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Lecture 4

ANATOMY OF THE LUNGS & PLEURA



OBJECTIVES

- Describe the anatomy of the pleura: subdivisions into parietal & visceral pleurae, supply of each of them.
- List the parts of parietal pleura and its recesses.
- Describe surface anatomy of both pleurae and the lungs.
- Describe the anatomy of lungs : shape, relations, nerve supply & blood supply.
- Describe the difference between right & left lungs.
- Describe the formation of bronchopulmonary segments and the main characteristics of each segment in the lung.

Pleura



Amazing video that explains this page and the next 2 pages!

Definition

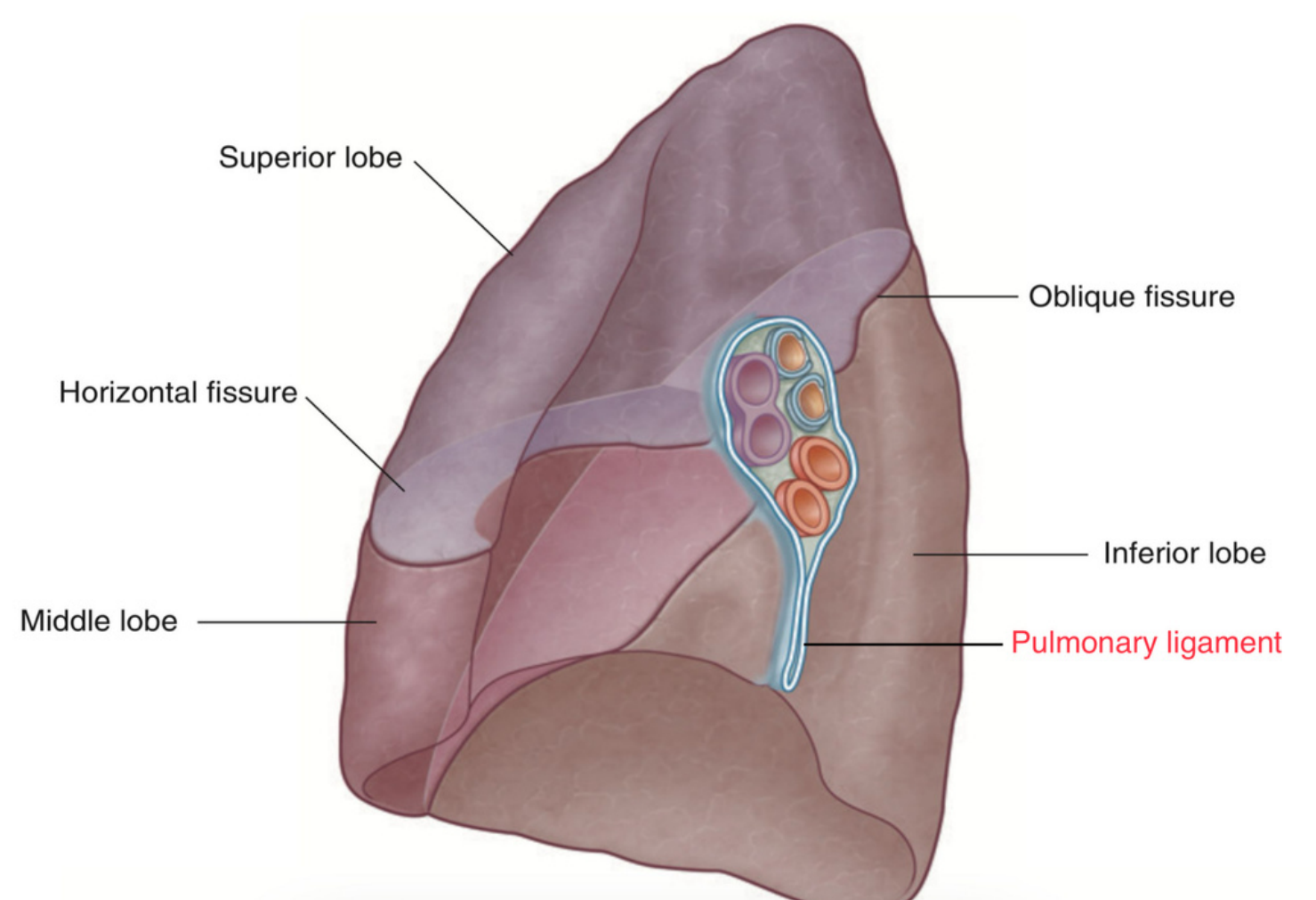
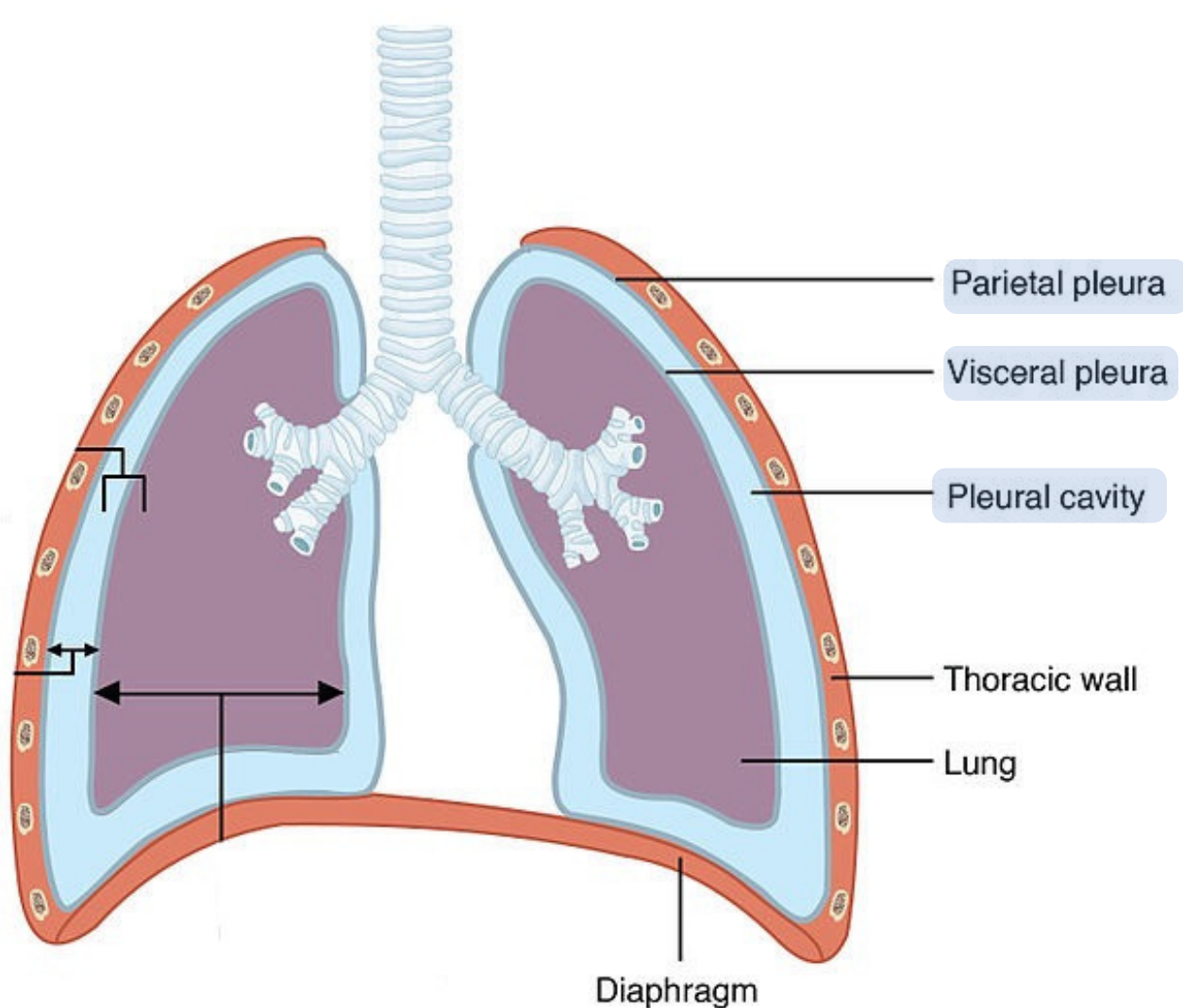
Double-layered serous membrane enclosing the lungs.

Parietal layer
which lines the thoracic walls.

has two layers

Visceral layer
which covers the surfaces of the lung.

- 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**.
- The space between the two layers, the pleural cavity, contains a thin film of pleural serous fluid (5-10 ml.).



Parietal Pleura

◆ It is divided according to the region in which it lies and the surfaces it covers, into:

Cervical Pleura

- Projects up into the neck about one inch above the medial $\frac{1}{3}$ of clavicle.
- It lines the under surface of the **suprapleural membrane**.

Mediastinal Pleura

covers the mediastinum. At the hilum, it is reflected on to the vessels and bronchi, and continuous with the **visceral pleura**.

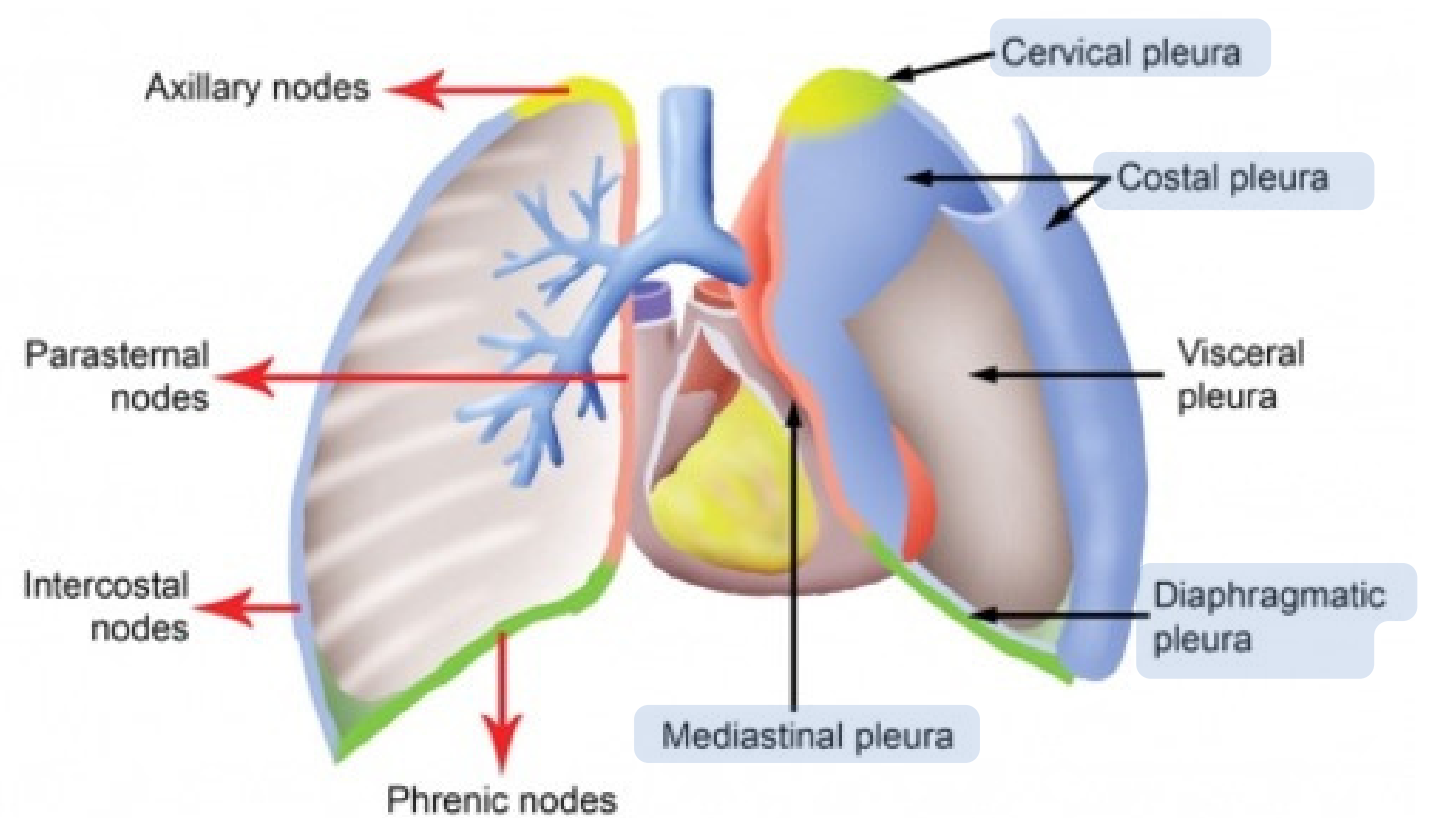
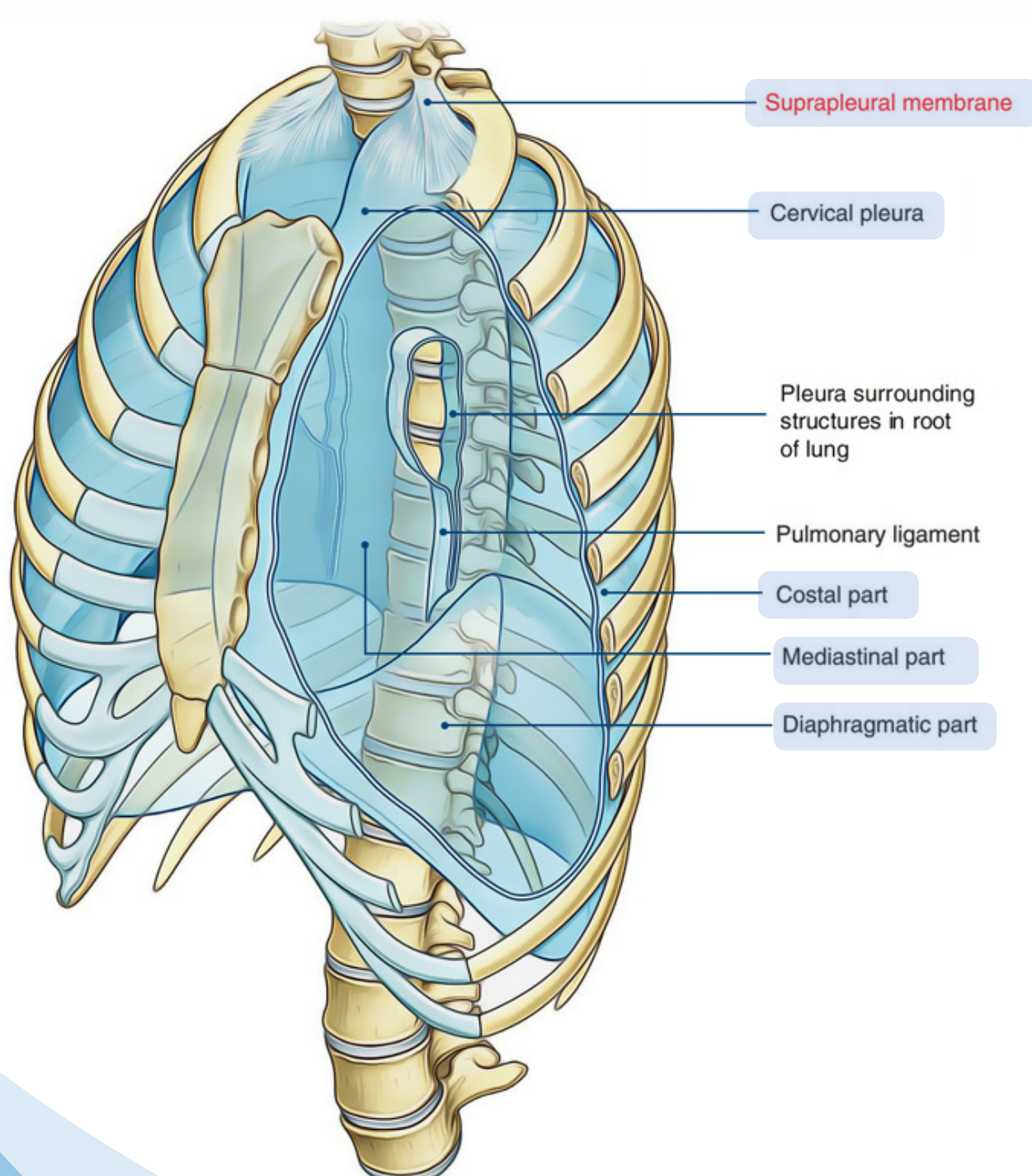
Costal Pleura

lines the back of the:

- Sternum
- Ribs & costal cartilages
- Intercostal spaces
- Sides of vertebral bodies

Diaphragmatic Pleura

covers the thoracic (upper) surface of the diaphragm.



Pleural Recesses

Types of Recesses

Costodiaphragmatic Recess

Slit-like space between costal and **diaphragmatic pleura**, along the **inferior border** of the lung which enters through it in deep inspiration.

Costomediastinal Recess

Slit-like space between costal and **mediastinal pleura**, along the **anterior border** of the lung which enters through it in deep inspiration.

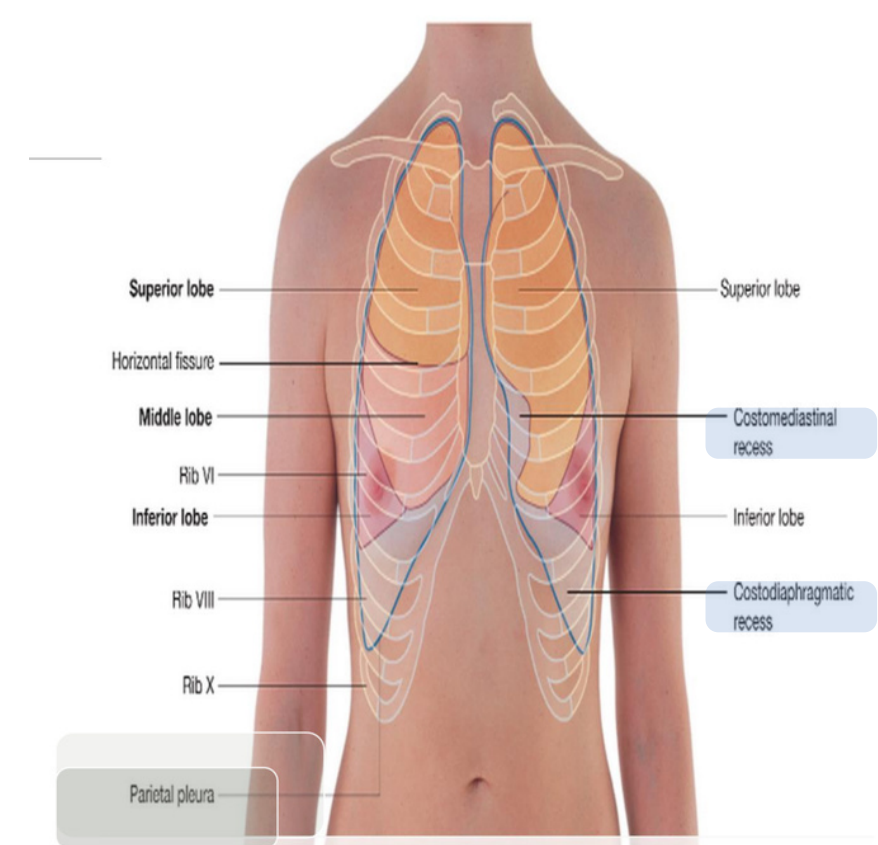
Pleural Nerve Supply

Parietal Pleura

It is sensitive to **Pain, Pressure, Temperature and Touch (PPTT)**.

▪ It is supplied as follows:

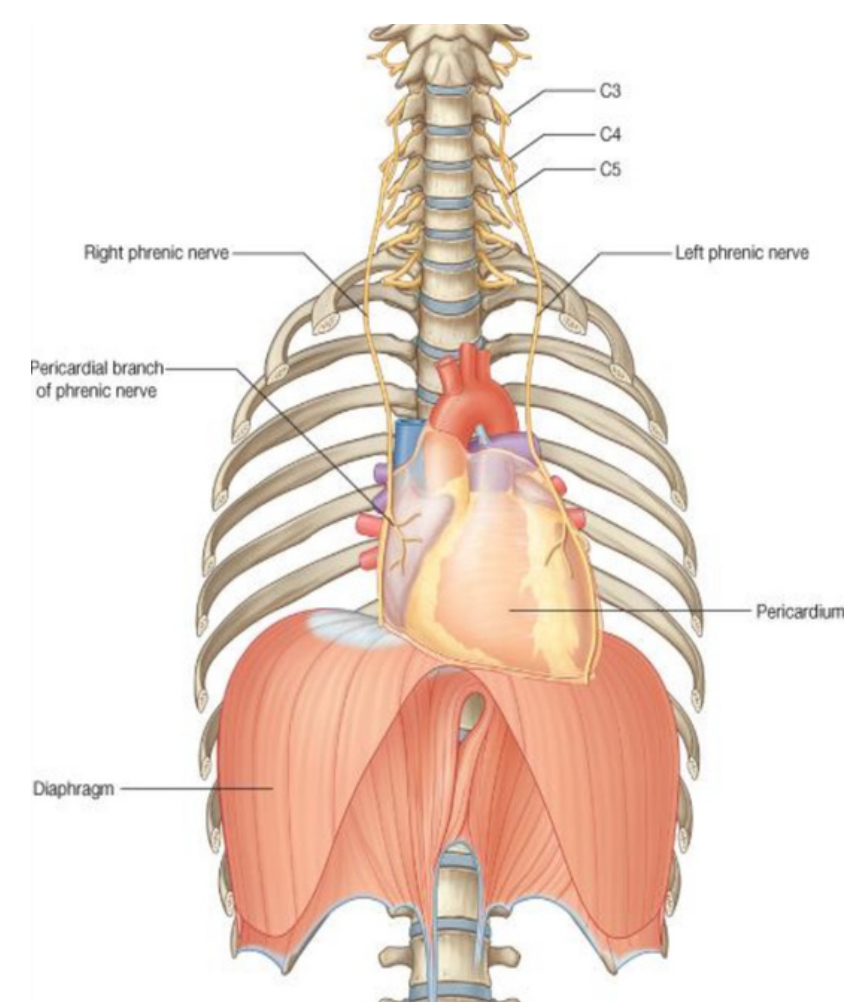
1. Costal pleura is segmentally supplied by the **intercostal nerves**.
2. Mediastinal pleura is supplied by **phrenic nerves**.
3. **Diaphragmatic pleura** is supplied:
 - Over the domes by **phrenic nerves**.
 - Around the periphery by **lower 6 intercostal nerves**.



Visceral Pleura

It is sensitive to **Stretch only**.

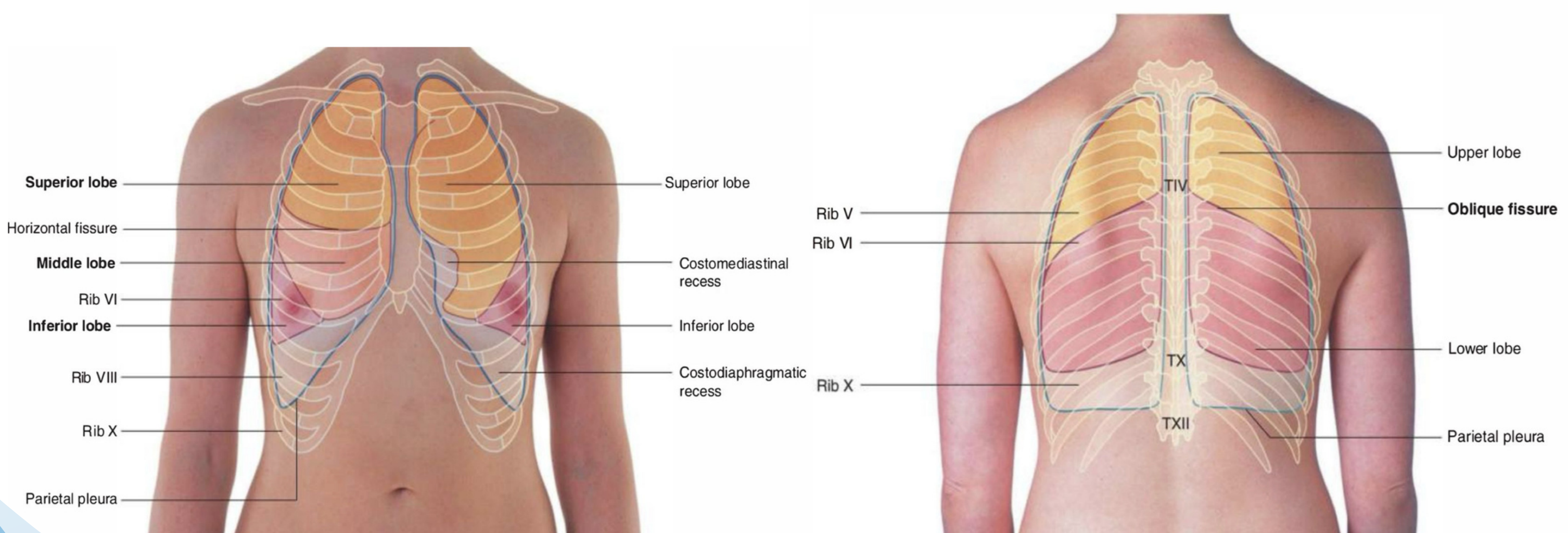
▪ It is supplied by the autonomic fibers from the **pulmonary plexus**.



Surface Anatomy of Pleura



<p>Apex</p>	<p>lies one inch above the medial 1/3 of the clavicle.</p>
<p>Anterior Margin</p>	<p>Right pleura: extends vertically from sterno-clavicular joint to xiphisternal joint (6th costal cartilage).</p> <p>Left pleura: Similar course but at the level the 4th costal cartilage deviates laterally and extends to lateral margin of the sternum to form cardiac notch then turns sharply downward to xiphisternal joint (6th costal cartilage).</p>
<p>Inferior Margin</p>	<p>passes around the chest wall, on the 8th rib in <u>midclavicular</u> line, 10th rib in <u>mid-axillary</u> line and finally reaching to 12th rib adjacent to vertebral column posteriorly (T12 spine).</p>
<p>Posterior Margin</p>	<p>along the vertebral column from the apex (C7) to the inferior margin (T12 spine).</p>

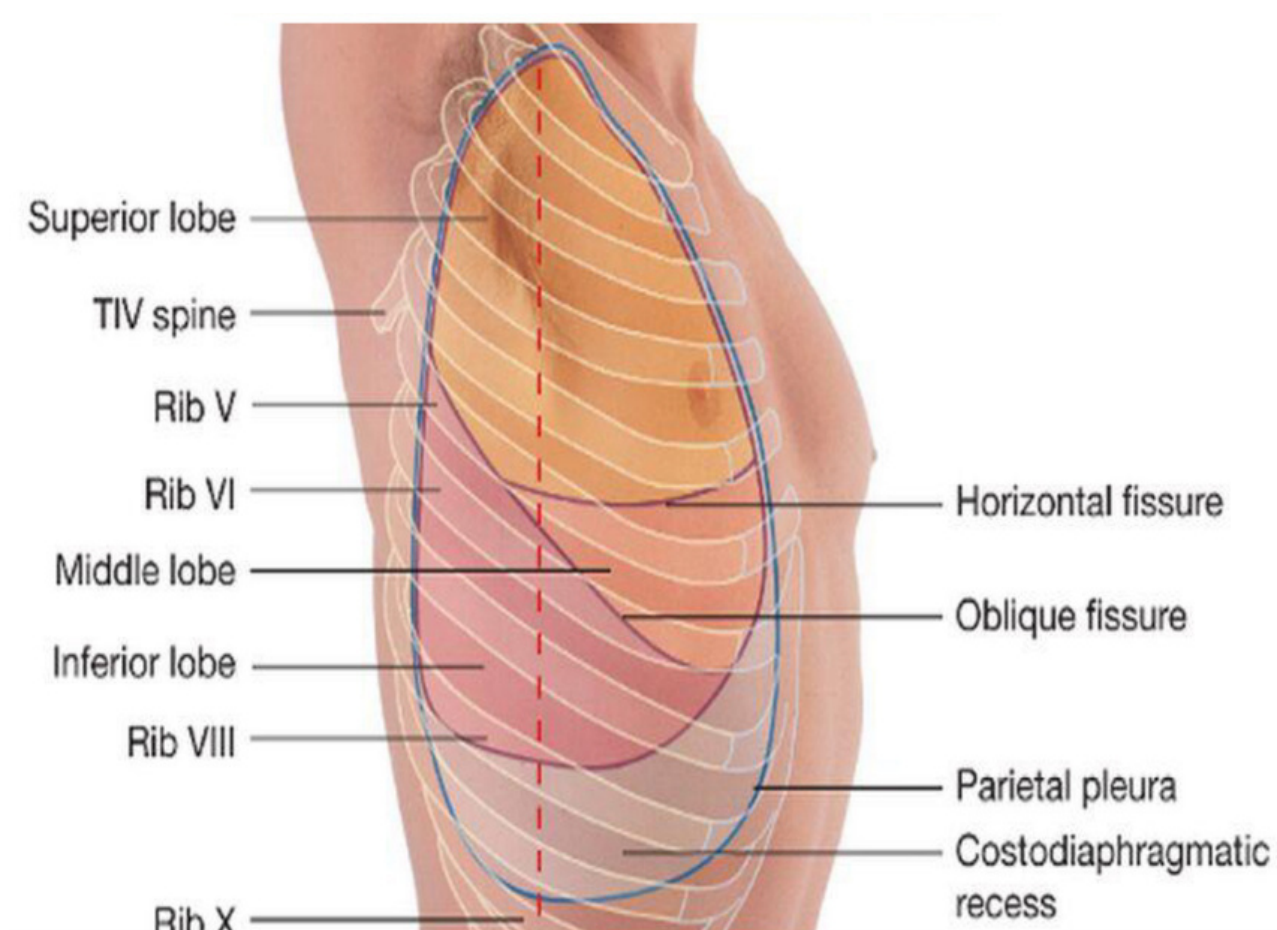
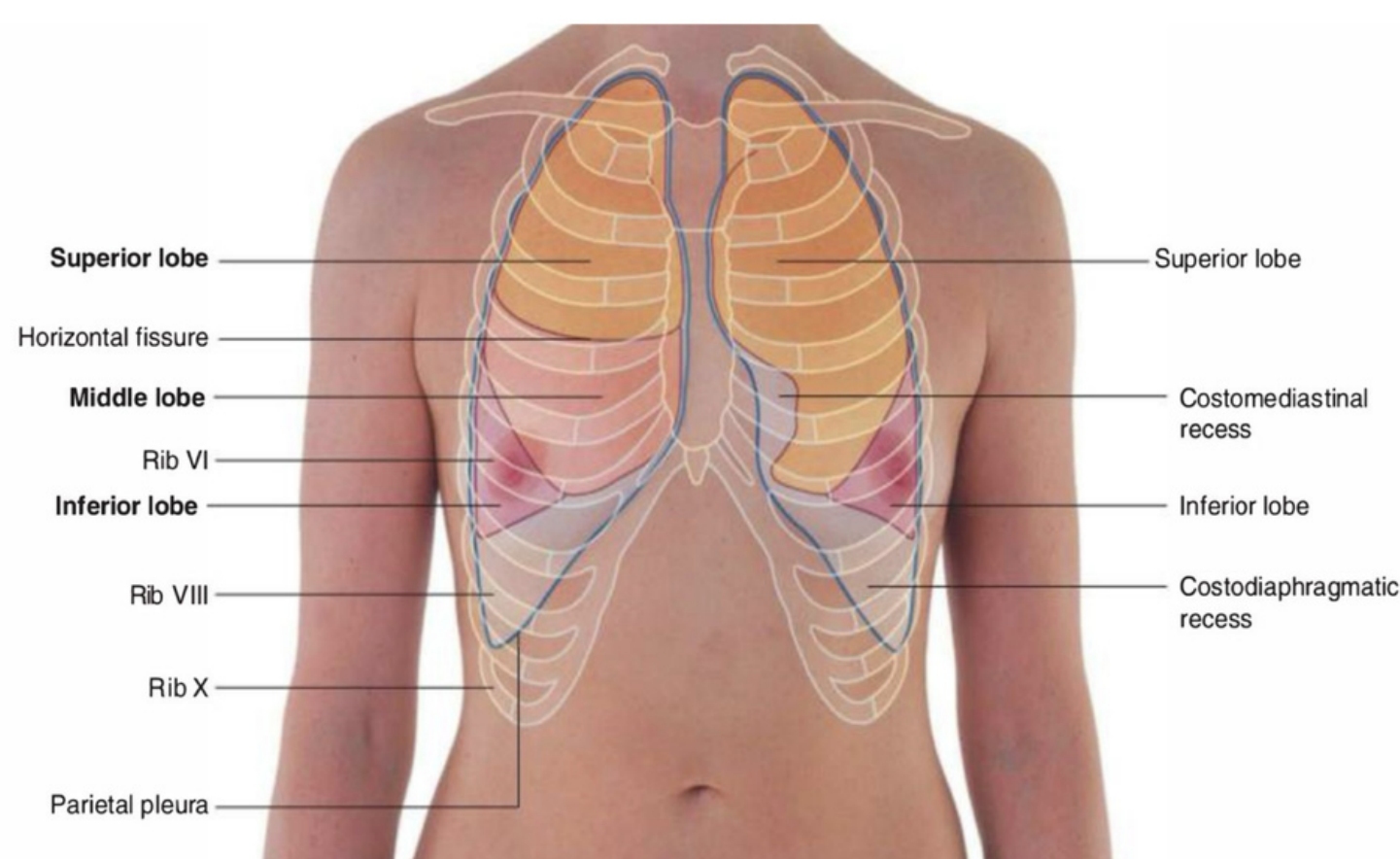


Surface Anatomy of lungs



Helpful Video
2:00 Till 5:16

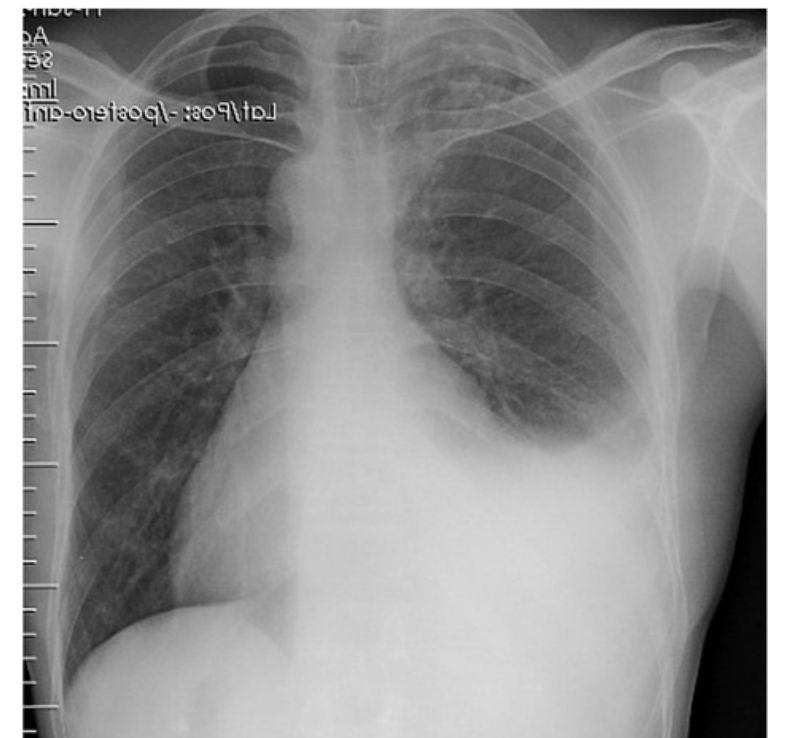
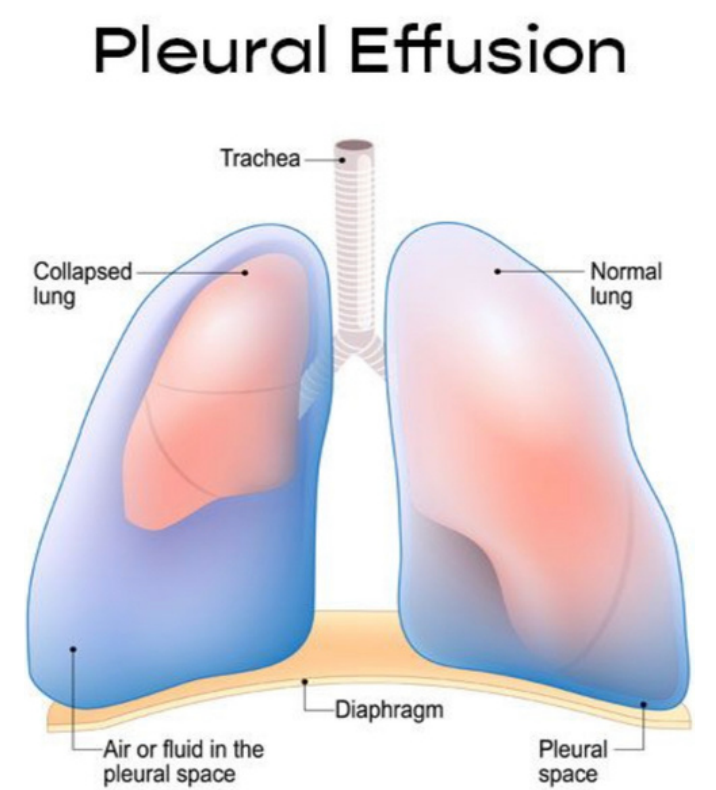
<p>Apex & anterior border</p>	<p>it corresponds nearly to the lines of pleura, but are slightly away from the median plane.</p>
<p>Inferior Margin</p>	<p>It passes around the chest wall, on the 6th rib in <u>midclavicular</u> line, 8th rib in <u>mid-axillary</u> line, and finally reaching to 10th rib adjacent to vertebral column posteriorly.</p> <p>Same as the pleura but more horizontally and finally reaching to the 10th thoracic spine.</p>
<p>Posterior Margin</p>	<p>it passes along the vertebral column from the apex (C7) to the inferior margin (T10 spine).</p>
<p>Oblique fissure</p>	<p>it is represented by a line extending from 4th thoracic spine, obliquely ending at 6th costal cartilage. (on both right and left lungs)</p>
<p>Transverse fissure (Only in the right lung)</p>	<p>It is represented by a line extending from 4th right costal cartilage to meet the oblique fissure.</p>



Pleural Effusion

About

- It is an abnormal accumulation of pleural fluid, about 300 ml, in the **Costodiaphragmatic pleural recess**. (normally, it is 5-10 ml).
- Caused by:
 - **Inflammation.**
 - **Tuberculosis.**
 - **Congestive heart disease.**
 - **Malignancy.**
- The lung is compressed & the bronchi are narrowed.
- **Auscultation** would reveal only faint and decreased breathing sounds over compressed or collapsed lung lobe.
- **Dullness** on percussion over the effusion.

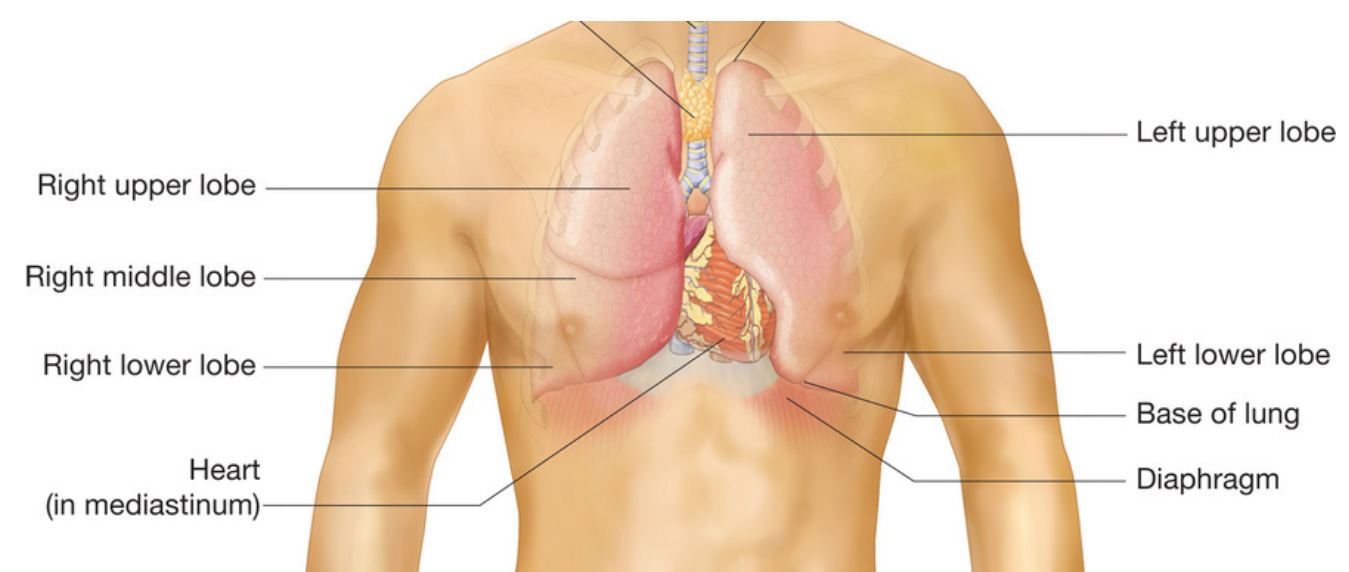


Lungs

- the lung is located in the thoracic cavity, one on each side of the mediastinum.

Each lung is:

- Conical in shape.
- Covered by the visceral pleura.
- Suspended free in its own pleural cavity.
- Attached to the mediastinum only by its root.



Each lung has:

Apex

- To identify the top of the lung.
- It projects into the root of the neck (1 inch above medial 1/3 of clavicle).
- It is covered by cervical pleura.
- It is grooved anteriorly by **subclavian artery**

Base

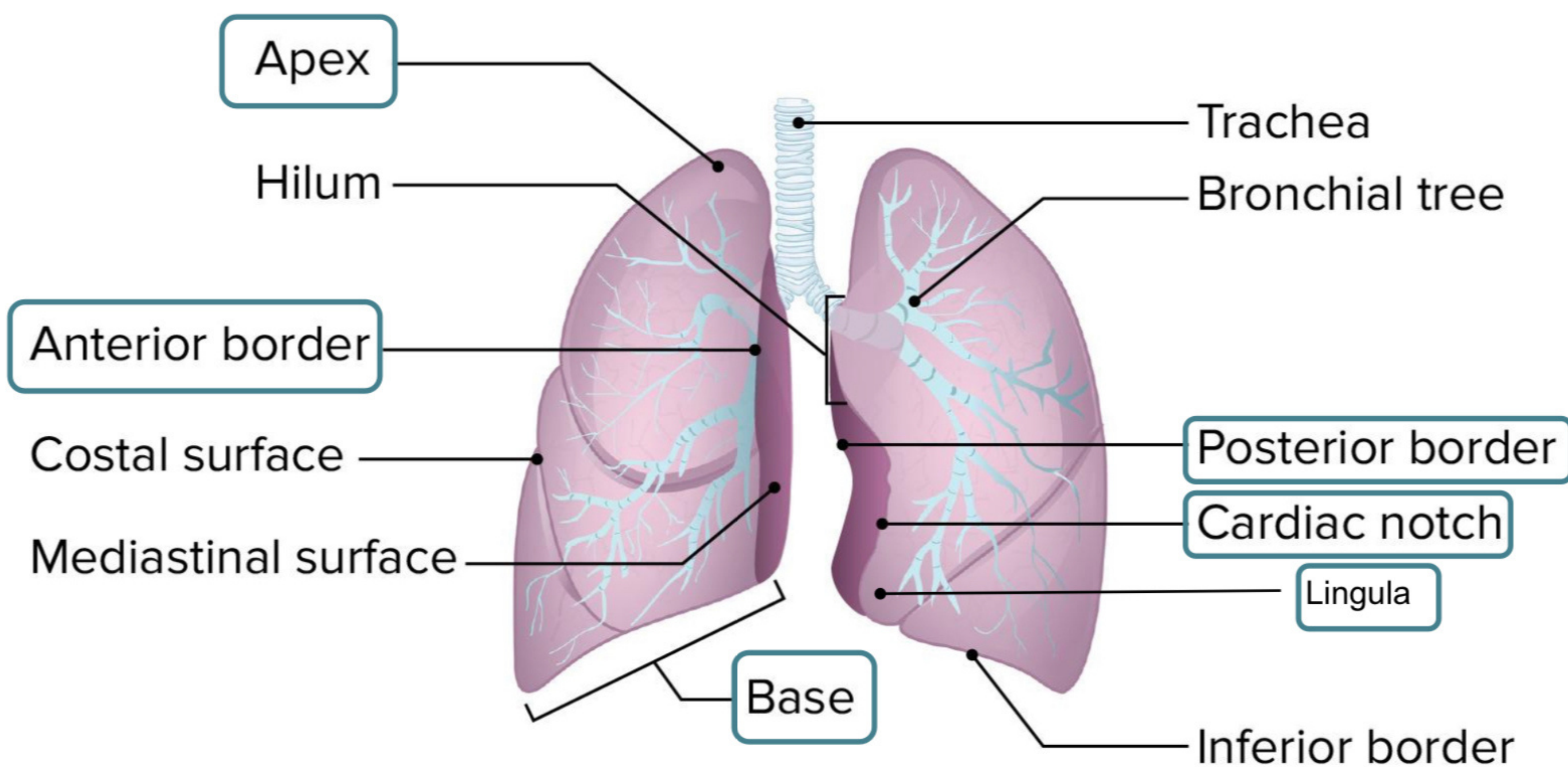
- To identify the bottom of the lung.
- Its inferior or diaphragmatic surface is concave and rests on the diaphragm

Anterior Border

- It is sharp, thin, and overlaps the heart.
- Anterior border of left lung presents a **cardiac notch** at its lower end, and has a thin projection called the **lingula** below the cardiac notch.

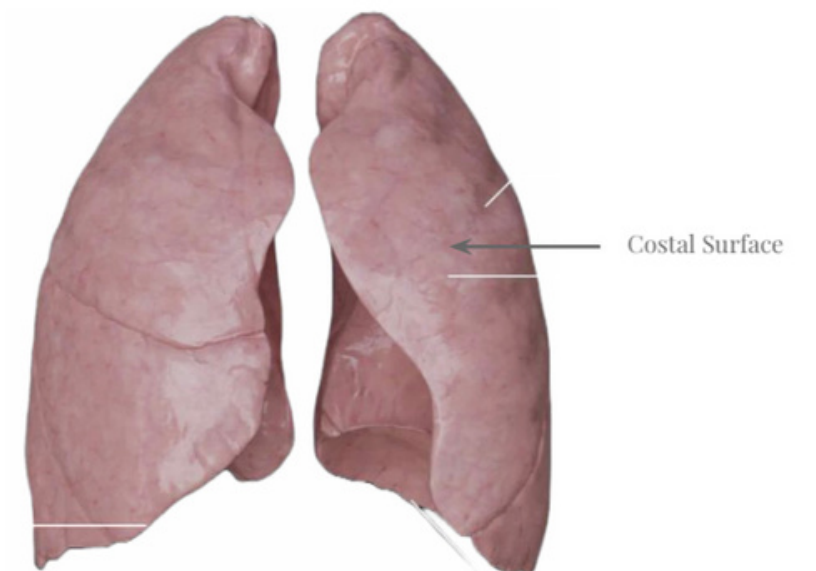
Posterior Border

- It is rounded, thick, and lies beside the vertebral column



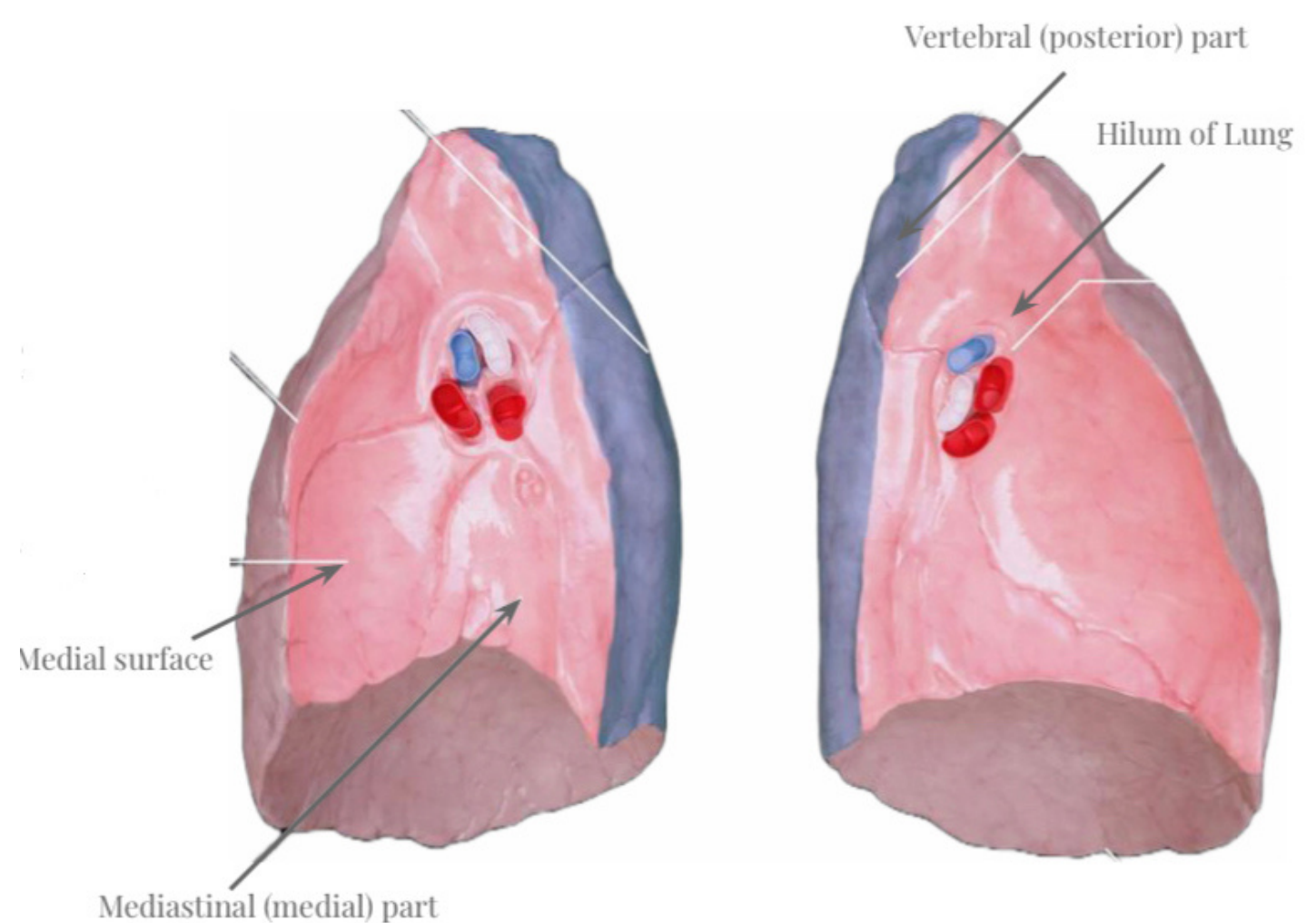
Costal (lateral) Surface

- It is convex
- Surrounded by the ribs from front & back.
- Covered by costal pleura which separates lung from:
 1. Ribs
 2. Costal cartilages
 3. Intercostal muscles.



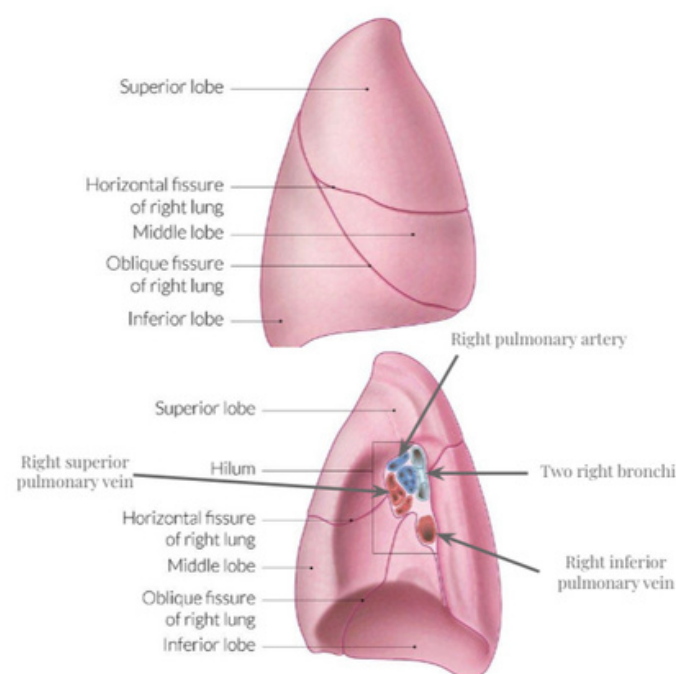
Mediastinum (medial) Surface

- It is where the bronchi, blood vessels, and lymphatic vessels enter the lung at the **hilum**.
- It is also related to the structures forming the **Mediastinum**.
- It is divided into 2 parts:
 1. Anterior (mediastinal) part: It contains a **hilum** in the middle (A depression in which bronchi, vessels, and nerves enter the lung, forming the root of lung).
 2. Posterior (vertebral) part: It is related to:
 1. Bodies of thoracic vertebrae
 2. Intervertebral discs.
 3. Posterior intercostal vessels.
 4. Sympathetic trunk.



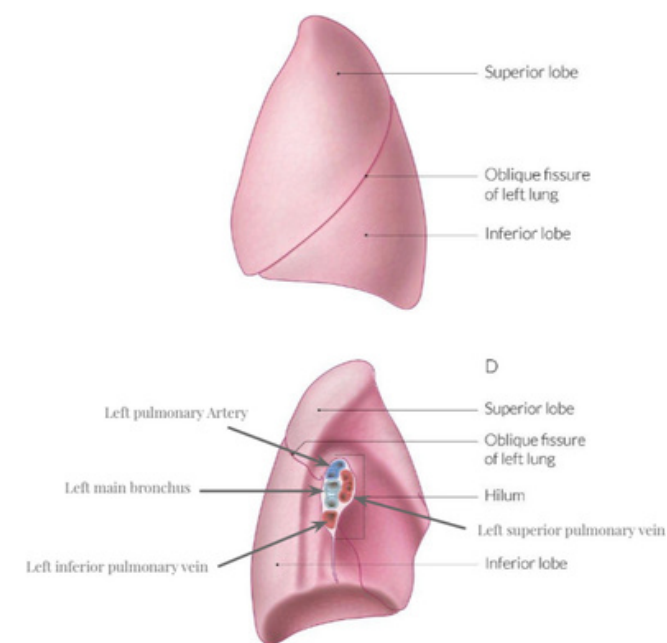
Right Lung

- Larger & shorter than left lung
- It is divided by 2 fissures, **oblique & horizontal** (transverse), into 3 lobes: upper, middle, and lower.
- On its root:
- The two bronchi lie **posteriorly**
- The pulmonary artery lies **superiorly** The pulmonary veins **inferiorly** and **anteriorly**



Left Lung

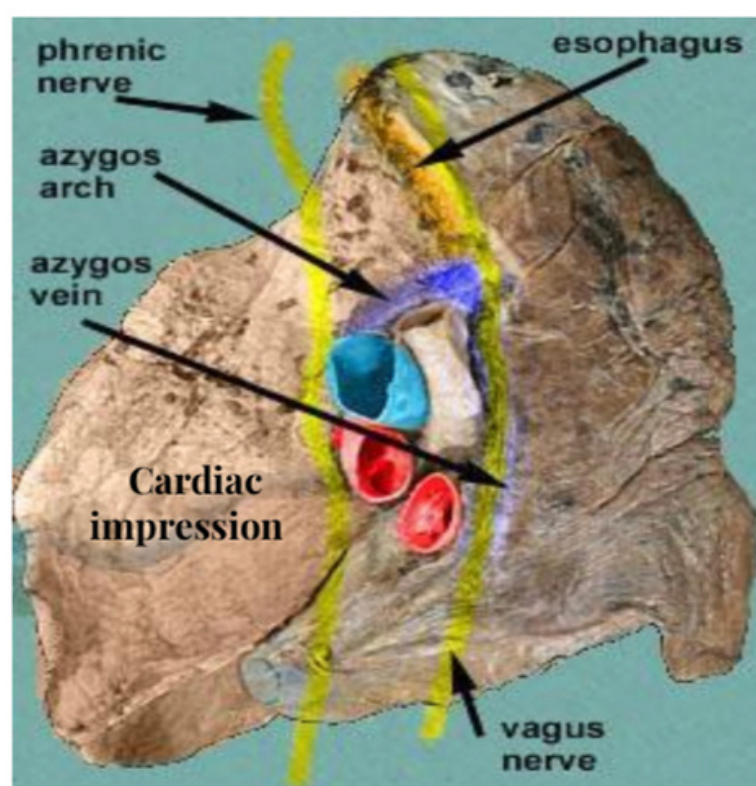
- Smaller & longer than left lung.
- It is divided by one **oblique** fissure into 2 lobes: upper and lower. There's NO horizontal fissure
- It has a **cardiac notch** at lower part of its anterior border.
- On its root:
- One bronchus lies **posteriorly**.
- The pulmonary artery lies **superiorly**.
- The pulmonary veins **inferiorly** and **anteriorly**.



Structures on the Mediastinal Surface of Lungs

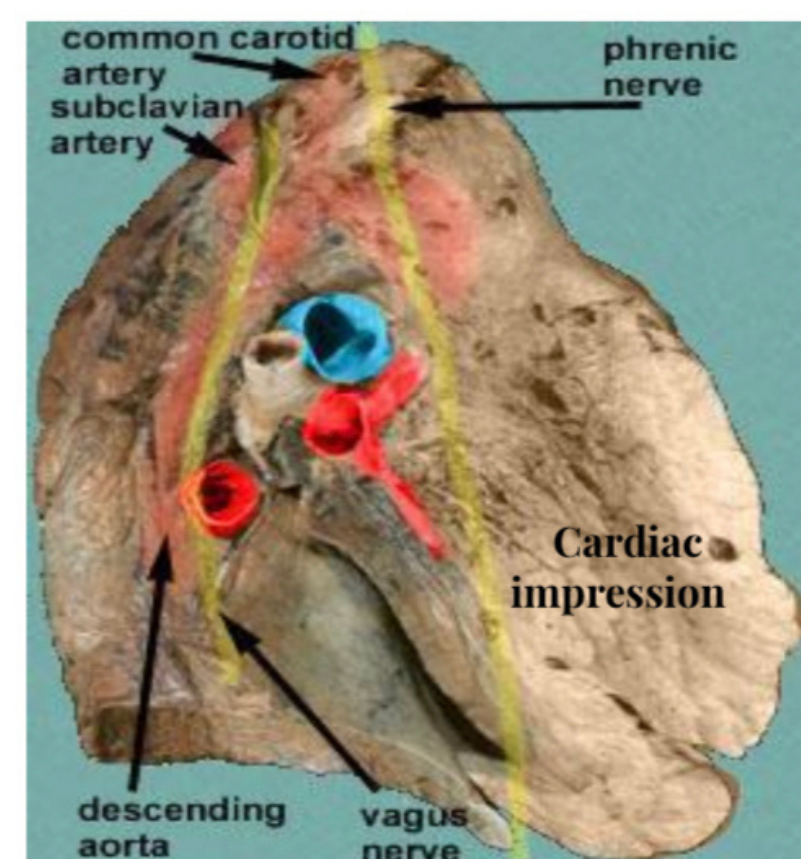
Right Lung

- **Azygos vein and its arch:** Posterior and over the root of the lung.
- **Vagus nerve:** Posterior to the root of the lung.
- **Phrenic nerve:** Anterior to the root of the lung.
- **Cardiac impression:** Related to right atrium.
- **Esophagus:** Posterior to the root of the lung.
- **Groove for I.V.C:** Below hilum and in front of pulmonary ligament



Left Lung

- **Descending aorta and its arches:** Posterior and over to the root of the lung.
- **Vagus nerve:** Posterior and over the root of the lung.
- **Phrenic nerve:** Anterior to the root of the lung.
- **Cardiac impression:** Related to left ventricle. ▪ **Groove for left common carotid and left subclavian arteries.**



Blood Supply

Arteries	Veins
<p>Bronchial arteries (From descending aorta): It supplies oxygenated blood to bronchi, lung tissue & visceral pleura.</p>	<p>Bronchial veins: Drain into azygos & hemiazygos veins.</p>
<p>Pulmonary artery: Carries non-oxygenated blood from right ventricle to the lung alveoli.</p>	<p>Pulmonary veins: Carry oxygenated blood from lung alveoli to the left atrium of the heart</p>

Nerve Supply

- ◆ **Pulmonary plexus** at the root of lung, formed of Autonomic Nervous system from sympathetic & parasympathetic fibers.

Sympathetic	Parasympathetic
<ul style="list-style-type: none"> ▪ From sympathetic trunk <p>Actions:</p> <ol style="list-style-type: none"> 1. Bronchodilation 2. vasoconstriction 	<ul style="list-style-type: none"> ▪ From vagus nerve <p>Actions:</p> <ol style="list-style-type: none"> 1. Bronchoconstriction 2. Vasodilation 3. Secretomotor to bronchial glands.

Bronchi

◆ The trachea divides into 2 main bronchi:

Left main bronchus	Right main bronchus
<p>On entering the hilum, it divides into:</p> <ul style="list-style-type: none">▪ Superiorlobarbronchus▪ Inferiorlobarbronchus	<ol style="list-style-type: none">1. Before entering the hilum, it divides into:<ul style="list-style-type: none">▪ Superiorlobar(secondary) bronchus2. On entering the hilum, it divides into:<ul style="list-style-type: none">▪ Middlelobarbronchus.▪ Inferiorlobarbronchus.

Bronchopulmonary Segments

◆ They are the anatomic, functional and surgical units of the lungs.

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.

Bronchopulmonary Segments

1

Each lobar (secondary) bronchus gives segmental (tertiary) bronchi.

2

Each segmental bronchus divides repeatedly into bronchioles.

3

Bronchioles divide into terminal bronchioles, which show delicate out-pouching 'the respiratory bronchioles'

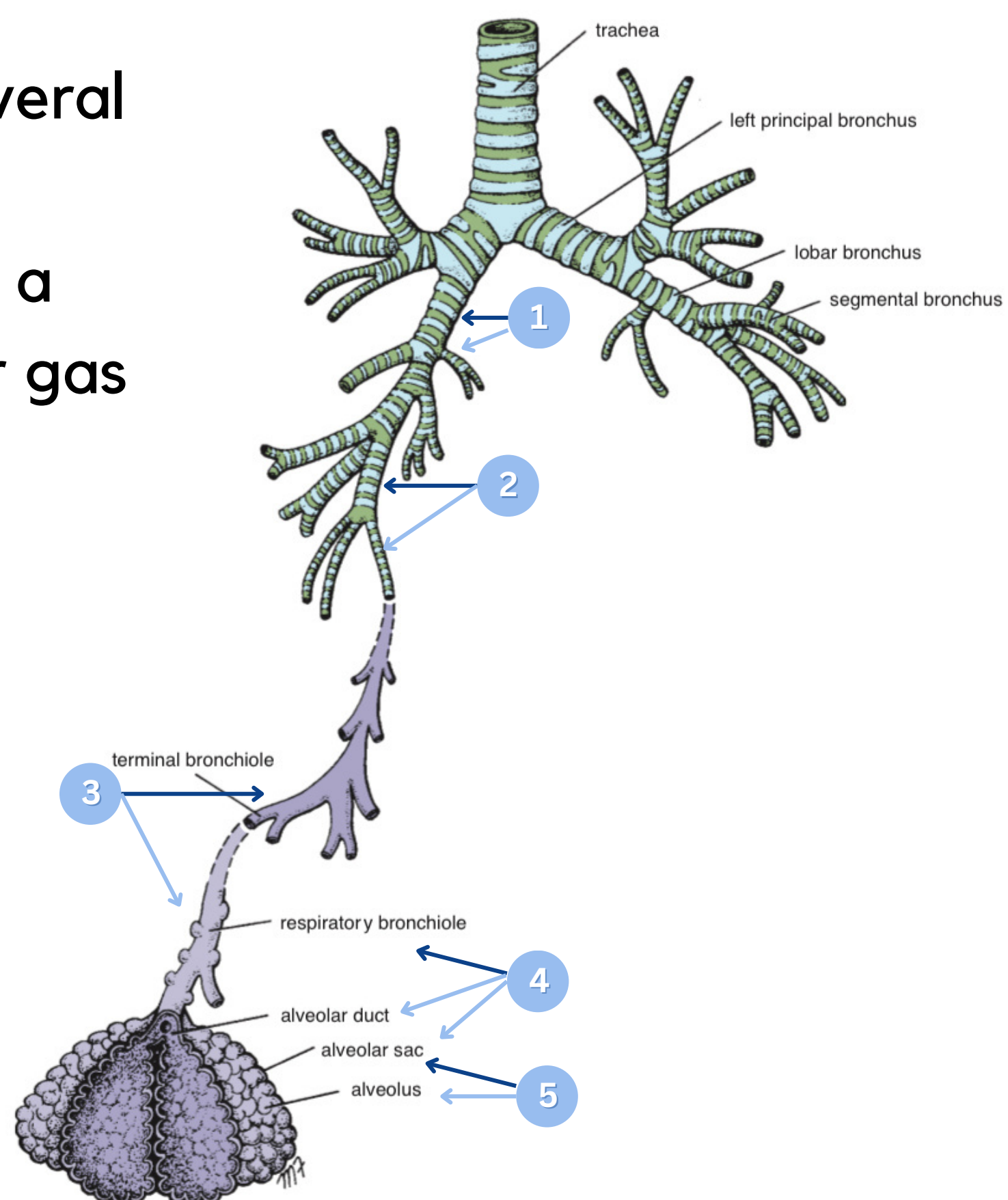
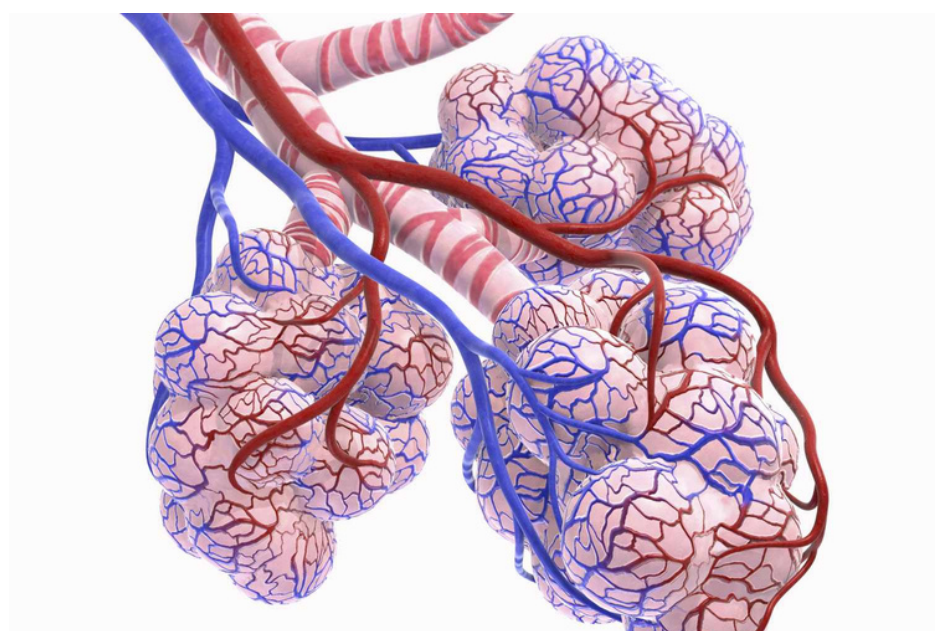
4

The respiratory bronchioles end by branching into alveolar ducts, which lead into alveolar sacs.

5

The alveolar sacs consist of several alveoli.

each alveolus is surrounded by a network of blood capillaries for gas exchange.



MCQs

1

The right lung is divided into?

A) 2 lobes

B) 1 lobe

C) 4 lobes

D) 3 lobes

2

What is below the right hilum and in front of pulmonary ligament?

A) Groove for left common carotid

B) Azygos vein

C) Groove for I.V.C

D) Groove for left subclavian

3

The normal range of pleural serous fluid?

A) 15-20 ml

B) 5-15 ml

C) 6-10 ml

D) 5-10 ml

4

The bronchi enter the lungs at the area called?

A) Apex

B) Base

C) Hilum

D) None

5

Cardiac impression on the mediastinal surface of the left lung is related to:

A) Right atrium

B) Left atrium

C) Right ventricle

D) Left ventricle



1)D - 2)C - 3)D - 4)C - 5)D

SAQs

1 What is the nerve supply of parietal pleura?

1

- 🔑 Costal pleura is supplied by the intercostal nerves.
Mediastinal pleura is supplied by phrenic nerves.
Diaphragmatic pleura: central part by phrenic nerves,
Around the periphery by lower 6 intercostal nerves

2 What is the nerve and action of parasympathetic fibers?

2

- 🔑 Vagus nerve - Bronchoconstriction and vasodilation and secretomotor to bronchial glands.

3 What are the causes of Pleural Effusion?

3

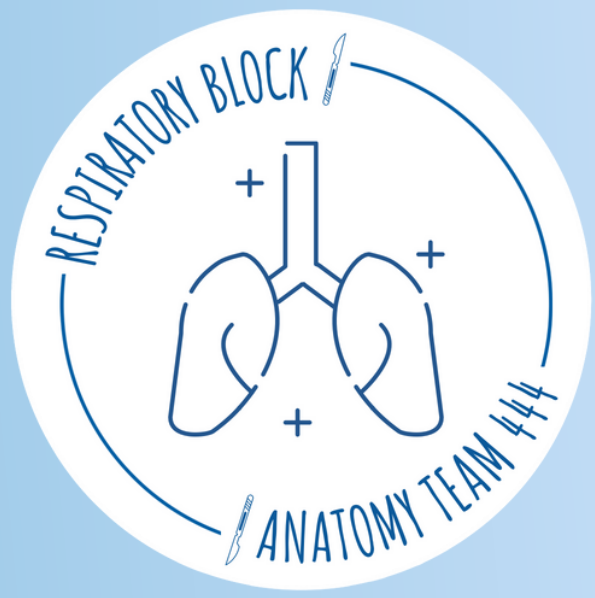
- 🔑 inflammation - TB - congestive heart disease - malignancy.

4 Visceral pleura is supplied by?

4

- 🔑 autonomic fibers from the pulmonary plexus

More questions? [Click here!](#)



TEAM LEADERS

Nisreen Alotaibi

Ziyad Alenazi

Basmah Alsantali

TEAM MEMBERS

• **Farah Aldriweesh**

• **Ward Alanazi**

• **Noorah Alkhilaiwi**

• **Jenan AlSayari**

• **Nouf Alotaibi**

• **Elaf Alshamlan**

• **Reyouf Alakeel**

• **Ashwaq Almutairi**

• **Aleen Almutairi**

• **Jana Alahaideb**

• **Wsaif Alotaibi**

• **Omar Alattas**

• **Ibrahim Altayyar**

• **Nasser Mohammed**

• **Abdulmalik Aldafas**

• **Ali Alhajji**

• **Sulaiman Abdulkarim**

• **Odai AlJarawneh**

• **Abdullah Algarni**

• **Ali Al-Abdulazem**

• **Waleed Alanazi**

