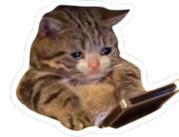


# Trachea & Lung & Pleura

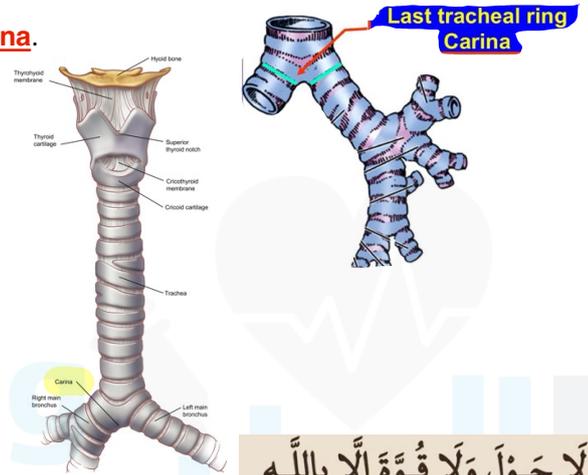


## Trachea

- The trachea is a cartilaginous tube forming part of the respiratory system.
- Length: 10–13 cm
- Beginning: At the level of **C6**, as a continuation of the larynx
- End: In the thorax, slightly to the **right** of the median plane, at the level of the sternal angle (lower border of T4), where it divides into the right and left bronchi

## Structure

- Formed of **18–20 C-shaped** cartilaginous rings.
- The concavity of the ring is directed posteriorly and completed by a **plain muscle (trachealis)** and **fibroelastic tissue**, allowing dilatation of the esophagus during swallowing (deglutition).
- The trachea is slightly deviated to the **right** of the median plane.
- The lower tracheal ring has a keel-like extension known as the **Carina**.



## Cervical part

- Platysma muscle
- Sternohyoid muscle
- Sternothyroid muscle
- Omohyoid muscle
- Sternomastoid muscle
- Deep cervical fascia
- Isthmus of the thyroid gland (in front of 2nd, 3rd, and 4th tracheal rings)

## Thoracic part

- Inferior thyroid veins
- Left brachiocephalic vein
- Recurrent laryngeal nerves (**between trachea and esophagus**)
- Arch of aorta

## Left Relations

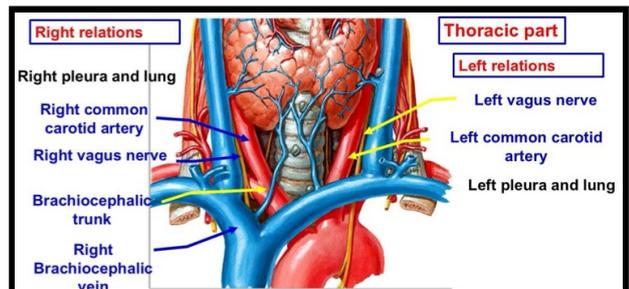
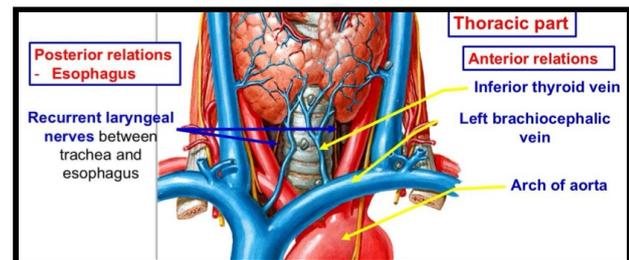
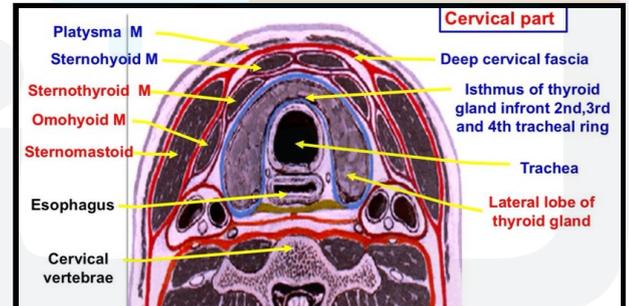
- Left pleura and lung
- Left common carotid artery
- Left vagus nerve
- Arch of aorta
- Left brachiocephalic vein

## Right Relations

- Right pleura and lung
- Right common carotid artery
- Right vagus nerve
- Brachiocephalic trunk
- Right brachiocephalic vein

## Posterior Support

- Cervical vertebrae (behind the trachea)



## Blood Supply

- Cervical part: by inferior thyroid vessels
- Thoracic part: by bronchial vessels

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## Nerve Supply

- Autonomic fibers from both vagi and both sympathetic chains

## Lymphatic Drainage

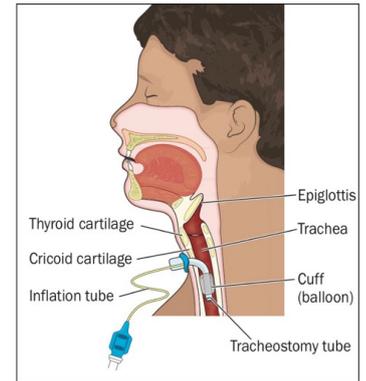
- Pretracheal and paratracheal lymph nodes

## Tracheostomy

- A tube inserted in the trachea approximately **midway between the thyroid cartilage and the suprasternal notch, just below the cricoid cartilage.**

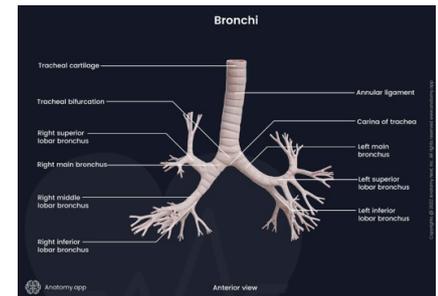
Indications (temporary or permanent):

- Airway obstruction in the upper airway (nose or mouth)
- Long-term ventilation
- Surgical procedures involving the neck or face
- Breathing muscle paralysis



## Bronchi

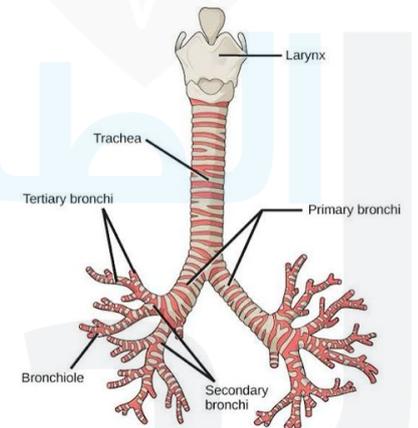
Left Bronchus	Right Bronchus	Feature
Narrow & long	Wide & short	<b>Diameter</b>
More oblique; forms angle about <b>45°</b> with trachea	More vertical; forms angle about <b>15°</b> with trachea	<b>Direction</b>
—	Foreign bodies and aspirated material are more likely to pass into the <b>right lung</b>	<b>Clinical Note</b>



Vomiting during operation leading to Pneumonia in the right lung (patient must be fasting more than 3 hours before surgery)

- Bronchial asthma** is a chronic respiratory disease that causes inflammation and narrowing of the airways, leading to symptoms like cough, wheezing, and shortness of breath.
- Causes: dust mites and pollen, irritants (as smoke, and vehicle exhaust; perfumes and cleaning products)
- T: bronchodilators and corticosteroids

Treatment: bronchodilators and corticosteroids (oral, injection, inhalation)

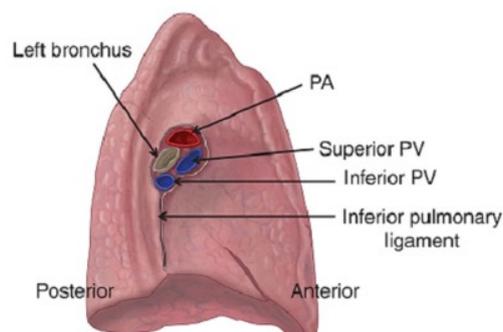


## Pleura

- The pleura is a closed serous sac that is invaginated by the lung from its medial side.
- It consists of two layers:
  - Parietal pleura
  - Visceral pleura
- It contains serous fluid, which acts as a lubricant to reduce friction between the two layers during respiration.

## Hilum (Root) of the Lung

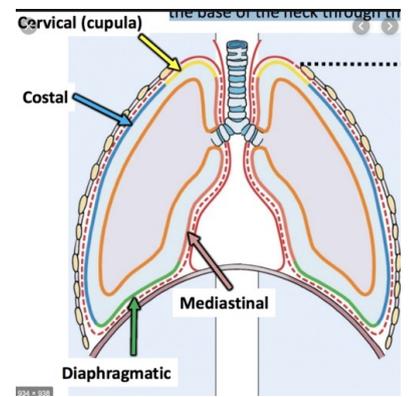
- The hilum is the bare area of the lung not covered by pleura.
- Pulmonary ligament:** A thickened part of the pleura below the root of the lung.
  - Allows free movement of the root of the lung during deep inspiration.
  - Acts as dead space for distension of **pulmonary veins** during increased blood return from the lungs.



## Pleura

### Parts of the Parietal Pleura

1. **Cervical (Cupula)**
  - Covers the apex of the lung
  - Bulges through the thoracic inlet to the neck
  - Covered by suprapleural membrane (Sibson's fascia).
  - Relations:
    - **Anteriorly:** Subclavian artery
    - **Posteriorly:** Neck of 1st rib (separated by 1st intercostal nerve, superior intercostal artery, sympathetic trunk)
2. **Costal pleura**
3. **Mediastinal pleura**
4. **Diaphragmatic pleura**



### Nerve Supply of Pleura

Nerve Supply	Pleura Type
Intercostal nerves	Costal pleura
Phrenic nerves	Mediastinal pleura
Phrenic and intercostal nerves	Diaphragmatic pleura
Autonomic nerves (anterior & posterior pulmonary plexuses)	Visceral pleura

### Blood Supply of Pleura

Blood Supply	Pleura Type
Intercostal vessels	Costal pleura
Pericardio-phrenic vessels	Mediastinal pleura
Pericardio-phrenic & intercostal vessels	Diaphragmatic pleura
Bronchial vessels	Visceral pleura

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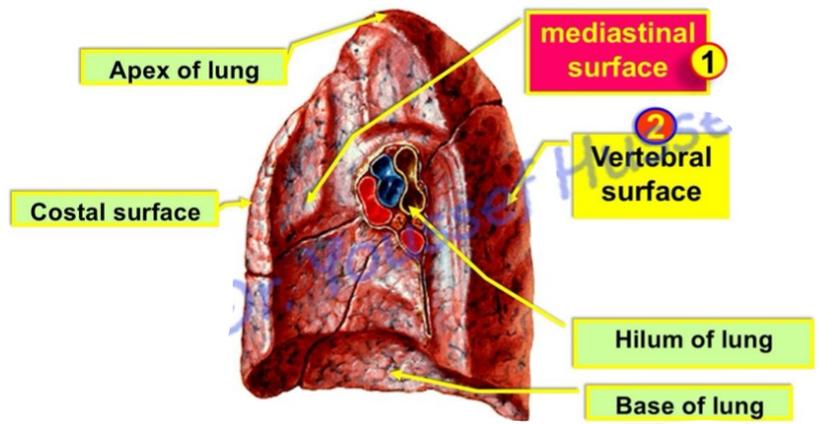
### Clinical Anatomy of Pleura

- **Pleurisy** ([inflammation of pleura](#)): Causes roughness of pleural surfaces → friction during respiration → severe pain on inspiration.
- **Pleural rub:** Friction sound heard with a stethoscope during respiration.
- Referred pain:
  - **Irritation of costal pleura** → pain referred to **thoracic wall/anterior abdomen (intercostal nerves)** → may be mistaken for acute abdominal pain.
  - **Irritation of mediastinal pleura** → pain referred to **shoulder (supraclavicular nerves C3–C4)**.

## Lungs

### Surfaces

- Apex
- Base
- Costal surface
- Mediastinal surface
- Vertebral surface
- Hilum



### Right vs. Left Lung

Left Lung	Right Lung	Feature
Smaller	Larger	Size
Longer & narrower	Shorter & wider	Length & Breadth
Cardiac notch & lingula below it	Straight	Anterior border
1 (oblique)	2 (oblique & horizontal)	Fissures
2 (upper, lower)	3 (upper, middle, lower)	Lobes

### Surface Anatomy of Pleura

1. **Apex:** One inch above the **middle** of the **medial 1/3** of the clavicle

2. **Anterior border:**

- From apex → **downward & medially** behind *sternoclavicular joint* → sternal angle (2nd costal cartilage, median plane).
- **Right side:** Descends vertically to level of **6th costal cartilage**.
- **Left side:** Descends to **4th costal cartilage**, then deviates laterally to reach left **6th costal cartilage** at the side of sternum.

3. **Inferior border** (Pleura = 0, 2, 4, 6, 8, 10, 12):

- 8th rib (**midclavicular line**)
- 10th rib (**midaxillary line**)
- 12th thoracic spine (**1 inch lateral to median plane, paravertebral line**)

4. **Posterior border:** Line upward from last point to apex.

### Surface Anatomy of Lung

1. **Apex:** One inch above the **middle** of the **medial 1/3** of the clavicle

2. **Anterior border:**

- From apex → **downward & medially** behind *sternoclavicular joint* → sternal angle (2nd costal cartilage).
- **Right side:** Descends vertically to **6th costal cartilage**.
- **Left side:** Descends to **4th costal cartilage**, then deviates laterally to **6th costal cartilage** at the side of sternum.

3. **Inferior border** (Lung = 0, 2, 4, 6, 6, 8, 10):

- 6th rib (**midclavicular line**)
- 8th rib (**midaxillary line**)
- 10th thoracic spine (**1 inch lateral to median plane, paravertebral line**)

4. **Posterior border:** Line upward from last point to apex.

## Main Differences Between Pleura and Lung (Surface Anatomy)

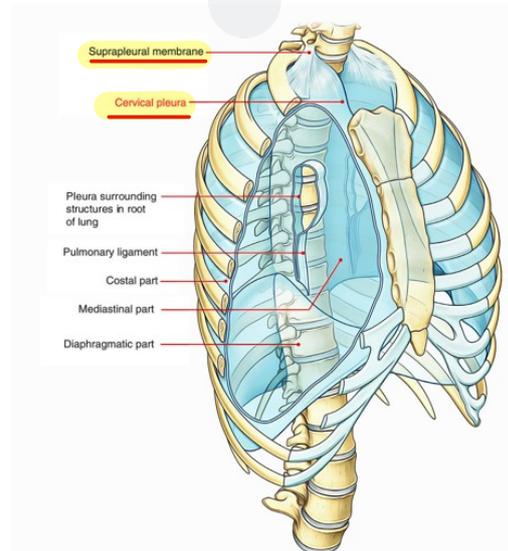
Explanation	Lung	Pleura	Feature
No difference in apex position.	Same (1 inch above the middle of the medial 1/3 of the clavicle)	1 inch above the middle of the medial 1/3 of the clavicle	1. Apex
No major difference except that the pleura extends slightly lower medially.	Same pathway as pleura.	Both start from the apex → behind sternoclavicular joint → sternal angle. • Right: descends to 6th costal cartilage. • Left: descends to 4th costal cartilage, then deviates laterally to 6th costal cartilage (sternal margin).	2. Anterior Border
The pleura extends two ribs below the lung to form the costodiaphragmatic recess.	Lung ends higher. • 6th rib (midclavicular line) • 8th rib (midaxillary line) • 10th thoracic spine (paravertebral line)	Pleura lies lower than the lung by about two ribs. • 8th rib (midclavicular line) • 10th rib (midaxillary line) • 12th thoracic spine (paravertebral line)	3. Inferior Border
No difference here.	Same as pleura	Line upward from last point to apex	4. Posterior Border

In short:

- Apex and posterior border → same for both.
- Anterior border → nearly the same, only slight difference near the left 4th costal cartilage.
- **Inferior border → main difference → pleura is 2 ribs lower than the lung.**

### Clinical Note

- The **cervical dome of the pleura and apex of the lungs** extend into the **neck**, covered by the **suprapleural membrane**.
- Therefore, they are vulnerable to stab wounds in the root of the neck or damage by an anesthetist's needle during a lower trunk brachial plexus nerve block.



## Surface Anatomy of the Fissures of the Lung

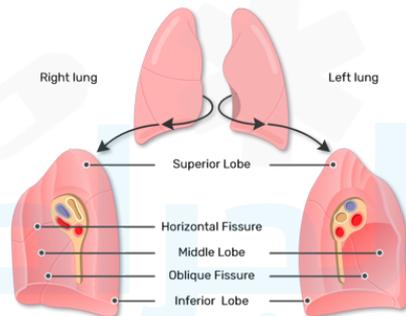
### B - Surface Anatomy of the Fissures of the Lungs

#### 1. The Oblique Fissure (in both right and left lungs):

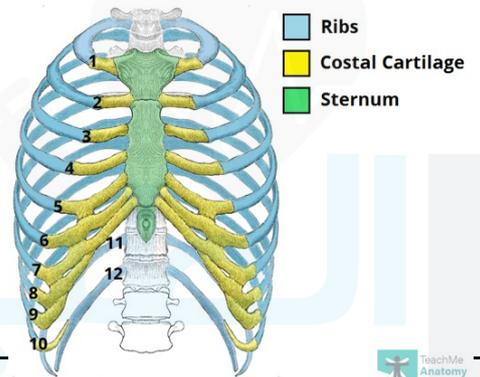
- Draw a line extending from the **posterior border** at a point at the level of the **3rd thoracic spine** (opposite the root of the spine of the scapula).
- The line is directed **downward** and **forward** to the **inferior border** at the **6th costochondral junction**.
- Roughly, the oblique fissure corresponds to the **medial border** of the **scapula** when placing the hand on the back of the head (**abduction**).

#### 2. The Horizontal Fissure (only in the right lung):

- From a point at the **anterior border opposite the 4th costal cartilage**, draw a line horizontally **backward** to meet the **oblique fissure at the right 5th rib** in the **midaxillary line**.



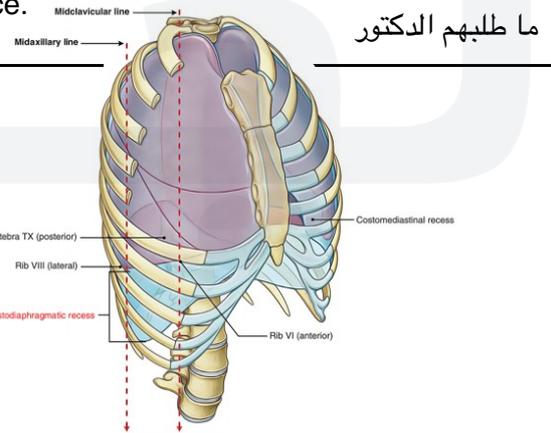
Mediastinal surface of the lungs



TeachMe Anatomy

### Lobes

- Upper lobe: the apex, upper part of anterior, greater part of mediastinal surface, and part of the costal surface.
- Lower lobe: greater part of the posterior and most of the costal surface.
- Middle lobe: lower part of anterior surface of the right lung.

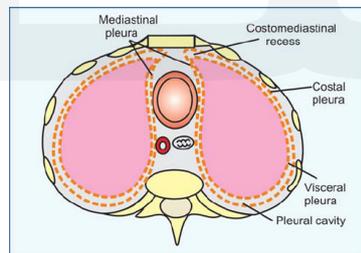


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### Pleural Recesses

#### Types

- **Costodiaphragmatic recess**
- **Costomediastinal recess**
- **Costodiaphragmatic angle**



#### Definition

- Narrow spaces inside the pleural cavity containing serous fluid for lubrication.

#### Importance

- They allow distension of the lungs during full inspiration.

#### Types of Pleural Recesses

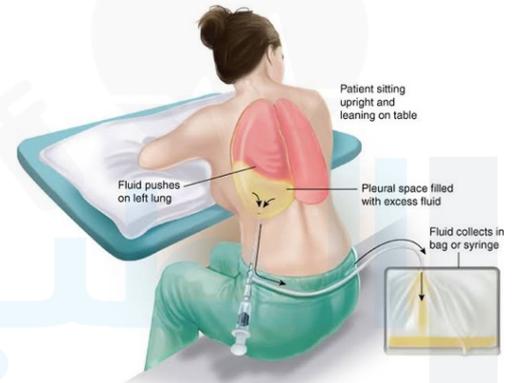
1. **Costodiaphragmatic recess**: between thoracic wall and diaphragm along the **inferior** border of the lung (larger and more important).
2. **Costomediastinal recess**: between the thoracic wall and mediastinum along the **anterior** border of the lung.

## Pathological Conditions

- **Hydrothorax** (pleural effusion): accumulation of serous fluid.
- **Chylothorax**: accumulation of lymph.
- **Hemothorax**: accumulation of blood.
- **Pyothorax** (Empyema): accumulation of pus.
- **Pneumothorax**: accumulation of air in the pleural cavity by stab wounds.
- **Hydropneumothorax**: air + serous fluid.
- **Pyopneumothorax**: air + pus.
- **Hemopneumothorax**: air + blood.

## Pleural Aspiration (Thoracentesis)

- Medical procedure involving the insertion of a needle or catheter into the pleural space to remove excess fluid.
- Best position: sitting on a chair or bed with arms resting on a table.
- **Site selection: intercostal space below one or two spaces from the dullness area (upper level of fluid), in the midaxillary or midposterior line.**
- The needle or catheter is inserted **directly above a rib** to avoid injury to the neurovascular bundle.
- Ultrasound guidance is often used.



## Relations of the Lungs

### 1. Apex

- Covered by the suprapleural membrane.

### 2. Base

- Related to:
- Right lung: right cupola of diaphragm and right lobe of liver.
- Left lung: left cupola of diaphragm, left lobe of the liver, spleen, and fundus of the stomach.

### 3. Costal Surface

- Smooth and convex.
- Related to:
- a) Ribs and their costal cartilages.
- b) Intercostal muscles, nerves, and vessels.

### 4. Medial Surface

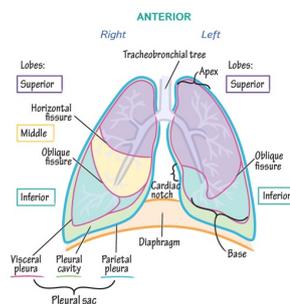
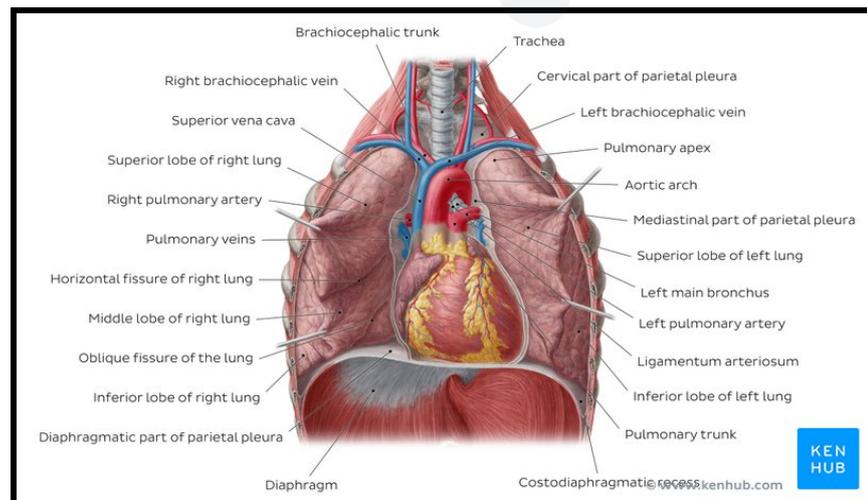
Contains the hilum, divided into two parts:

#### I. Posterior Part (Vertebral Surface):

- Related to:
- Vertebral column and intervertebral discs.
- Sympathetic chains and splanchnic nerves.
- Posterior intercostal nerves and vessels.

#### II. Anterior Part (Mediastinal Surface):

(See below)

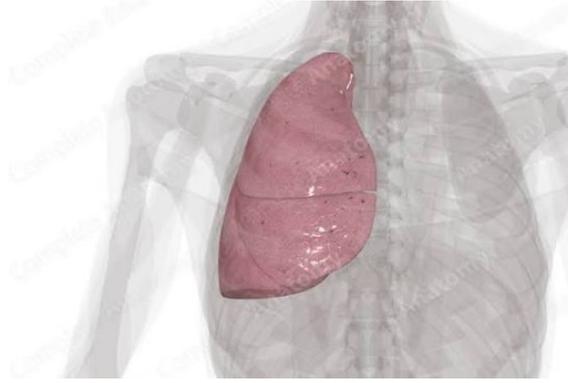


# Right Lung

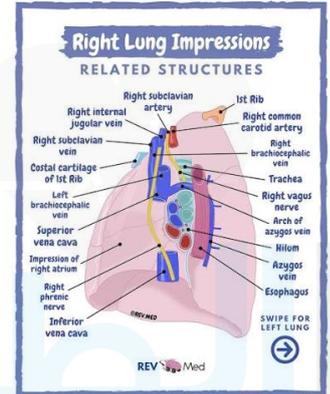
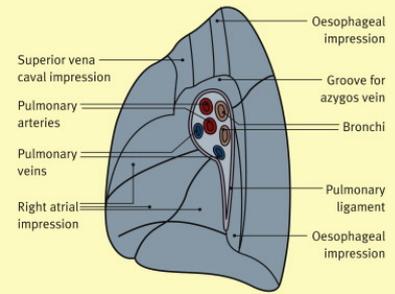
## Relations of the Mediastinal Surface of the Lungs

### Structures:

- Esophagus
- Arch of azygos vein
- Azygos vein
- Thoracic vertebra
- Root of right lung
- Trachea
- Right vagus nerve
- Right brachiocephalic vein
- Ascending aorta and thymus gland
- Superior vena cava (SVC)
- Cardiac impression (Right Atrium)
- Inferior vena cava (IVC)
- Right phrenic nerve
- Pericardiophrenic vessels



Medial surface of the right lung



### Mediastinal Surface of the **Right Lung**

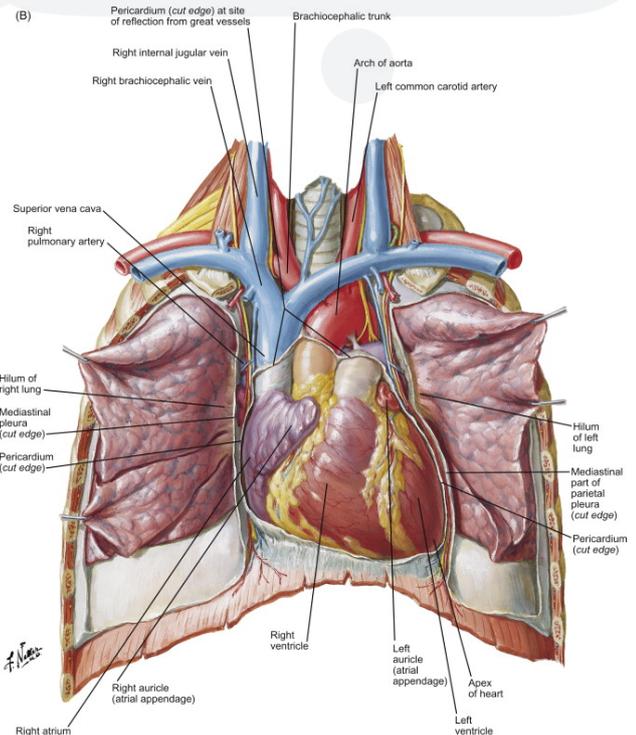
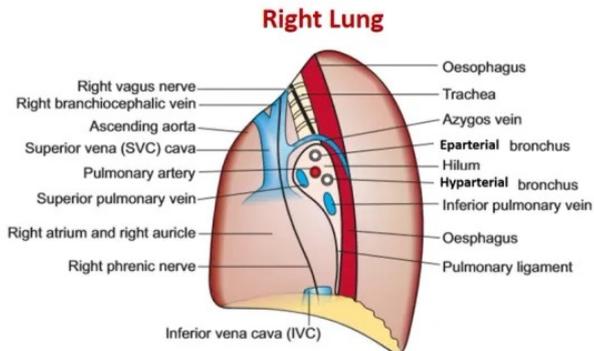
- **In front of the hilum:**
- Pericardial impression (pericardium and right atrium)
- Groove for SVC (vertical, in front of upper hilum, with right phrenic nerve) Continue above with brachiocephalic vein
- Ascending aorta and thymus gland (anterior to groove of SVC)

### Above the hilum:

- Groove for arch of azygos vein
- Above the arch: **3 vertical impressions from anterior to posterior:**
- 1. Groove for right brachiocephalic vein and right phrenic nerve
- 2. Groove for trachea and right vagus nerve
- 3. Groove for esophagus

### Behind the hilum:

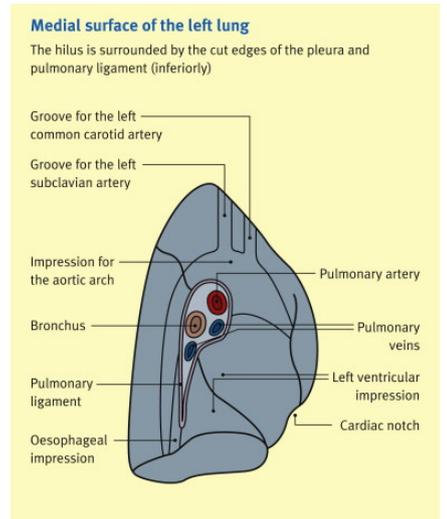
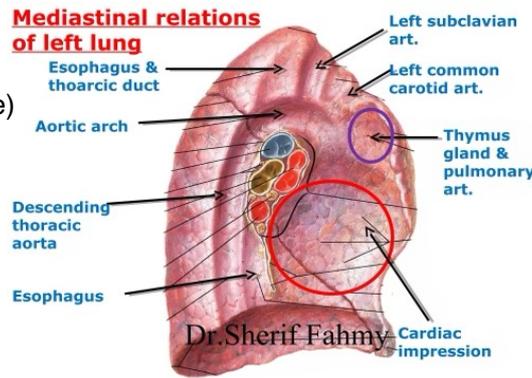
- Groove for azygos vein (upper part)
- Esophagus (lower part)
- **Below the hilum:** Groove for IVC and right phrenic nerve.



Structures:

- Left common carotid artery
- Arch of aorta
- Thymus gland & pulmonary trunk
- Phrenic nerve
- Pericardiophrenic vessels
- Cardiac impression (Left Ventricle)
- Left subclavian artery
- Esophagus
- Thoracic duct
- Left recurrent laryngeal nerve
- Thoracic vertebra
- Descending aorta
- Left phrenic nerve

# Left Lung

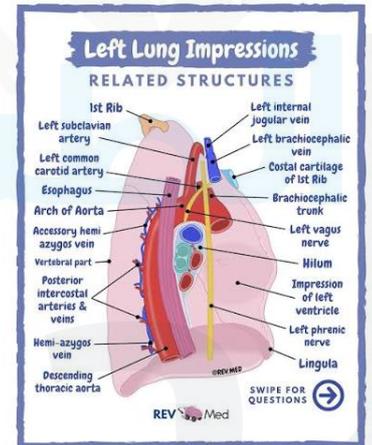


## Mediastinal Surface of the Left Lung

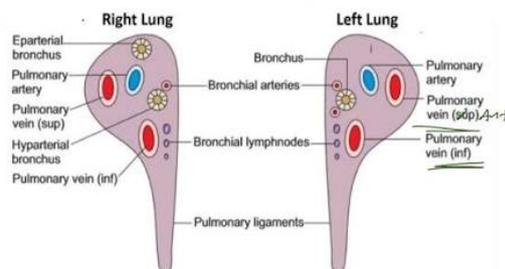
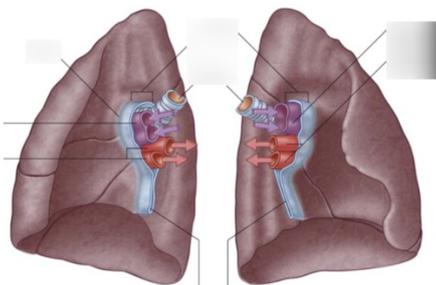
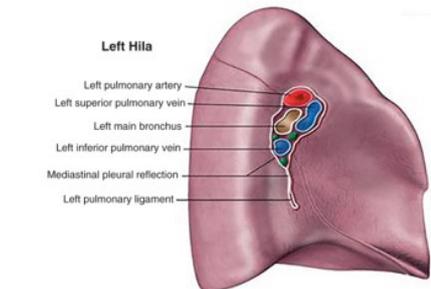
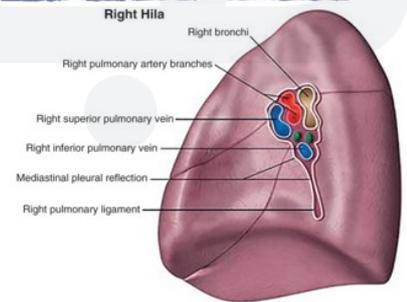
- **In front of the hilum:**
- Pericardial impression (pericardium and left ventricle)
- Pulmonary trunk and thymus gland (anterior border, above pericardial impression)

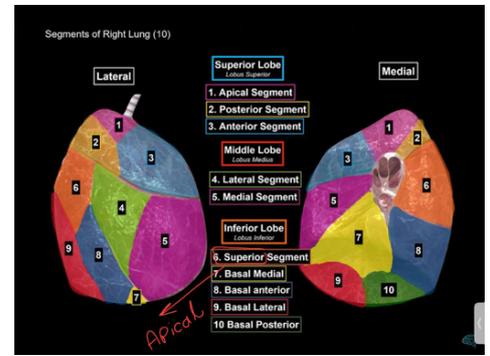
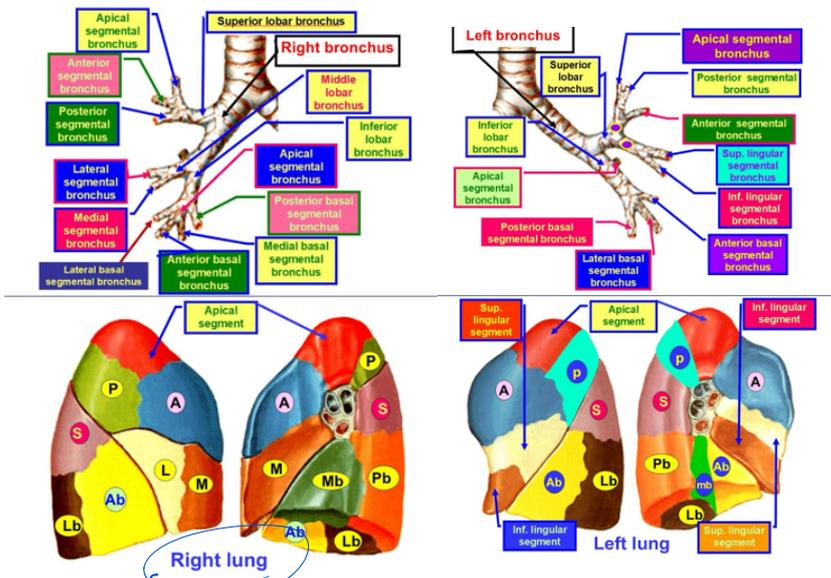
### Above the hilum:

- Groove for arch of aorta
- **Above the arch: 3 vertical impressions from anterior to posterior:**
- 1. Groove for left common carotid artery
- 2. Groove for left subclavian artery
- 3. Groove for esophagus and thoracic duct
- Left phrenic and vagus nerves descend between them. 1&2
- **Behind the hilum:**
- Esophagus (lower part)
- Groove for descending aorta (behind hilum and esophagus)

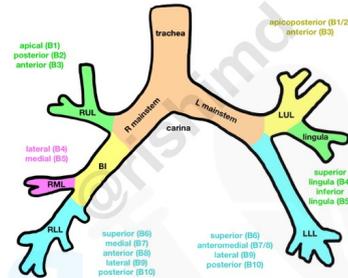


	Hilum of Right lung	Hilum of Left lung
<b>Bronchus</b>	<b>2 bronchi;</b> a) Eparterial (behind and above pulmonary artery). b) Hyparterial (behind and below pulmonary artery).	<b>Only one bronchus</b> (Behind and below pulmonary artery).
<b>Pulmonary A</b>	<b>One artery</b>	<b>One artery</b>
<b>2 pulmonary veins</b>	- Superior in front of pulmonary artery. - Inferior (lower).	- Superior in front of pulmonary artery. - Inferior (lower).
<b>bronchial vessels</b>	<b>Posterior to bronchi</b>	<b>Posterior to bronchi</b>
<b>Lymph nodes</b>	<b>Broncho-pulmonary lymph nodes.</b>	<b>Broncho-pulmonary lymph nodes.</b>





### BRONCHOPULMONARY SEGMENTS



### Bronchopulmonary Segments

- Definition: anatomical, functional, and surgical units of the lungs.
- Right lung: 10 segments.
- Left lung: 9 segments.
- Each segment is pyramidal, with apex at the hilum and base at the outer surface.
- Segments are separated by fibrous septa and supplied by VAB (Vein, Artery, Bronchus).
- Clinical importance: each segment can be removed without affecting others.

### Blood Supply of the Lung

#### Arterial Supply

- Left lung: upper and lower bronchial arteries from descending thoracic aorta.
- Right lung: right bronchial artery from either
- right 3rd posterior intercostal artery, or
- upper left bronchial artery.

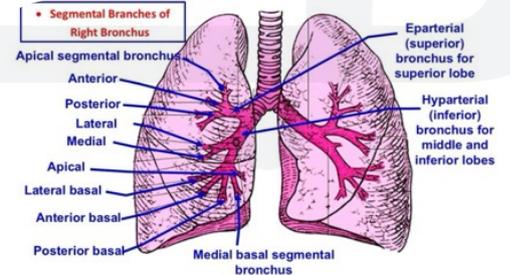
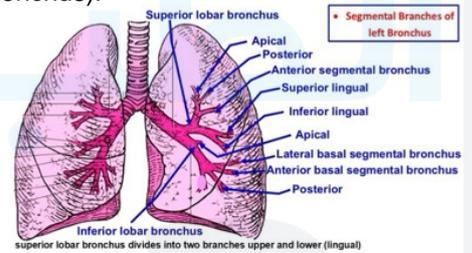
#### Venous Drainage

- Right bronchial veins: drain into arch of azygos vein.
- Left bronchial veins: drain into accessory hemiazygos vein.

#### Nerve Supply

- Anterior and posterior pulmonary plexuses formed of:
- 1. Sympathetic fibers: from 2nd, 3rd, and 4th thoracic sympathetic ganglia.
- 2. Parasympathetic fibers: from vagus nerve.

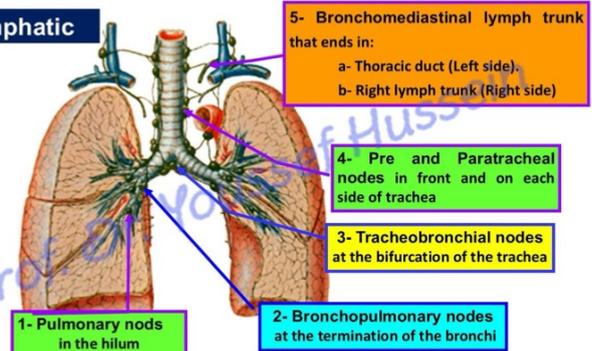
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### Lymphatic Drainage

1. Pulmonary nodes: in the hilum.
2. Bronchopulmonary nodes: at the termination of bronchi.
3. Tracheobronchial nodes: at the bifurcation of trachea.
4. Pre- and paratracheal nodes: in front and on each side of the trachea.
5. Bronchomediastinal lymph trunk:
  - Ends in thoracic duct (left side).
  - Ends in right lymph trunk (right side).

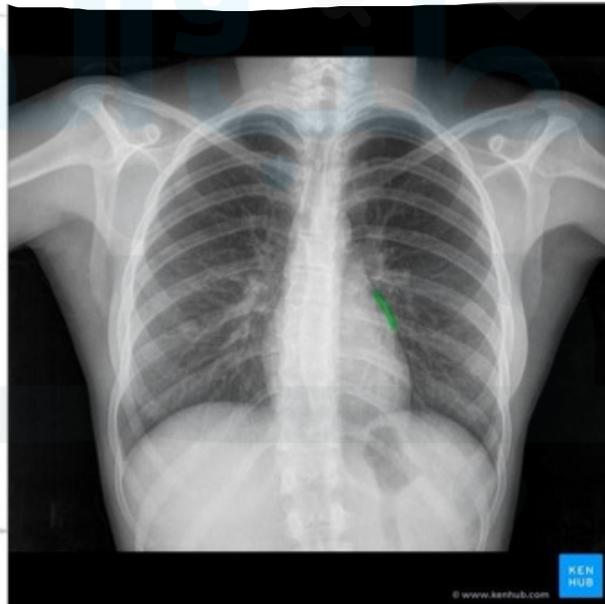
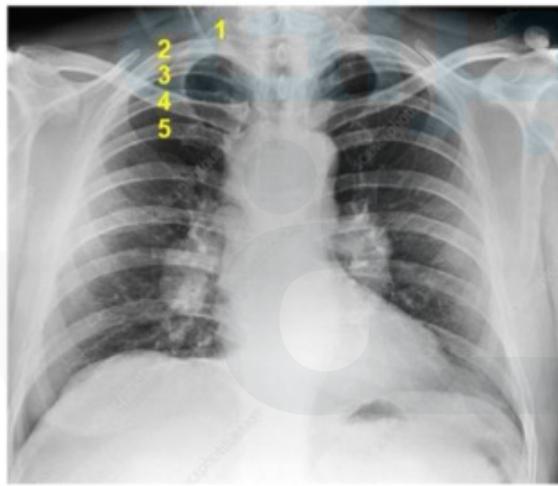
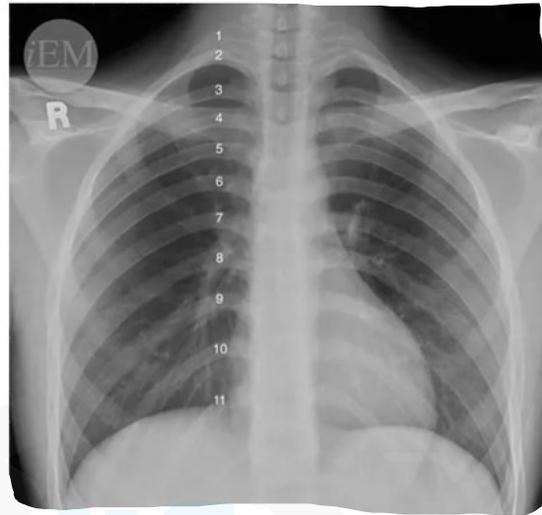
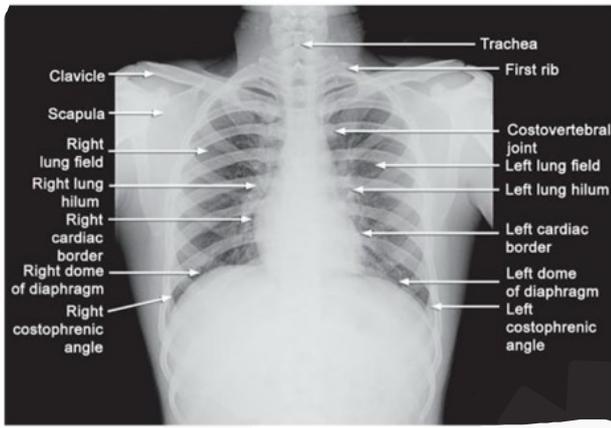
### Lymphatic



### Chest X-ray Landmarks

- Clavicle
- Scapula
- Right lung field
- Right lung hilum
- Right cardiac border
- Right dome of diaphragm
- Right costophrenic angle

# Chest x-ray



Mediastinal Surface of the Right Lung	Mediastinal Surface of the Left Lung	Region
<ul style="list-style-type: none"> <li>• Pericardial impression (pericardium and right atrium)- Groove for SVC (vertical, in front of upper hilum, with right phrenic nerve)- Ascending aorta and thymus gland (anterior to groove of SVC)Continue above with brachiocephalic vein</li> </ul>	<ul style="list-style-type: none"> <li>• Pericardial impression (pericardium and left ventricle)- Pulmonary trunk and thymus gland (anterior border, above pericardial impression)</li> </ul>	In front of the hilum
<ul style="list-style-type: none"> <li>• Groove for arch of azygos vein- Above the arch: 3 vertical impressions from anterior to posterior:1. Groove for right brachiocephalic vein and right phrenic nerve2. Groove for trachea and right vagus nerve3. Groove for esophagus</li> </ul>	<ul style="list-style-type: none"> <li>• Groove for arch of aorta- Above the arch: 3 vertical impressions from anterior to posterior:1. Groove for left common carotid artery2. Groove for left subclavian artery3. Groove for esophagus and thoracic duct- Left phrenic and vagus nerves descend between them.1&amp;2</li> </ul>	Above the hilum
<ul style="list-style-type: none"> <li>• Groove for azygos vein (upper part)- Esophagus (lower part)- Below the hilum: Groove for IVC and right phrenic nerve</li> </ul>	<ul style="list-style-type: none"> <li>• Esophagus (lower part)- Groove for descending aorta (behind hilum and esophagus)</li> </ul>	Behind the hilum

لَا حَوْلَ وَلَا قُوَّةَ إِلَّا بِاللَّهِ  
"من كنوز الجنة"

This file contains all the anatomical information InShaaAllah. Not all the pictures have been attached. To study the pictures, please visit the original file. Good luck.



DR. YOUSSEF HUSSEIN  
DONE BY : RAGHAD MRAYAT