**

- ✓ The pulmonary trunk divides to the left of the median plane; this means that the right branch is longer.
- ✓ Enters the hilum (root) of the right lung between aparterial and hyparterial bronchi and
- ✓ **Its relations (IMPORTANT):**
  - 1- Posteriorly: right main bronchus going to hilum
  - 2- Anteriorly: superior & inferior right pulmonary vein.

2. **The left pulmonary artery:**

- ✓ **Shorter** than the right.
- ✓ The most superior structure in the hilum of the left lung.
- ✓ **Its relations (IMPORTANT):**
  - 1- Posteriorly: descending aorta
  - 2- Anteriorly: superior pulmonary vein.
  - 3- Right bronchial artery (branch from right third posterior intercostal artery)
  - 4- Inferiorly: Left main bronchus.

- **Pulmonary veins:** 4 veins in total

- ✓ Two on each side (superior, inferior)
- ✓ Begin at the hilum of the lung, pass through the root of the lung.
- ✓ Carry **oxygenated** blood from the lungs back to the left atrium.

- **Bronchial vessels:** The main nutritive blood supply of the pulmonary tissues which carries oxygenated blood.

1. **The right bronchial artery:** Originates from the third posterior intercostal artery > a branch of the descending thoracic aorta.
2. **The left bronchial arteries:** Both arise directly from descending thoracic aorta.
  - ✓ The superior left bronchial artery arises at the level of T5.

- **The bronchial veins:** 4 veins in total
  - ✓ The left side drains into the hemiazygos vein or intercostal veins into the pulmonary veins or the left atrium (the amount of blood CO<sub>2</sub> in bronchial veins is small compared to the amount of blood O<sub>2</sub> in the left atrium and pulmonary veins so the CO<sub>2</sub> is dissolved).
  - ✓ The right-side drains into **azygos** vein (main vein that drains the chest) > arch of azygos > SVC > right atrium (this is the usual pathway of deoxygenated blood)
- **Autonomic innervation of lungs and visceral pleura:**
  - ✓ From thoracic sympathetic ganglia
  - ✓ Plexus of sympathetic chain+ parasympathetic (vagus nerve) around the tracheal bifurcation and main bronchi. There are anterior and posterior pulmonary plexuses.
  - ✓ autonomic innervation for visceral pleasure, and sensory for parietal.
  - ✓ Supplied by visceral afferents and efferent & sensitive to stretch (vagus & sympathetic)
  - ✓ **Effect of parasympathetic (imp) = bronchoconstriction.**
  - ✓ **Effect of sympathetic (imp) = bronchodilation**
  - ✓ Clinical correlation: we give an asthma patient in emergency situations epinephrine (adrenaline =sympathomimetic) to bronchodilate his bronchus.

(الدكتور كان معجوق بال lymphatic drainage فيفضل ترجعوا للشيت، وبالنسبة للمعلومات الي ذكرها عن ال pleura ما ضفتها لانو رح تتفصل بالمحاضرة المسجلة)