



# RS

## ANATOMY

MODIFIED NO. 5 part 2



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# Trachea and lungs (2)

## Color code

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■	Slides
■	Doctor
■	Additional info
■	Important

- We have 2 lungs in the thoracic cavity.
- The right lung is made up of 3 lobes ; upper , middle and lower , separated by horizontal fissure and oblique fissure.
- The left lung is made up of 2 lobes : upper and lower , separated by oblique fissure.

# Lungs

- organs of respiration and lie on either side of the mediastinum
- surrounded by the right and left pleural cavities Spongy, grey, dark later on.
- **The weight of the lung 600-800gm , 90% air & 10% tissue** (connective tissue, elastic and reticular fibers >> to help the lungs in inflation )
- The pulmonary arteries deliver deoxygenated blood to the lungs from the right ventricle of the heart.
- Oxygenated blood returns to the left atrium via the pulmonary veins.
- The right lung is normally a little larger than the left lung because the middle mediastinum, containing the heart, bulges more to the left than to the right.

Left lung is narrower

-Right lung is shorter, more vertical



- **Healthy Lungs:** In a healthy non-smoker, the lungs are typically **pink** and soft.
- **Smoker's Lungs:** The lungs of a smoker or someone exposed to heavy pollution appear **grayish** or **blackened** due to the accumulation of pollutants.

- The right lung is shorter and wider; because the liver is pushing the diaphragm upward pressing against the right lung .
- The left lung is longer and narrower, and has a **lingula** -لُؤسِين- (A tongue-like projection of the upper lobe of the left lung) and **cardiac notch** (An indentation on the anterior border of the left lung, It accommodates the heart, making the left lung slightly smaller than the right lung.)

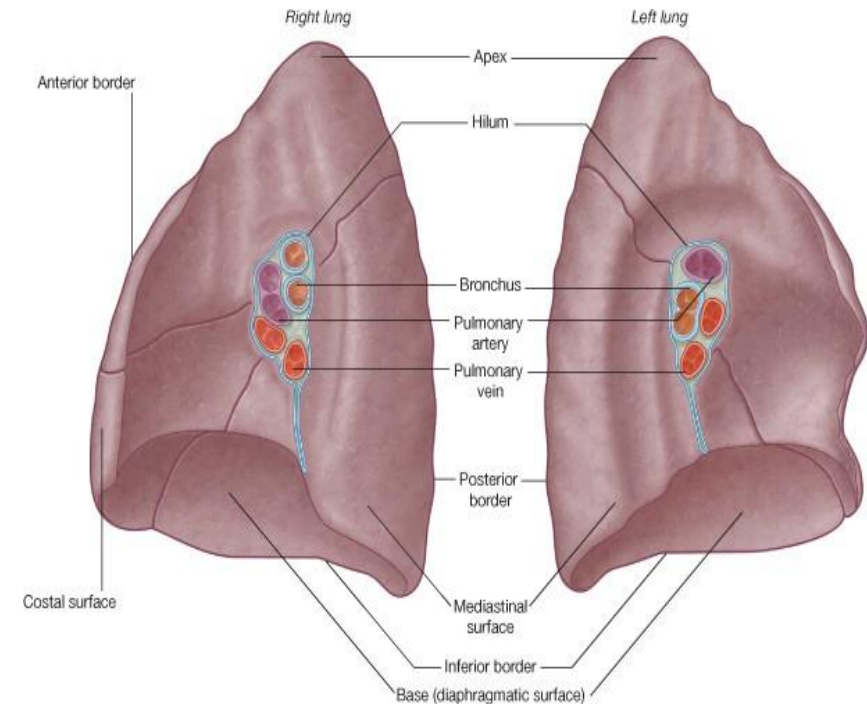
# Lungs

- Each lung has a half-cone shape
- base, apex, **two** surfaces and **three** borders
- The **base** sits on the diaphragm. (also called diaphragmatic surface , this surface has a sharp boarder called > diaphragmatic boarder)
- The **apex** projects above rib I and into the root of the neck.

1 inch above the medial 1/3<sup>rd</sup> of the clavicle and is Covered by suprapleural membrane.

- **costal surface** lies immediately adjacent to the ribs and intercostal spaces.
- The **mediastinal surface** lies against the mediastinum anteriorly and the vertebral column posteriorly
- contains the comma-shaped hilum of the lung through which structures enter (the bronchi and the pulmonary artery) and leave (pulmonary veins).
- The hilum also contain bronchial vessels and nerves (sympathetic and parasympathetic) and also lymph nodes and lymphatic vessel.

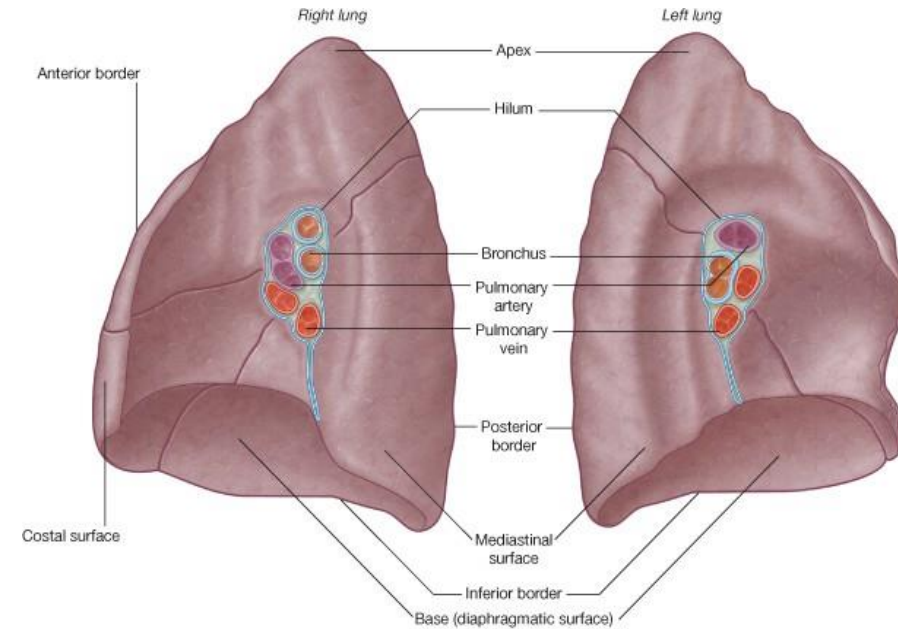
- Note : the doctor said :
- We have three surfaces : costal , mediastinal and diaphragmatic.





# Lungs

- inferior border of the lung is **sharp** and separates the base from the costal surface. (also called **diaphragmatic border**)
- The anterior and posterior borders separate the costal surface from the medial surface.
- the **anterior** and **inferior** borders, are sharp,
- the **posterior** border is smooth and rounded



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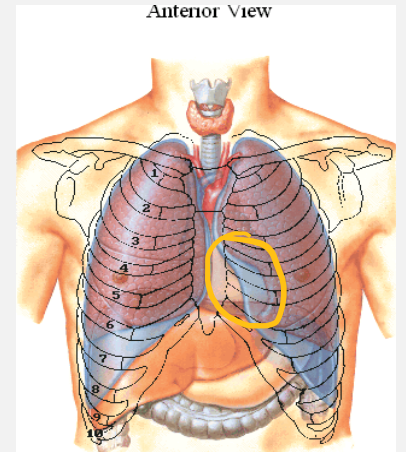
- The surface anatomy of the lung is the same as visceral surface

#### ❖ The apex:

- 1 inch above the medial 1/3rd of the clavicle and is the apex of the lung. (in the root of the neck)
- In other books the apex is 3-4 cm above the 1<sup>st</sup> costal cartilage
- The apex is important, its covered by three membranes: visceral, parietal, and **suprapleural membrane**.
- If we want to insert a cannula in the subclavian vein ( which is located in the upper boarder of the 1<sup>st</sup> rib) we might injure the apex causing lung collapse.

#### ❖ The anterior surface:

- The anterior border extends from the apex to the sternal angle midline and extends downward till the 6<sup>th</sup> costal cartilage in the midline
- Here the right anterior border is different than the left, because of the **cardiac notch**
- On the left side, from the 4<sup>th</sup> costal cartilage until the 6<sup>th</sup> costal cartilage, the left lung is displaced by 1cm to left ( the half circle -like border in the pic is the cardiac notch)
- If a patient present with fluid in the **pericardium (cardiac tamponade)** we Aspirate this patient from the cardiac notch.



#### ❖ The base:

- To identify the base there are three points, the first is on 6<sup>th</sup> costal cartilage in the midclavicular line, the second point is on the 8<sup>th</sup> rib at the midaxillary line, the third point is on the scapular line (also called paravertebral line which descends the inferior angle of the scapula) when it's 4cm away from the dorsal spine of the 10<sup>th</sup> thoracic vertebra

#### ❖ The posterior surface:

- From the apex posteriorly till the 10<sup>th</sup> thoracic vertebra

- The base is the most important surface because if we take the parietal pleura from the anterior, apex, posterior it will be the same as the lung surface, except the base
- The base in parietal pleura will reach **8<sup>th</sup> costal cartilage in the midclavicular line** (instead of 6<sup>th</sup>), and **the 10<sup>th</sup> rib at the midaxillary line** (instead of 8<sup>th</sup>), and **at the level of 12<sup>th</sup> thoracic vertebra** (instead of 10<sup>th</sup>)
- Why is this difference between the bases of the two spaces? Its because the inflation of the lung is downward
- The surface anatomy of pleura descends 2 spaces downward

# Surface anatomy of the lung

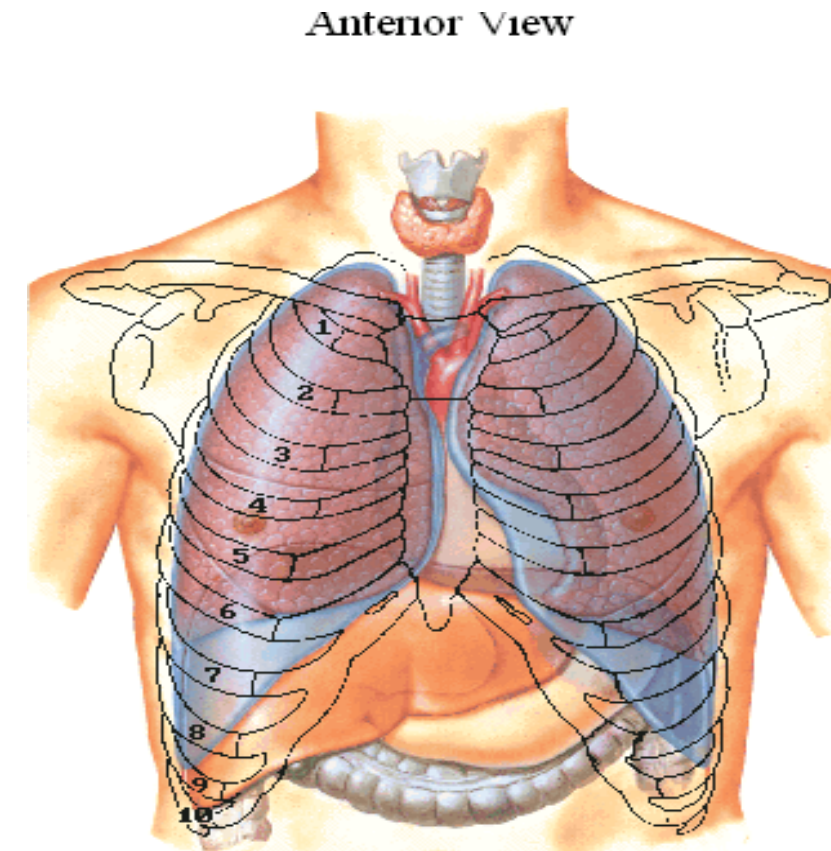
- At end-expiration
  - 6<sup>th</sup> rib – midclavicular
  - 8<sup>th</sup> rib – midaxillary
  - 10<sup>th</sup> T.vertebra\_

## Posteriorly

- apex is at 1<sup>st</sup> Th vertebra
- Posterior border Extend from 7<sup>th</sup> C vert. to the 10<sup>th</sup> T vert.
  - lies 4cm from the midline

## Inferior border

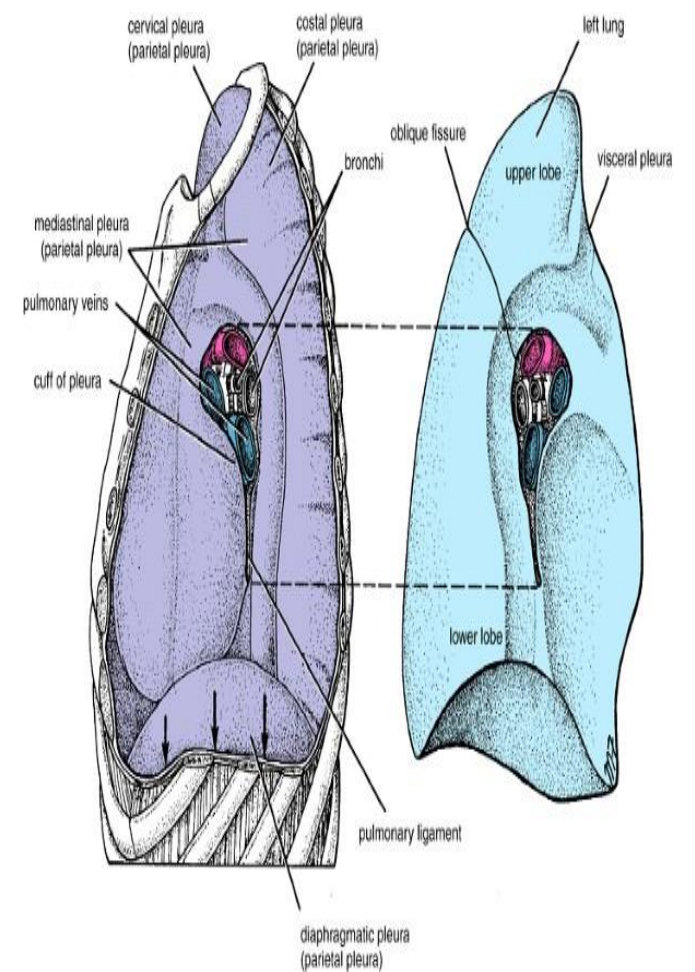
- Ascend and descend between 9<sup>th</sup> & 12<sup>th</sup> rib





# Root and hilum

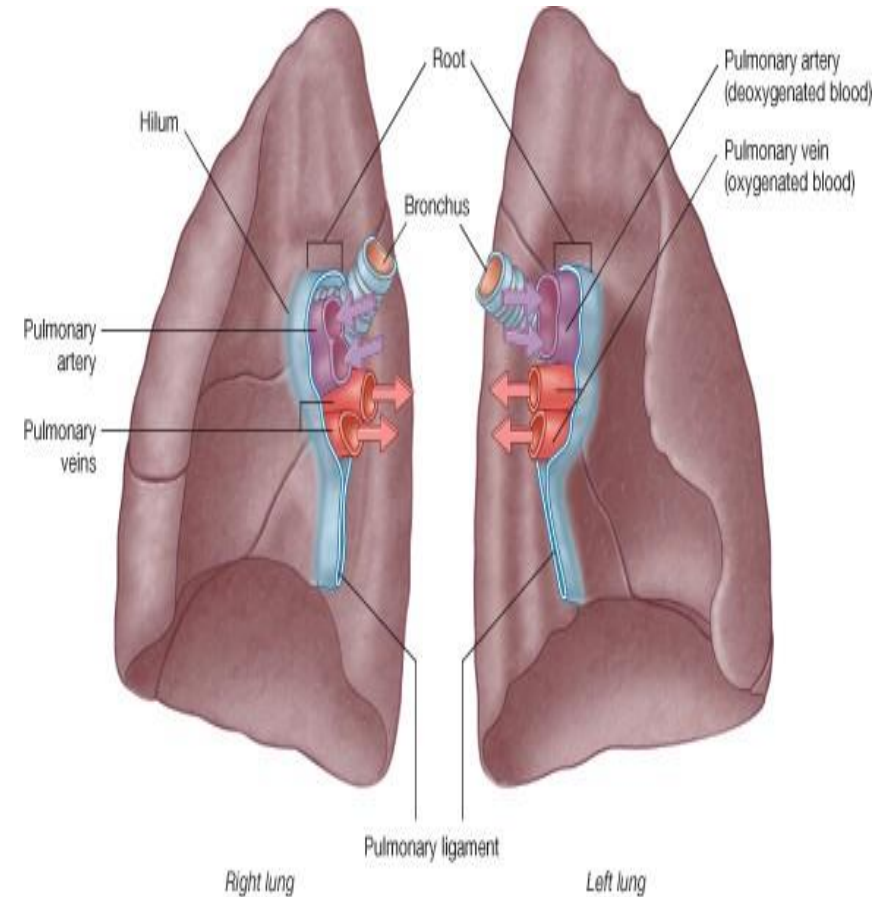
- The **root** of each lung is a short tubular collection of structures that together attach the lung to structures in the mediastinum
- **covered by a sleeve of mediastinal pleura that reflects onto the surface of the lung as visceral pleura**
- **A thin blade-like fold of pleura projects inferiorly from the root of the lung. This structure is the pulmonary ligament**
- **pulmonary ligament** stabilize the position of the inferior lobe and may also accommodate the down-and-up translocation of structures in the root during breathing
- **the vagus nerves pass immediately posterior to the roots of the lungs, while the phrenic nerves pass immediately anterior to them.**



- The lung is surrounded by two membranes (pleura), one is adherent to the surface of the lung is called the visceral pleura, and the other is the parietal pleura lining the thoracic cavity
- Around The hilum the visceral pleura and the parietal pleura is adherent to each other covering the hilum by a sleeve of mediastinal pleura that reflects onto the surface of the lung as visceral pleura.
- A thin blade-like fold of pleura projects inferiorly from the root of the lung. This structure is the **inferior pulmonary ligament**

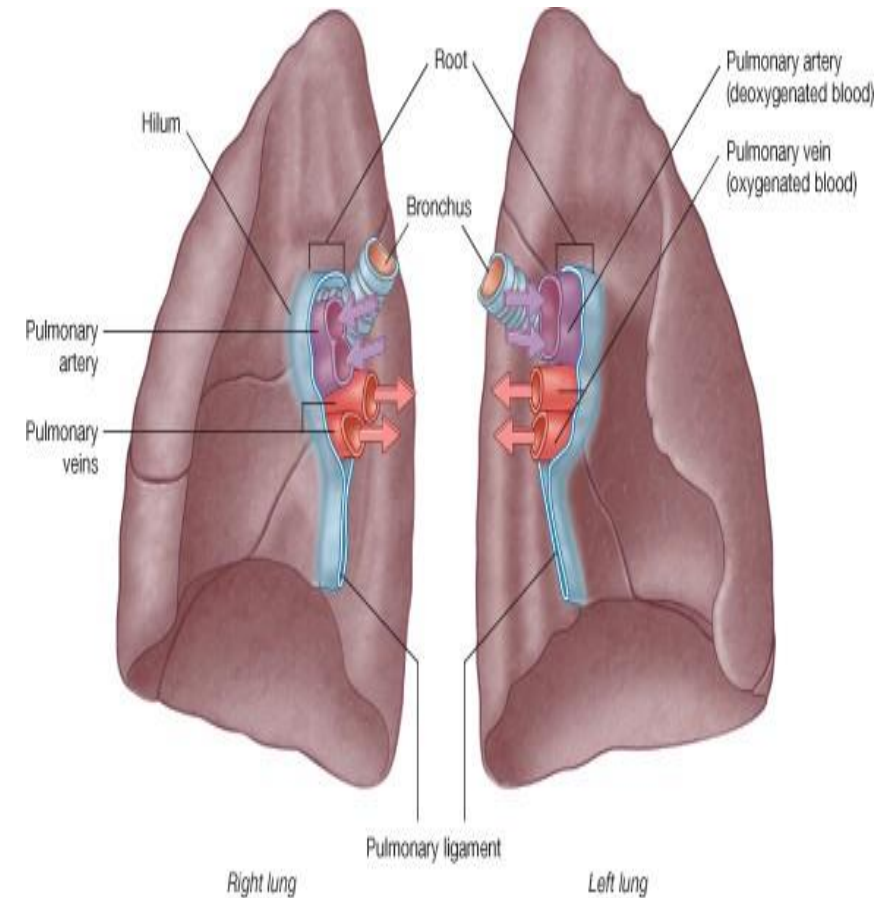
# Root and hilum

- Within each root and located in the hilum are:
- **pulmonary artery;**
- **two pulmonary veins;**
- **a main bronchus;**
- **bronchial vessels;**
- **nerves;**
- **lymphatics.**



# Root and hilum

- the pulmonary artery is superior at the hilum,
- the pulmonary veins are inferior, and the bronchi are somewhat posterior in position.
- On the right side, the lobar bronchus to the superior lobe branches from the main bronchus in the root,
- on the left it branches within the lung itself, and is superior to the pulmonary artery

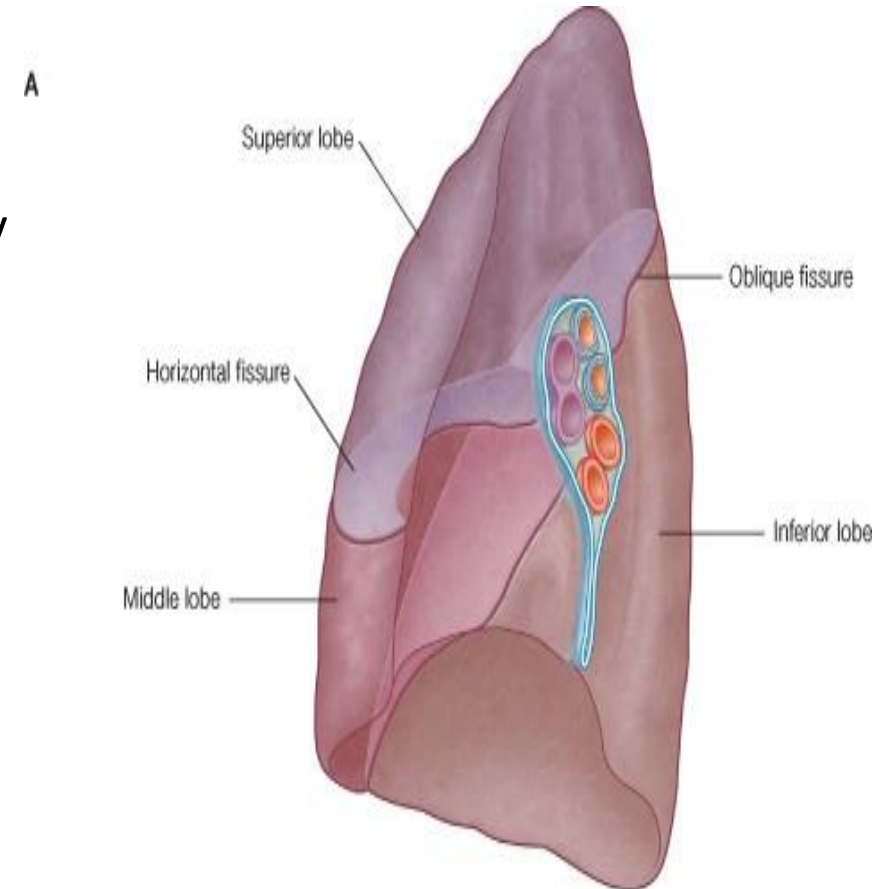


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- The hilum of **right lung** contains **two** bronchi (**Eparterial and Hyparterial**) and **anterior** to them is the pulmonary artery (which contains deoxygenated blood)
- The **left lung** contains only **one** main bronchi (why? Simply because it divides after the hilum) and the most **superior** is the pulmonary artery
- The two pulmonary veins which contain oxygenated blood, is inferior compared to the artery and bronchi, named superior and inferior pulmonary veins

# Right lung

- The **right lung** has three lobes and two fissures
- Normally, the lobes are freely movable against each other because they are separated, almost to the hilum, by invaginations of visceral pleura.
- These invaginations form the **fissures**:
- the **oblique fissure** separates the **inferior lobe (lower lobe)** from the superior lobe and the **middle lobe of the right lung**;
- the **horizontal fissure** separates the **superior lobe (upper lobe)** from the middle lobe.

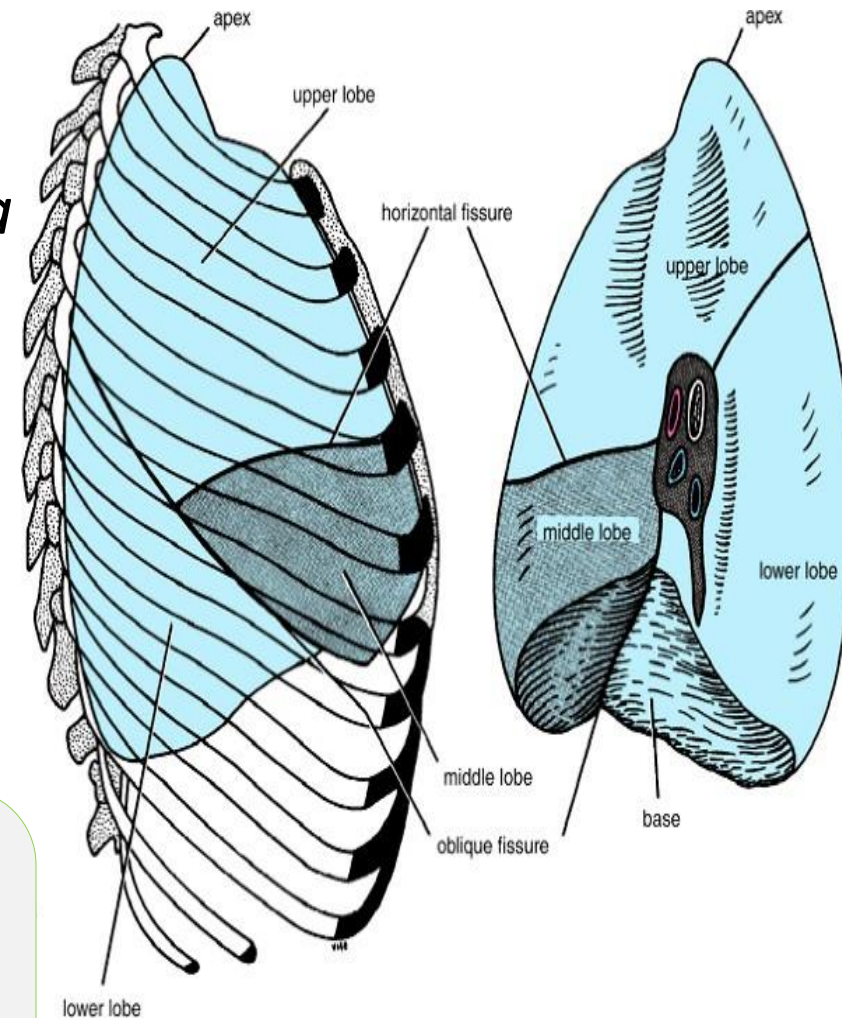




# Right lung

- *The approximate position of the oblique fissure on a patient, in quiet respiration,*
- *begins roughly at the spinous process of vertebra **T4** level of the spine, crosses the **fifth** interspace laterally, and then follows the contour of **rib VI** anteriorly*

- How to identify the oblique fissure of the right lung?
- Start posteriorly at the **dorsal spine of T3 or T4.**
- Move anteriorly about **4 cm medially from the 5th intercostal space.**
- Follow the line down to the level of the **6th rib.**
- It's the nearly same in the right lung and left lung

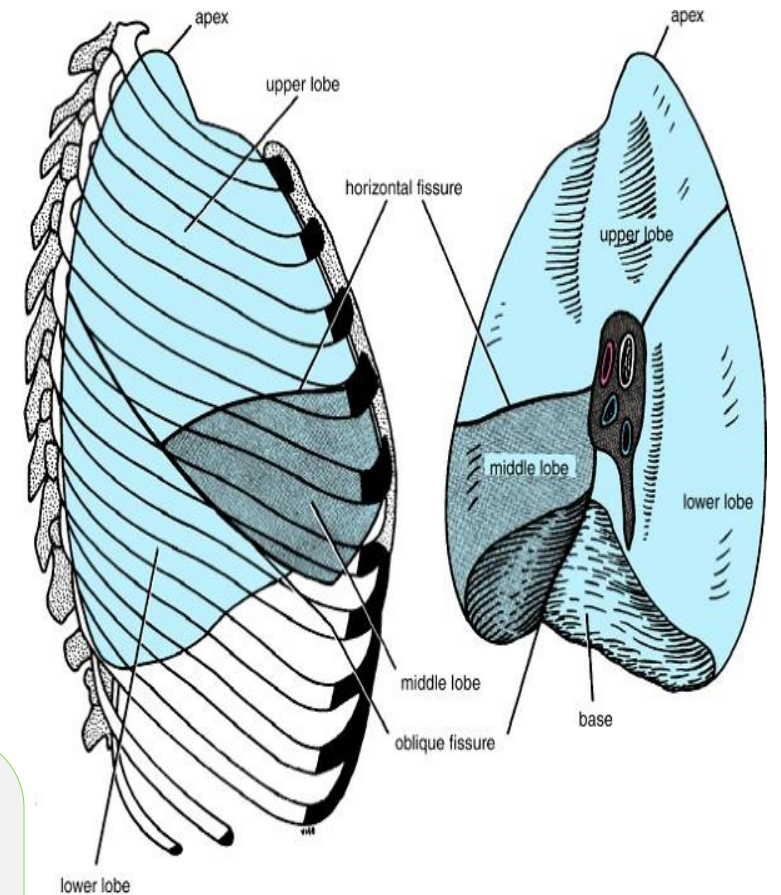




# Right lung

- The horizontal fissure follows the **fourth intercostal** space from the sternum until it meets the oblique fissure as it crosses rib V.
- *The orientations of the oblique and horizontal fissures determine where clinicians should listen for lung sounds from each lobe.*
- *When listening to lung sounds from each of the lobes, it is important to position the stethoscope on those areas of the thoracic wall related to the underlying positions of the lobes*

- How to identify the horizontal fissure of the right lung?
- Start anteriorly at the **4th intercostal space**.
- Follow it to the **5th intercostal space**.
- Continue to the **6th rib**, where it intersects with the oblique fissure.
- Its only in the right lung

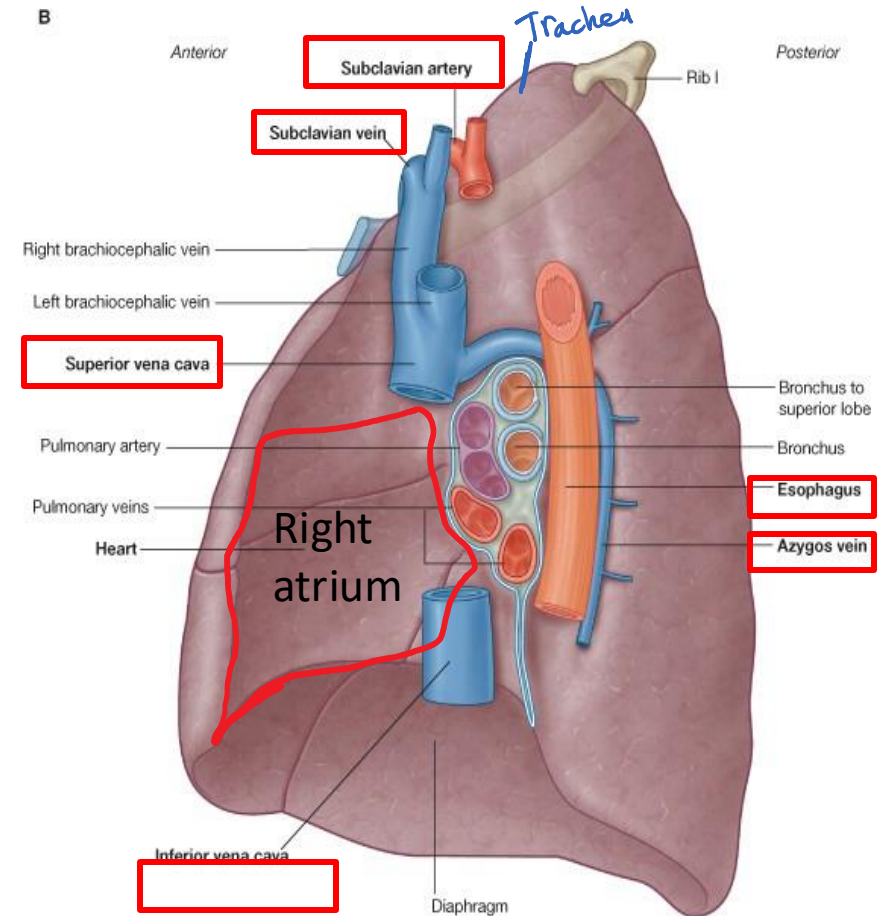


NOTE: the green text represents what the doctor said, while the black text is what the doctor mentioned from the slides :)

- This picture represents the mediastinal surface of the right lung. The mediastinal surface is characterized by various impressions caused by adjacent organs. These impressions are primarily **made by venous structures**. The impressions on the right lung are as follows:

**1. Right Atrium:** The space anterior to the hilum of the lung is occupied by the pericardium of the right atrium. The right atrium creates an impression on this area. Additionally, the superior vena cava (SVC) and inferior vena cava (IVC) drain into the right atrium.

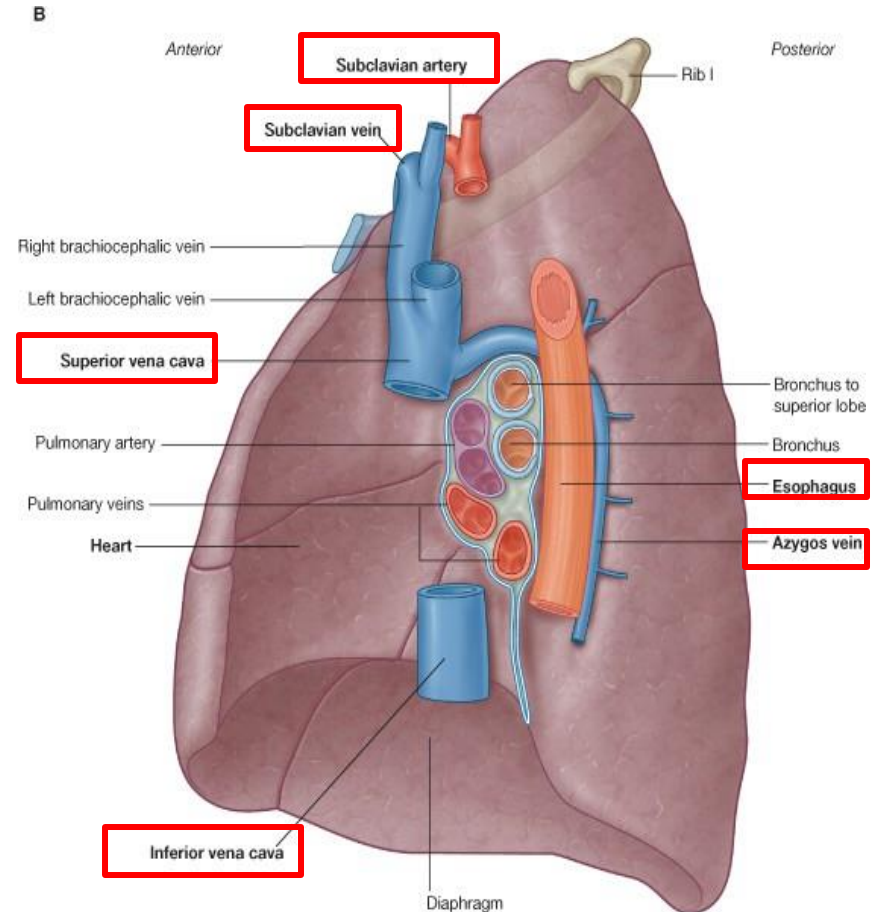
**2. Subclavian Artery and Vein:** The subclavian artery and vein are related to the anterior border of the lung's apex, and they lie near the first rib on the costal surface.



**3. Esophagus :** The esophagus creates an impression on the lung posterior to the hilum and at the apex of the lung.

**4. Trachea:** The trachea makes an impression anterior to the esophagus on the right lung only, as it is deviated to the right.

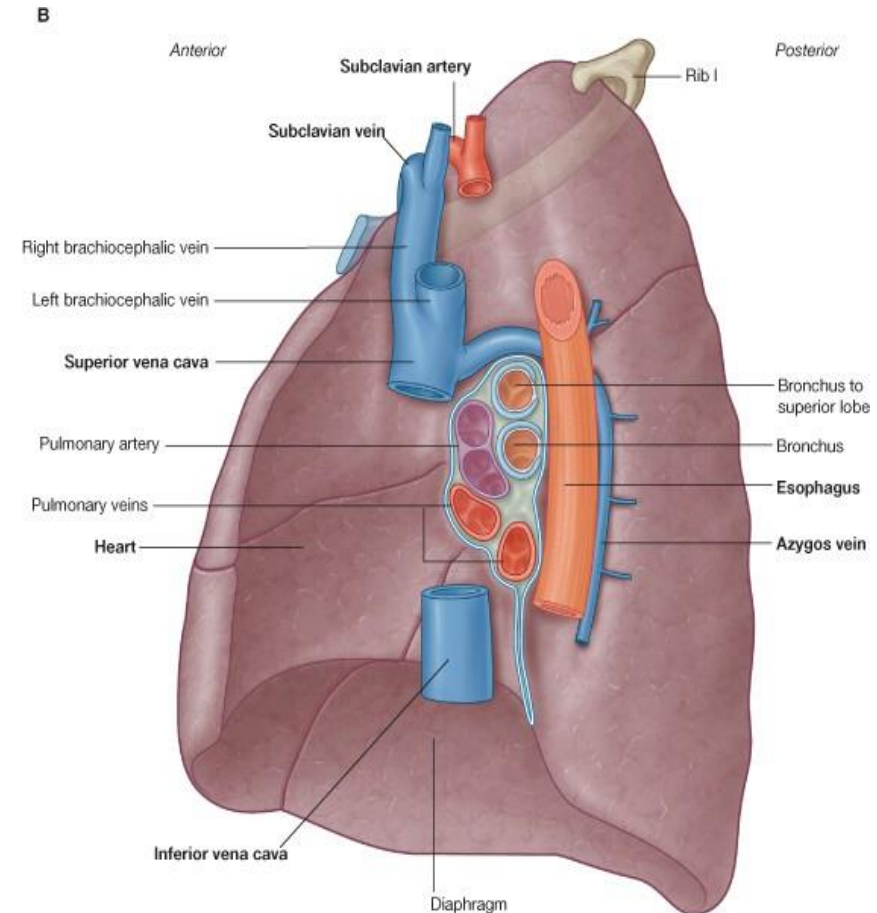
**5. Azygos Vein and its Arch:** The arch of the azygos vein, which drains into the superior vena cava (SVC), creates an impression on the mediastinal surface of the right lung.



# Right lung

- The medial surface of the right lung lies adjacent to a number of important structures the heart,
- **inferior vena cava,**
- **superior vena cava,**
- **azygos vein,**
- **esophagus.**

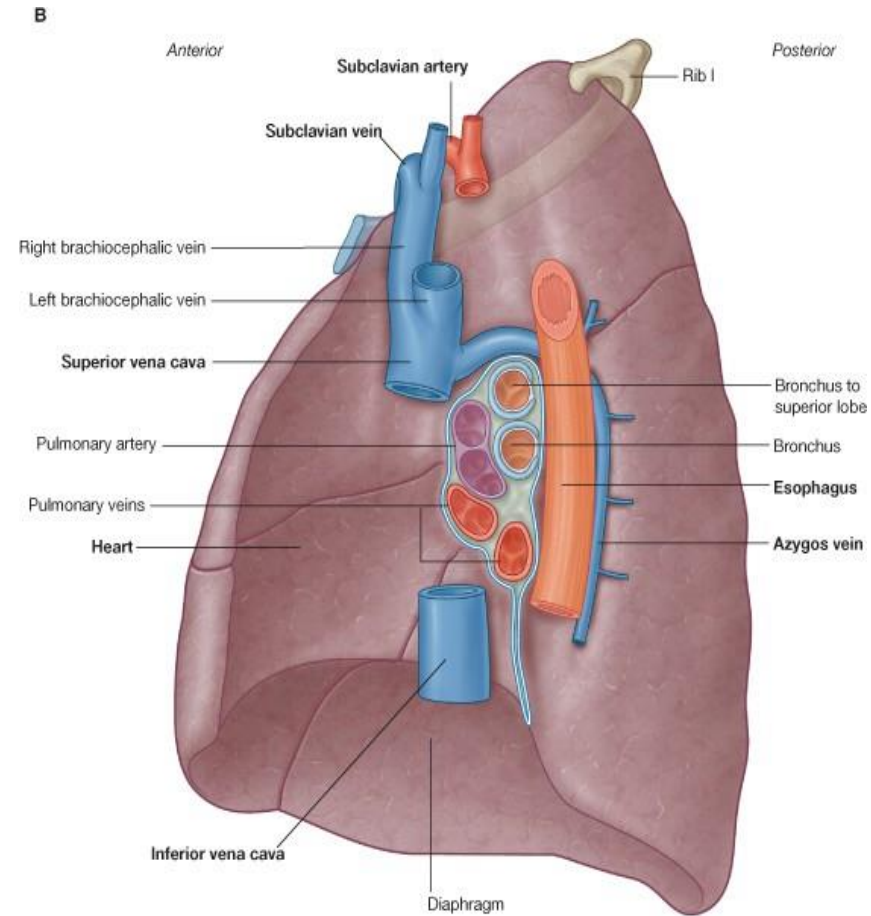
Everything doctor mentioned from this slide was explained in the previous slides.





# Right lung

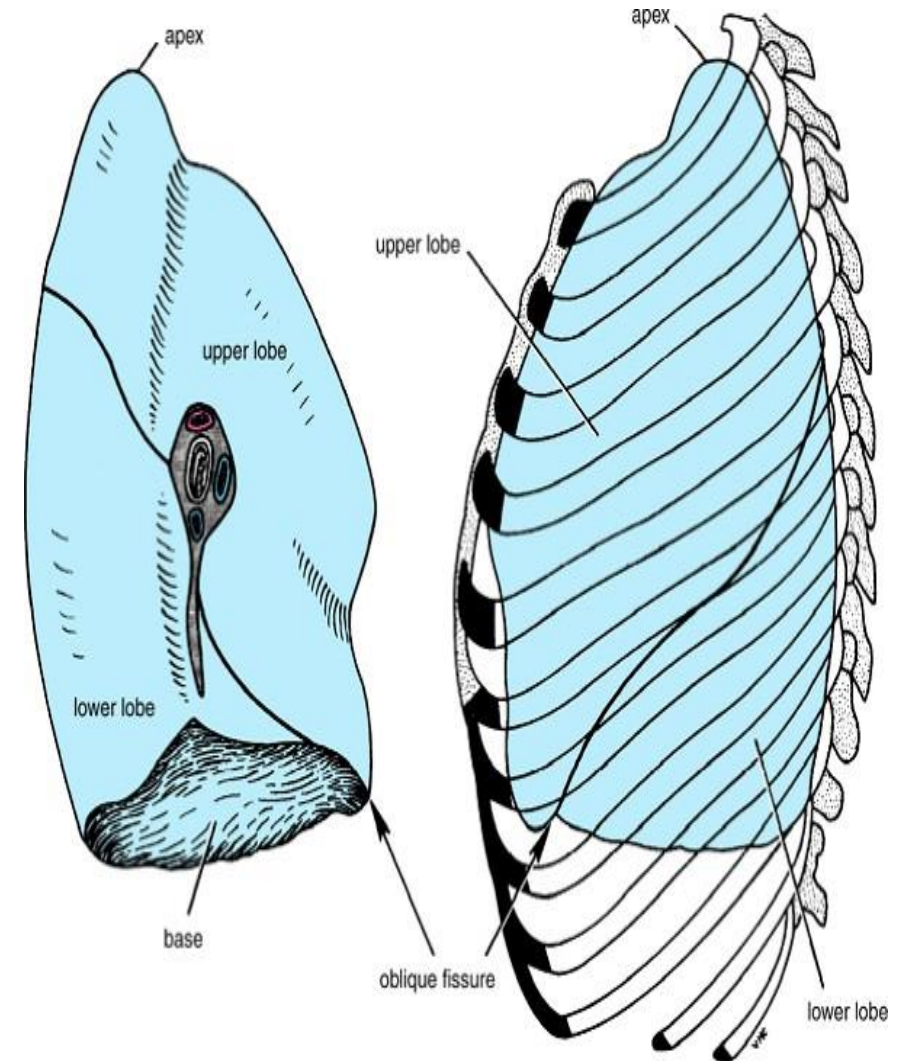
- The right subclavian artery and vein arch over and are related to the superior lobe of the right lung as they pass over the dome of cervical pleura and into the axilla.





# Left lung

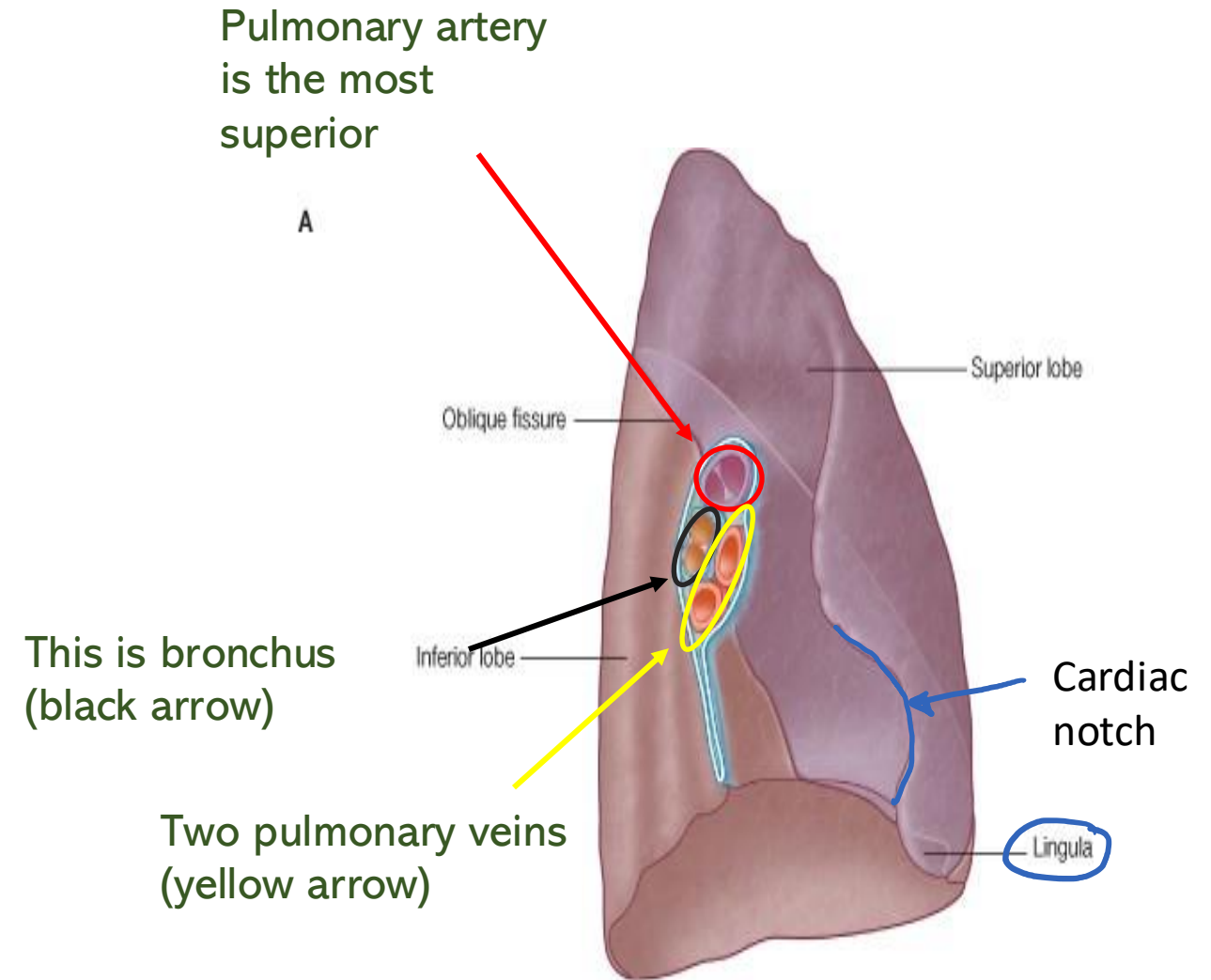
- The **left lung** is smaller than the right lung and has two lobes separated by an oblique fissure (it only has oblique fissure , it doesn't have horizontal fissure).
- **oblique fissure** of the left lung is slightly more oblique than the corresponding fissure of the right lung
- During quiet respiration, the approximate position of the left oblique fissure can be marked by line on the thoracic wall
- Its surface anatomy like right lung , it begins between the spinous processes of vertebrae T3 and T4, crosses the fifth interspace laterally, and follows the contour of rib VI anteriorly
- As with the right lung, the orientation of the oblique fissure determines where to listen for lung sounds from each lobe.



# Left lung

The left lung is distinguished by the presence of the cardiac notch (heart's projection) and the lingula.

- The inferior portion of the medial surface of the left lung, is notched because of the **heart's projection** into the left pleural cavity from the middle mediastinum
- On the anterior surface of the lower part of the superior lobe a tongue-like extension (the **lingula of left lung**) projects over the heart bulge.

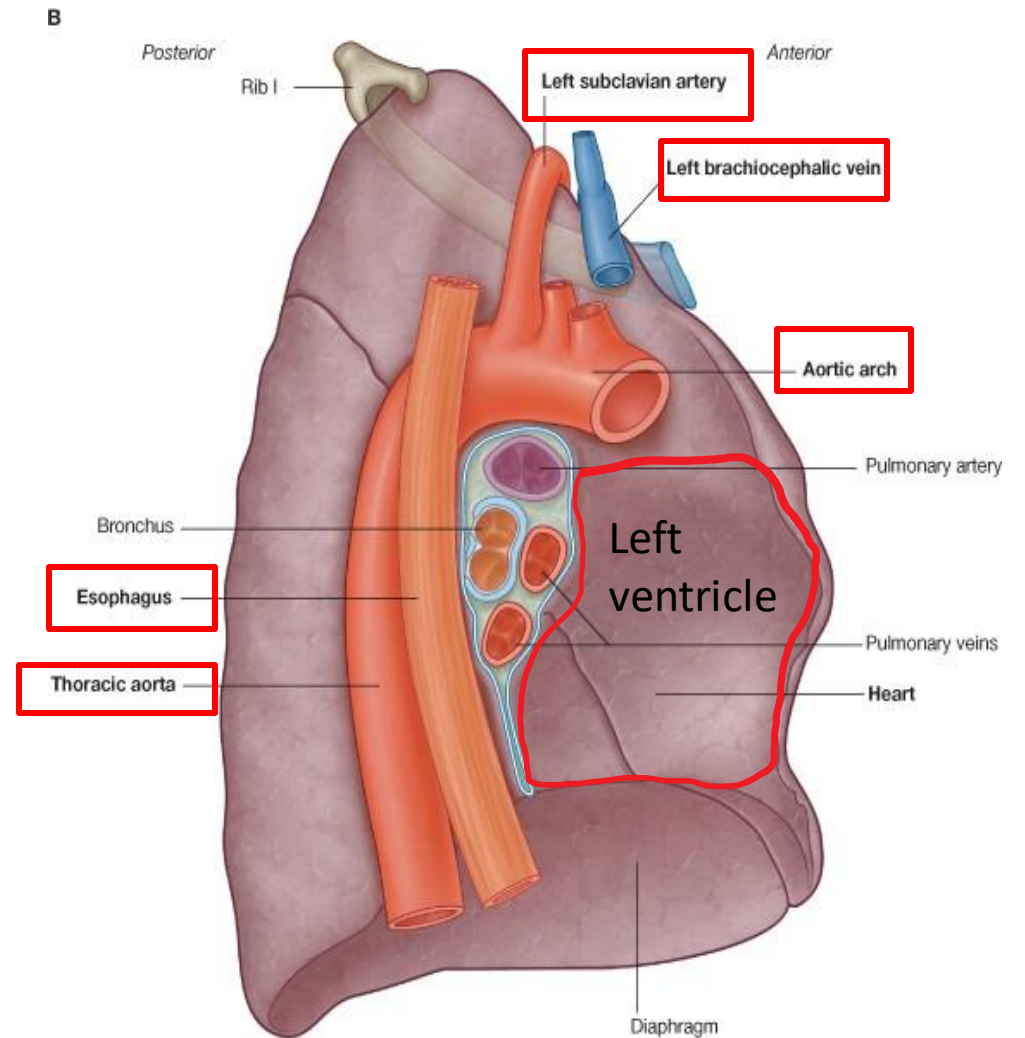


• In the left lung, the impressions are primarily **related to structures carrying oxygenated blood**. The key impressions include:

**1. Pericardium of the Left Ventricle:** This structure creates an impression anterior to the hilum. The left ventricle is the main pump of oxygenated blood to the body.

**2. Arch of the Aorta and its Branches:** The arch of the aorta passes above and creates a distinct impression on the superior part of the lung. Its major branches, such as the left subclavian artery and the left common carotid artery, also contribute to the impression.

**3. Left Subclavian Artery and Left Common Carotid Artery:** These vessels create impressions superior to the hilum as they arise from the arch of the aorta and ascend towards the neck and upper limb.

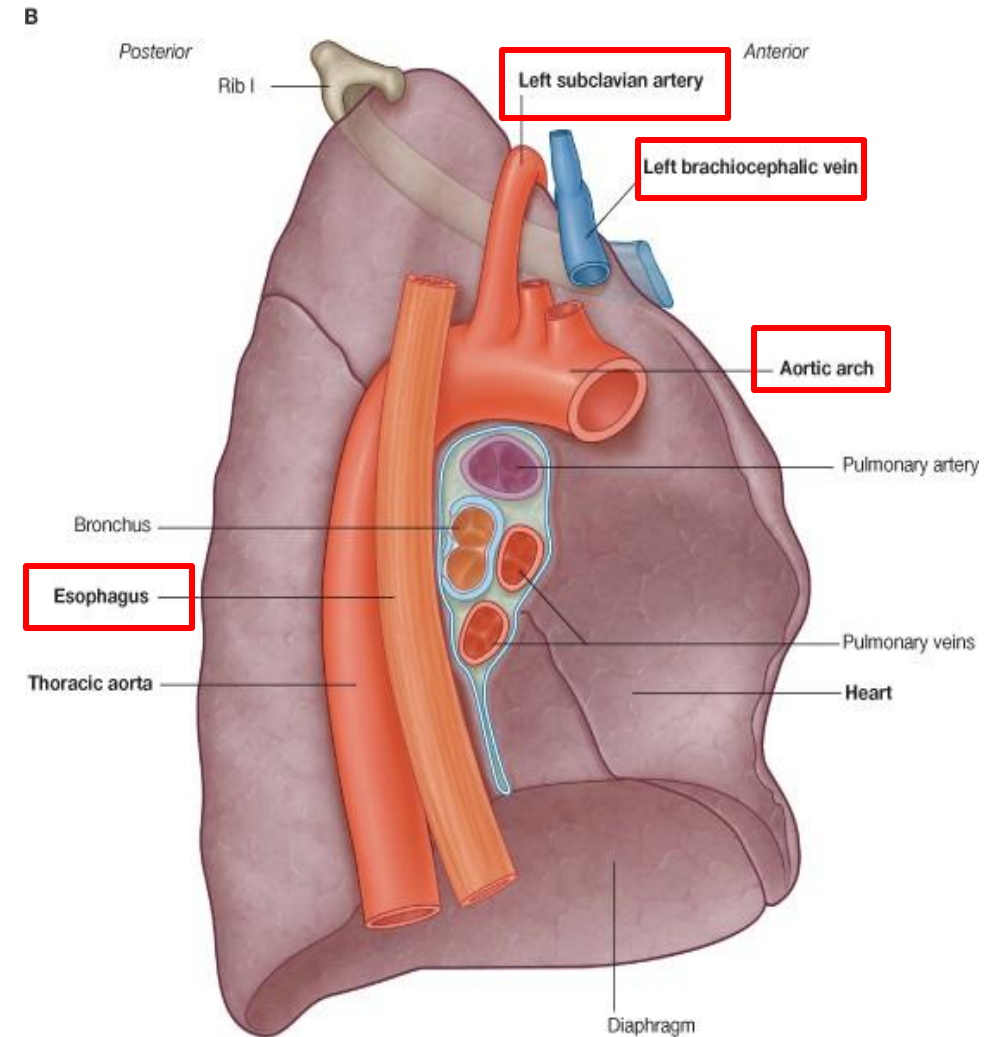


**4. Descending Thoracic Aorta:** Behind the hilum, the descending thoracic aorta runs downward, forming a **posterior impression**.

**5. Esophagus:** The esophagus creates an impression in two main regions of the left lung:

- **At the apex:** The esophagus makes a slight impression near the lung's apex. However, the trachea does not create an impression because it deviates to the right.

- **In the lower part of the lung:** The esophagus also forms an impression posterior and below the hilum, in front of the descending thoracic aorta.



➤ Reasons for the lower impression:

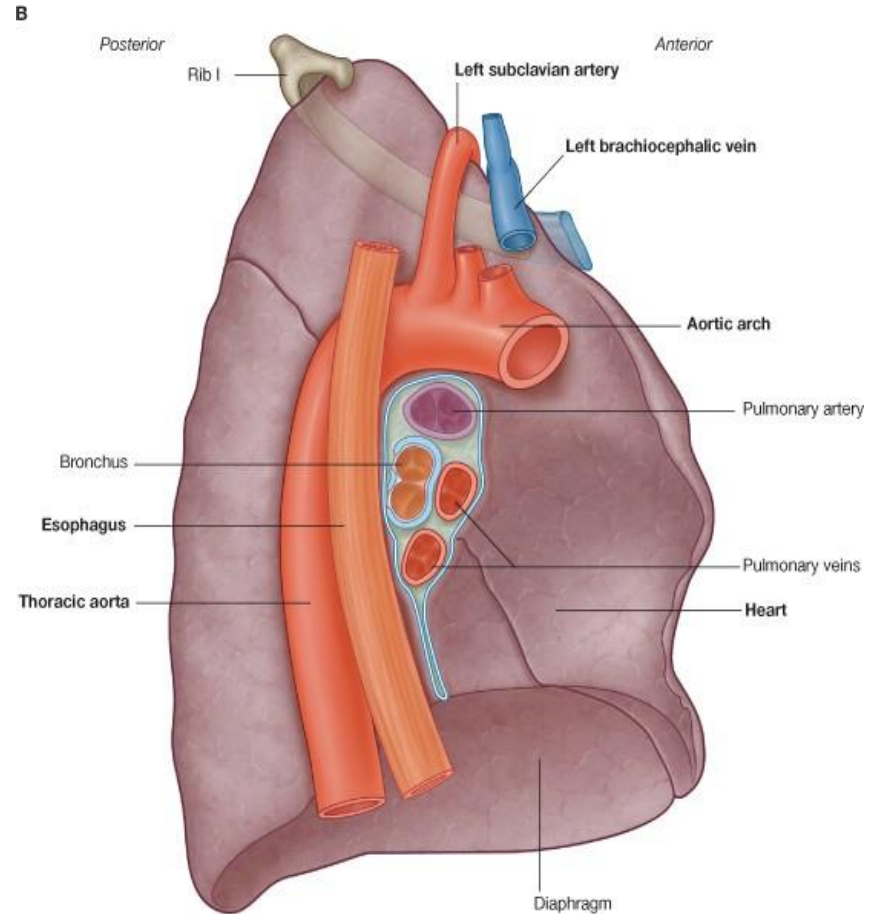
- The esophagus must pass through the diaphragm through the esophageal hiatus,( an opening which is 1inch to the left at the level of T10 ) enforcing it to cross anterior to the descending thoracic aorta.
- The aorta, in contrast, passes through the diaphragm at the T12 level (midline )via the aortic hiatus, ensuring that the esophagus occupies a more anterior position relative to the aorta in this region.

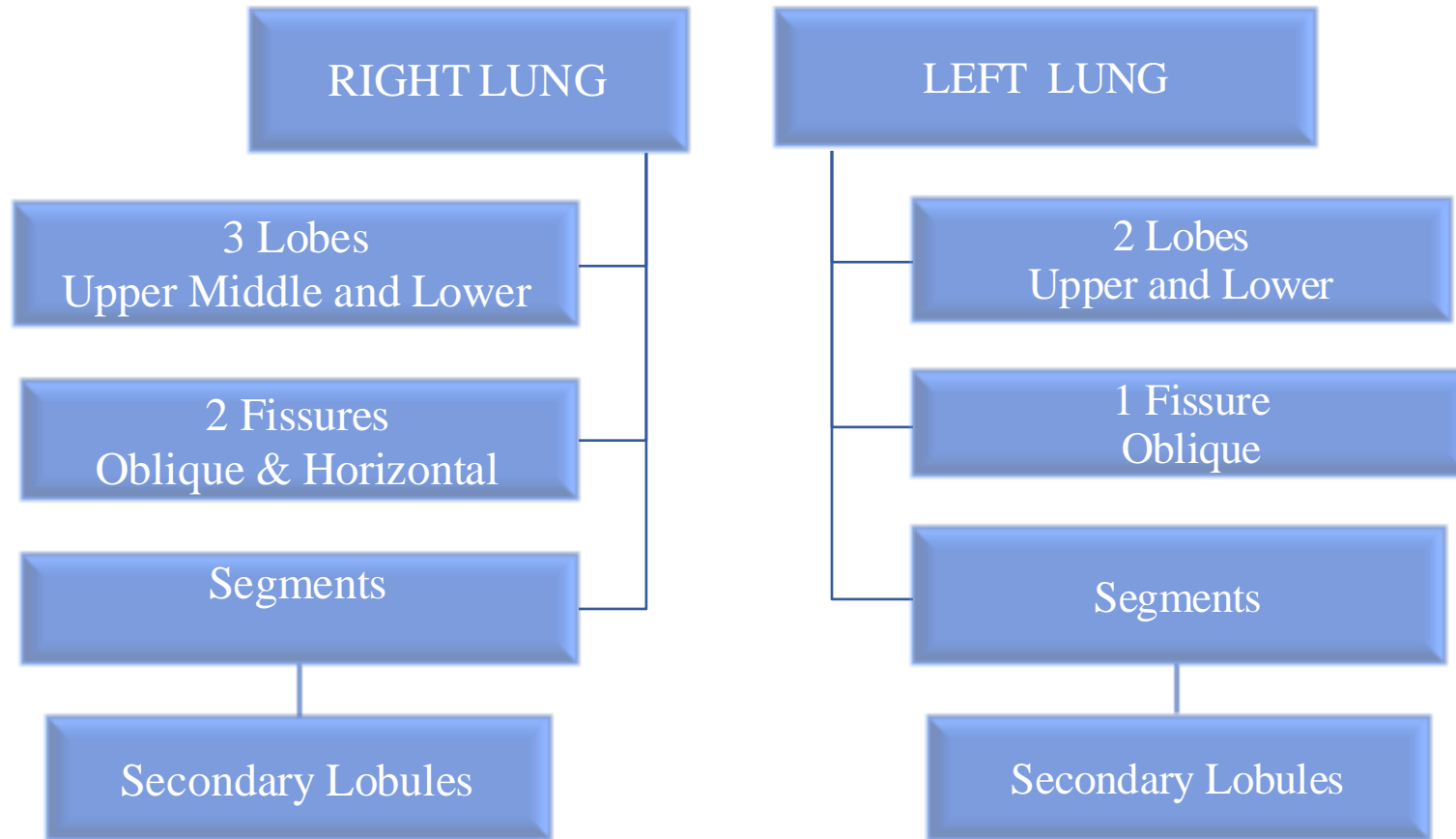


# Left lung

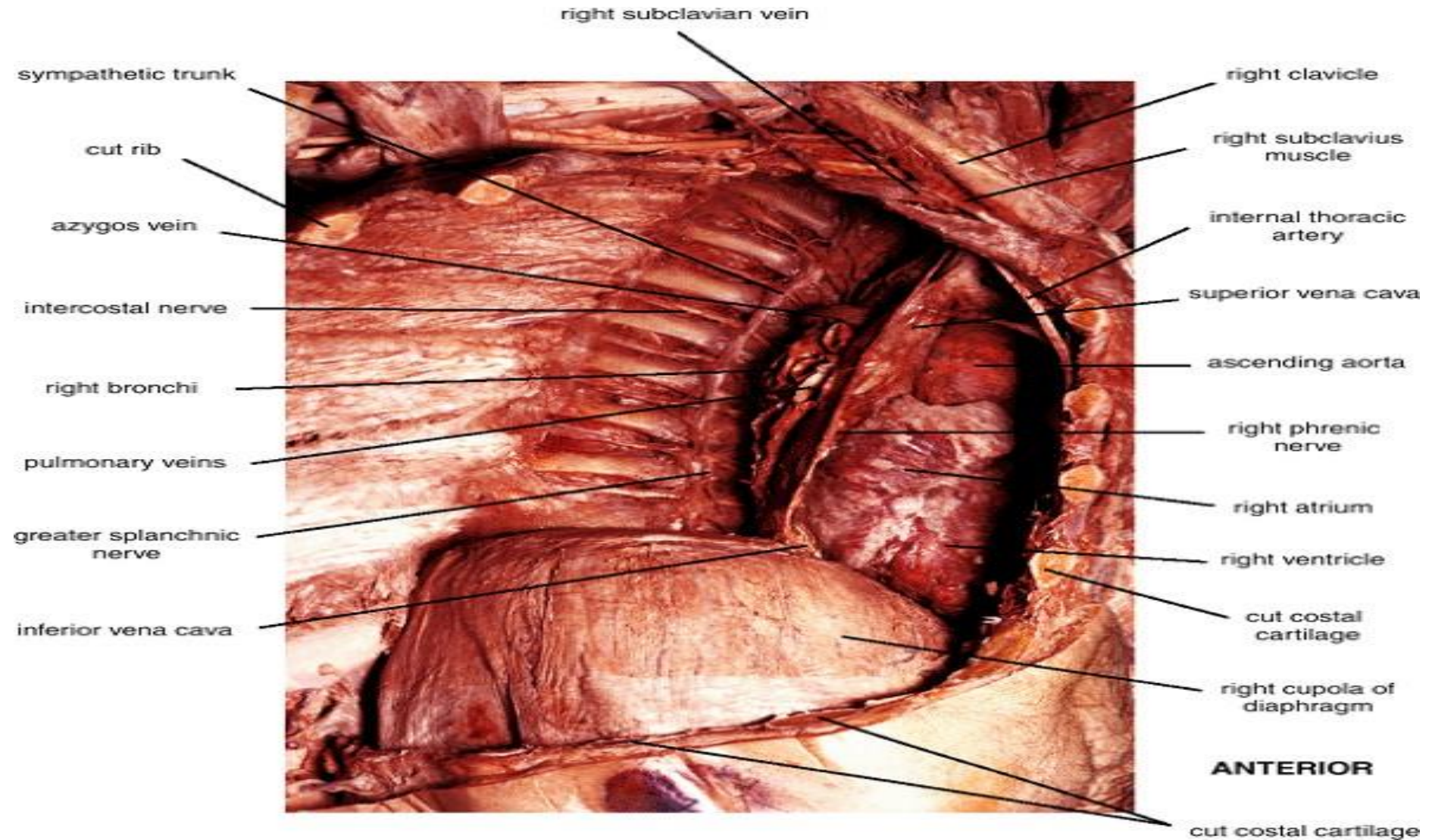
- The medial surface of the left lung lies adjacent to a number of important structures the
- **heart,**
- **aortic arch,**
- **thoracic aorta,**
- **esophagus**

Everything doctor mentioned from this slide was explained in the previous slides.





# Right side

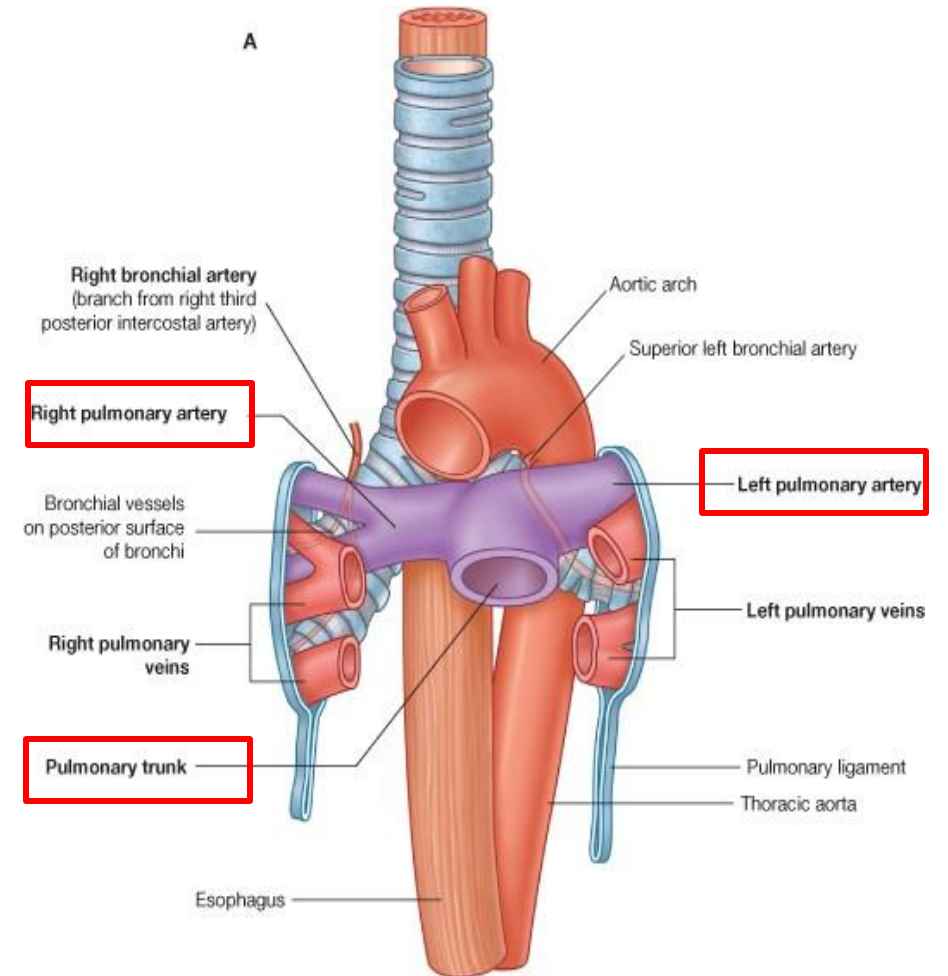




# Left side

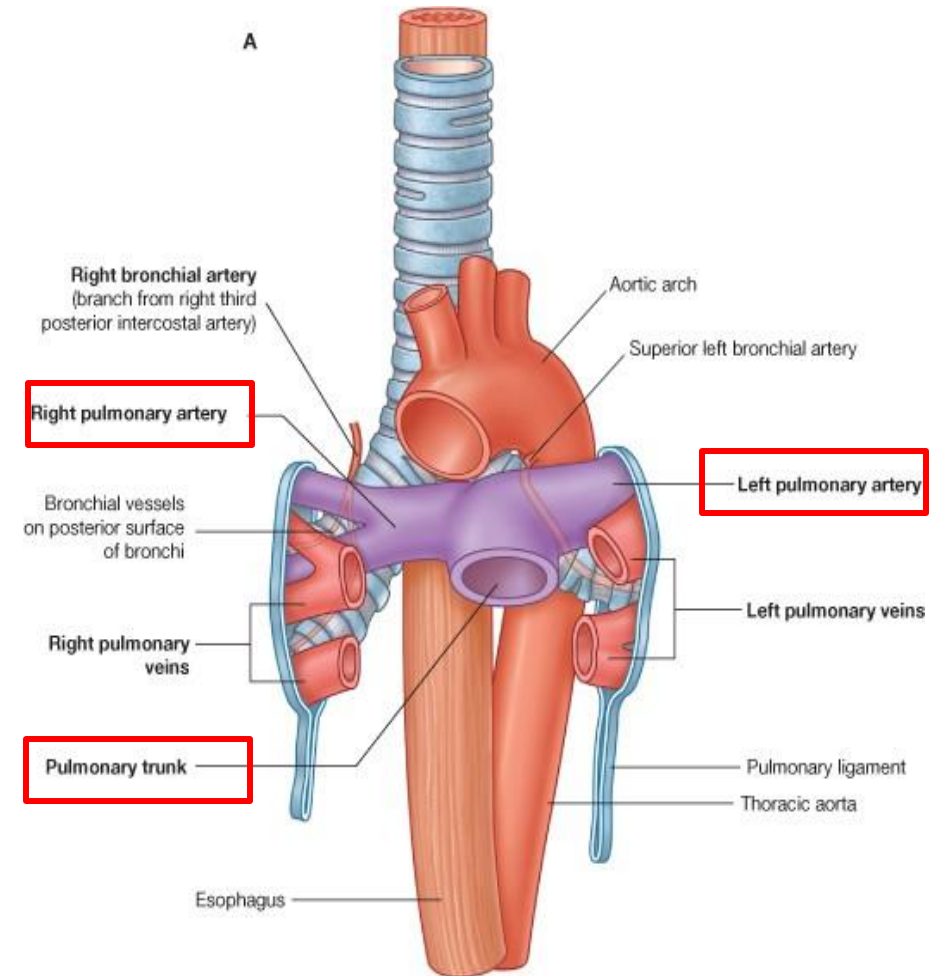


- The pulmonary trunk originates from the right ventricle, where it carries deoxygenated blood from the heart to the lungs. It ascends on the left side of the midline, traveling upward and slightly posteriorly to reach the level of T4, near the sternal angle. At this level (T4), the pulmonary trunk bifurcates into the right and left pulmonary arteries, which deliver blood to the respective lungs for oxygenation. Because the pulmonary trunk is already positioned on the left side of the midline, the left pulmonary artery is shorter, as it directly enters the left lung.





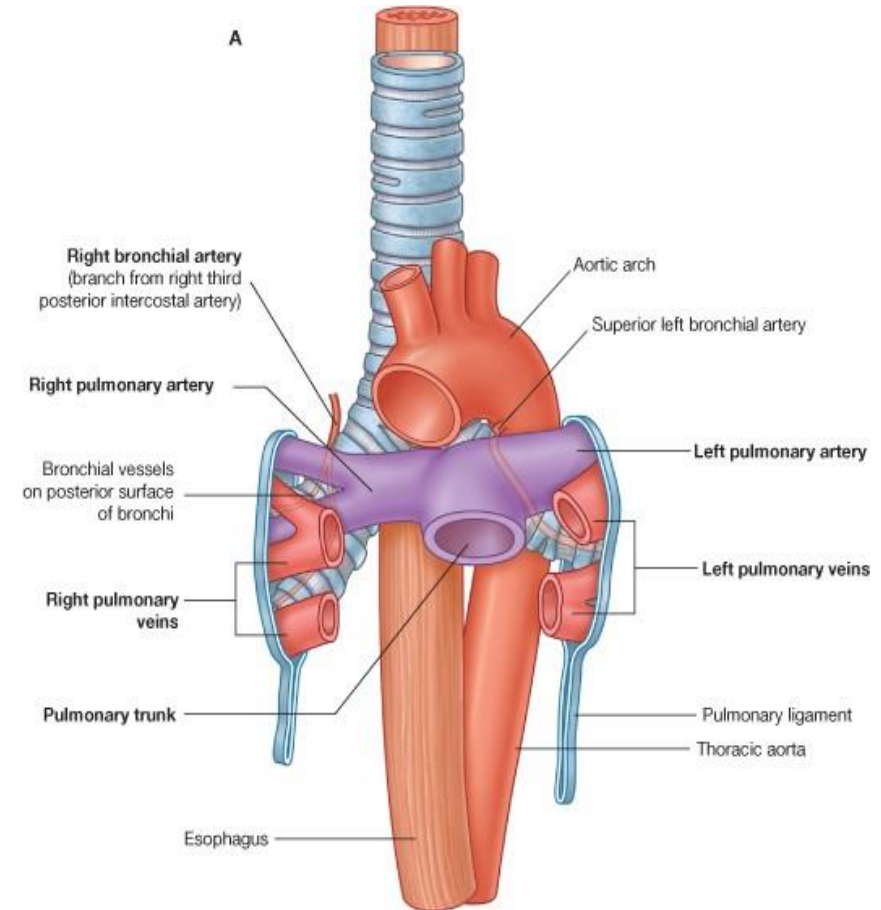
- The **right pulmonary artery** is longer than the left and passes horizontally across the mediastinum. It passes:
  - Anteriorly and slightly inferiorly to the tracheal bifurcation and anteriorly to the right main bronchus.
  - Posteriorly to the ascending aorta, superior vena cava, and upper right pulmonary vein.
- The **left pulmonary artery** is shorter than the right one and lies anterior to the descending aorta and left main bronchus. And posterior to the superior pulmonary vein.



# Pulmonary arteries

- The right and left pulmonary arteries originate from the **pulmonary trunk** and carry deoxygenated blood to the lungs from the right ventricle of the heart
- The bifurcation of the pulmonary trunk occurs to the left of the midline just inferior to vertebral level T4, and anteroinferiorly to the left of the bifurcation of the trachea.
- The **right pulmonary artery** is longer than the left and passes horizontally across the mediastinum. It passes:
  - anteriorly and slightly inferiorly to the tracheal bifurcation and anteriorly to the right main bronchus;
  - posteriorly to the ascending aorta, superior vena cava, and upper right pulmonary vein.

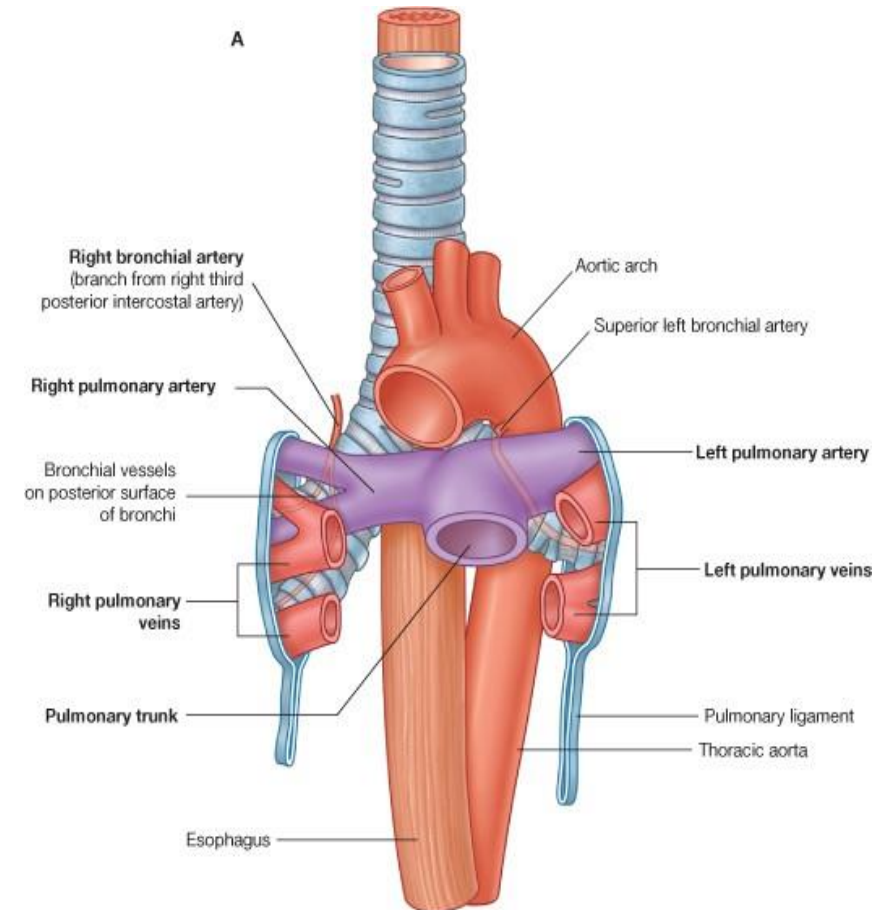
Everything doctor mentioned from this slide was explained in the previous slides.



# Pulmonary arteries

- The right pulmonary artery enters the root of the lung and gives off a large branch to the superior lobe of the lung.
- The main vessel continues through the hilum of the lung, gives off a second (recurrent) branch to the superior lobe, and then divides to supply the middle and inferior lobes
- The **left pulmonary artery** is shorter than the right and lies anterior to the descending aorta and posterior to the superior pulmonary vein
- It passes through the root and hilum and branches within the lung.

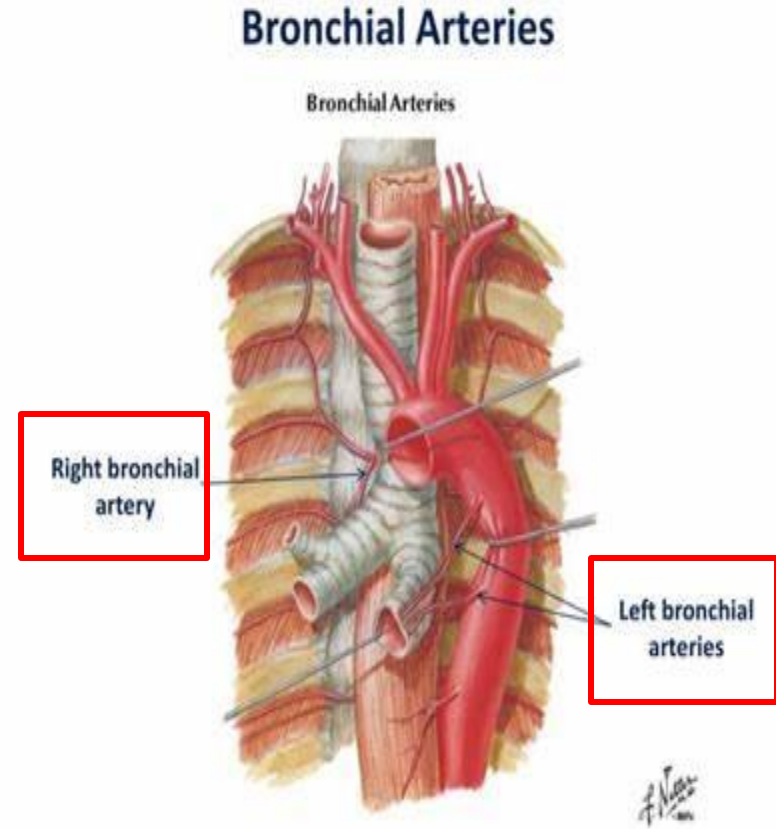
Everything doctor mentioned from this slide was explained in the previous slides.



# Pulmonary veins (4 in numbers [ 2 from right lung and 2 from left lung])

- On each side a **superior pulmonary vein** and an **inferior pulmonary vein** carry oxygenated blood from the lungs back to the heart (left atrium).
- The veins begin at the hilum of the lung, pass through the root of the lung, and immediately drain into the left atrium.

- The bronchial arteries are the primary blood supply to the lungs and visceral pleura (not pulmonary arteries) , providing nutrients and oxygen.
- A single right bronchial artery normally arises from the third posterior intercostal artery.
- Two left bronchial arteries arise directly from the anterior surface of the descending thoracic aorta.
- After branching, these arteries pass through the hilum of the lung and supply the lung tissue and visceral pleura.



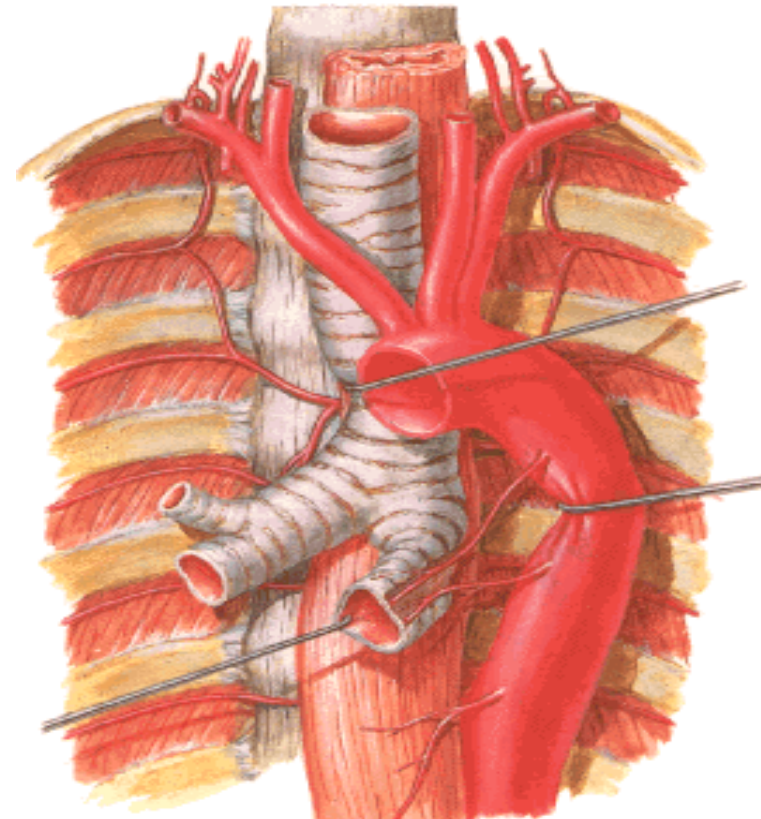


# Bronchial arteries and veins

- constitute the 'nutritive' vascular system of the pulmonary tissues (bronchial walls and glands, walls of large vessels, and visceral pleura).
- They interconnect within the lung with branches of the pulmonary arteries and veins.
- The bronchial arteries originate from the thoracic aorta or one of its branches:
- a single **right bronchial artery** normally arises from the third posterior intercostal artery
- two **left bronchial arteries** arise directly from the anterior surface of the thoracic aorta
- the **superior left bronchial artery** arises at vertebral level T5, and the inferior one inferior to the left bronchus.
- The bronchial arteries run on the posterior surfaces of the bronchi and ramify in the lungs to supply pulmonary tissues.

Everything doctor mentioned from this slide was explained in the previous slide.

## Bronchial Arteries



# bronchial veins

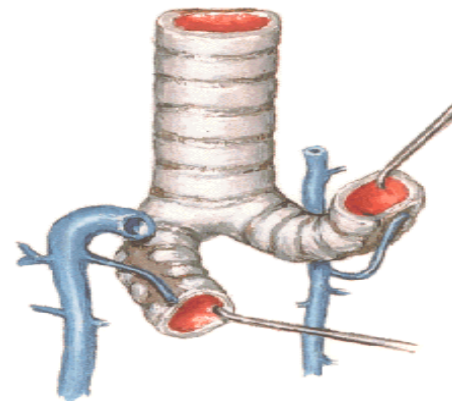
- **bronchial veins** drain into:
- either the pulmonary veins or the left atrium;
- into the azygos vein on the right or into the superior intercostal vein or hemiazygos vein on the left.

Bronchial veins drain into

Mainly into azygous vein (on the right side) or the hemiazygos vein (on the left side), to SVC to the right atrium.

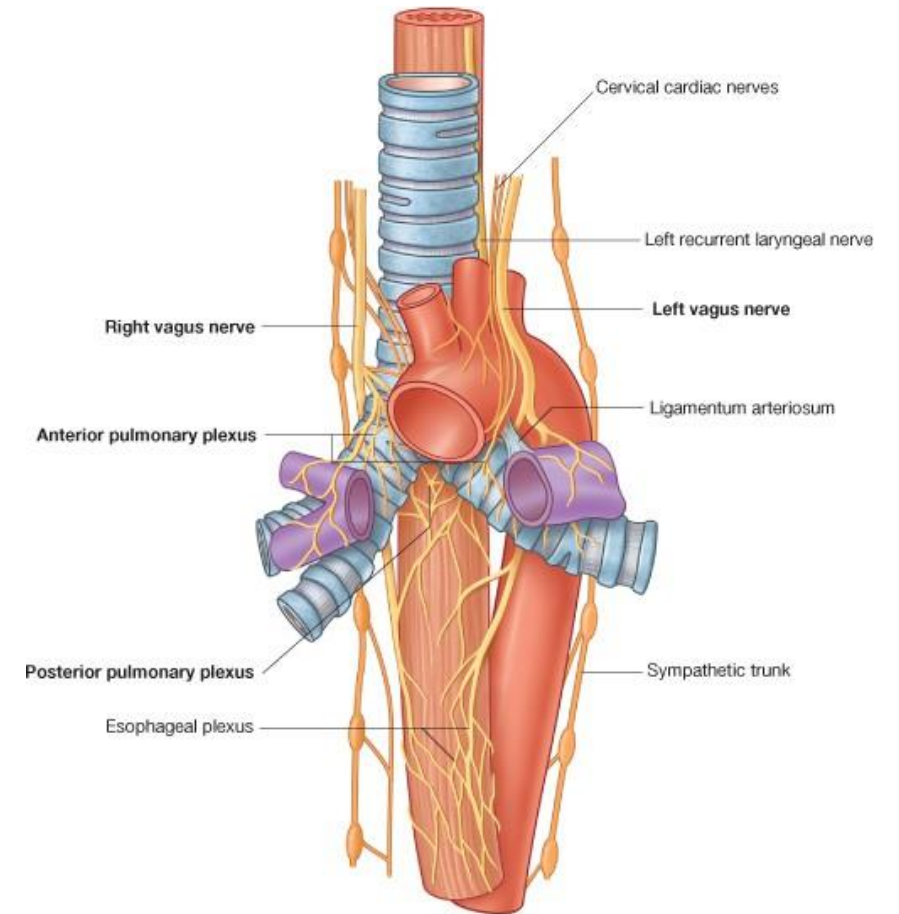
Sometimes may drain to the pulmonary veins. Which empty is the Left atrium, This results in a small mixture of blood in the left atrium, where approximately 2% of the blood is venous (deoxygenated) and 98% remains arterial (oxygenated).

**Bronchial Veins**

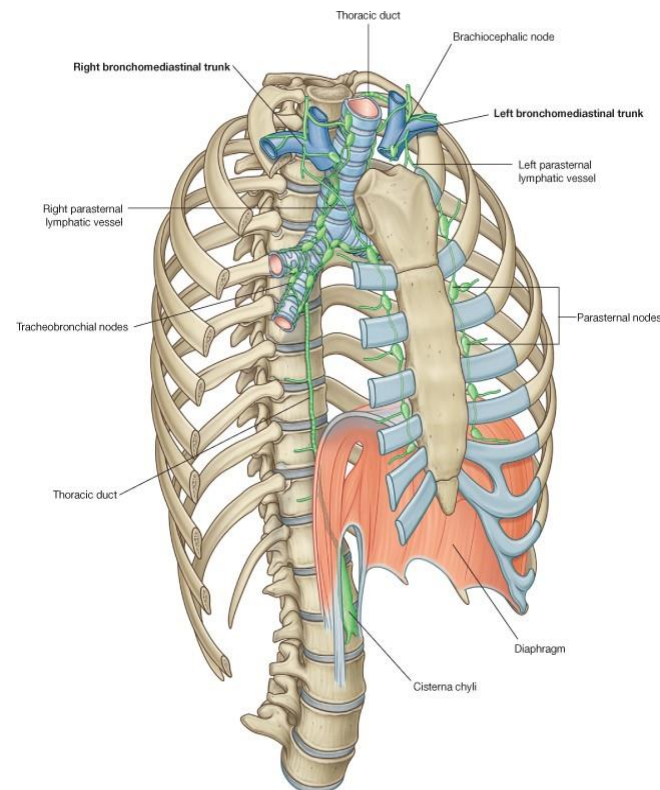


# Innervation

- The visceral pleura and other structures of the lung are supplied by **visceral afferents and efferents** distributed through the **anterior pulmonary plexus and posterior pulmonary plexus**
- These interconnected plexuses lie anteriorly and posteriorly to the tracheal bifurcation and main bronchi.
- The anterior plexus is much smaller than the posterior plexus.
- Branches of these plexuses, which ultimately originate from the sympathetic trunks and vagus nerves (parasympathetic), are distributed along branches of the airway and vessels
- **Visceral efferents** from:
  - the vagus nerves (parasympathetic) constrict the bronchioles; but dilates the vessels.
  - the sympathetic system dilate the bronchioles, but constrict the vessels.



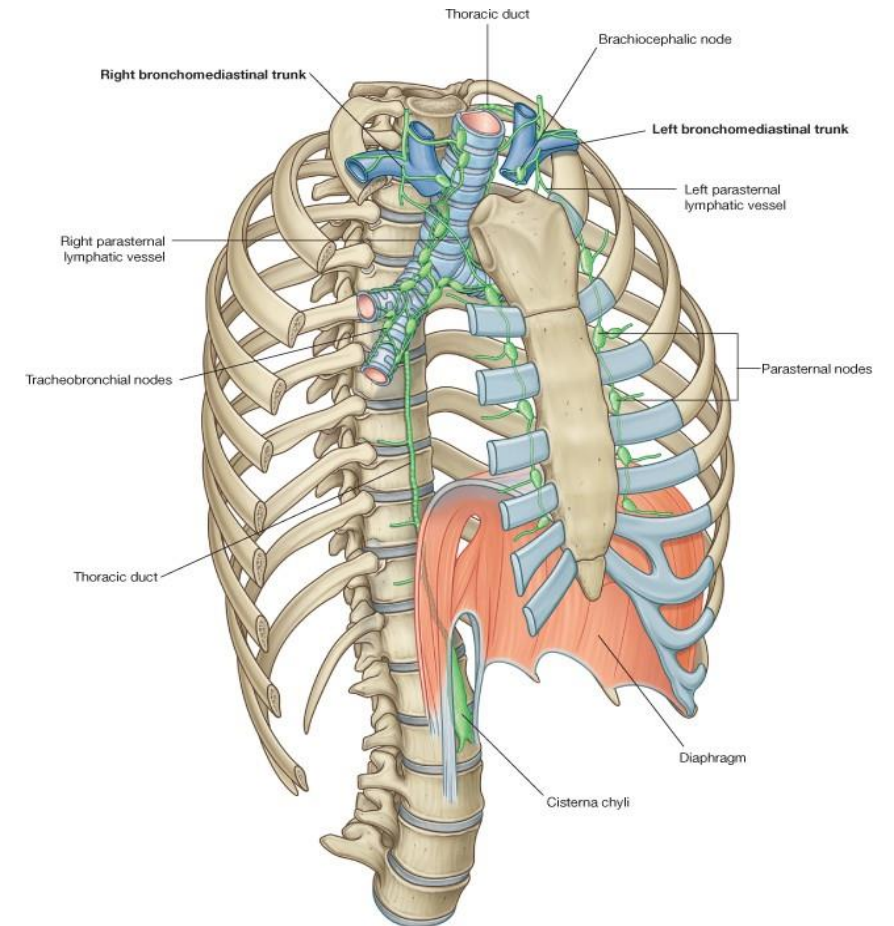
- The lymphatic drainage of the lung consists of both superficial (subpleural) and deep lymphatics, which drain into the tracheobronchial nodes located near the bronchi and trachea. From the **tracheobronchial nodes**, the lymph flows **to the paratracheal nodes** along the trachea and then **to the parasternal nodes** near the sternum. The lymph continues toward the **thoracic duct on the left side of the body, or the right lymphatic duct on the right side**. Ultimately, **both ducts empty into the venous system at the beginning of the brachiocephalic vein**.



# Lymphatic drainage

- Superficial, or subpleural, and deep lymphatics of the lung drain into lymph nodes called **tracheobronchial nodes** around the roots of lobar and main bronchi and along the sides of the trachea
- As a group, these lymph nodes extend from within the lung, through the hilum and root, and into the posterior mediastinum
- Efferent vessels from these nodes pass superiorly along the trachea to unite with similar vessels from **parasternal nodes** and **brachiocephalic nodes**, to form the **right** and **left bronchomediastinal trunks**
- These trunks drain directly into deep veins at the base of the neck, or may drain into the right lymphatic trunk or thoracic duct.

Everything doctor mentioned from this slide was explained in the previous slide.





سُورَةُ يُوسُفَ

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

حَتَّىٰ إِذَا اسْتَيْسَسَ الرُّسُلُ وَظَنُّوا أَنَّهُمْ قَدْ كُذِبُوا  
جَاءَهُمْ نَصْرُنَا فَنُجِّى مَنْ نَشَاءُ وَلَا يُرَدُّ بَأْسُنَا عَنِ الْقَوْمِ  
الْمُجْرِمِينَ ﴿١١٠﴾

VERSIONS	SLIDE #	BEFORE CORRECTION	AFTER CORRECTION
V1→ V2			
V2→V3			



امسح الرمز و شاركنا بأفكارك لتحسين أدائنا !!