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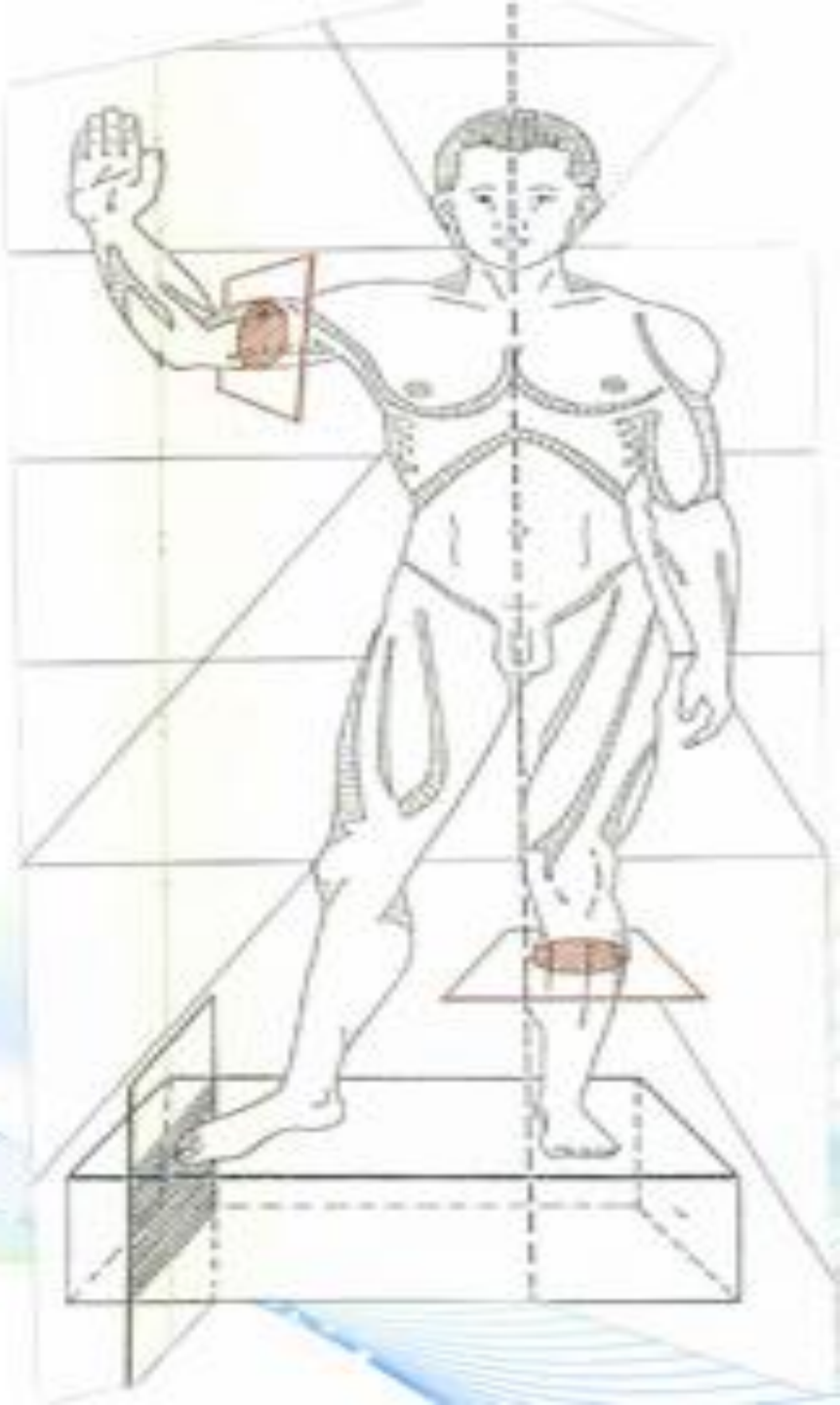
FACULTÉ DE MÉDECINE ET DE PHARMACIE - MARRAKECH
ANATOMIE FMPM

THE LUNGS AND PLEURAE



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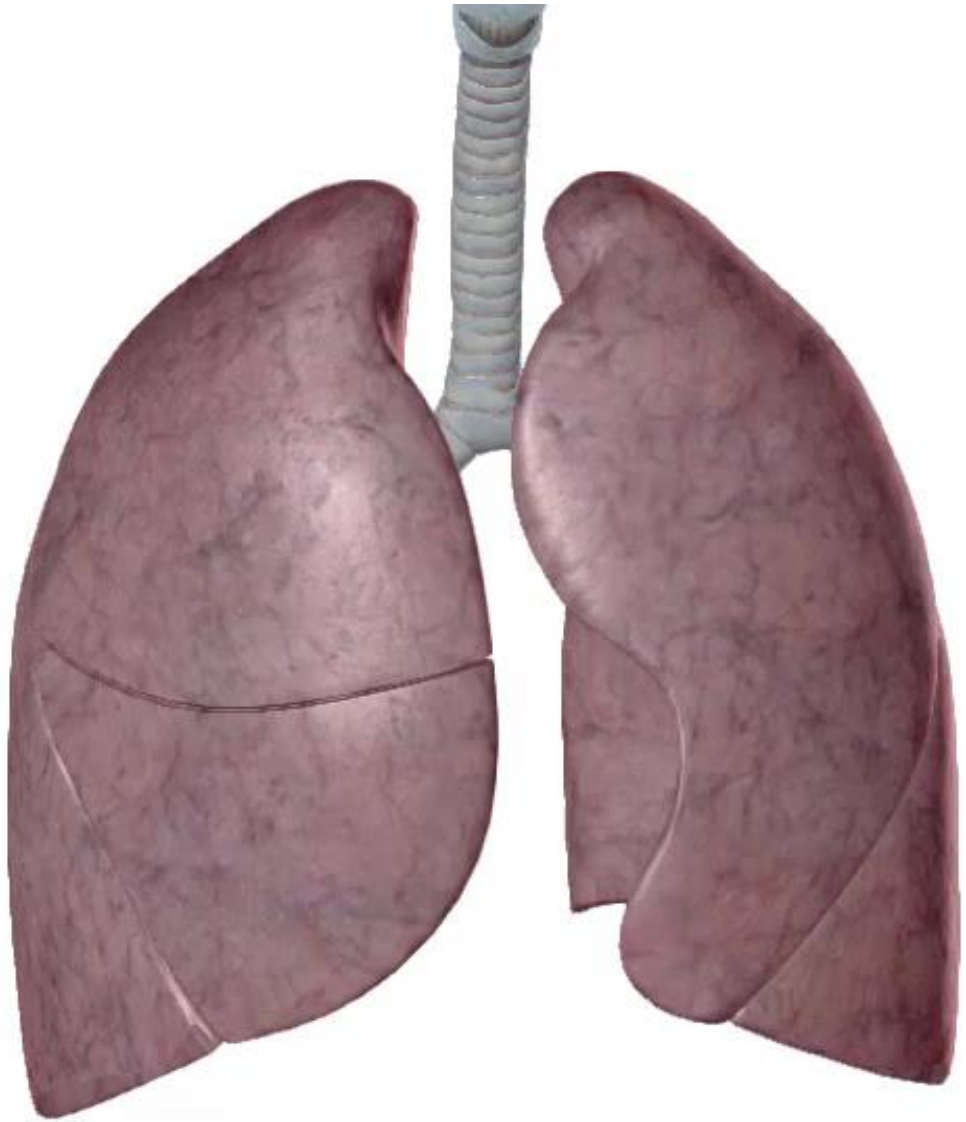


I. INTRODUCTION :

- The lungs are paired, asymmetrical organs.
- They are located in the thoracic cage and are surrounded by the pleurae.

II. EXTERNAL CONFIGURATION

1. Situation :

- They are contained each within the thoracic cage.
- They occupy the lateral regions of the thoracic cage.

2. Consistency :

- Soft and elastic.

3. Color :

- Shiny and pink.

4. Weight :

- Right lung : 700 grams.
- Left lung : 600 grams.

5. External configuration:

The lung has the shape of a truncated cone, featuring :

- 3 surfaces,
- 3 borders,
- 1 apex.

5. External configuration:

Lateral (costal) surface :

- It is crossed by the path of the pulmonary fissures.

Internal (mediastinal) surface :

- It features in its middle part the pulmonary hilium :
  - **The right pulmonary hilium :**
- Oval in shape
- Approached by the right main pulmonary pedicle , with its three regions :
  - ✓ Posteriorly : the main bronchus.
  - ✓ Anteriorly : the right pulmonary artery and right superior pulmonary vein.
  - ✓ Inferiorly: the right inferior pulmonary vein.

5. External configuration:

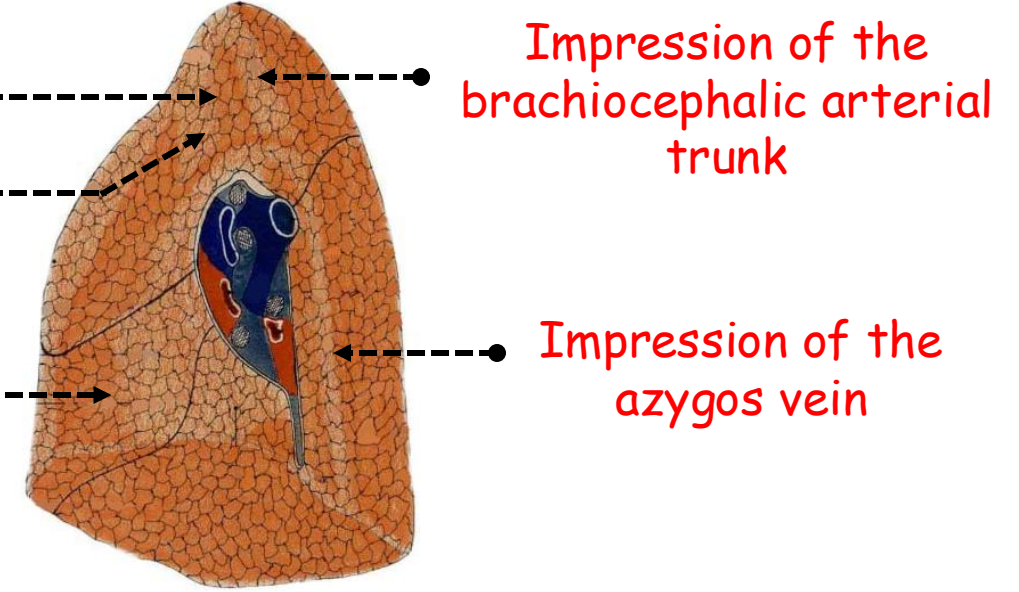
- **The left pulmonary hilium :**

- Higher and more central.
- Has a racket-like shape.
- Approached by the left main pulmonary pedicle , with its three regions, similar to the right side.

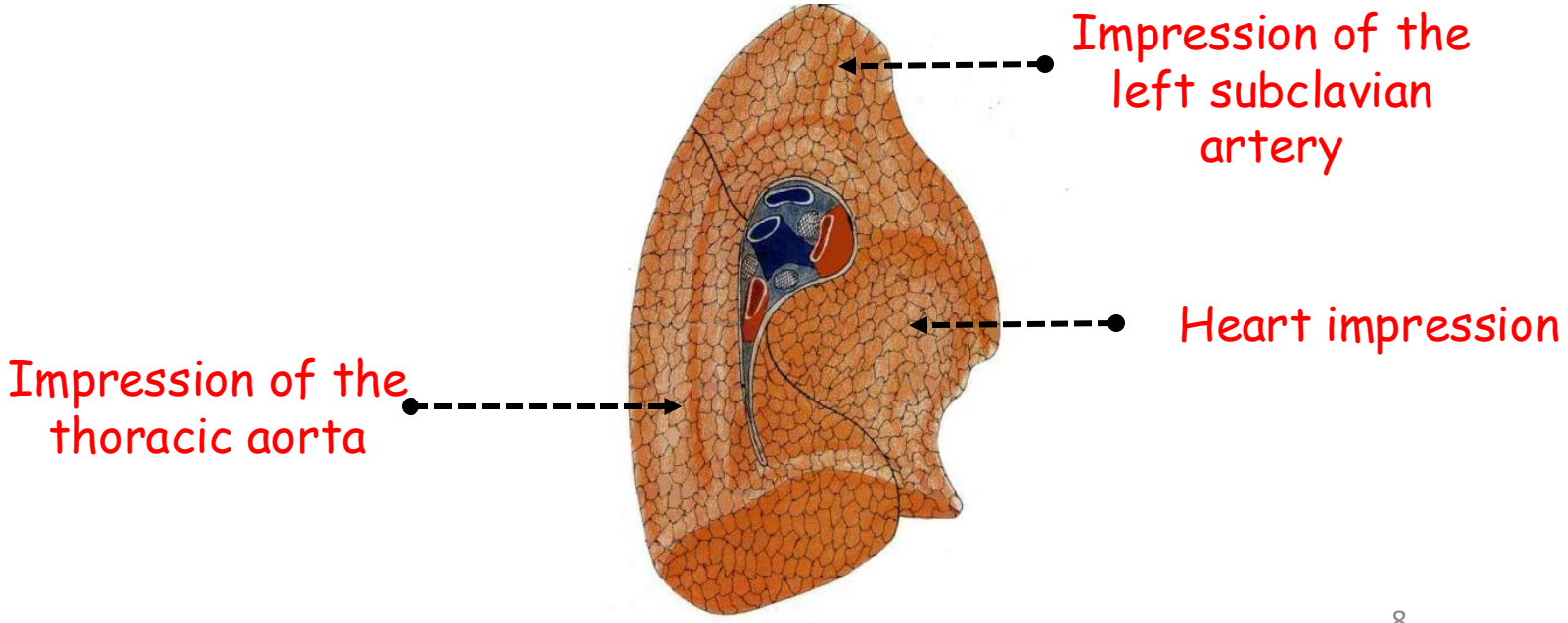
5. External configuration:

Medial surface :

- On the right :
  - The heart (right atrium),
  - The superior vena cava,
  - The brachiocephalic venous trunk,
  - The brachiocephalic arterial trunk,
  - The azygos vein and its arch.
- On the left :
  - The heart (left ventricle),
  - The thoracic aorta,
  - The left subclavian artery.



MEDIAL VIEW OF THE RIGHT LUNG



MEDIAL VIEW OF THE LEFT LUNG

5. External configuration :

Diaphragmatic surface

- It is molded by the convexity of the diaphragmatic dome.

Borders :

A- Anterior border :

- Separates the costal and mediastinal surfaces anteriorly.

B- Posterior border :

- Separates the costal and mediastinal surfaces posteriorly.

C- Inferior border :

- Delineates the base of the lung.
- It has two disctinct portions :
  - ✓ Lateral and posterior portion.
  - ✓ Medial and anterior portion.

Apex :

- It protrudes beyond the the thoracic cavity.

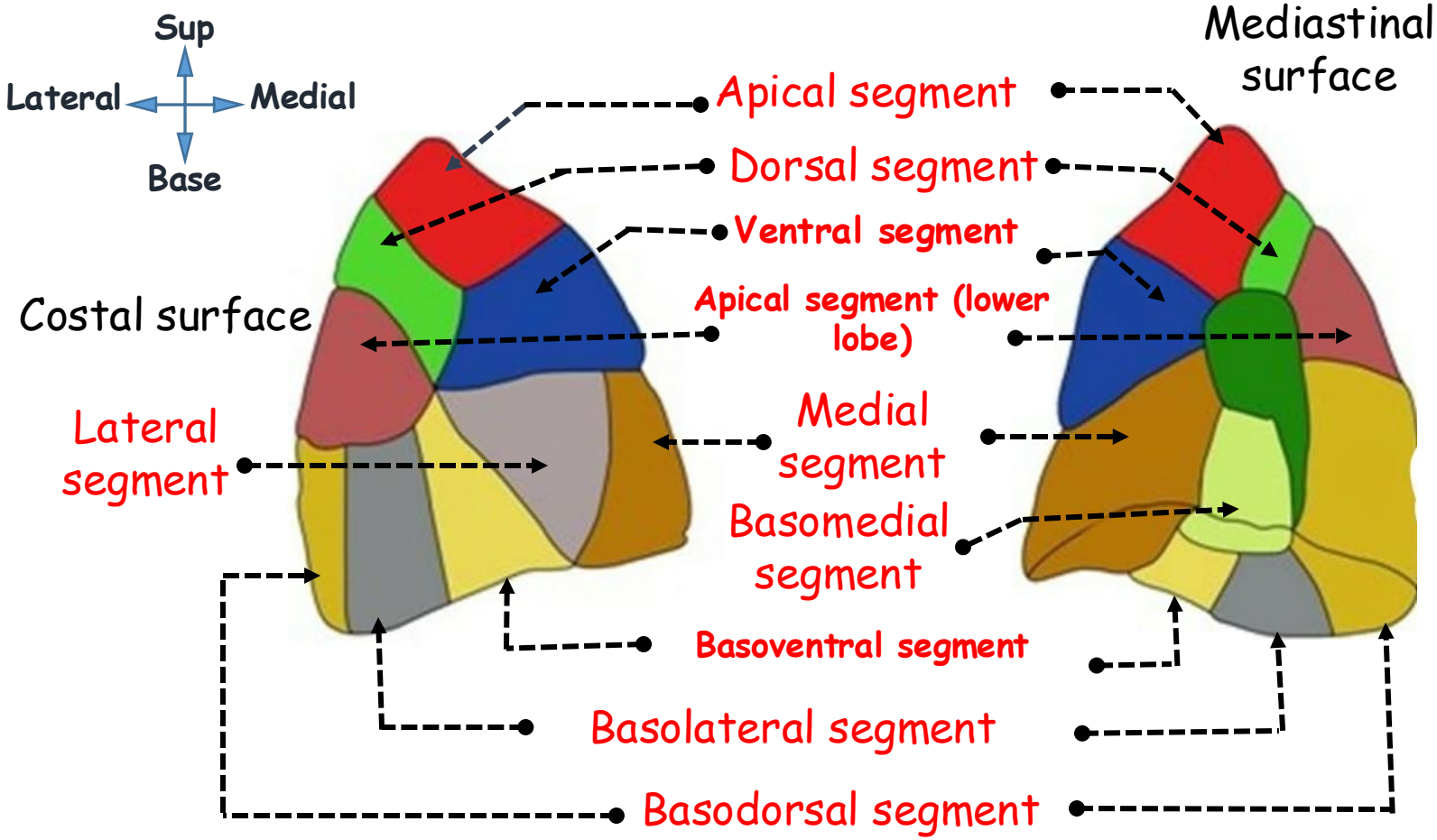
- Its lower boundary is marked by the groove of the first rib.

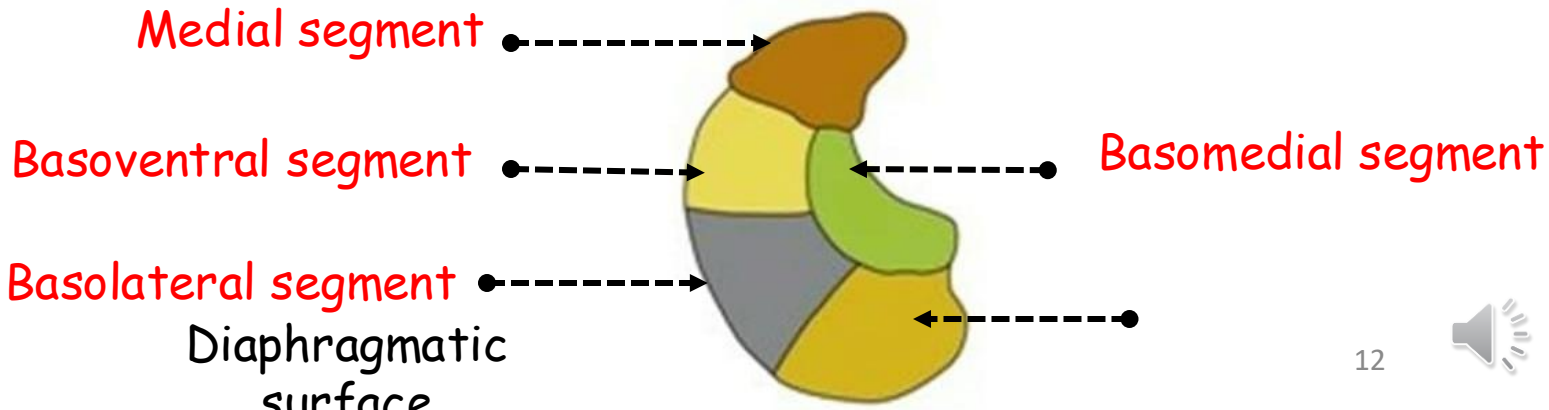
6. Segmentation of the right lung :

- The right lung is divided by **2 fissures** into **3 lobes** :
  - Upper lobe,
  - Middle lobe,
  - Lower lobe.
- The fissures are :
  - Oblique fissure,
  - Horizontal fissure.

6. Segmentation of the right lung

- **Upper lobe :**
  - Apical segment,
  - Dorsal segment,
  - Ventral segment.
- **Middle lobe :**
  - Lateral segment,
  - Medial segment.
- **Lower lobe :**
  - ✓ Superior group :
  - Apical segment.
  - ✓ Inferior group :
  - Basomedial segment,
  - Basoventral segment,
  - Basolateral segment,
  - Basodosral segment.





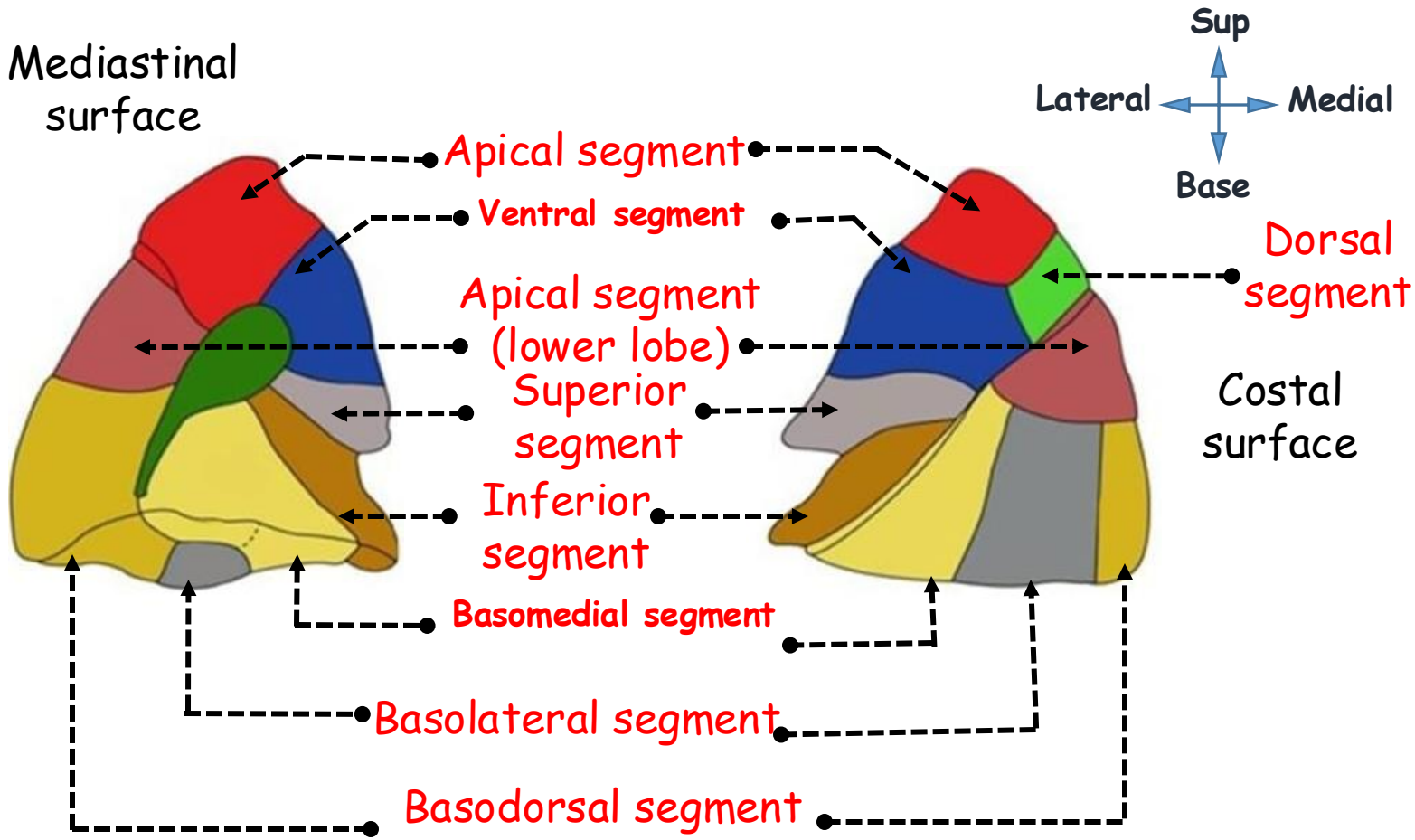
7. :Segmentation of the left lung

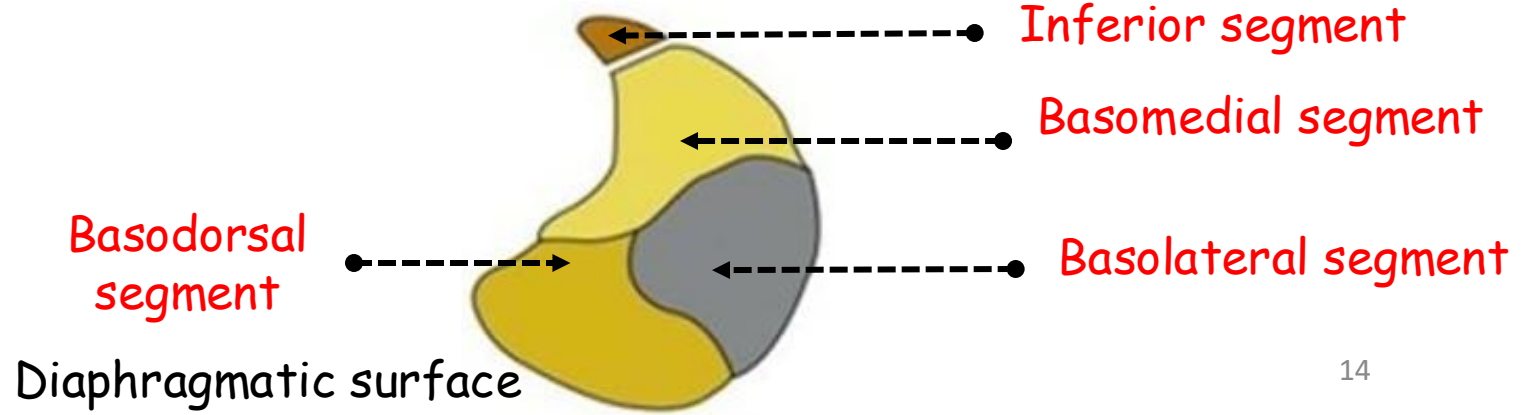
The left lung is divided by **the oblique fissure** into **2 lobes :**

- Upper lobe,
- Lower lobe.

7. Segmentation of the left lung:

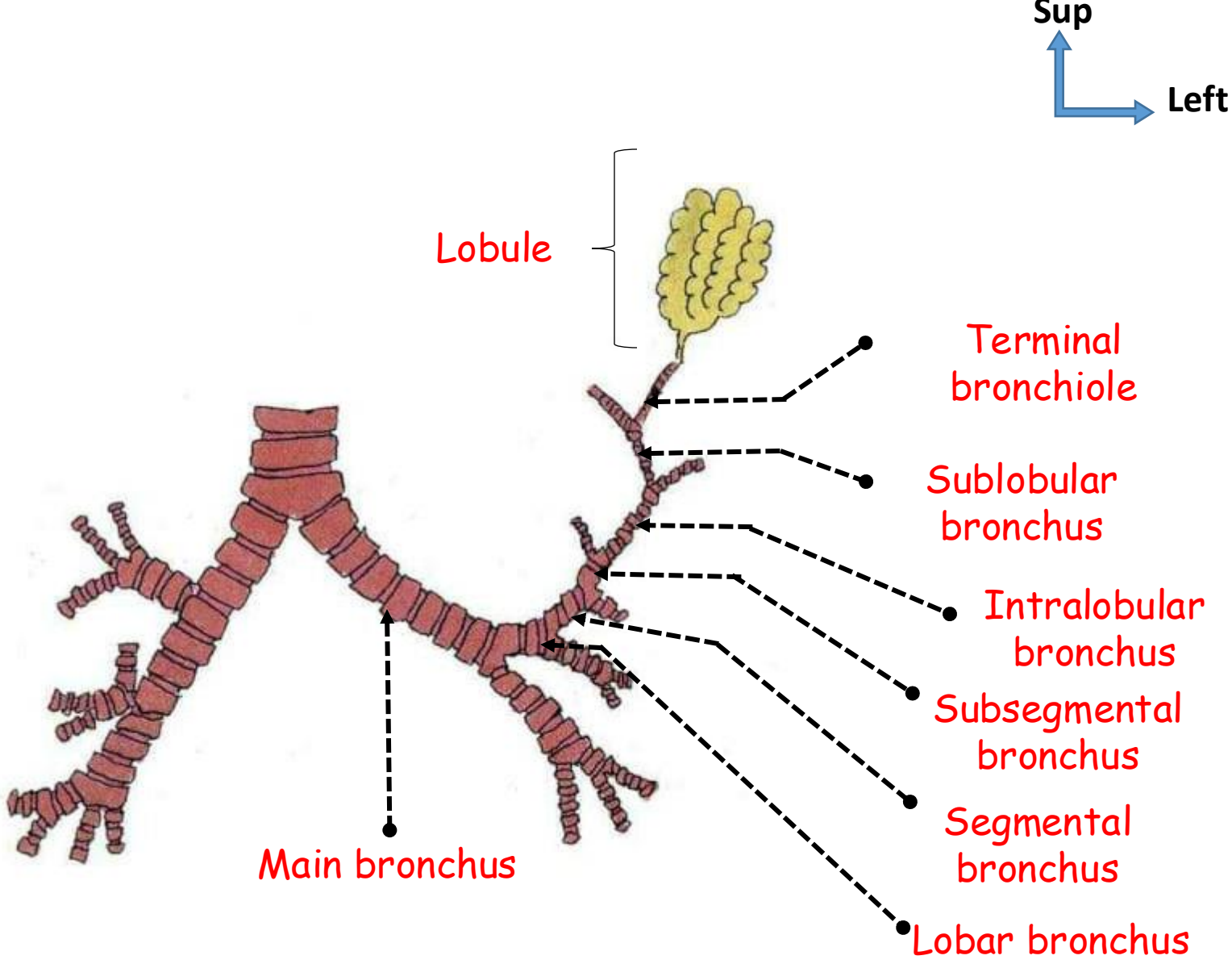
- **Upper lobe:**
  - ✓ Superior group or culmen:
    - Apical segment,
    - Dorsal segment,
    - Ventral segment.
  - ✓ Inferior group or lingula:
    - Superior segment,
    - Inferior segment.
- **Lower lobe:**
  - ✓ Superior group:
    - Apical segment.
  - ✓ Inferior group:
    - Basomedial segment,
    - Basoventral segment,
    - Basolateral segment,
    - Basodorsal segment.





III. INTERNAL CONFIGURATION:

- The pulmonary parenchyma is segmented into progressively smaller elements, accompanied by bronchial, vascular and neural divisions that also reduce is size.
- The entire structure forms a « tree ».
- Each segment of every is divided into numerous elements, each of which constituts a functional respirotary unit, called **pulmonary lobules.**



SYSTEMATIC VIEW OF THE BRONCHIAL DIVISION FORMING THE BRONCHIAL TREE

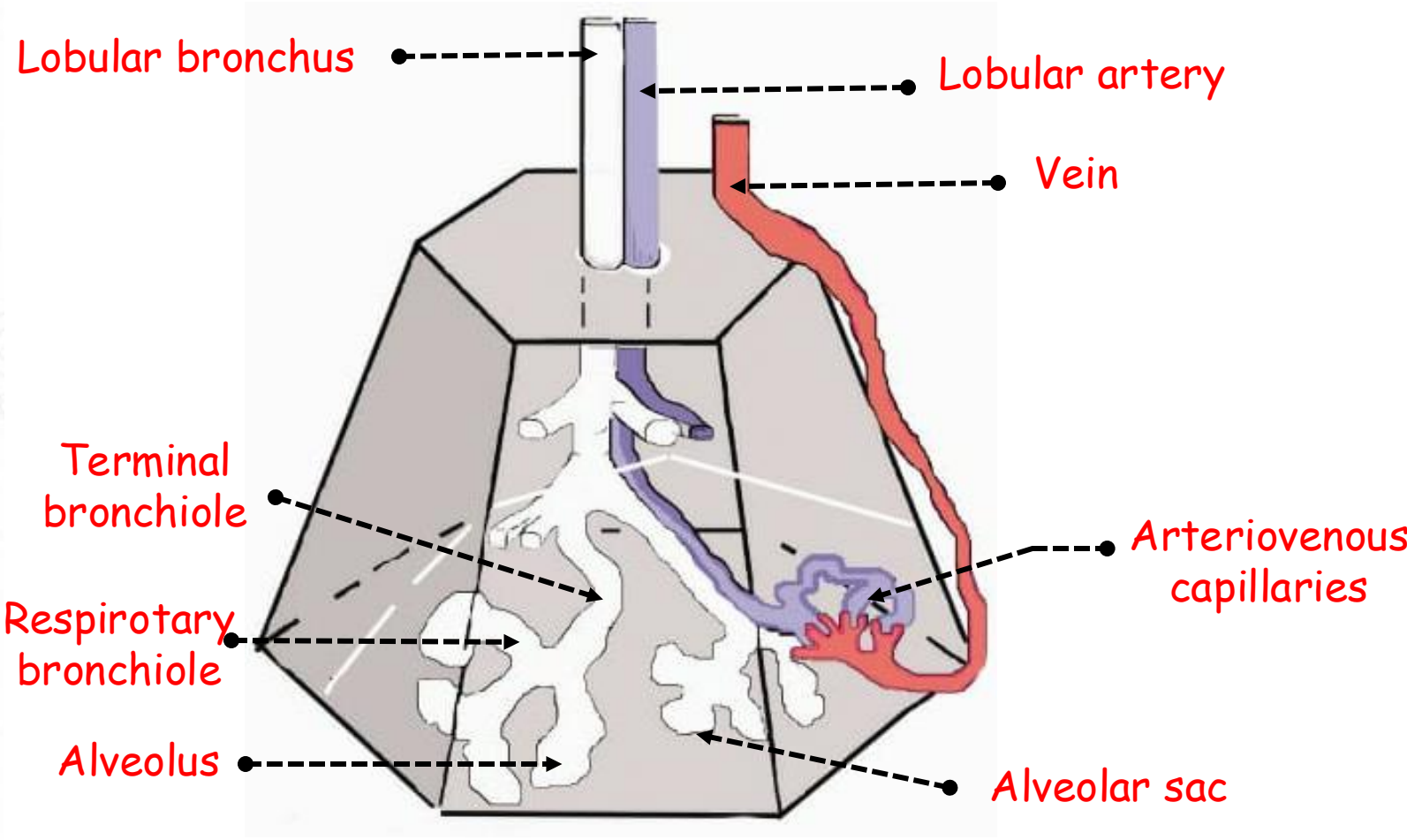
The morphological unit of the lung : **the Miller lobule.**

- The Miller lobule is of variable size.
- It is traversed at its apex by a broncho-vascular axis :

  -The lobular bronchus,

  -The lobular arteries,

  -The veins.
- They are approximately 5000 Miller lobules, each surrounded by a septal envelope connected to the pleura.
- Each lobule consists of 3 to 5 acinar units, which themselves subdivide into alveolar sacs, and then into alveoli.
- The alveoli enveloped by arterio-venous capillaries.



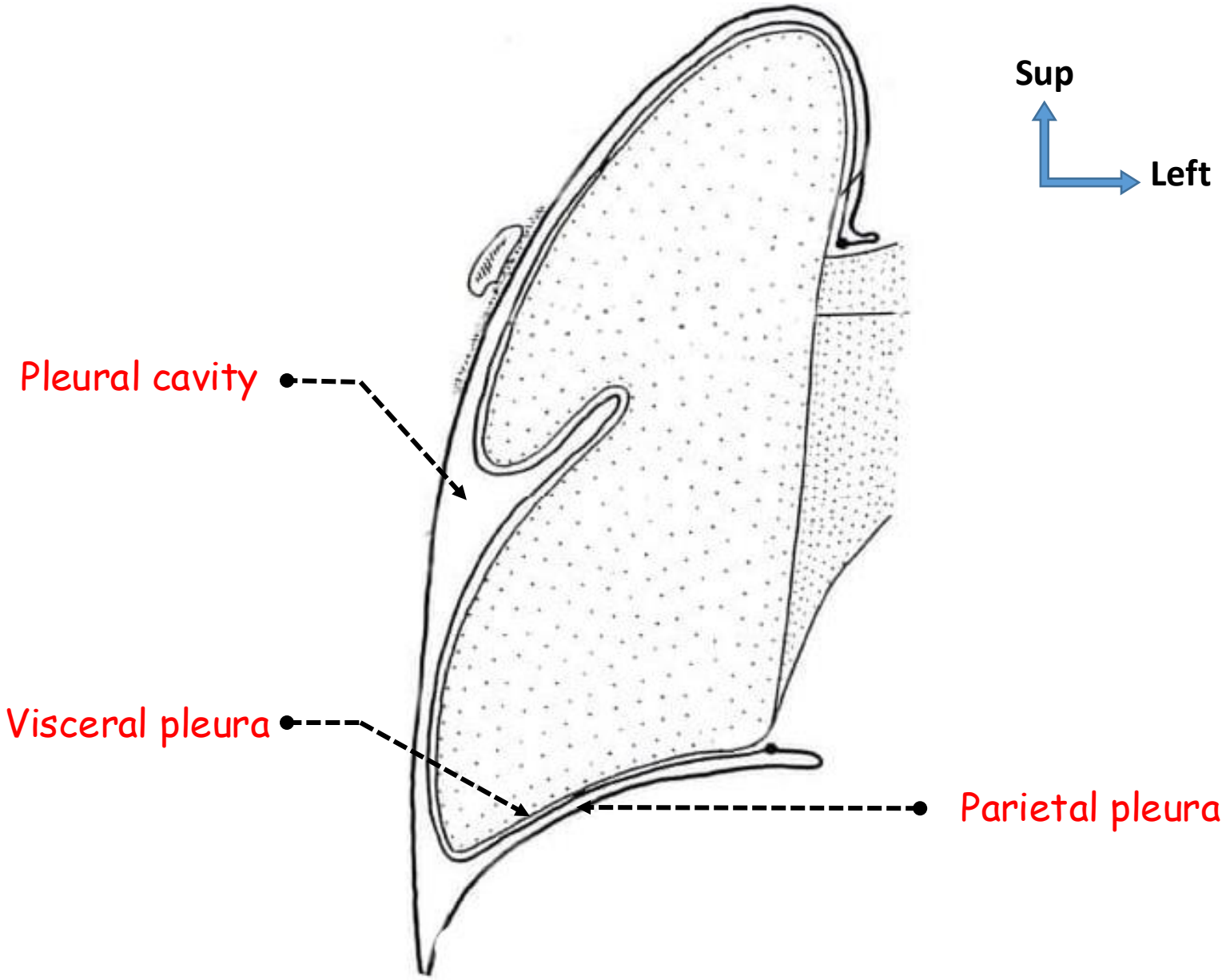
THE MILLER LOBULE

IV.PLEURAE :

- Each pleura is a serous membrane surrounding each lung.

- They consist of two layers :
  - **Visceral pleura**
  - **Parietal pleura**.

- The two layers form a virtual space:
  - **the pleural cavity.**



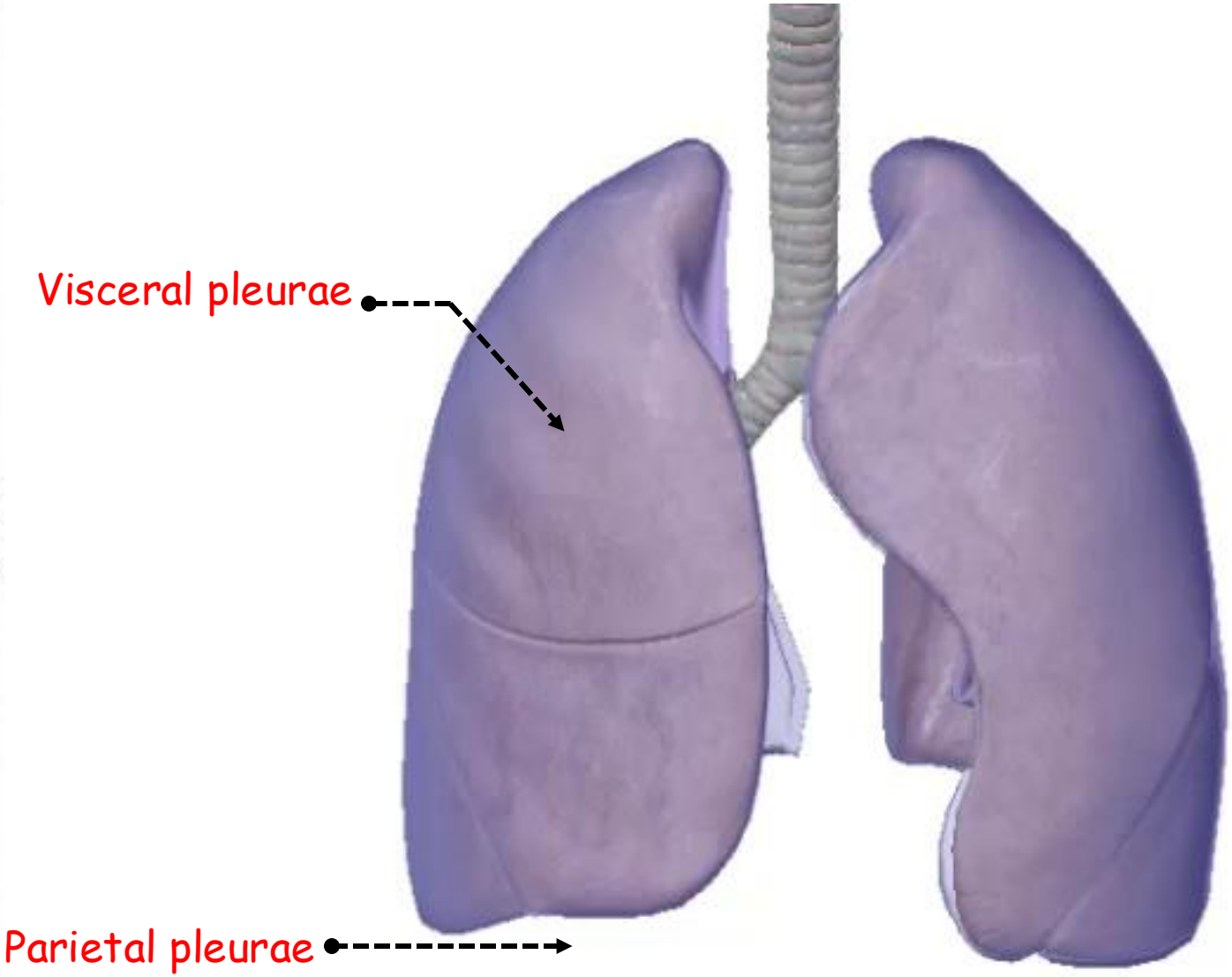
A FRONTAL SECTION OF THE THORAX (source: Joseph Fourier University in Grenoble)

Visceral pleura :

- It is thin and transparent.
- It covers the surface of the lung and the lobar fissures.

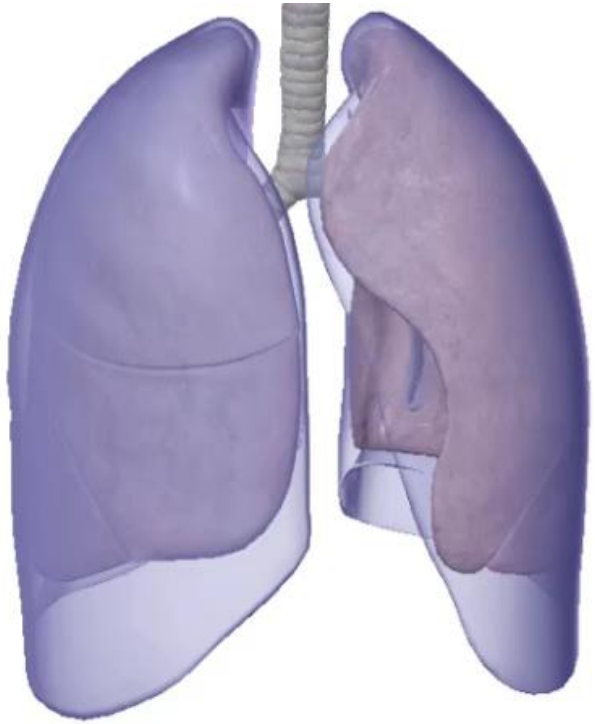
Parietal pleura :

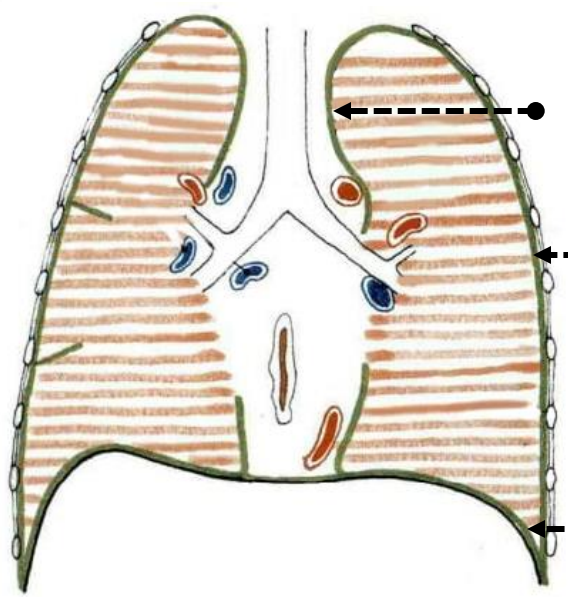
- It lines the deep surface of the cavity containing the lung.
- It is divided into three segments :
  - Costal segment,
  - Medial segment,
  - Inferior segment.



Parietal pleura :

- Costal pleura.
- Diaphragmatic pleura.
- Mediastinal pleura :
  - Superior level : supra-pedicular,
  - Middle level : pedicular,
  - Inferior level : sub-pedicular.



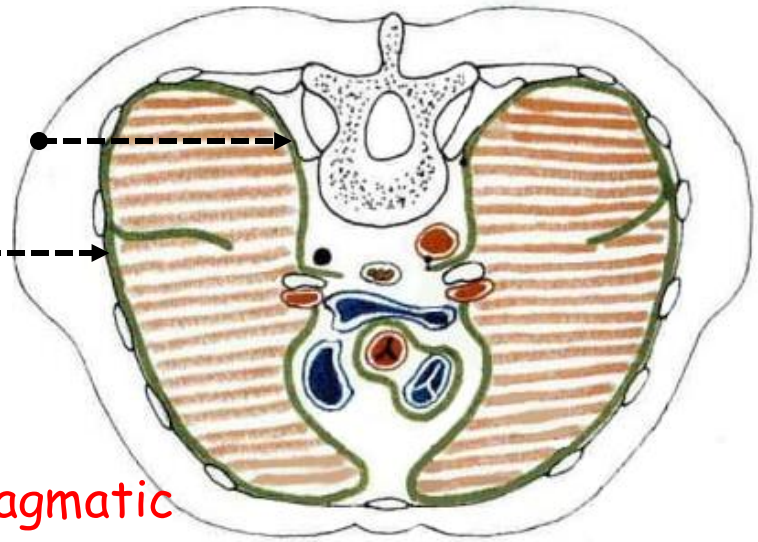


Mediastinal pleura

Costal pleura

Diaphragmatic pleura

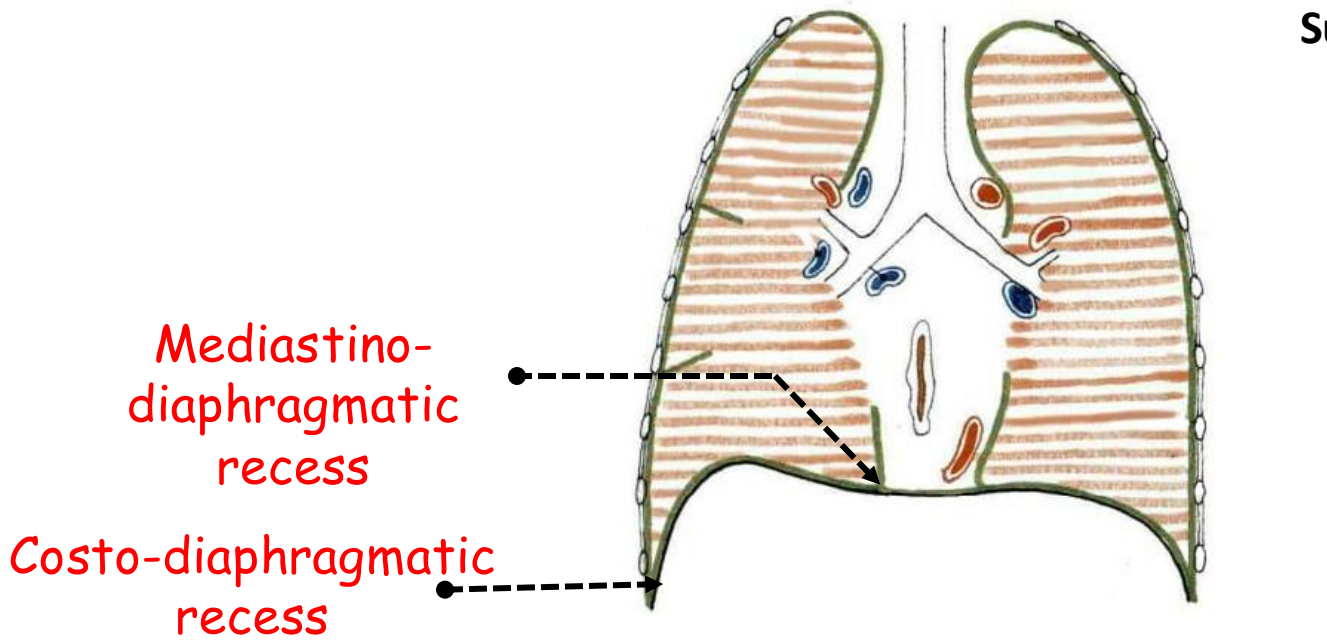
FRONTAL SECTION OF THE THORAX



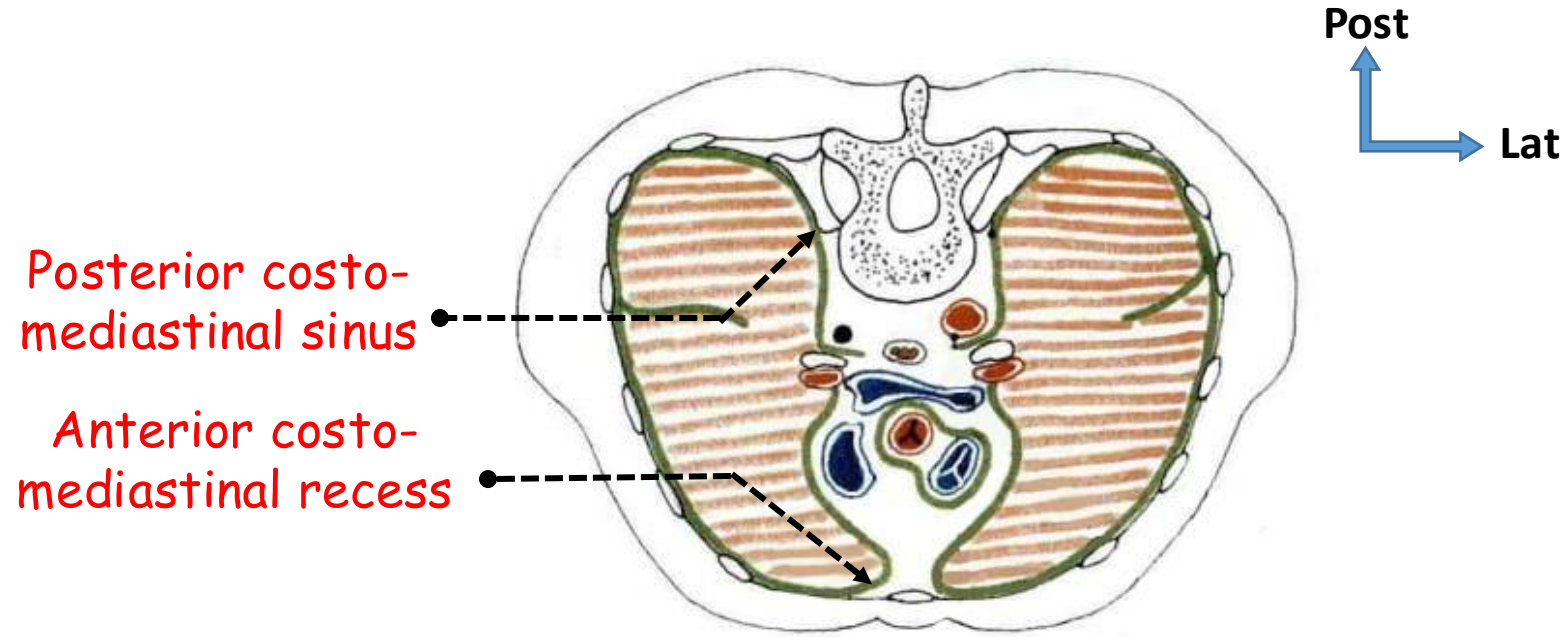
TRANSVERSE SECTION OF THE THORAX

Parietal pleura :

- The three segments of the parietal pleura continue without interruption into one another, forming **4 pleural recesses :**
  - Anterior costo-mediastinal recess,
  - Posterior costo-mediastinal recess,
  - Mediastino-diaphragmatic recess,
  - Costo-diaphragmatic recess.



FRONTAL SECTION OF THE THORAX

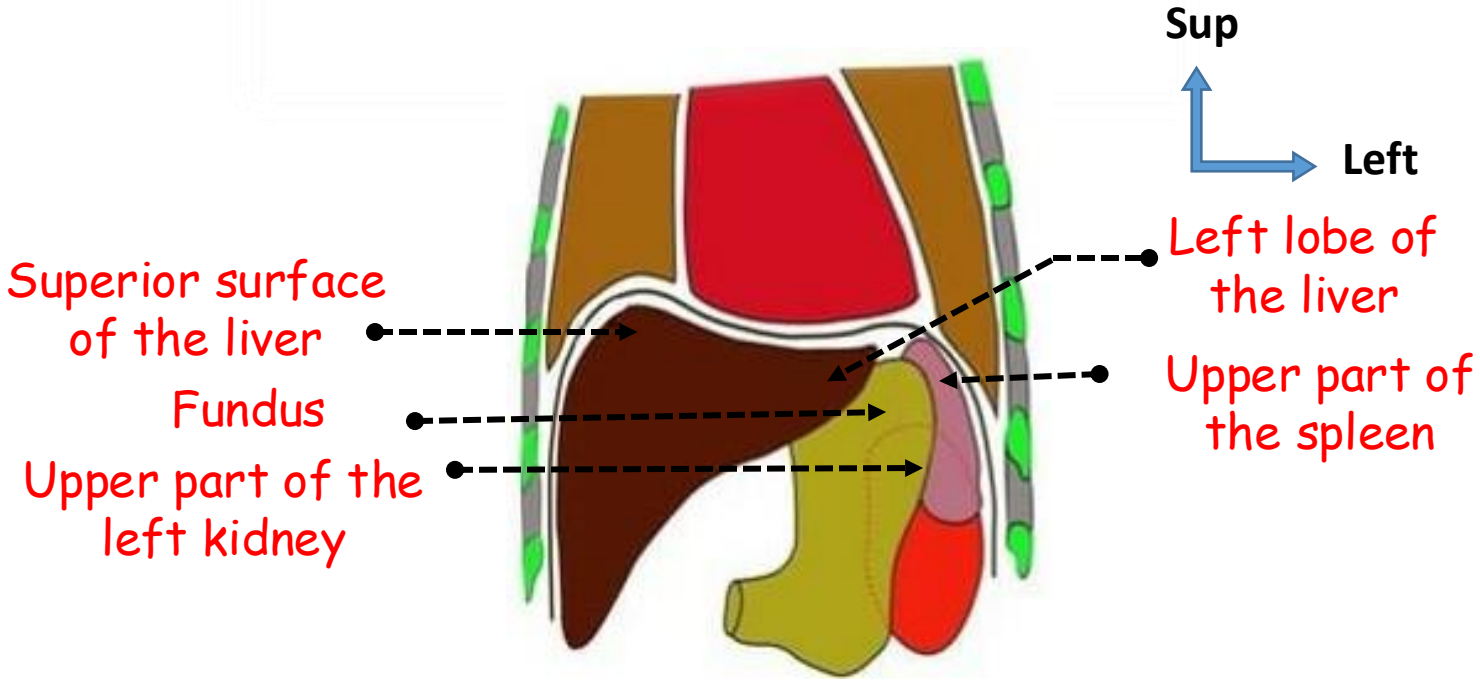


TRANSVERSE SECTION OF THE THORAX

V. ANATOMICAL RELATIONS

Inferior or diaphragmatic relations:

- **On the right :**
  - The superior surface of the liver.
- **On the left :**
  - The left lobe of the liver,
  - The fundus of the stomach,
  - The left adrenal gland,
  - The upper part of the left kidney,
  - The upper part of the spleen, more laterally.

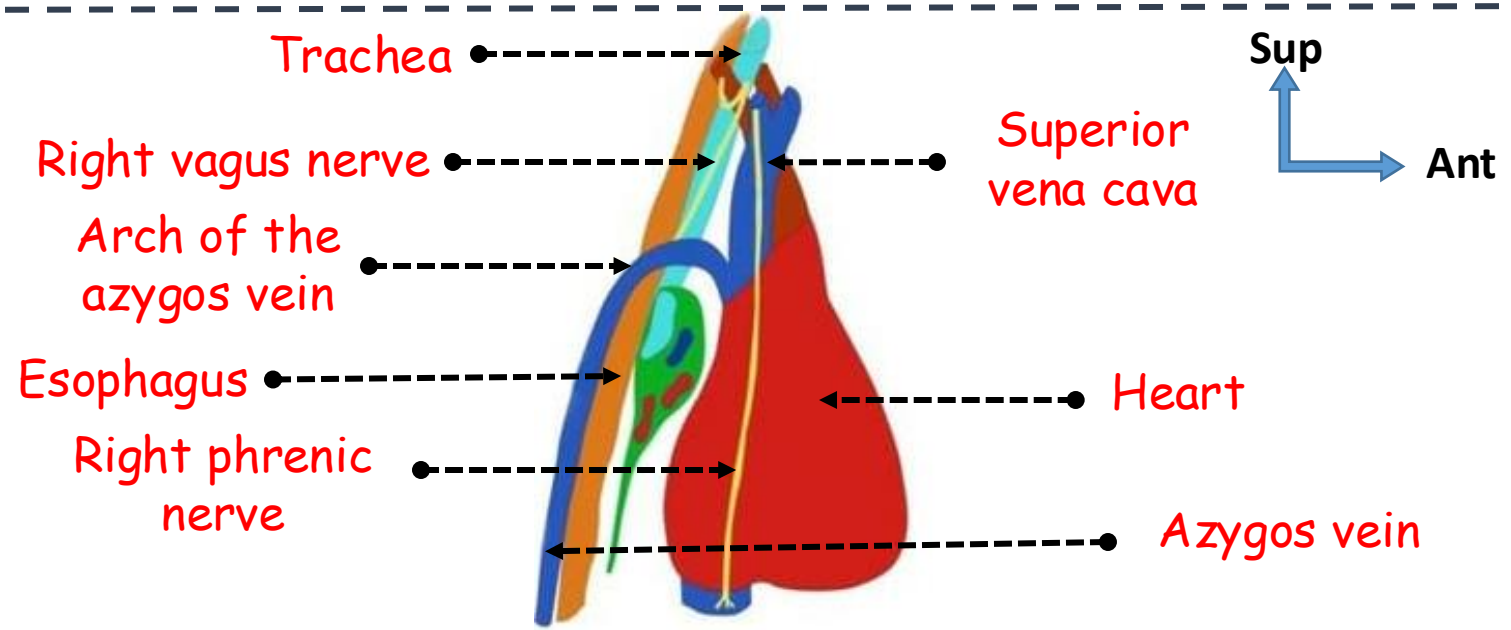


FRONTAL THORACO-ABDOMINAL SECTION

Internal or mediastinal relations:

➢ On the right:

- ❑ In **the anterior mediastinum** :
  - The heart : right atrium,
  - The superior vena cava and the brachiocephalic venous trunk,
  - The right phrenic nerve.
- ❑ In **the middle mediastinum** :
  - The trachea,
  - The arch of the azygos vein,
  - The right vagus nerve.
- ❑ In **the posterior mediastinum** :
  - The esophagus,
  - The azygos vein,
  - The lateral vertebral sympathetic chain.



RIGHT LATERAL VIEW OF THE MEDIASTINUM

Internal or mediastinal relations:

➢ On the left :

❑ In **the anterior mediastinum :**

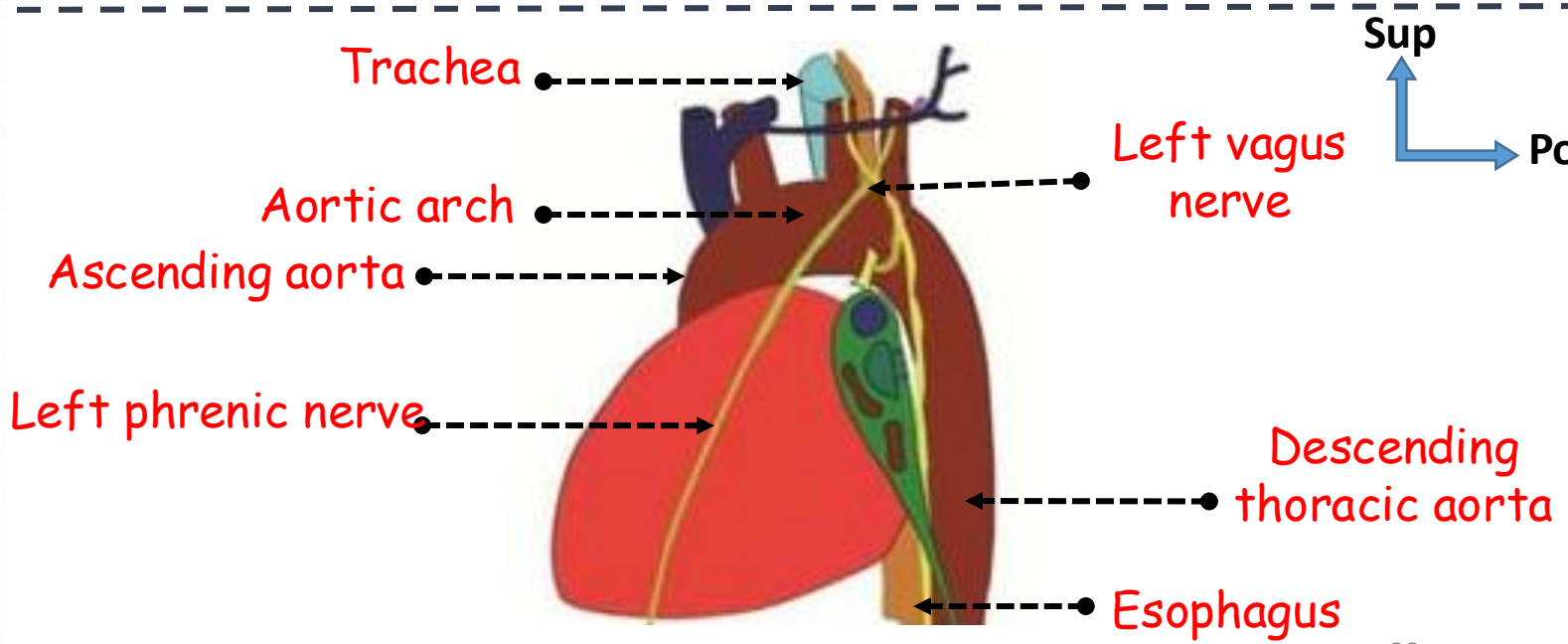
- The heart : left ventricle,
- Ascending aorta,
- The left phrenic nerve.

❑ In **the middle mediastinum :**

- The trachea,
- The aortic arch,
- The left vagus nerve.

❑ In **the posterior mediastinum :**

- The esophagus.
- Descending thoracic aorta,
- The thoracic duct,
- Lateral vertebral sympathetic chain.



LEFT LATERAL VIEW OF THE MEDIASTINUM

External or parietal relations:

- The costal surface of the lung is molded to the inner surface of the thoracic wall.

Relations of the apex :

- **Anteriorly :**
  - The subclavian artery,
  - The anterior scalene muscle,
  - The phrenic nerve,
  - The vagus nerve,
  - The recurrent laryngeal nerve.
- **Posteriorly :**
  - The neck of the first rib,
  - The cervico-thoracic ganglion,
  - The first intercostal pedicle.

Relations of the apex:

- **Laterally :**
  - The middle scalene muscle.
- **Medially :**
  - On the right :
    - The brachiocephalic venous trunk,
    - The esophagus,
    - The trachea,
  - On the left :
    - The common carotid artery,
    - The left subclavian artery,
    - The esophagus,
    - The thoracic duct.

VI. VASCULARIZATION – INNERVATION – LYMPHATIC DRAINAGE SYSTEM:

Arterial and venous vascularization

- A functional system :

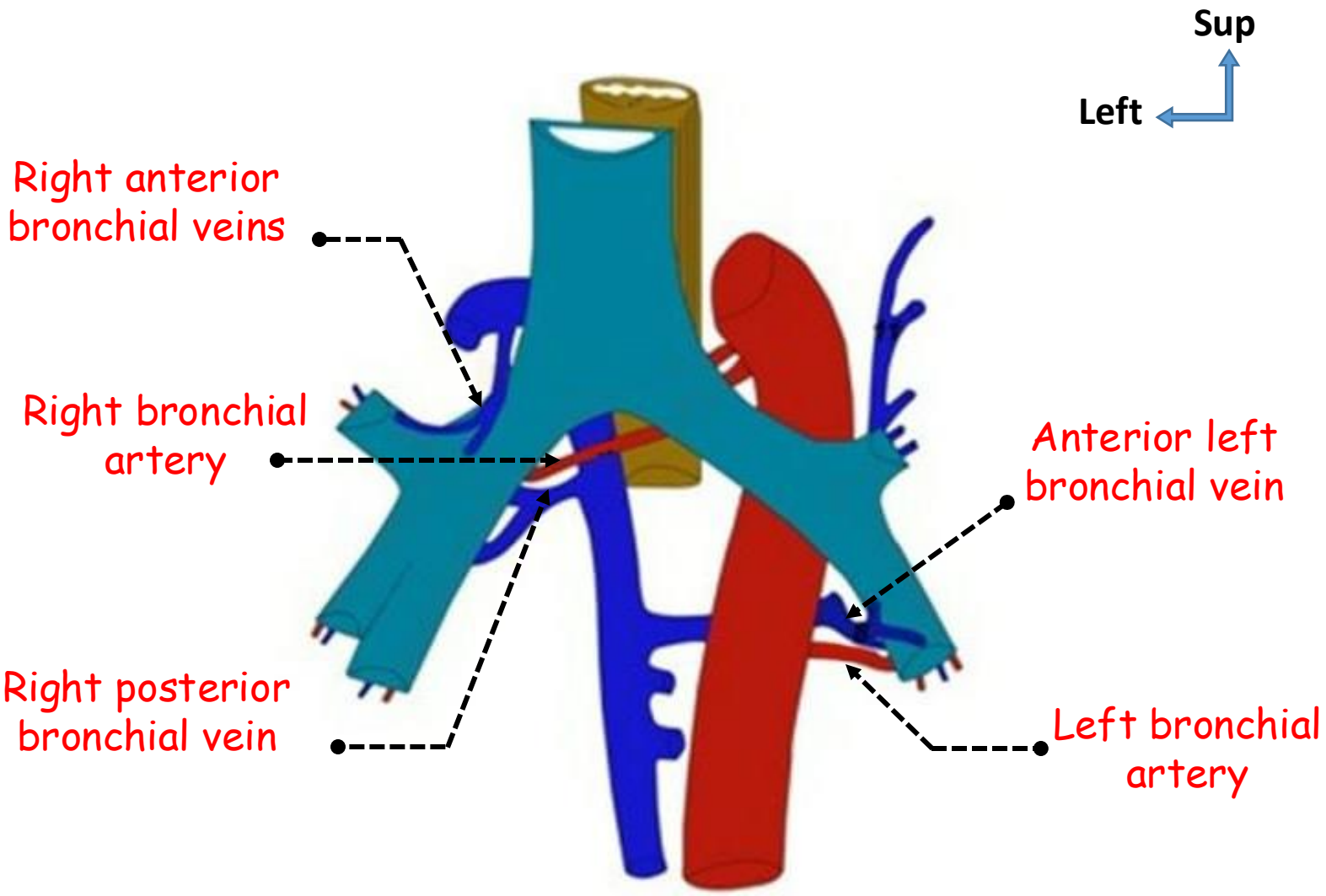
- Pulmonary artery trunk :
  - Right pulmonary artery,
  - Left pulmonary artery.

- Pulmonary veins :
  - 2 right pulmonary veins,
  - 2 left pulmonary veins.

Arterial and venous vascularization:

- **A nutritive system:**

- Bronchial arteries.
- Bronchial veins.



BRONCHIAL ARTERIES AND VEINS

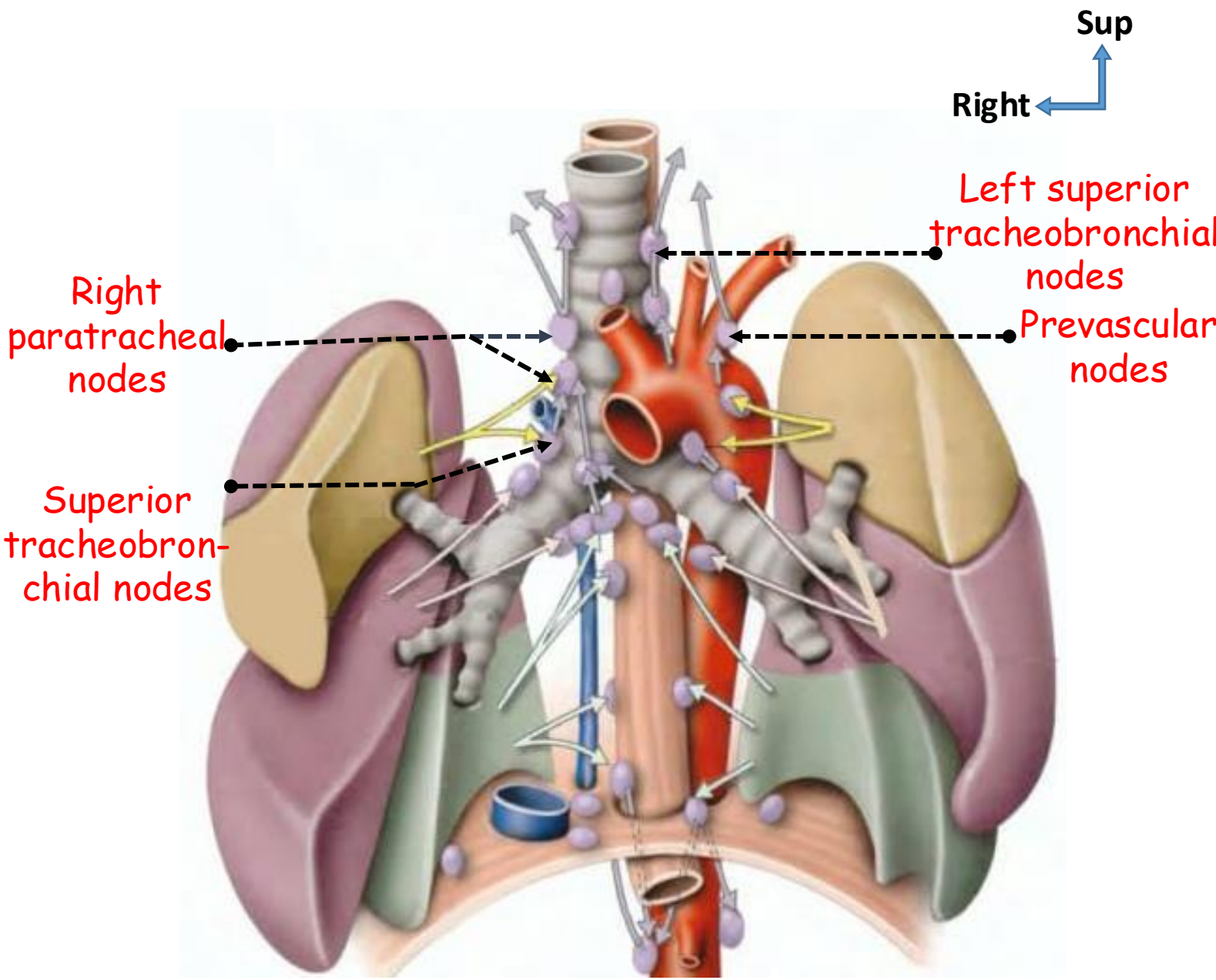
Lymphatic drainage:

- 3 lymphatic territories :

Upper pulmonary territories :

- The antero-medial part of the right upper lobe drains in :
  - The superior tracheobronchial lymph nodes,
  - The right paratracheal lymph nodes.

- The upper part of the left upper lobe drains in :
  - The prevascular lymph nodes,
  - The left superior tracheobronchial lymph nodes.



LYMPHATIC DRAINAGE TERRITORIES OF THE LUNGS

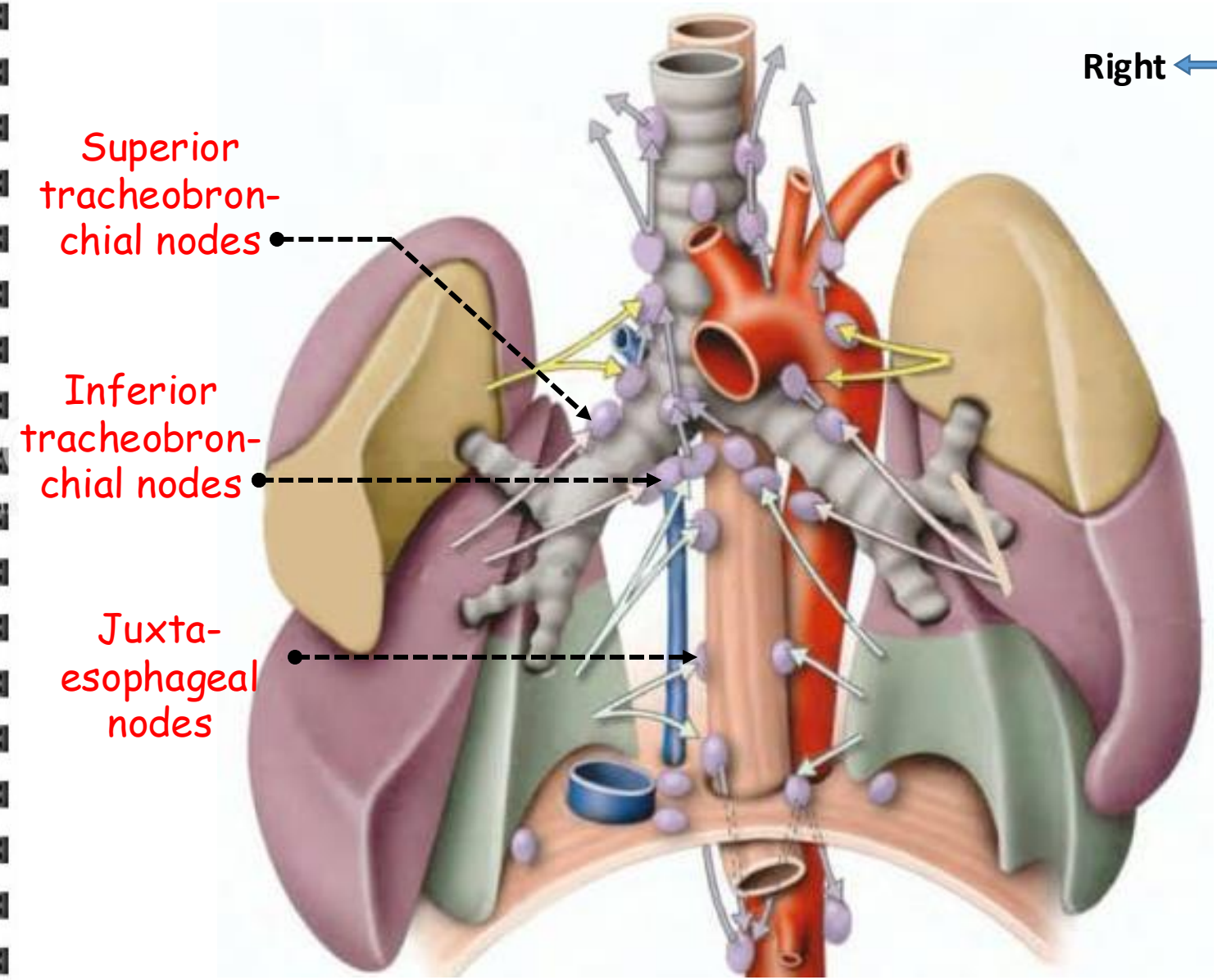
Lymphatic drainage:

Middle pulmonary territories:

- These drain in :
  - Superior tracheobronchial lymph nodes,
  - Inferior tracheobronchial lymph nodes.

Lower pulmonary territories:

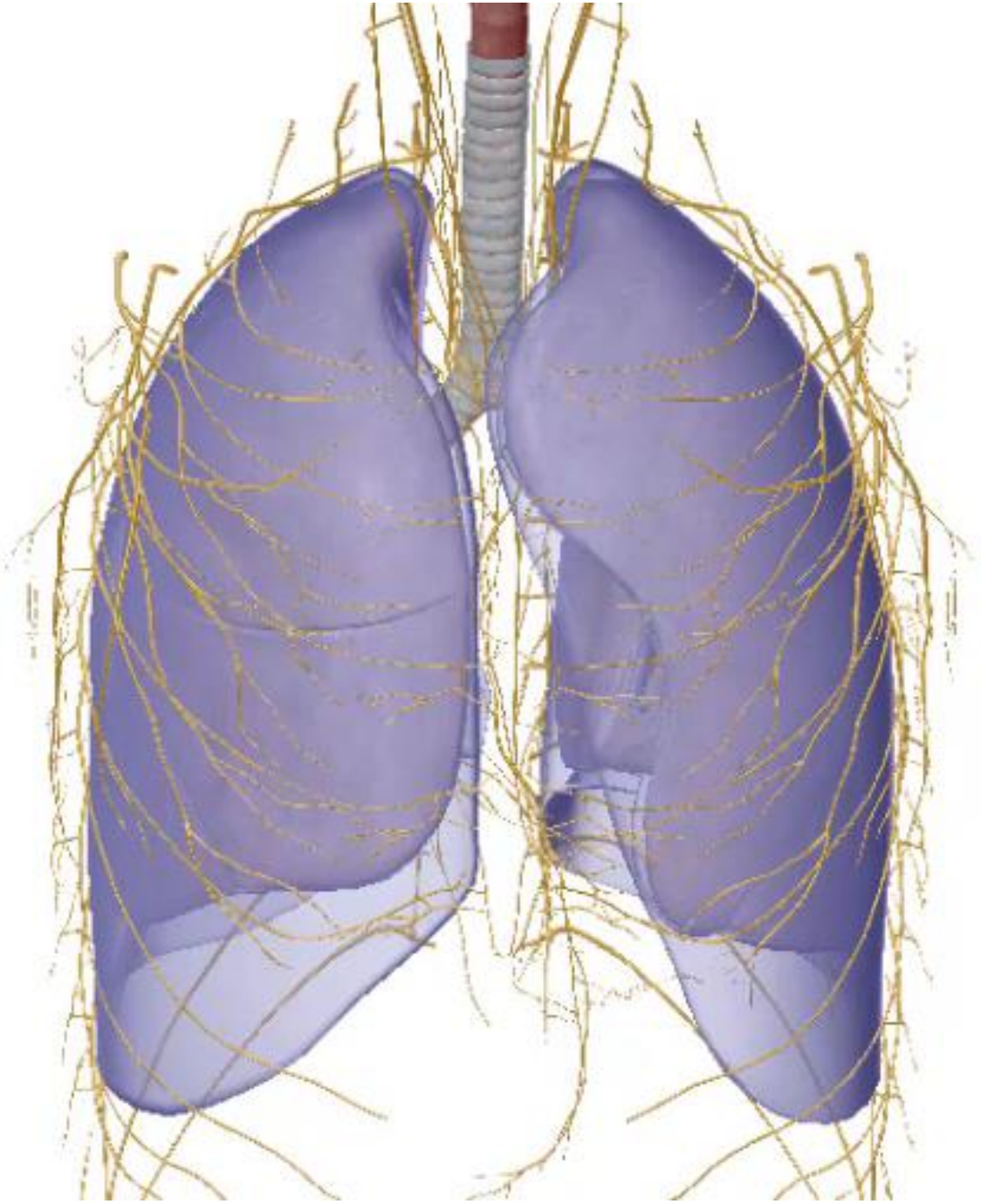
- These drain in :
  - Inferior tracheobronchial lymph nodes,
  - Juxta-esophageal pulmonary lymph nodes.



LYMPHATIC DRAINAGE TERRITORIES OF THE LUNGS

Innervation:

- The nerves originate from the pulmonary plexus and consist of :
  - Parasympathetic neurofibers that are bronchodilatory,
  - Sympathetic neurofibers that are broncho-constrictive.
- Together these anatomic fibers regulate bronchial tone, airflow and blood flow in the lungs.



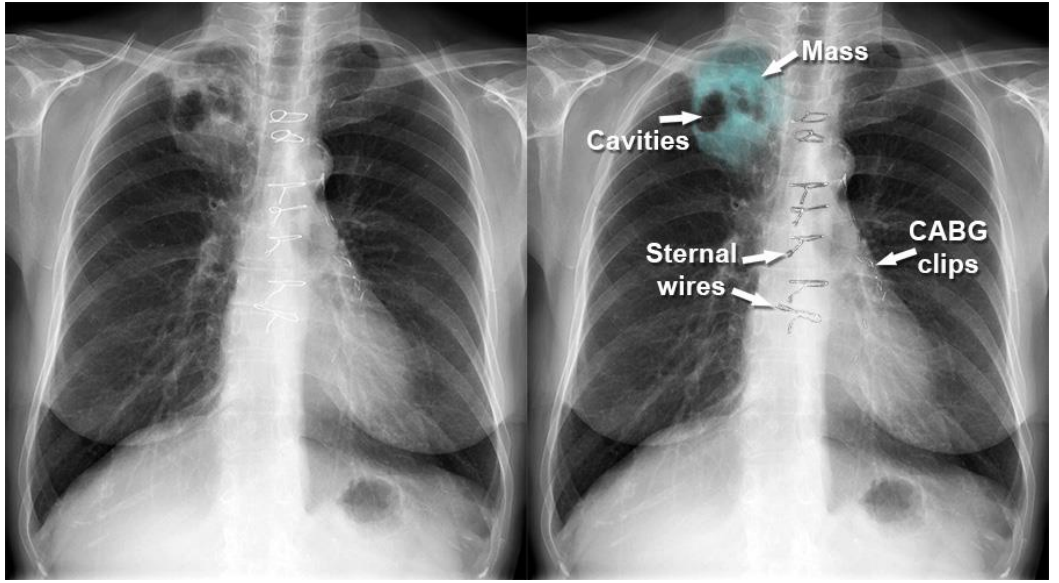
VI. CLINICAL APPLICATIONS:

- Lung cancer:

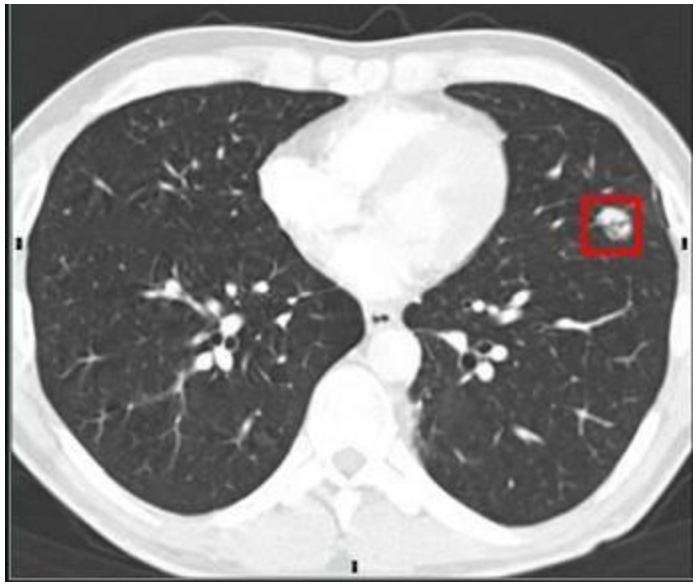
- It's one of the most common cancers worldwide.

- If suspicious, a bronchial fibroscopy with biopsy confirms the diagnosis. Cancer may spread via lymph nodes to the hilum and mediastinum, making surgery difficult. A full workup includes chest x-ray and CT scan.

- **Radiology findings :**
  - ✓ **Chest x-ray** (PA view): screens for abnormalities like opacities, pneumothorax (air), or pleural effusion (fluid).
  - ✓ **Chest CT scan**: assesses tumour spread in lung tissue (parenchymal window) and lymph nodes or vessel involvement (mediastinal window).



Chest X-Ray showing a lung mass



Chest CT scan showing a lung tumor

VII. CONCLUSION :

- The lung is a respiratory organ that also plays an important role in the purification and protection of the body against the environment with which it maintains constant air contact.

- A thorough understanding of its anatomy has become essential in order to make the most of advancements in surgery and modern imaging.