

Anatomy Team

433

*King Saud University
College of medicine
Respiratory Block*

4 Lung And Pelura



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Objectives

- 1) The anatomy of the pleura
- 2) The anatomy of lungs
- 3) The formation of **bronchopulmonary segments** and the main characteristics of these segments in the lung.

Color Index

- Red : Important.
- Violet: Explanation.
- Gray: Additional Notes.

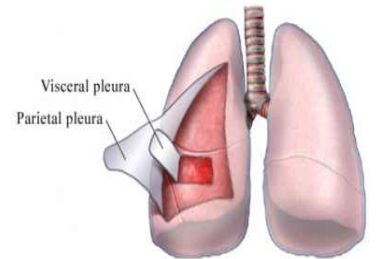
The rest colors are for
Coordination

Say " بسم الله " then start

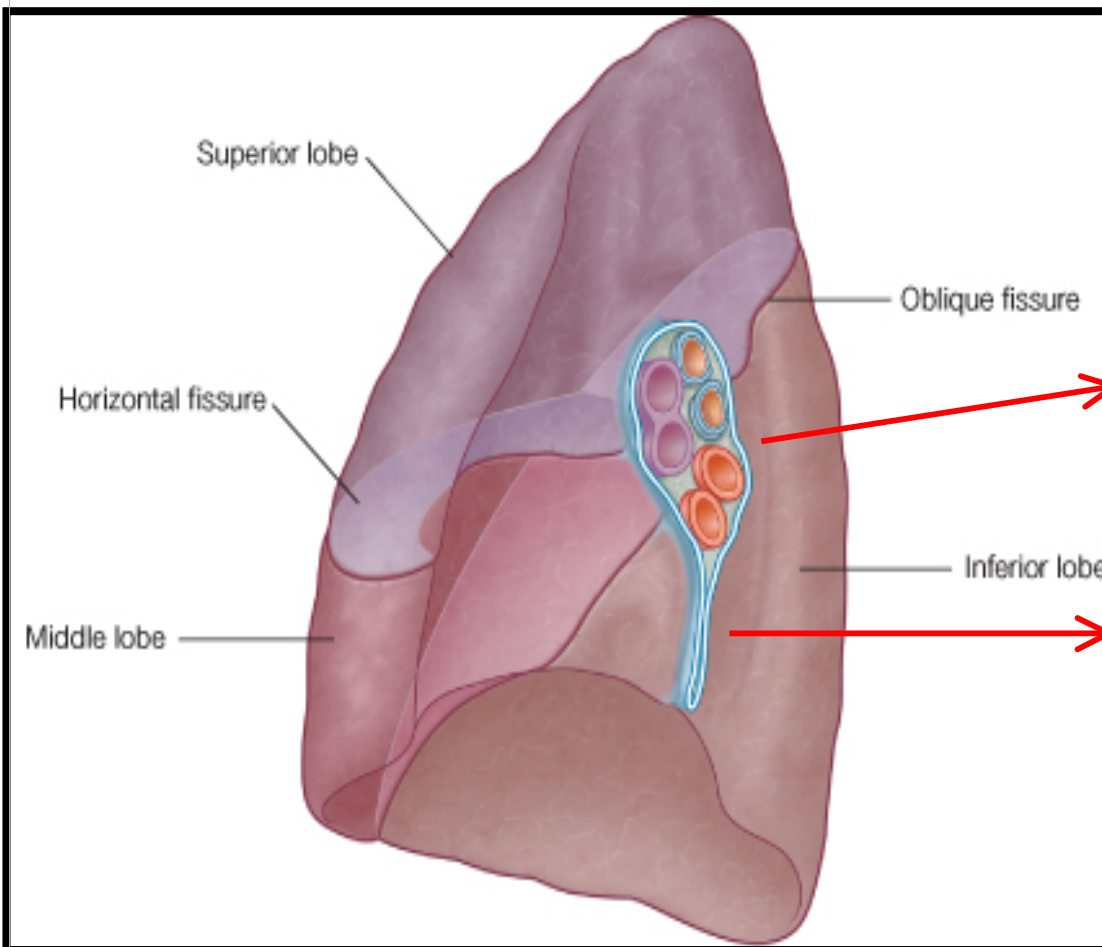
Pleura

Pleura are: double-layered serous membrane **enclosing the lung.**

- Has two layers:
 - Parietal layer:** lines the thoracic walls.
 - Visceral layer:** covers the surfaces of the lung.



The pleural cavity is a space between those two layers, it contains a very thin fluid (5-10 ml)



The two layers continue with each other around the **root** of the lung where it forms a loose cuff hanging down called the ***pulmonary ligament.***

{Parietal Pleura}: divides into:

1) Cervical Pleura:

Projects up into the neck about one inch above the medial 1/3rd of clavicle.
It lines the under surface of the suprapleural membrane.

2) Costal pleura:

Lines **the back** of the:

- A) Sternum,
- B) Ribs & costal cartilages,
- C) Intercostal spaces &
- D) Sides of vertebral bodies

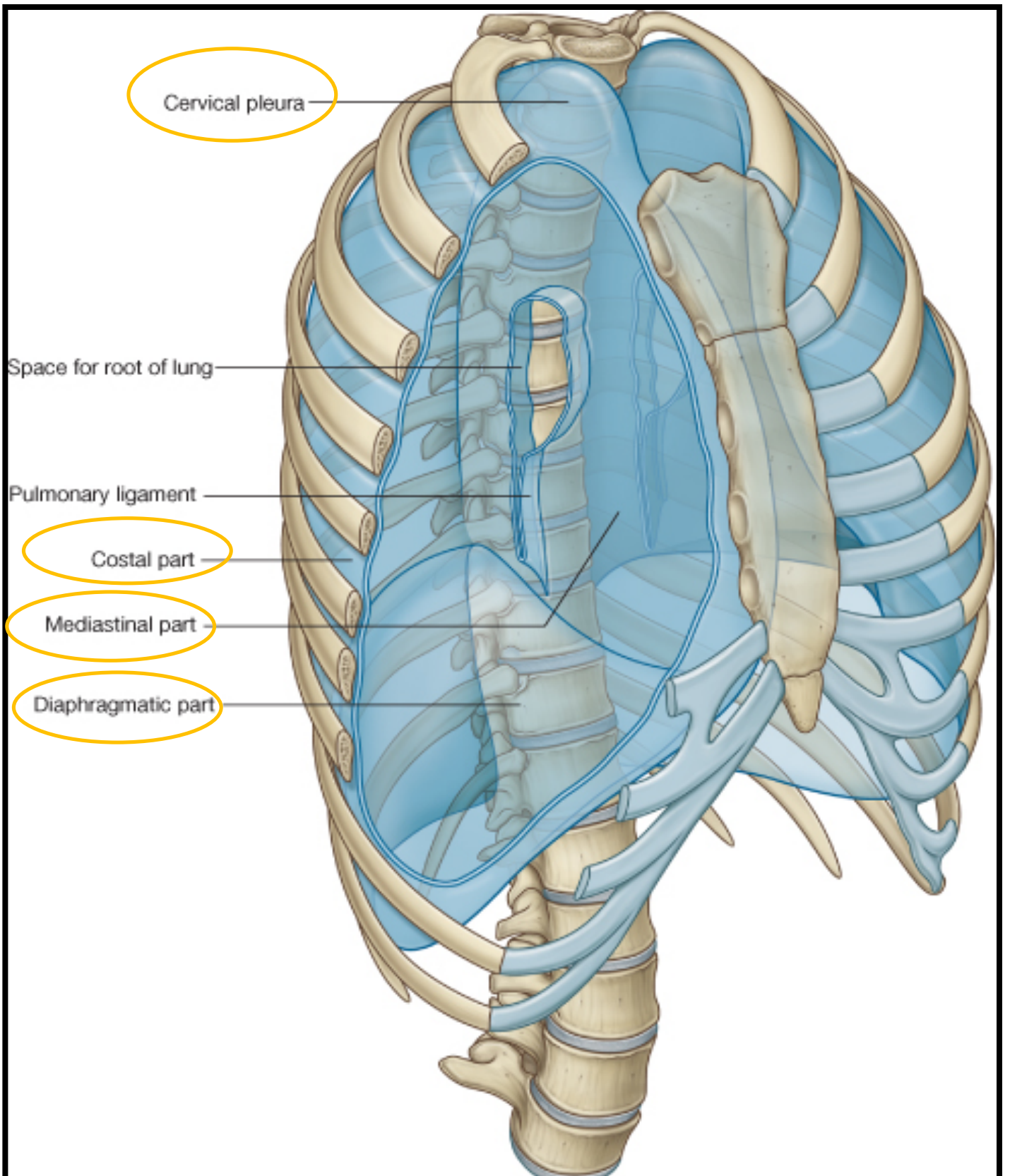
3) Mediastinal pleura:

It covers the mediastinum. At the hilum, it is reflected on to the vessels and bronchi.

It continuous with the visceral pleura.

4) Diaphragmatic pleura:

It covers the thoracic (upper) surface of the diaphragm.



Pleural Recesses

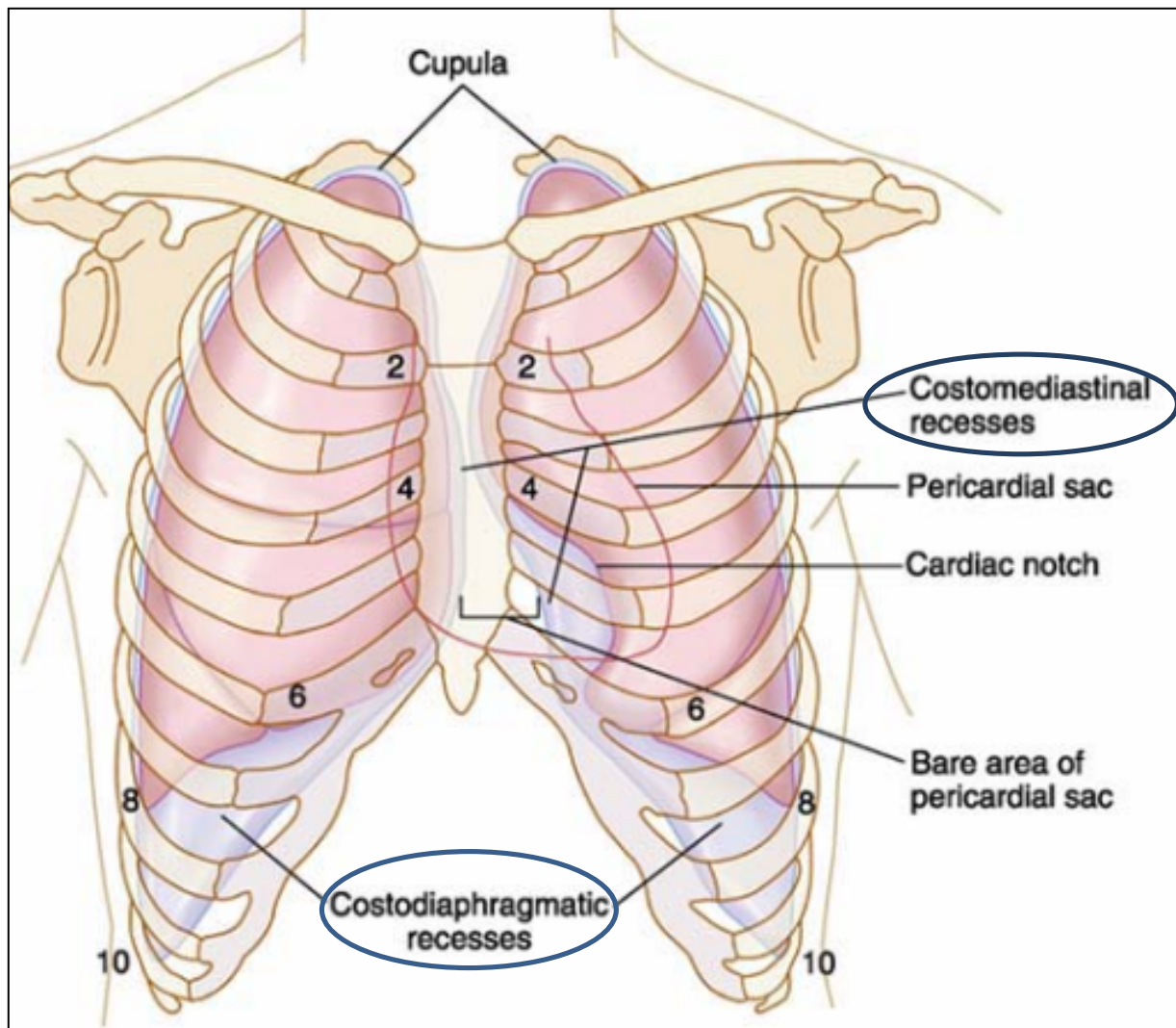
Costodiaphragmatic:

Slit like space between **costal** and **diaphragmatic pleurae**, along the inferior border of the lung

Costomediastinal:

Slit like space between **costal** and **mediastinal pleurae**, along the anterior border of the lung

These two recesses can be filled normally during deep inspiration, and abnormally during pleural effusion (will be explained in next slides)



Nerve supply to the pleura:

A. Parietal pleura:

sensitive to: pain, pressure, temperature, and touch.

supplied by :

- Costal pleura >>> *segmentally supplied by the intercostal nerves.*
- Mediastinal pleura >>> *supplied by phrenic nerves.*
- Diaphragmatic pleura >>> *supplied over the domes (medially) by phrenic nerves, and around the periphery by lower 6 intercostal nerves.*

B. Visceral pleura:

sensitive to: stretch only.

supplied by: the autonomic fibers from the pulmonary plexus.

SURFACE ANATOMY OF PLEURA

Apex (superior & anterior) :

Lies one inch above the medial 1/3 of the clavicle. Then:

Right pleura:

The anterior margin extends vertically from **sternoclavicular joint** to the **6th costal cartilage**.

Left pleura:

The anterior margin extends vertically from **sternoclavicular joint** to the **4th costal cartilage**. **BUT** between the 4th and 6th costal cartilages, there is a deviate for about 1 inch to the left (laterally) to form the **cardiac notch**.

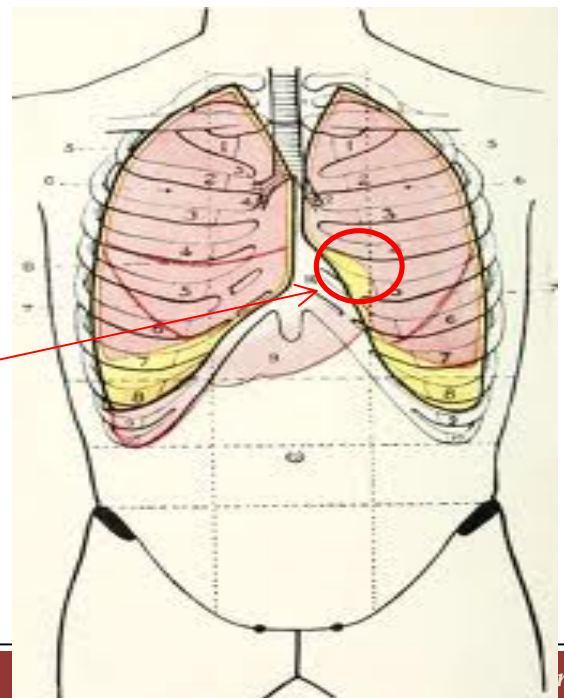
Inferior margin:

Passes around the chest wall, on the **8th rib** in midclavicular line, then to the **10th rib** in mid-axillary line, and finally reaches to the **last thoracic spine**.

Posterior margin:

Along the vertebral column, from the apex to the inferior margin.

The cardiac notch



Pleural Effusion

It is an abnormal accumulation of pleural fluid, about **300 ml**, in the *Costodiaphragmaticpleural recess*. (what is the normal !!!)

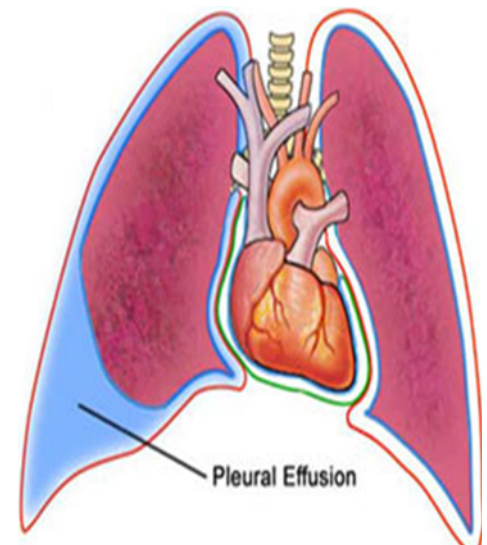
This causes the lung to be compressed, & the bronchi to be narrowed.

Causes:

- Inflammation,
- TB,
- congestive heart disease,
- malignancy.

Auscultation would reveal only faint & decreased breathing sounds over compressed or collapsed lung lobe.

Dullness on **percussion** over the effusion.



The lungs

- Located in the thoracic cavity, one on each side of the mediastinum
- Each lung :
 - a) Conical in shape.
 - b) Covered by the visceral pleura.
 - c) Suspended free in its own pleural cavity.
 - d) Attached to the mediastinum only by its root.
 - e) Has apex and base
 - ✓ *has an apex*: which projects into the root of the neck (1/2 an inch above medial 1/3 of clavicle, see surface of the pleura), covered by **cervical pleura** and grooved anteriorly by subclavian artery.
 - ✓ *has a base*: (Inferior or diaphragmatic surface) is concave and rests on the diaphragm.
 - f) Has a costal surface (surrounded by the ribs from front and back).
 - g) Medial surface :
 - ✓ where the bronchi, blood vessels and lymphatic vessels enter the lung at the hilum
 - ✓ related to the structures forming the mediastinum

Borders of the lung:

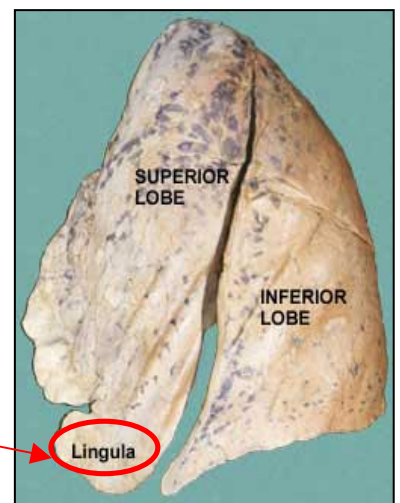
Anterior border:

Both lungs: Is **sharp, thin**, and overlaps the heart.

left lung: presents a cardiac notch at its lower end, and has a thin projection called the **lingula** below the cardiac notch.

Posterior border:

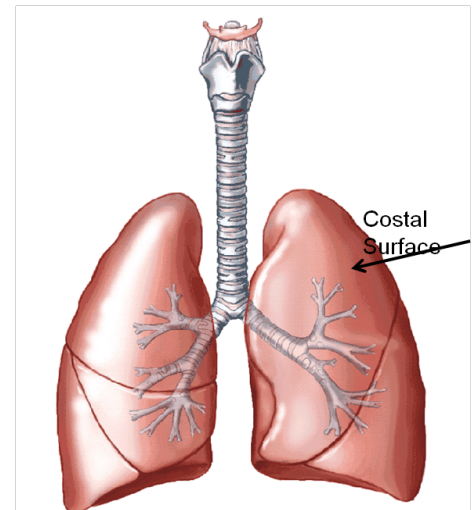
Is **rounded, thick**, and lies beside the vertebral column.



Surfaces of lung:

Costal surface:

Convex and covered by costal pleura which separates lung from: ribs, costal cartilages, & intercostal muscles.

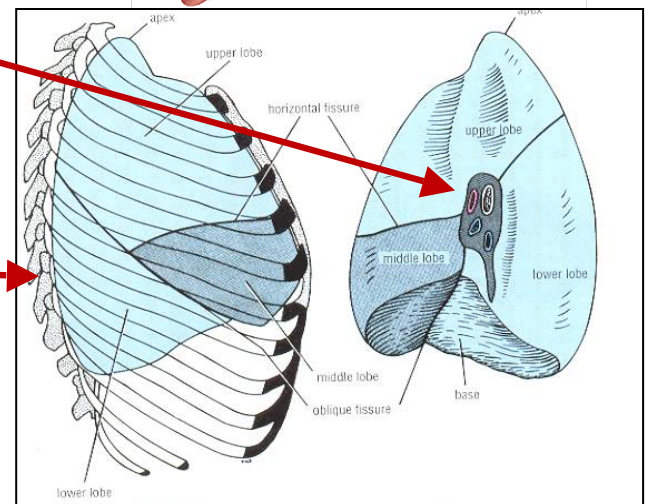


Medial surface:

1) Anterior (mediastinal) part: Contains a hilum in the middle (it is a depression in which bronchi, vessels, & nerves forming the root of lung).

2) Posterior (vertebral) part: It is related to:

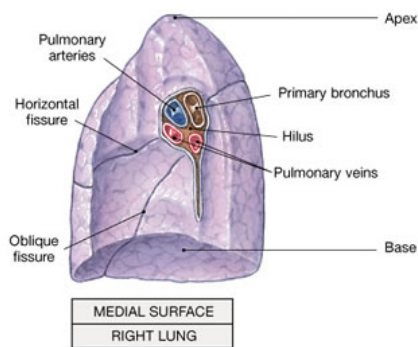
- Bodies of thoracic vertebrae,
- Intervertebral discs,
- Posterior intercostal vessels,
- Sympathetic trunk.



LUNG ROOTS

Right lung:

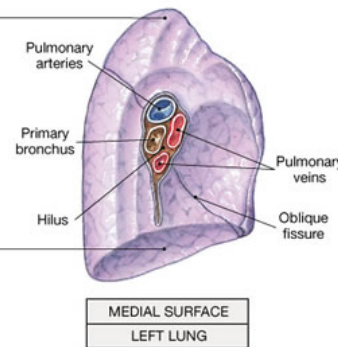
- 2 bronchi:** Lie posterior.
- Pulmonary artery:** Is superior
- Pulmonary veins:** Are inferior and anterior.



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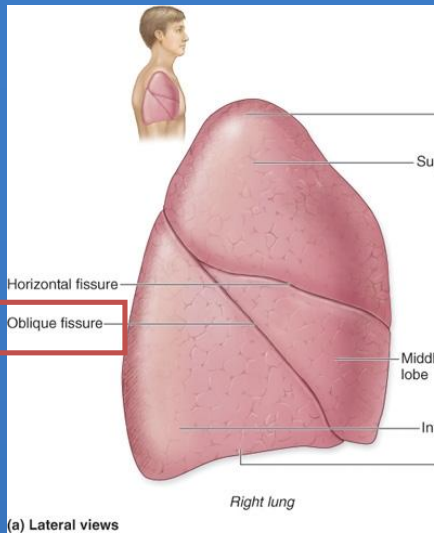
Left lung:

- One bronchus:** Lies posterior
- Pulmonary artery:** Is superior
- Pulmonary veins:** Are inferior and anterior



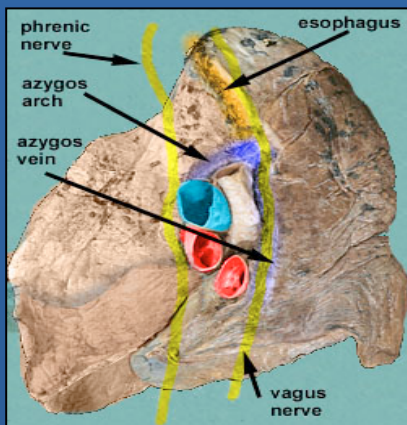
Right Lung

Larger & shorter than left lung, and divided by 2 fissures (oblique & horizontal) into **3 lobes** (upper, middle, and lower lobes).



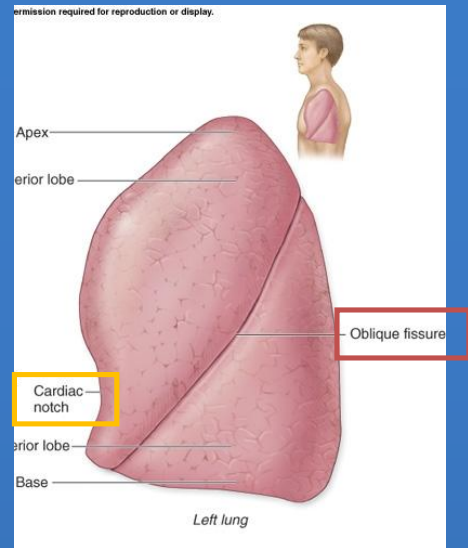
Mediastinal surface of right lung

- 1) **Azygos vein and its arch** (posterior and over the root of the lung).
- 2) **Vagus nerve** posterior to the root of the lung.
- 3) **Esophagus** posterior to the root.
- 4) **Phrenic nerve** anterior to the root of the lung.
- 5) **Cardiac impression**: related to right atrium.
- 6) Below hilum and in front of pulmonary ligament : groove for **I.V.C.**



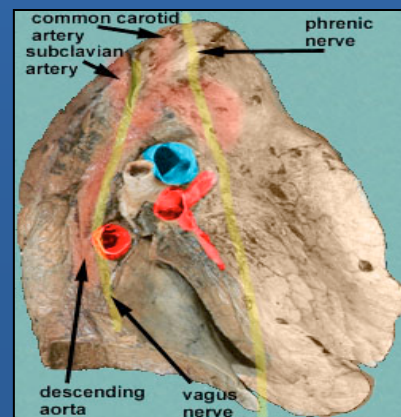
Left Lung

Divided by one oblique fissure into **2 lobes** (upper and lower). There is **No** horizontal fissure. It has a **cardiac notch** at lower part of its anterior border.



Mediastinal surface of left lung

- 1) **Descending aorta** posterior to the root.
- 2) **Vagus nerve** posterior to the root of the lung
- 3) **Arch of the aorta** over the root of the lung
- 4) **Groove for left common carotid** and **left subclavian arteries**.
- 5) **Phrenic nerve** anterior to the root of the lung.
- 6) **Cardiac impression**: related to left ventricle.



Blood supply of lung

- Bronchial arteries (From descending aorta): It supply oxygenated blood to bronchi, lung tissue, & visceral pleura.
- Bronchial veins: drain into **azygos** & **hemiazygos** veins.
- Pulmonary artery: carries non-oxygenated blood from right ventricle to the lung alveoli.
- 2 Pulmonary veins : carry oxygenated blood from lung alveoli to the left atrium of the heart.

Nerve supply of lung

Pulmonary plexus at the root of lung, it is formed of autonomic N.S. from:

1. **Sympathetic Fibers:** FROM Sympathetic trunk. ACTION: broncho-dilatation /and vasoconstriction.
2. **Parasympathetic Fibers:** FROM Vagus nerve. ACTION: broncho-constriction and secretomotor to bronchial glands /and vasodilatation.

Bronchi

The trachea divides into 2 main bronchi:

Right main bronchus: which divides before entering the hilum, it gives: superior lobar (secondary) bronchus. On entering hilum, it divides into middle & inferior lobar bronchi.

Left main bronchus: On entering hilum, it divides into superior & inferior lobar bronchi.

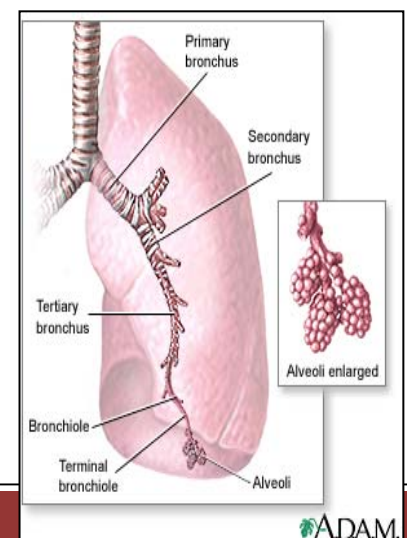
More information mentioned in previous lecture

Bronchopulmonary segments:

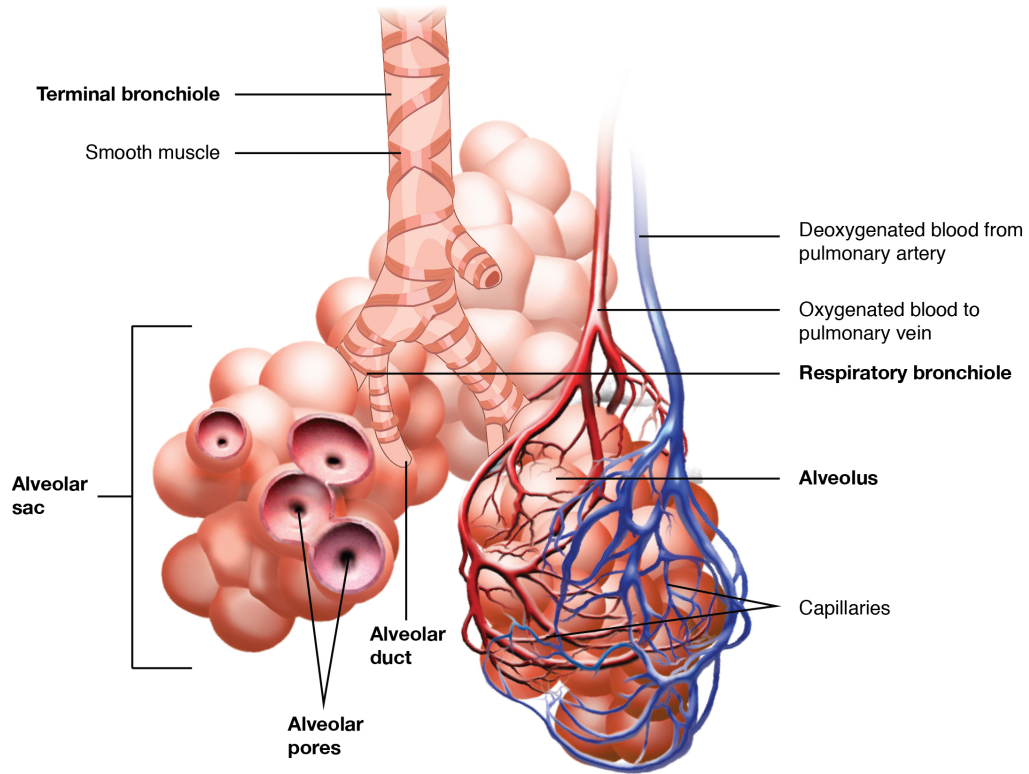
It's the surgical, functional and anatomical unit of the lung.

Each lobar (secondary) bronchus gives segmental (tertiary) bronchi. Then every segmental bronchi divides repeatedly into bronchioles. Bronchioles divide into terminal bronchioles which show delicate outpouching 'the respiratory bronchioles'

Lobar (secondary) bronchi → segmental (tertiary) bronchi → bronchioles → terminal bronchioles → respiratory bronchioles.



The respiratory bronchioles end by branching into alveolar ducts, which lead into alveolar sacs. The alveolar sacs consist of several alveoli, each alveolus is surrounded by a network of blood capillaries for gas exchange.



The main characteristics of a bronchopulmonary segment:

- 1) It is a subdivision of a lung lobe.
- 2) It is pyramidal shaped, its apex toward the lung root.
- 3) It is surrounded by connective tissue septa.
- 4) It has a segmental bronchus, a segmental artery, lymph vessels, and autonomic nerves.
- 5) The segmental vein lies in the inter-segmental C.T. septa, between the segments.
- 6) A diseased segment can be removed surgically, because it is a structural unit.



SUMMARY

- ✓ The Pleura divides into: parietal pleura & visceral pleura.
- ✓ The Parietal pleura is sensitive to pain, pressure, temperature, and touch. Whereas the Visceral pleura is sensitive to stretch only.
- ✓ There are TWO Pleural Recesses: costodiaphragmatic recesses & costamediastinal recesses.
- ✓ Pleural Effusion is an abnormal accumulation of pleural fluid about 300 ml in the costodiaphragmatic pleural recess. (Normal is 5-10 ml)
- ✓ The lung has anterior and posterior borders, and costal and medial surfaces.
- ✓ The right lung is divided by 2 fissures: oblique & horizontal. Whereas the left lung has only one oblique fissure.
- ✓ Mediastinal surface of right lung: Azygos vein, Vagus nerve, Esophagus POSTERIORLY. Phrenic nerve ANTERIORLY.
- ✓ Mediastinal surface of left lung: Descending aorta, Vagus nerve POSTERIORLY. Phrenic nerve ANTERIORLY.
- ✓ Bronchopulmonary segments:
Lobar (secondary) bronchi → segmental (tertiary) bronchi → bronchioles → terminal bronchioles
→ respiratory bronchioles → alveolar ducts → alveolar sacs → alveoli



Multiple Choice Questions

1) The Mediastinal pleura is supplied by which nerve?

- A- intercostal nerves B- vagus nerve C- phrenic nerves

4) The cardiac notch is between the:

- A- 8th & 10th costal cartilages B- 4th & 6th costal cartilages C- 3rd & 6th costal cartilages

3) The pulmonary artery in both lungs is:

- A- anterior B- superior C- inferior D- posterior

2) The cardiac impression in the mediastinal surface of right lung is related to:

- A- right atrium B- left atrium C- right ventricle D- left ventricle

5) The pulmonary artery carries ____ blood, from ____ to the lung alveoli:

- A- oxygenated / left ventricle B- oxygenated / right ventricle
C- non-oxygenated / left ventricle D- non-oxygenated / right ventricle

6) The groove for the left common carotid & left subclavian arteries is in the _____ of _____:

- A- mediastinal surface / left lung B- costal surface / left lung
C- mediastinal surface / right lung D- costal surface / right lung

Q Ans:

1-C, 2-B, 3-B, 4-A, 5-D, 6-A