



# The Lungs Mediastinum

Lecture no.2

Assoc. Prof. ALINA ȘIȘU MD, PhD



**Thicker than pulmonary pleura**

**Parietal pleura has 4 parts:**

**Costal pleura**

**Lines thoracic wall (ribs, intercostal spaces)**

**Mediastinal pleura**

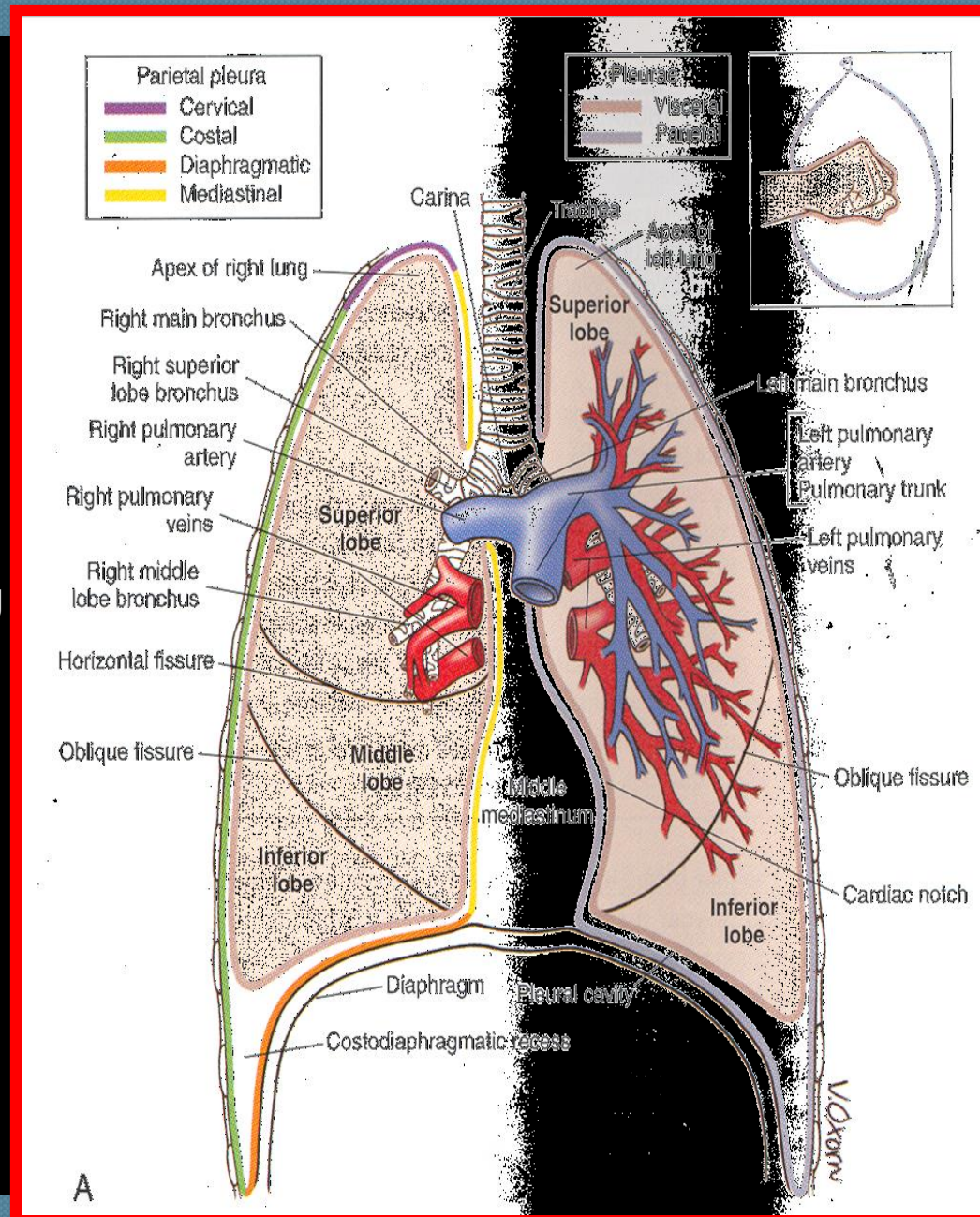
**Lines corresponding surface of mediastinum; reflected over root of lung becomes continuous with pulmonary pleura around hilum**

**Cervical pleura**

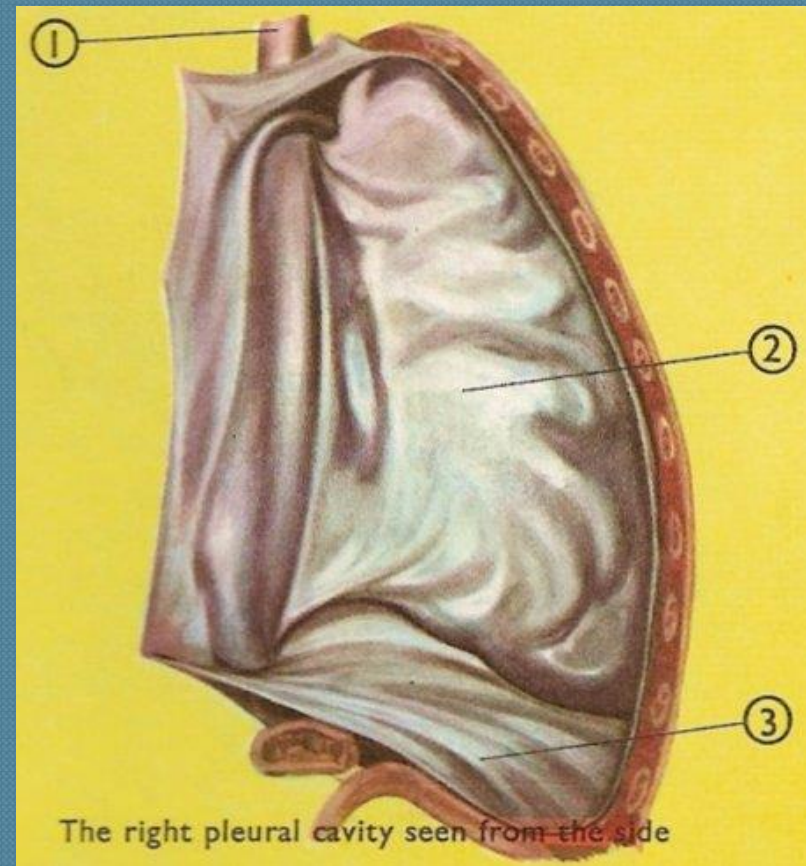
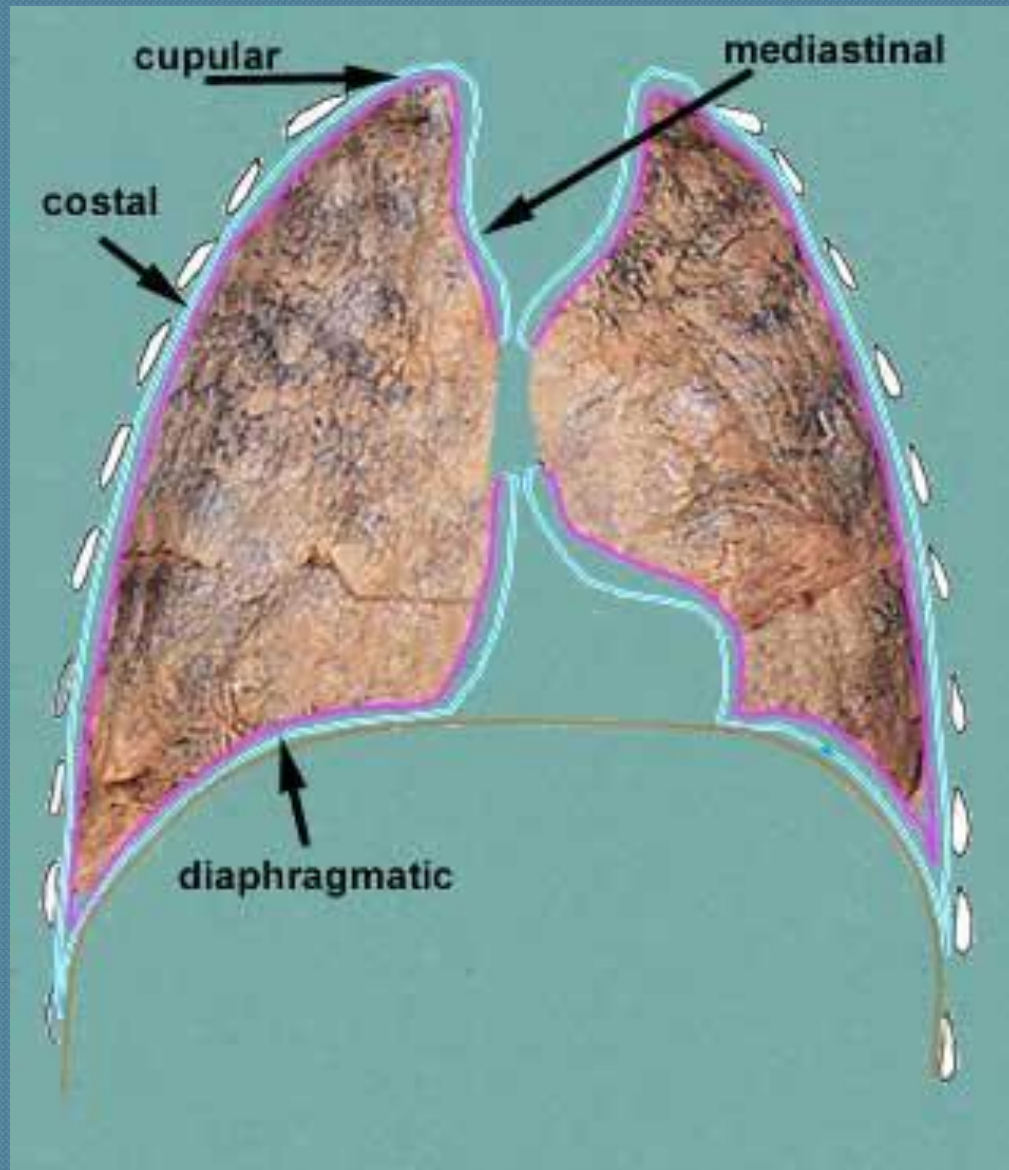
**Extends into neck about 2 inches above 1<sup>st</sup> costal cartilage & one inch above medial 1/3 clavicle; covers apex of lung**

**Diaphragmatic pleura**

**Lines superior surface of diaphragm**







1. Oesophagus. 2. Parietal pleura. 3. Diaphragmatic parietal pleura.



# The parietal pleura relations:

- **The cervical pleura** – ascends through the superior aperture of the thorax, passing above the clavicle in the close vicinity of the supraclavicular triangle
- Here can be found the suspensory apparatus of the pleural dome, which comprises the costopleural and vertebropleural ligaments, together with the *scalenus anterior* muscle, which receives fibers from the *scalenus medius* muscle.
- **The phrenic pleura (diaphragmatic)** – has relations with the organs situated into the supramesocolic floor by the medium of the diaphragm.

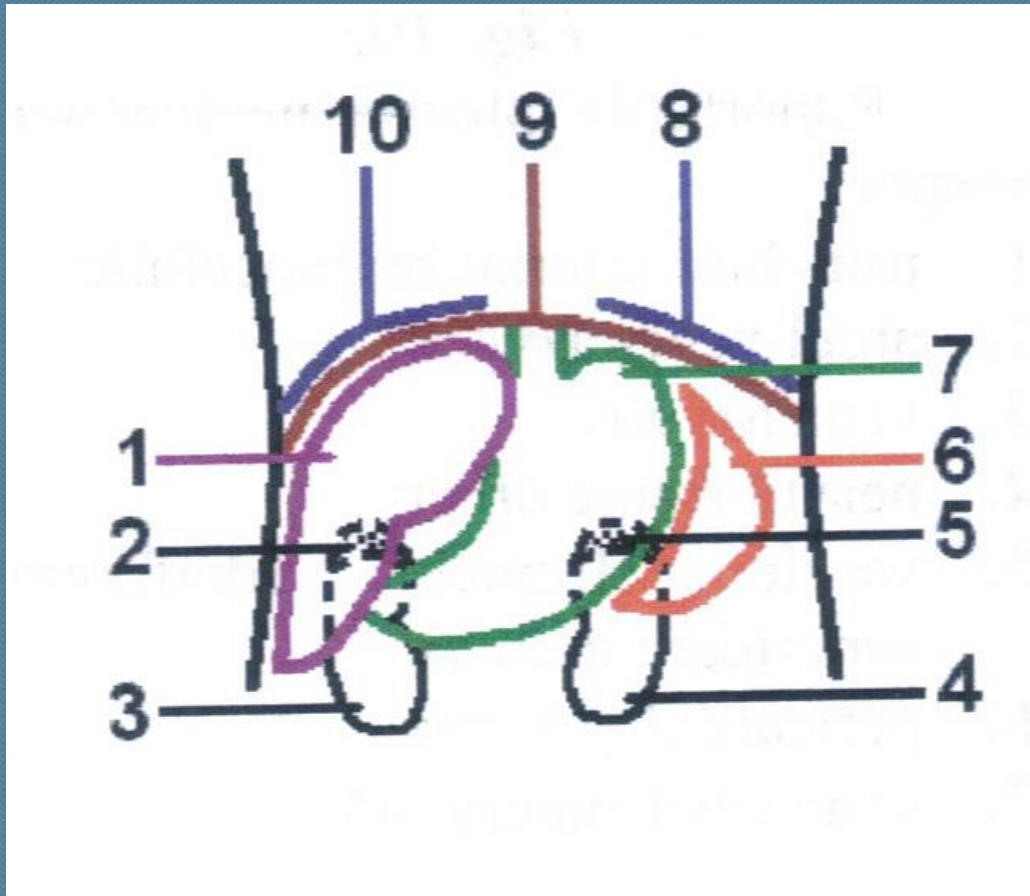


- ◉ **Costal pleura** – has relations with the costal arches.
- ◉ **Mediastinal pleura** – has relations with the trachea, the bronchi, the tracheal and tracheobronchic lymph nodes, with the oesophagus and the vagus nerves.
- ◉ In the vicinity of the pulmonary hilum, the phrenic nerves pass prehilar and the vagus nerves pass retrohilar.



## The phrenic pleura (diaphragmatic)

It has relations with the organs situated into the supramesocolic floor, by the means of the diaphragm.



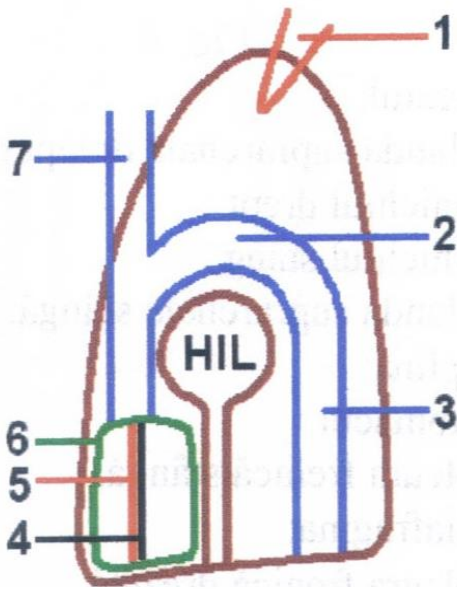
1. Liver
2. Right suprarenal gland
3. Right kidney
4. Left kidney
5. Left suprarenal gland
6. Spleen
7. Stomach
8. Left phrenic pleura
9. Diaphragm
10. Right phrenic pleura



## The mediastinal pleura (Hilum)

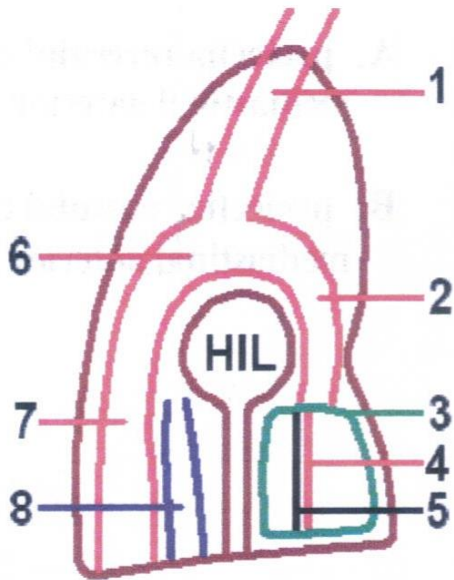
Relations on the right side:

1. Brachiocephalic trunk
2. Azygos vein arch
3. Azygos vein
4. Right phrenic nerve
5. Phrenic vessels
6. Pericardium and heart
7. Superior vena cava



Relations on the left side:

1. Left subclavian vein
2. Ascending aorta
3. Pericardium and heart
4. Phrenic vessels
5. Left phrenic nerve
6. Aortic arch
7. Descending aorta, thoracic part
8. Oesophagus





## The pulmonary fissure projection:

The right lung presents three lobes (superior, middle and inferior), which are separated one between the other by two fissures:

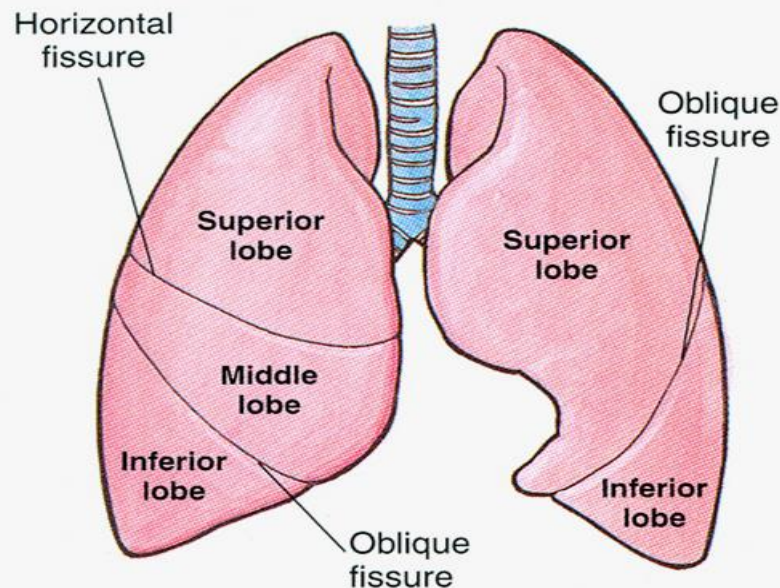
- Oblique fissure.
- Horizontal fissure.

The left lung has two lobes (superior and inferior), which are separated by the oblique fissure

- The superior lobe of the lung presents:
  - The culmen – corresponding to the superior lobe on the right lung.
  - The lingula – corresponding to the middle lobe on the right lung.

### Right lung (three lobes)

Superior (upper) lobe separated by horizontal fissure from the middle lobe separated by oblique fissure from the inferior (lower) lobe



### Left lung (two lobes)

Superior (upper) lobe separated by oblique fissure from the inferior (lower) lobe



## The Respiratory Apparatus (*Apparatus Respiratorius*; Respiratory System)

The opening of the pulmonary diverticulum lies between the two fifth arch masses and behind a “central mass” in the middle line—the proximal end of the diverticulum is compressed between the fifth arch masses.

The right and left lung buds grow out behind the ducts of Cuvier, and are at first symmetrical, but their ends soon become lobulated, three lobules appearing on the right, and two on the left; these subdivisions are the early indications of the corresponding lobes of the lungs.

The buds undergo further subdivision and ramification, and ultimately end in minute expanded extremities—the infundibula of the lung.

After the sixth month the air-sacs begin to make their appearance on the infundibula in the form of minute pouches.

**The pulmonary arteries are derived from the sixth aortic arches.**

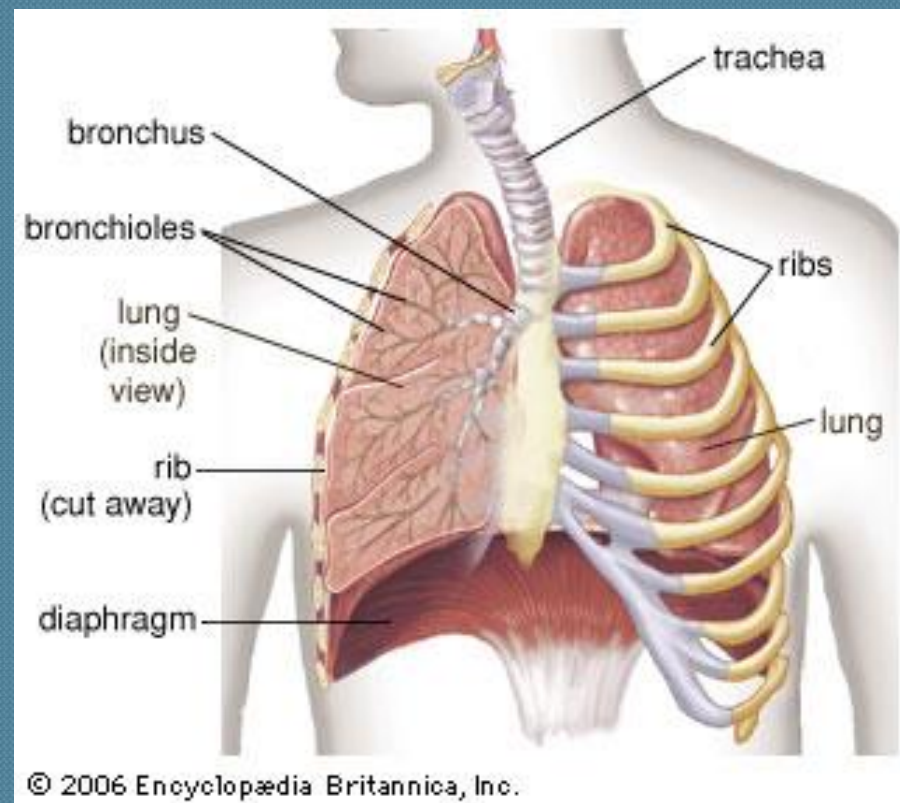
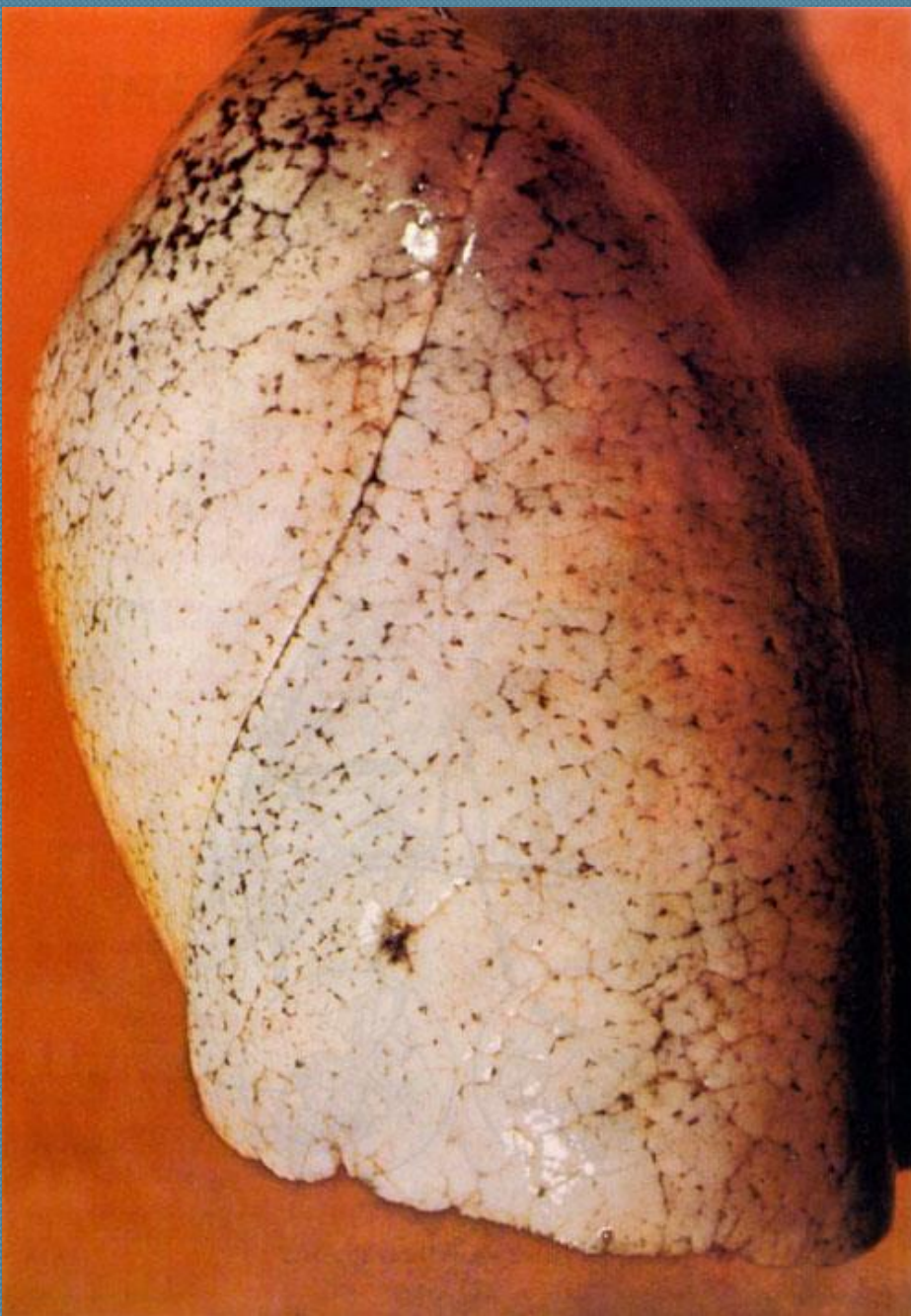
During the course of their development the lungs migrate in a caudal direction, so that by the time of birth the bifurcation of the trachea is opposite **the fourth thoracic vertebra**. As the lungs grow they project into that part of the coelom which will ultimately form the pleural cavities, and the superficial layer of the mesoderm enveloping the lung rudiment expands on the growing lung and is converted into the pulmonary pleura.



# The Lungs

- Are paired organs, situated into the pleuro – pulmonary regions.
- Present a spongy, soft, elastical and tearable aspect.
- Present a weight of approximately 1300 grams –the right lung 700 grams and the left one 600 grams.
- The lungs have a capacity of aproximately 5,000 cm<sup>3</sup>, depending of the age, gender and constitution.
- Their color is grey – pinkish in infant and grey – purple in adults.
- Their shape is cone-like.







# The lungs (*pulmones*)

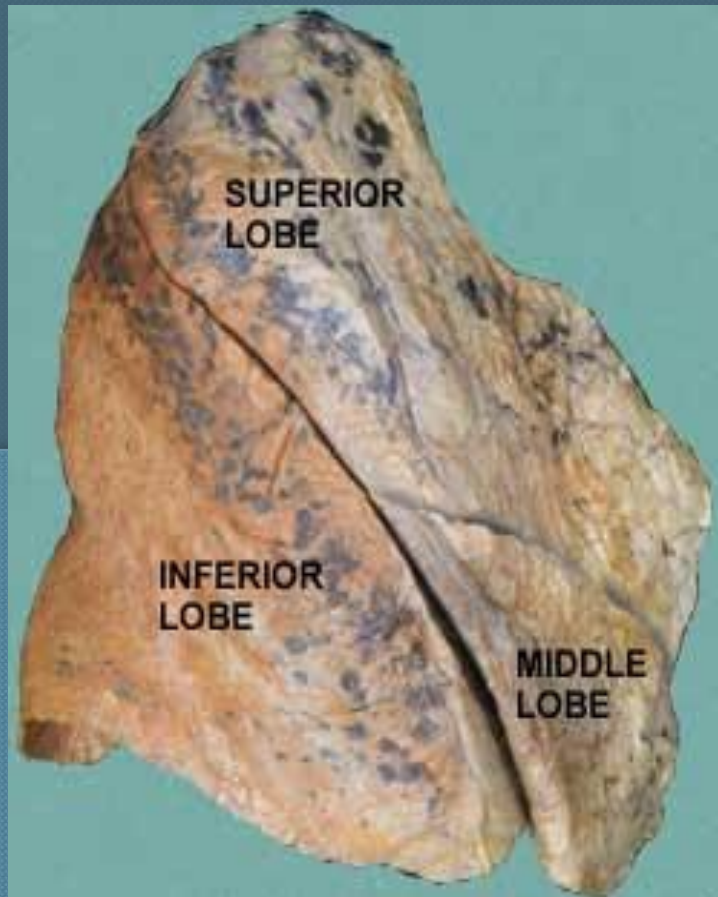
The lungs are the essential organs of respiration; they are two in number, placed one on either side within the thorax, and separated from each other by the heart and other contents of the mediastinum).

The substance of the lung is of a light, porous, spongy texture;  
it floats in water, and crepitates when handled, owing to the presence of air in the alveoli;  
it is also highly elastic; hence the retracted state of these organs when they are removed from the closed cavity of the thorax.

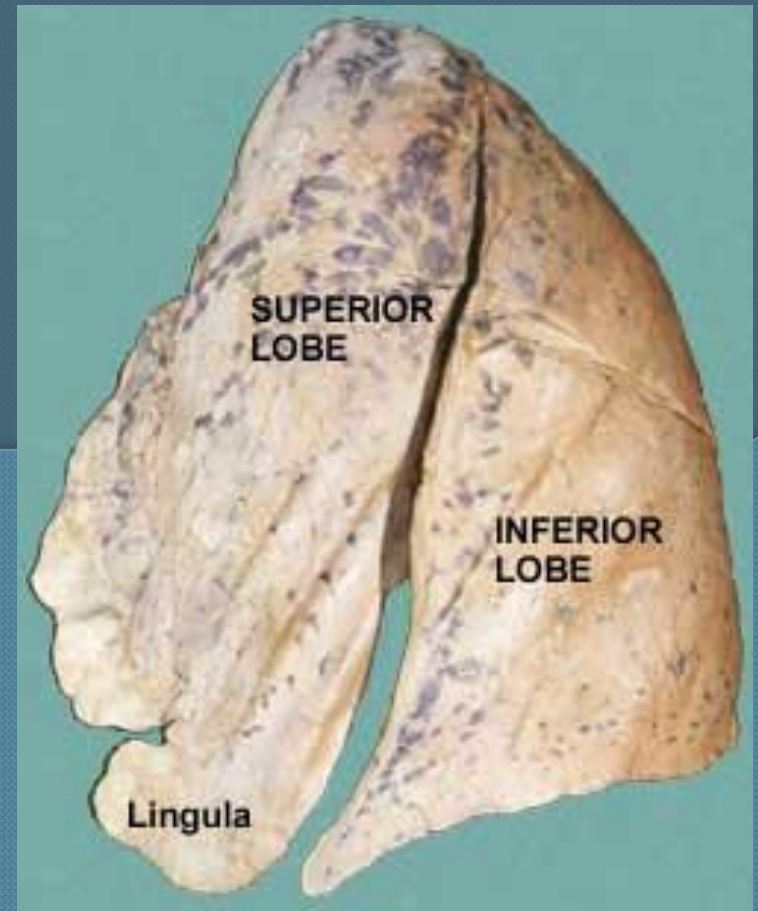
The lungs are heavier in the male than in the female.

Each lung is conical in shape, and presents for examination **an apex, a base, three borders, and two surfaces.**





Right lung



Left lung



# External morphology

The Lung presents :

- **A base.**
- **Two surfaces.**
- **Two borders**
- **The apex** is superiorly oriented, passing over the first rib with 2-3 cm. It has the same relations with the visceral pleura.
- **The base** is concave , disposed inferiorly on the diaphragmatic surface.
- Its relations are common with those of the diaphragmatic pleura (phrenic).
- The circumference of the pulmonary base is considered as being its 3<sup>rd</sup> border, **the inferior border.**



**The apex (*apex pulmonis*)** is rounded, and extends into the root of the neck, reaching from 2.5 to 4 cm. above the level of the sternal end of the first rib.

**The base (*basis pulmonis*)** is broad, concave, and rests upon the convex surface of the diaphragm, which separates the right lung from the right lobe of the liver, and the left lung from the left lobe of the liver, the stomach, and the spleen.

Since the diaphragm extends higher on the right than on the left side, the concavity on the base of the right lung is deeper than that on the left.

Laterally and behind, the base is bounded by a thin, sharp border which projects for some distance into the phrenicocostal sinus of the pleura, between the lower ribs and the costal attachment of the diaphragm.

The base of the lung descends during inspiration and ascends during expiration.

## **Surfaces**

**The costal surface (*facies costalis*; external or thoracic surface)** is smooth, convex, of considerable extent, and corresponds to the form of the cavity of the chest, being deeper posterior than anterior.



- **The costal surface** – oriented laterally, convex, presenting costal impression. Its relations are common with those of the costal pleura.
- **The mediastinal surface** – plane, presenting the impression of the mediastinal organs. Its relations are common with those of the mediastinal pleura. Here one can find the pulmonary hilum, presenting the shape of a tennis racket, with its handle oriented inferiorly.
- **The hilum** divides the mediastinal surface into the following portions:
  - Suprahilar.
  - Hilar.
  - Infrahilar, in a transverse plane.
  - Prehilar.
  - Hilar.
  - Retrohilar – in a frontal plane.



# *The pleurae*

Each lung is invested by an exceedingly delicate serous membrane, **the pleura**, which is arranged in the form of a closed invaginated sac.

A portion of the serous membrane covers the surface of the lung and dips into the fissures between its lobes; it is called **the pulmonary pleura**.

The rest of the membrane lines the inner surface of the chest wall, covers the diaphragm, and is reflected over the structures occupying the middle of the thorax; this portion is termed **the parietal pleura**.

The two layers are continuous with one another around and below the root of the lung; in health they are in actual contact with one another, but the potential space between them is known as **the pleural cavity**.

When the lung collapses or when air or fluid collects between the two layers the cavity becomes apparent.

The right and left pleural sacs are entirely separate from one another; between them are all the thoracic viscera except the lungs, and they only touch each other for a short distance in front; opposite the second and third pieces of the sternum the interval between the two sacs is **termed the mediastinum**.



## **Pulmonary Ligament (*ligamentum pulmonale; ligamentum latum pulmonis*)**

From the above description it will be seen that the root of the lung is covered in front, above, and behind by pleura, and that at its lower border the investing layers come into contact.

Here they form a sort of mesenteric fold, the pulmonary ligament, which extends between the lower part of the mediastinal surface of the lung and the pericardium.

Just above the diaphragm the ligament ends in a free falciform border. It serves to retain the lower part of the lung in position.

## **Structure of Pleura**

Like other serous membranes, the pleura is covered by a single layer of flattened, nucleated cells, united at their edges by cement substance. These cells are modified connective-tissue corpuscles, and rest on a basement membrane.

Beneath the basement membrane there are net-works of yellow elastic and white fibers, imbedded in ground substance which also contains connective-tissue cells.

Blood vessels, lymphatics, and nerves are distributed in the substance of the pleura.

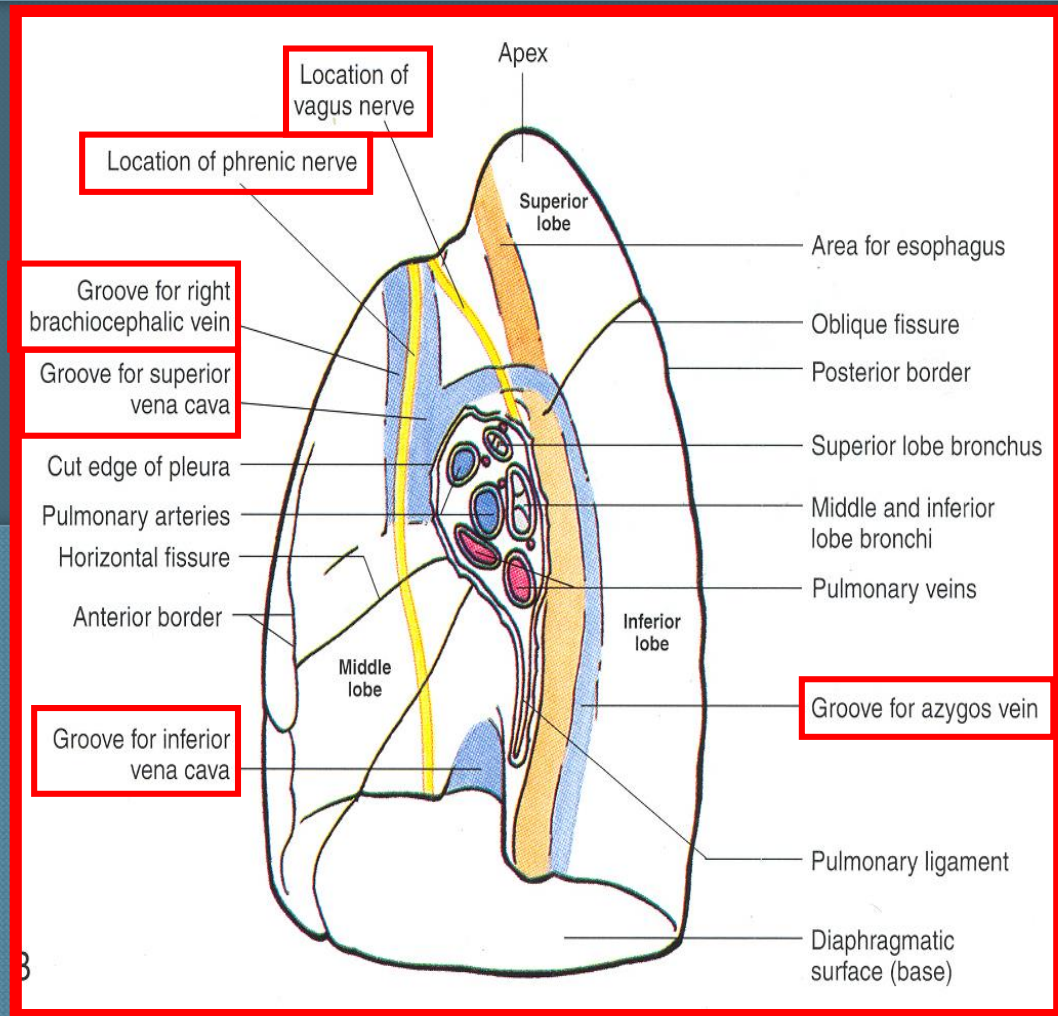
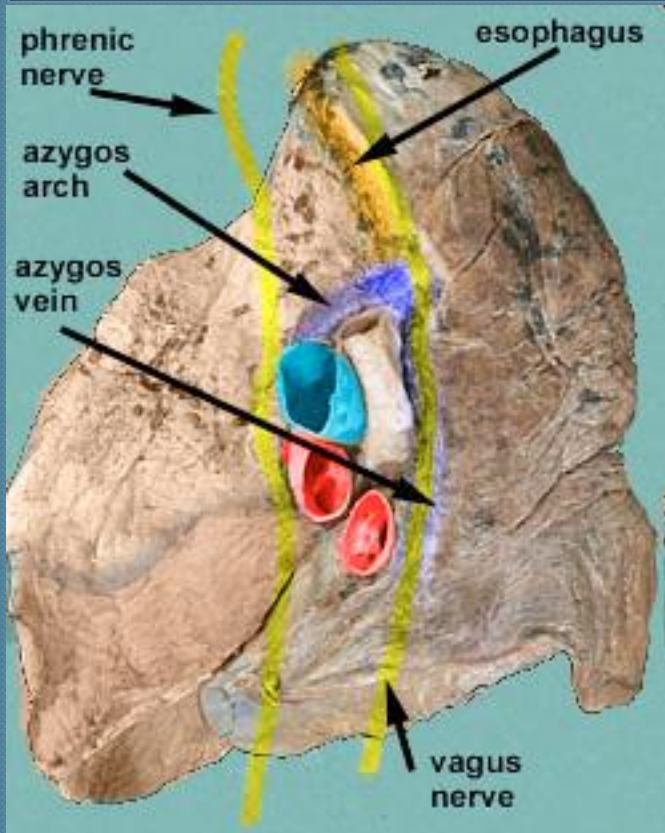


## • **Vessels and Nerves**

- The arteries of the pleura are derived from the:
  - intercostal,
  - internal mammary,
  - musculophrenic,
  - thymic,
  - pericardiac,
  - and bronchial.
- The veins correspond to the arteries.
- The nerves are derived from the phrenic and sympathetic.



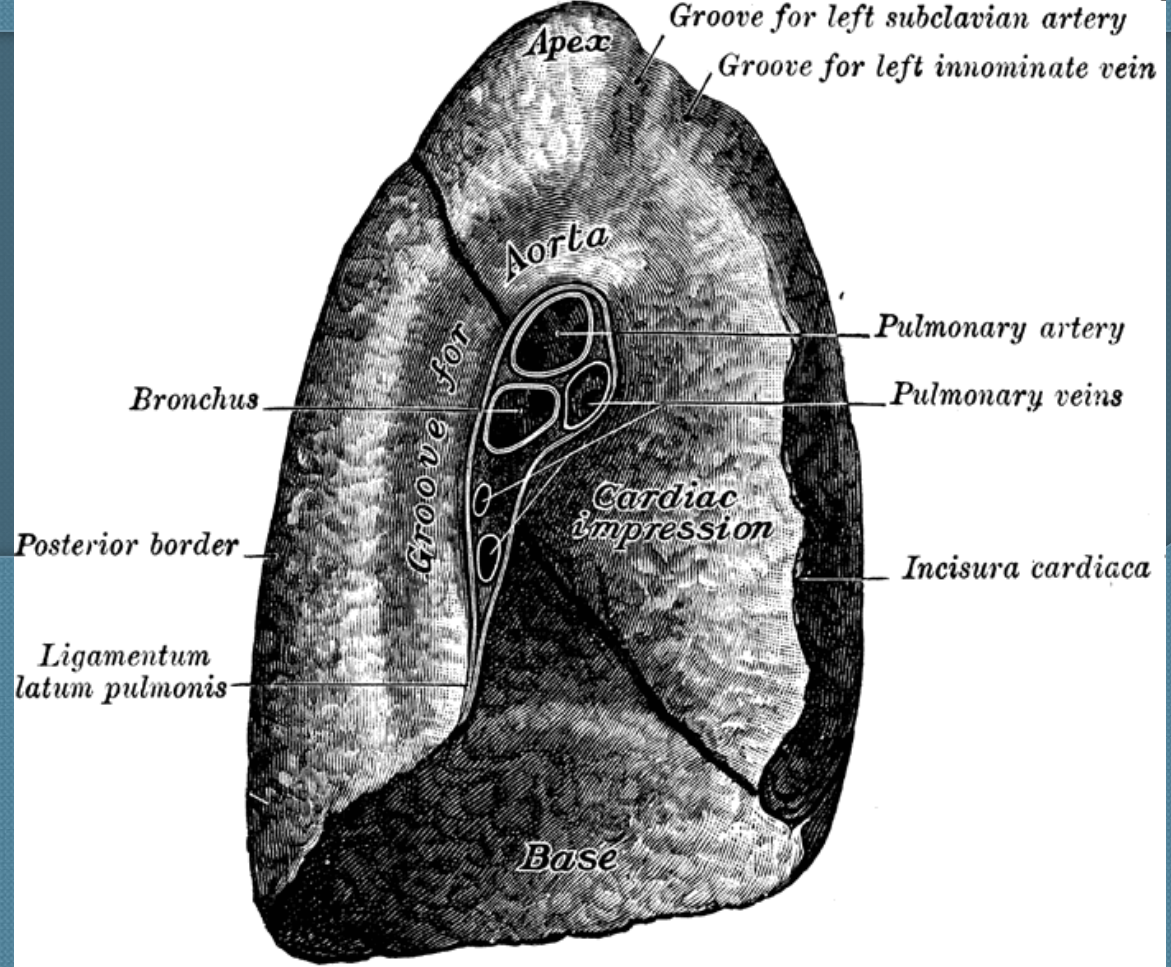
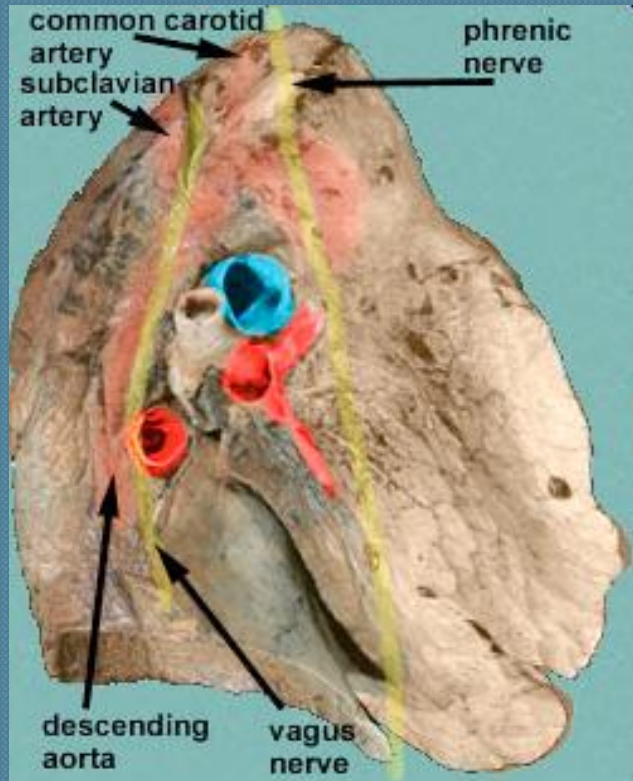
# The Mediastinal surface of the right lung



1. Azygos vein
2. SVC
3. IVC
4. Right innominate vein
5. Innominate artery
6. oesophagus
7. phrenic nerve



# The Mediastinal Surface of the Left Lung



1. Aorta
2. Common carotid artery
3. Left subclavian artery
4. Descending aorta
5. Oesophagus
6. Left Phrenic nerve
7. left innominate vein



The **mediastinal surface** (*facies mediastinalis*; inner surface) is in contact with the mediastinal pleura.

It presents a deep concavity, **the cardiac impression**, which accommodates the pericardium; this is larger and deeper on the left than on the right lung, on account of the heart projecting farther to the left than to the right side of the median plane. Above and behind this concavity is a triangular depression named **the hilum**, where the structures which form the root of the lung enter and leave the viscus.

These structures are invested by pleura, which, below the hilus and behind the pericardial impression, forms the pulmonary ligament.

On the **right lung** immediately above the hilus, is an arched furrow which accommodates **the azygos vein**; while running upward, and then arching lateralward some little distance below the apex, is a wide **groove for the superior vena cava and right innominate vein**; behind this, and nearer the apex, is a furrow for **the innominate artery**.

Behind the hilus and the attachment of the pulmonary ligament is a vertical groove for the oesophagus; this groove becomes less distinct below, owing to the inclination of the lower part of the oesophagus to the left of the middle line.

In front and to the right of the lower part of the oesophageal groove is a deep concavity for the extrapericardiac portion of the thoracic part of the inferior vena cava.



**On the left lung** immediately above the hilus, is a well-marked curved furrow produced by **the aortic arch**, and running upward from this toward the apex is a groove accommodating **the left subclavian artery**; a slight impression in front of the latter and close to the margin of the lung lodges **the left innominate vein**.

Behind the hilus and pulmonary ligament is a vertical furrow produced by **the descending aorta**, and in front of this, near the base of the lung, **the lower part of the oesophagus** causes a shallow impression.



## Borders

**The inferior border (*margo inferior*)** is thin and sharp where it separates the base from the costal surface and extends into the phrenicocostal sinus; medially where it divides the base from the mediastinal surface it is blunt and rounded.

**The posterior border (*margo posterior*)** is broad and rounded, and is received into the deep concavity on either side of the vertebral column.

It is much longer than the anterior border, and projects, below, into the phrenicocostal sinus.

**The anterior border (*margo anterior*)** is thin and sharp, and overlaps the front of the pericardium.

The anterior border of the right lung is almost vertical, and projects into the costomediastinal sinus; that of the left presents, below, an angular notch, the cardiac notch, in which the pericardium is exposed.



## **Fissures and Lobes of the Lungs**

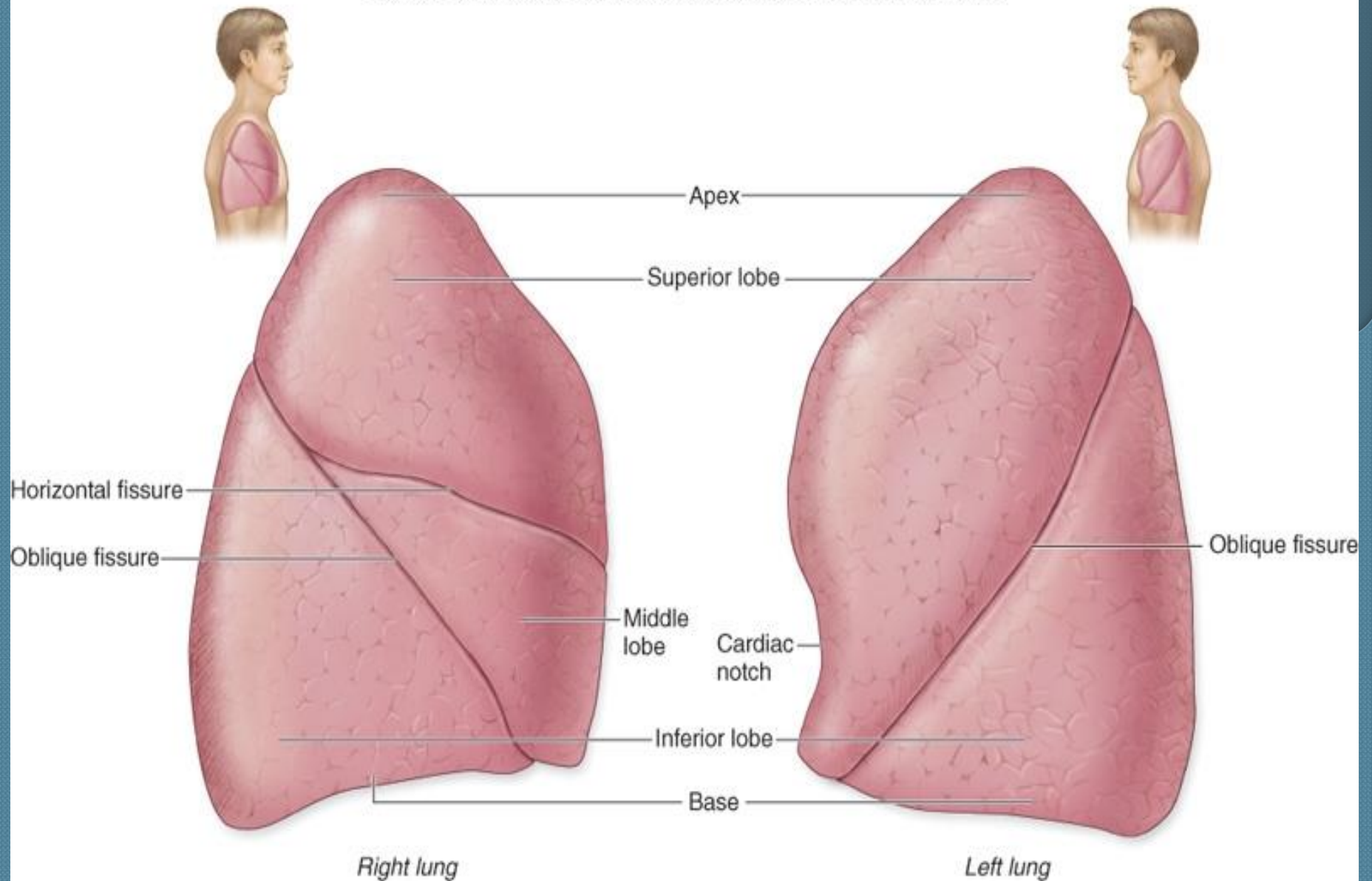
**The left lung** is divided into two lobes, **superior and inferior**, by an interlobular fissure, oblique fissure, which extends from the costal to the mediastinal surface of the lung both above and below the hilus.

As seen on the surface, this fissure begins on the mediastinal surface of the lung at the upper and posterior part of the hilus, and runs backward and upward to the posterior border, which it crosses at a point about 6 cm. below the apex.

**The superior lobe** lies above and in front of this fissure, and includes the apex, the anterior border, and a considerable part of the costal surface and the greater part of the mediastinal surface of the lung.

**The inferior lobe**, **the larger of the two**, is situated below and behind the fissure, and comprises almost the whole of the base, a large portion of the costal surface, and the greater part of the posterior border.





(a) Lateral views



**The right lung** is divided into **three lobes, superior, middle, and inferior**, by two interlobular fissures, the right oblique fissure and the horizontal fissure.

One of these separates the inferior from the middle and superior lobes, and corresponds closely with the fissure in the left lung.

Its direction is, however, more vertical, and it cuts the lower border about 7.5 cm. behind its anterior extremity.

**The other fissure separates the superior from the middle lobes.**

It begins in the previous fissure near the posterior border of the lung, and, running horizontally forward, cuts the anterior border on a level with the sternal end of the fourth costal cartilage; on the mediastinal surface it may be traced backward to the hilus.

**The middle lobe, the smallest lobe of the right lung**, is wedge-shaped, and includes the lower part of the anterior border and the anterior part of the base of the lung.

The right lung, although shorter by 2.5 cm. than the left, in consequence of the diaphragm rising higher on the right side to accommodate the liver, is broader, owing to the inclination of the heart to the left side; its total capacity is greater and it weighs more than the left lung.



## **The Root of the Lung (*radix pulmonis*)**

A little above the middle of the mediastinal surface of each lung, and nearer its posterior than its anterior border, is its root, by which the lung is connected to the heart and the trachea.

The root is formed by:

- ❖ the bronchus,
- ❖ the pulmonary artery,
- ❖ the pulmonary veins,
- ❖ the bronchial arteries and veins,
- ❖ the pulmonary plexuses of nerves,
- ❖ lymphatic vessels,
- ❖ bronchial lymph glands,
- ❖ and areolar tissue, all of which are enclosed by a reflection of the pleura.

The root of the right lung lies posterior to the superior vena cava and part of the right atrium, and inferior to the azygos vein.

That of the left lung passes inferior the aortic arch and anterior of the descending aorta;

the phrenic nerve, the pericardiophrenic artery and vein, and the anterior pulmonary plexus, lie in front of each, and the vagus and posterior pulmonary plexus posterior of each; below each is the pulmonary ligament.



**The structures composing the root of each lung are arranged in a similar manner from anteroposterior on both sides:**

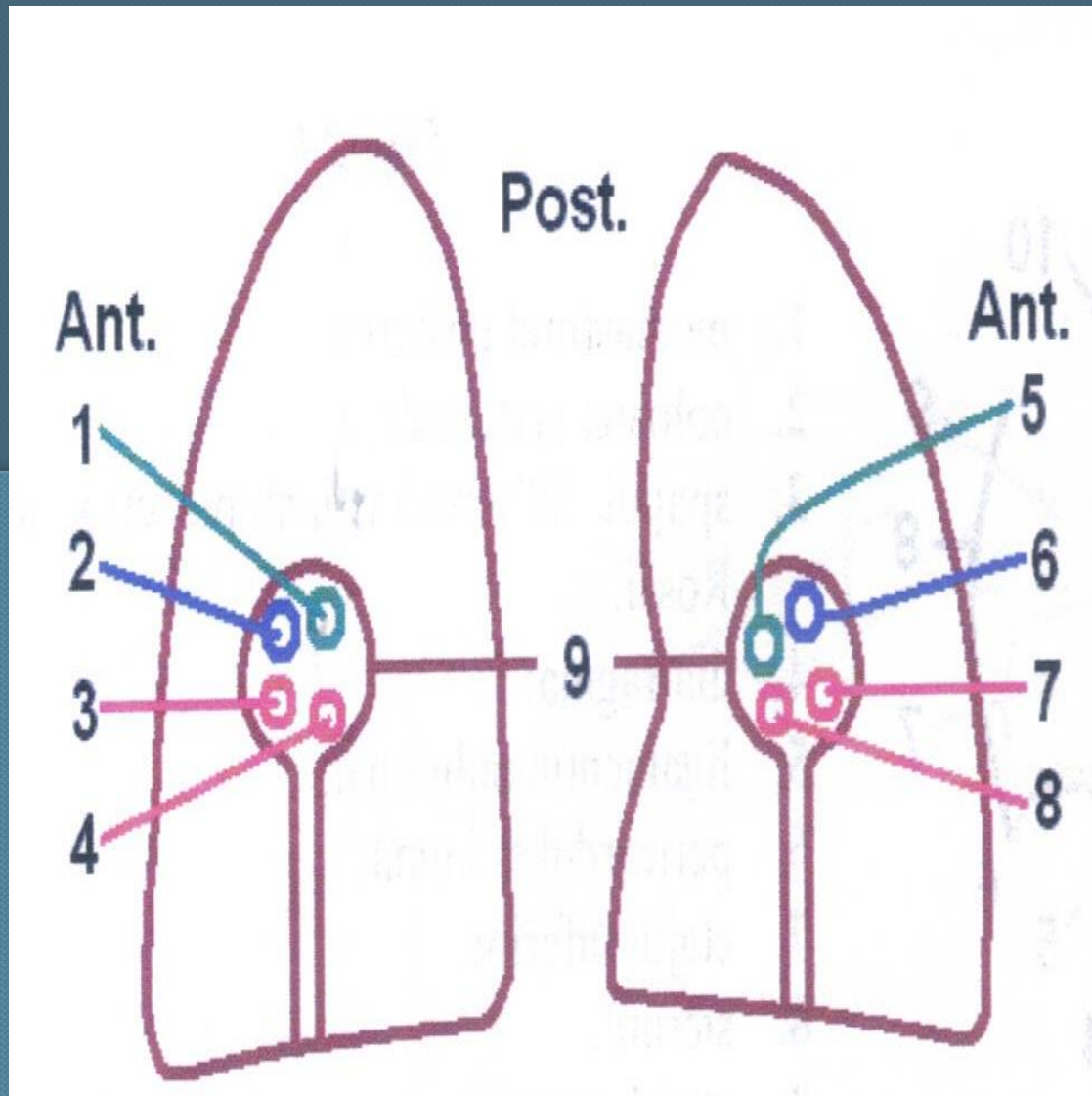
- 1. the superior of the two pulmonary veins anterior;**
- 2. the pulmonary artery in the middle;**
- 3. the bronchus, together with the bronchial vessels, posterior.**

**From above downward, on the two sides, their arrangement differs, thus:**

- A. On the right side their position is—eparterial bronchus, pulmonary artery, hyparterial bronchus, pulmonary veins,**
- B. but on the left side their position is—pulmonary artery, bronchus, pulmonary veins.**

**The lower of the two pulmonary veins, is situated below the bronchus, at the apex or lowest part of the hilum.**

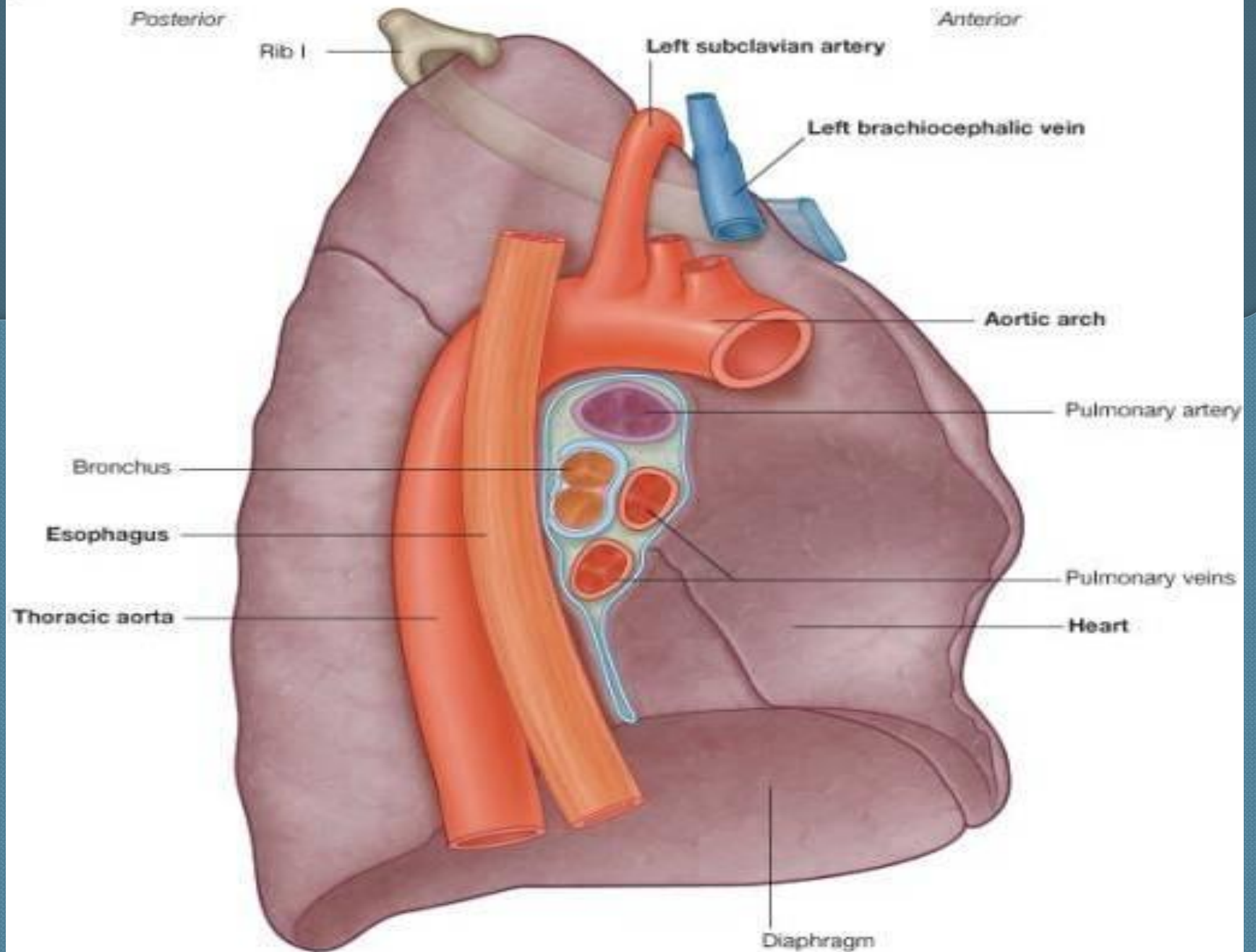




1. Right main bronchus
2. Right pulmonary artery, anterior to the bronchus
3. Superior right pulmonary vein
4. Inferior right pulmonary vein
5. Left pulmonary bronchus
6. Left pulmonary artery, superior to the bronchus
7. Superior left pulmonary vein, anterior to the bronchus
8. Inferior left pulmonary vein
9. Pulmonary hilum

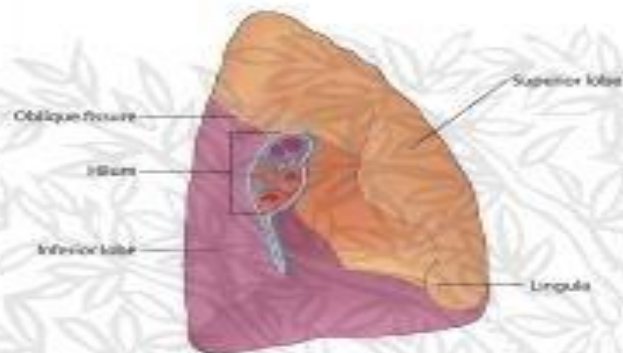


**B**

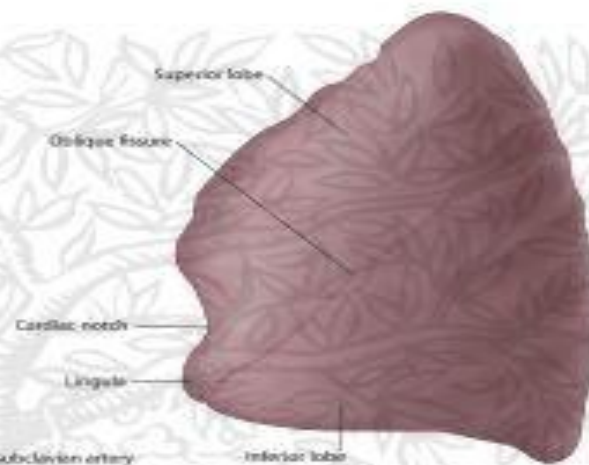




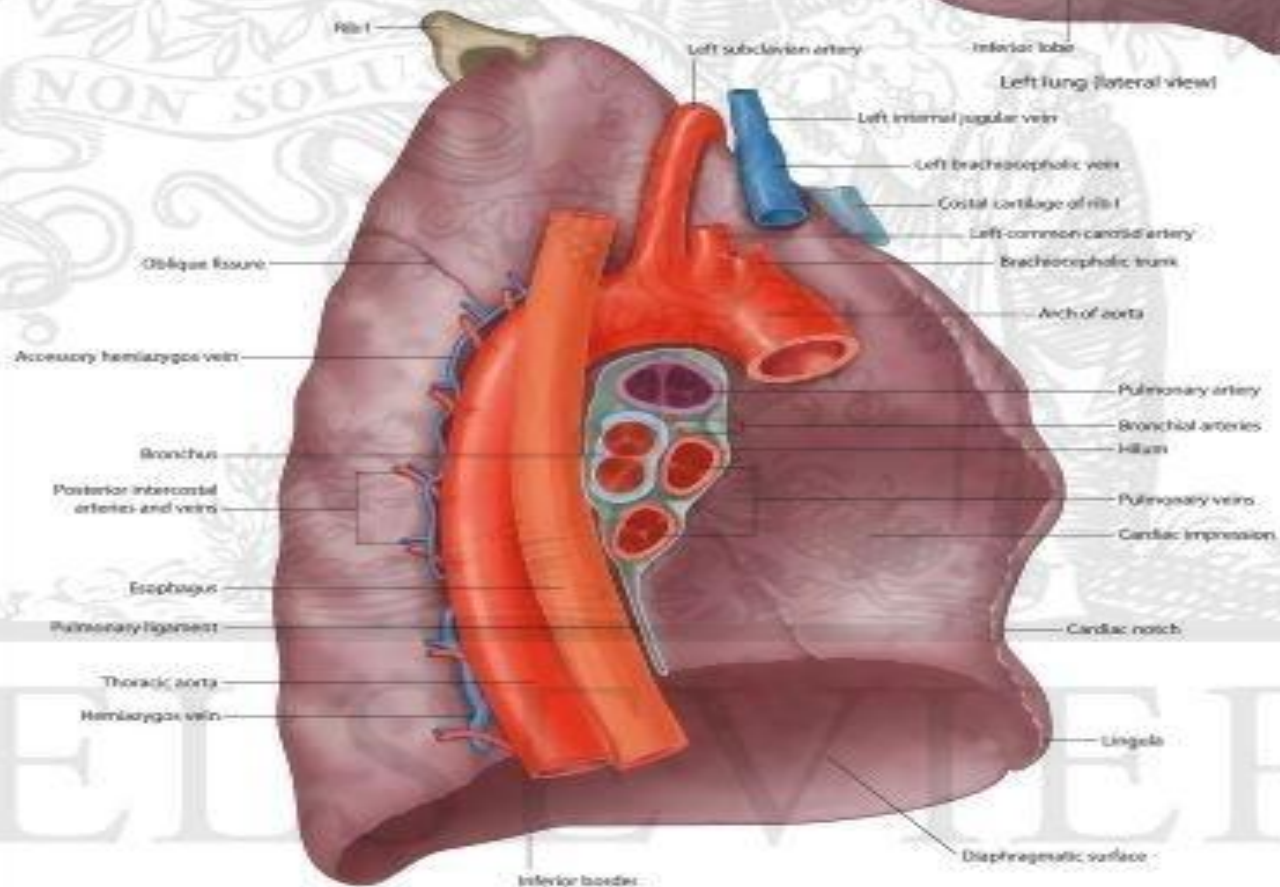
# Left lung



Lobes of the left lung (anteromedial view)



Left lung (lateral view)

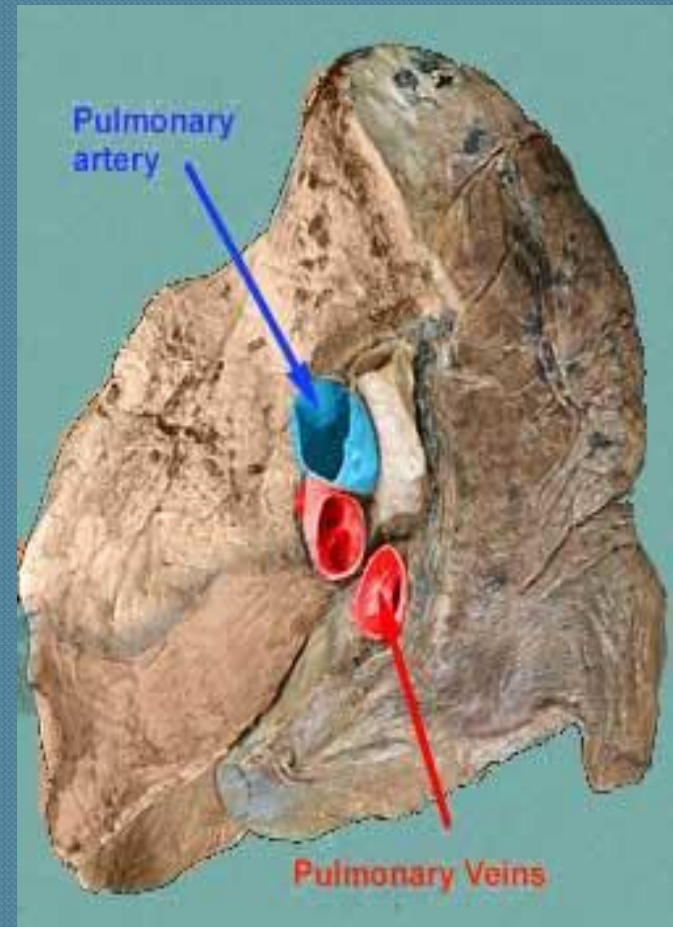
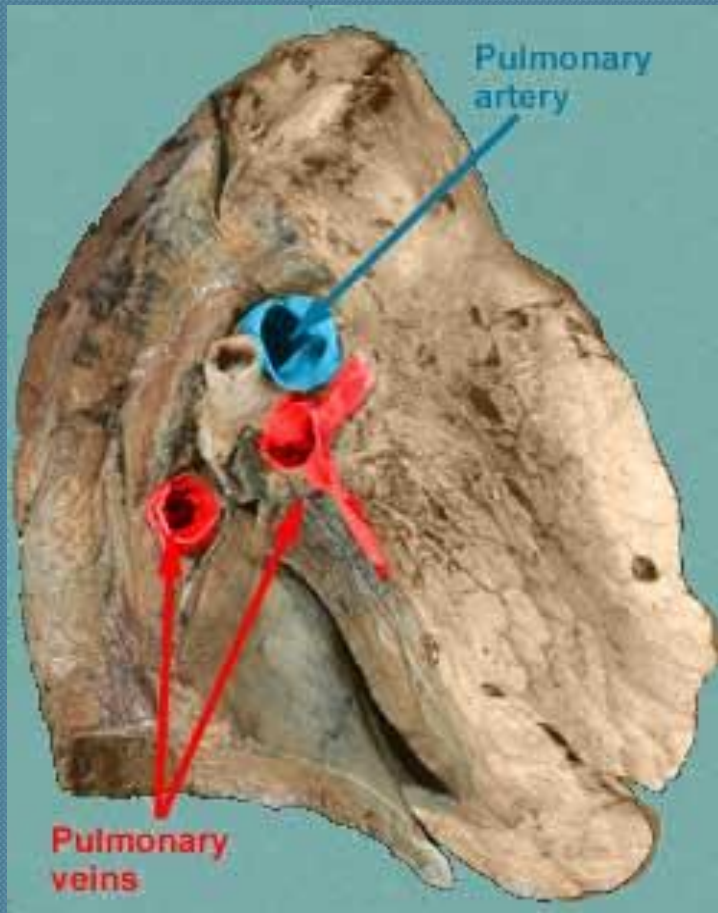


Left lung and related structures (medial view)



## The right pulmonary hilum presents:

- The bronchi posteriorly
- The pulmonary arteries superiorly
- The pulmonary veins infero-anterior.



## The left pulmonary hilum presents:

- The bronchi situated posteriorly.
- The pulmonary arteries superiorly.
- The pulmonary veins antero-inferiorly.



## Divisions of the Bronchi

Just as the lungs differ from each other in the number of their lobes, so the bronchi differ in their mode of subdivision.

**The right bronchus** gives off, about 2.5 cm. from the bifurcation of the trachea (=carina), a branch for the superior lobe.

This branch arises above the level of the pulmonary artery, and is therefore named **the eparterial bronchus**.

All the other divisions of the main stem come off below the pulmonary artery, and consequently are termed **hyarterial bronchi**.

The first of these is distributed to the middle lobe, and the main tube then passes downward and backward into the inferior lobe, giving off in its course a series of large ventral and small dorsal branches.

**The left bronchus** passes below the level of the pulmonary artery before it divides, and hence all its branches are hyarterial; it may therefore be looked upon as equivalent to that portion of the right bronchus which lies on the distal side of its eparterial branch.

The first branch of the left bronchus arises about 5 cm. from the bifurcation of the trachea, and is distributed to the superior lobe.

The main stem then enters the inferior lobe, where it divides into ventral and dorsal branches similar to those in the right lung.



# Structure

The lungs are composed of an external serous coat, a subserous areolar tissue and the **pulmonary substance or parenchyma**.

The serous coat is **the pulmonary pleura**; it is thin, transparent, and invests the entire organ as far as the root.

**The subserous areolar tissue** contains a large proportion of elastic fibers; it invests the entire surface of the lung, and extends inward between the lobules.

**The parenchyma** is composed of secondary lobules which, although closely connected together by an interlobular areolar tissue, are quite distinct from one another, and may be teased asunder without much difficulty in the fetus.

The secondary lobules vary in size; those on the surface are large, of pyramidal form, the base turned toward the surface; those in the interior smaller, and of various forms.

Each secondary lobule is composed of several **primary lobules**, the anatomical units of the lung.

**The primary lobule** consists of an alveolar duct, the air spaces connected with it and their bloodvessels, lymphatics and nerves.



The alveoli are lined by a delicate layer of simple squamous epithelium, the cells of which are united at their edges by cement substance.

Between the squames are here and there smaller, polygonal, nucleated cells.

Outside the epithelial lining is a little delicate connective tissue containing numerous elastic fibers and a close net-work of blood capillaries, and forming a common wall to adjacent alveoli.

The foetal lung resembles a gland in that the alveoli have a small lumen and are lined by cubical epithelium.

After the first respiration the alveoli become distended, and the epithelium takes on the characters described above.



## Vessels and Nerves

**The pulmonary artery** conveys the **venous blood** to the lungs; it divides into branches which accompany the bronchial tubes and end in a dense capillary net-work in the walls of the alveoli.

In the lung the branches of the pulmonary artery are usually above and in front of a bronchial tube, the vein below.

The pulmonary capillaries form plexuses which lie immediately beneath the lining epithelium, in the walls and septa of the alveoli and of the infundibula. In the septa between the alveoli the capillary net-work forms a single layer.

The capillaries form a very minute network, the meshes of which are smaller than the vessels themselves; their walls are also exceedingly thin.

The arteries of neighboring lobules are independent of each other, but the veins freely anastomose.



**The pulmonary veins** commence in the pulmonary capillaries, the radicles coalescing into larger branches which run through the substance of the lung, independently of the pulmonary arteries and bronchi.

After freely communicating with other branches they form large vessels, which ultimately come into relation with the arteries and bronchial tubes, and accompany them to the hilus of the organ.

Finally they open into the left atrium of the heart, conveying oxygenated blood to be distributed to all parts of the body by the aorta.

For the nutrition of the lung: they are derived from the thoracic aorta or from the upper aortic intercostal arteries, and, accompanying the bronchial tubes, are distributed to the bronchial glands and upon the walls of the larger bronchial tubes and pulmonary vessels.

Those supplying the bronchial tubes form a capillary plexus in the muscular coat, from which branches are given off to form a second plexus in the mucous coat; this plexus communicates with small venous trunks that empty into the pulmonary veins.

Others are distributed in the interlobular areolar tissue, and end partly in the deep, partly in the superficial, bronchial veins.

Lastly, some ramify upon the surface of the lung, beneath the pleura, where they form a capillary network.



The bronchial vein is formed at the root of the lung, receiving superficial and deep veins corresponding to branches of the bronchial artery.

It ends on the right side in the azygos vein, and on the left side in the highest intercostal or in the accessory hemiazygos vein.

## Nerves

The lungs are supplied from the **anterior and posterior pulmonary plexuses**, formed chiefly by branches from the **sympathetic and vagus**.

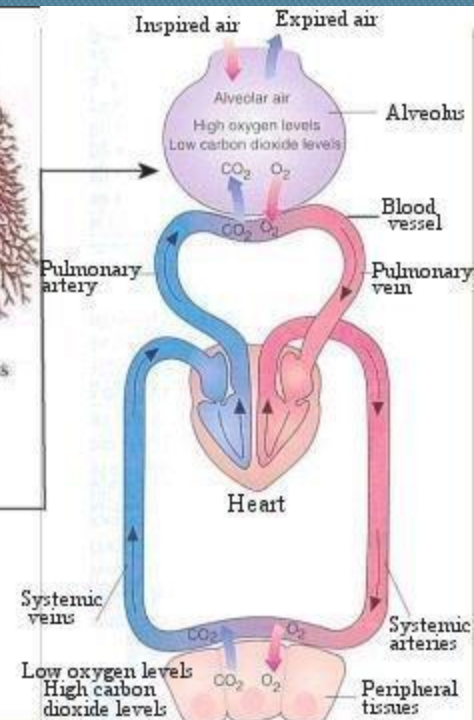
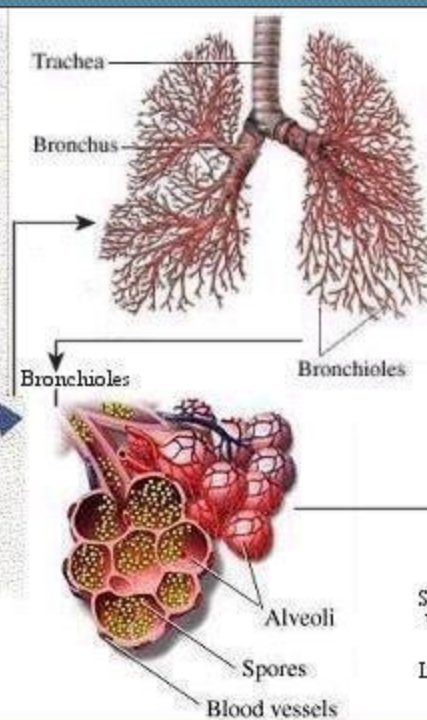
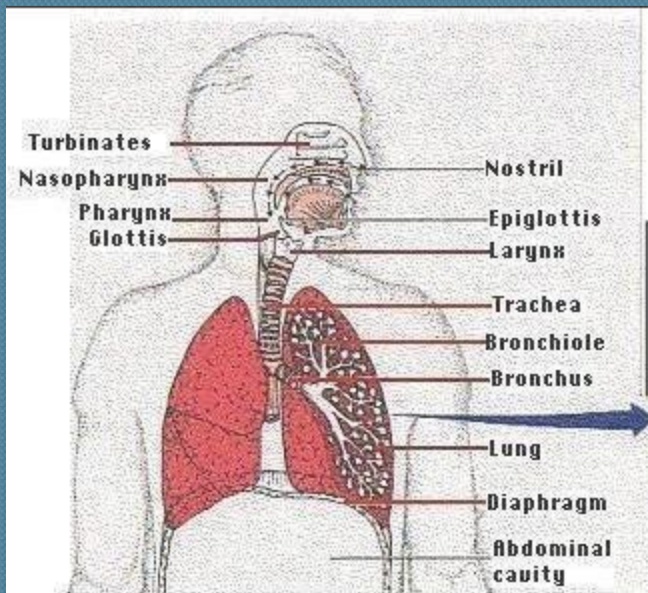
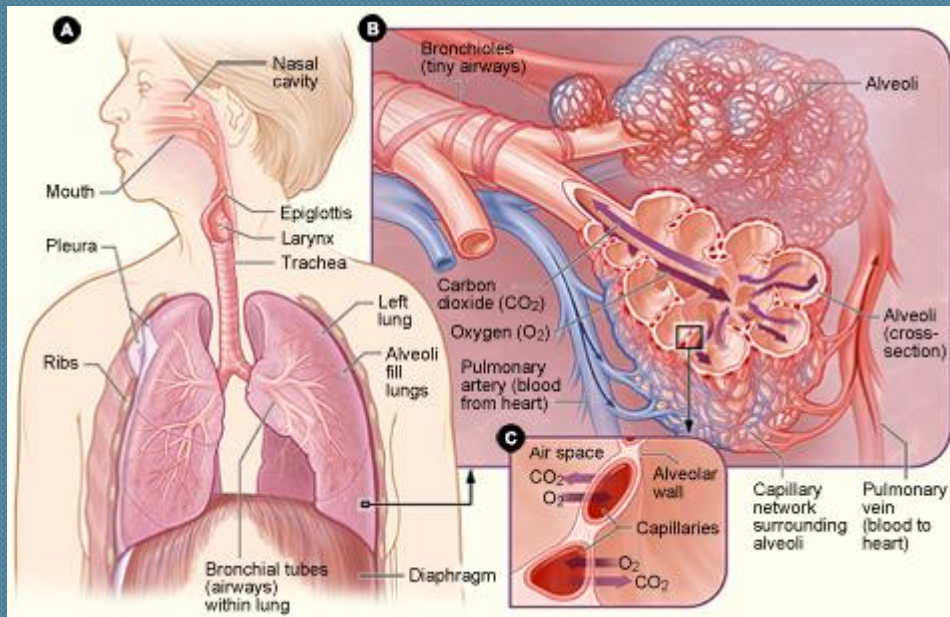
The filaments from these plexuses accompany the bronchial tubes, supplying efferent fibers to the bronchial muscle and afferent fibers to the bronchial mucous membrane and probably to the alveoli of the lung.

Small ganglia are found upon these nerves.











## **Pulmonary segments**

- **Represents clinical and morphofunctional unities , with own vascularization and aeration.**
- They have a pyramidal shape, with its base at the surface of the lung and their tip at the pulmonary hilum.
- Each segment presents a bronchoarterial axis and the veins are disposed into the periphery, as a covering of the segment, marking the limit between the segments.



# Each lung presents 10 segments

- The right lung

- A. The superior lobe

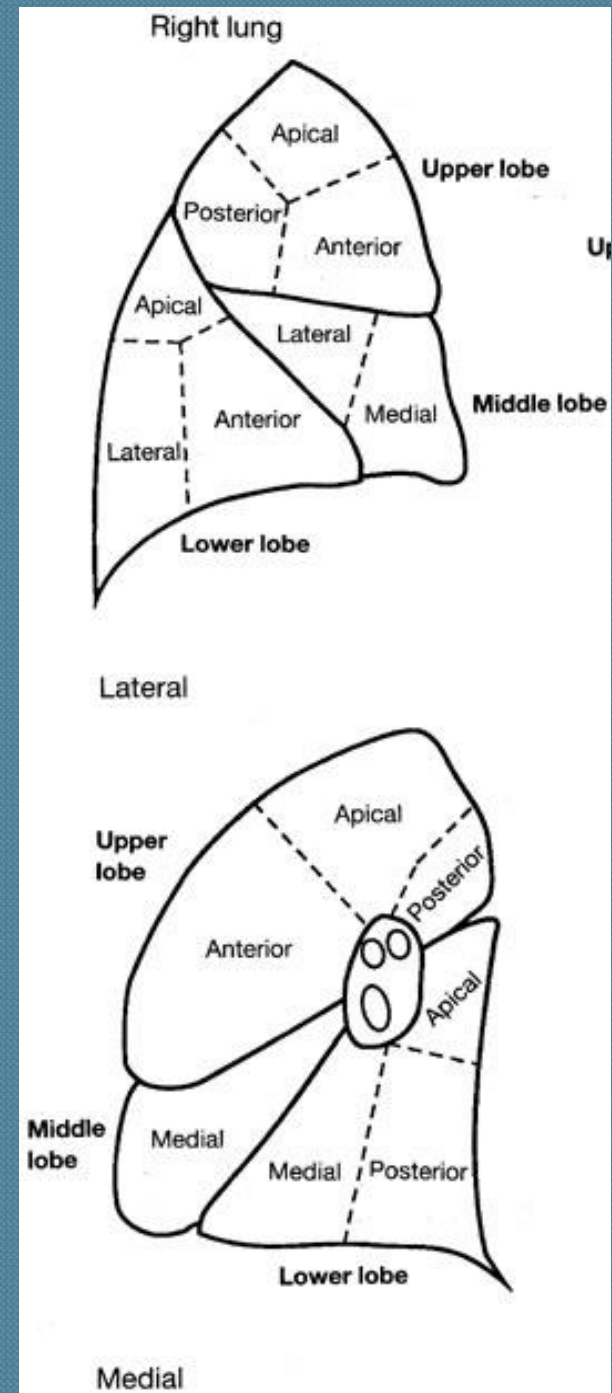
1. Apical.
2. Posterior.
3. Anterior.

- B. The middle lobe

4. Lateral.
5. Medial.

- C. The inferior lobe

6. Basal apical.
7. Basal medial.
8. Basal anterior.
9. Basal lateral.
10. Basal posterior.





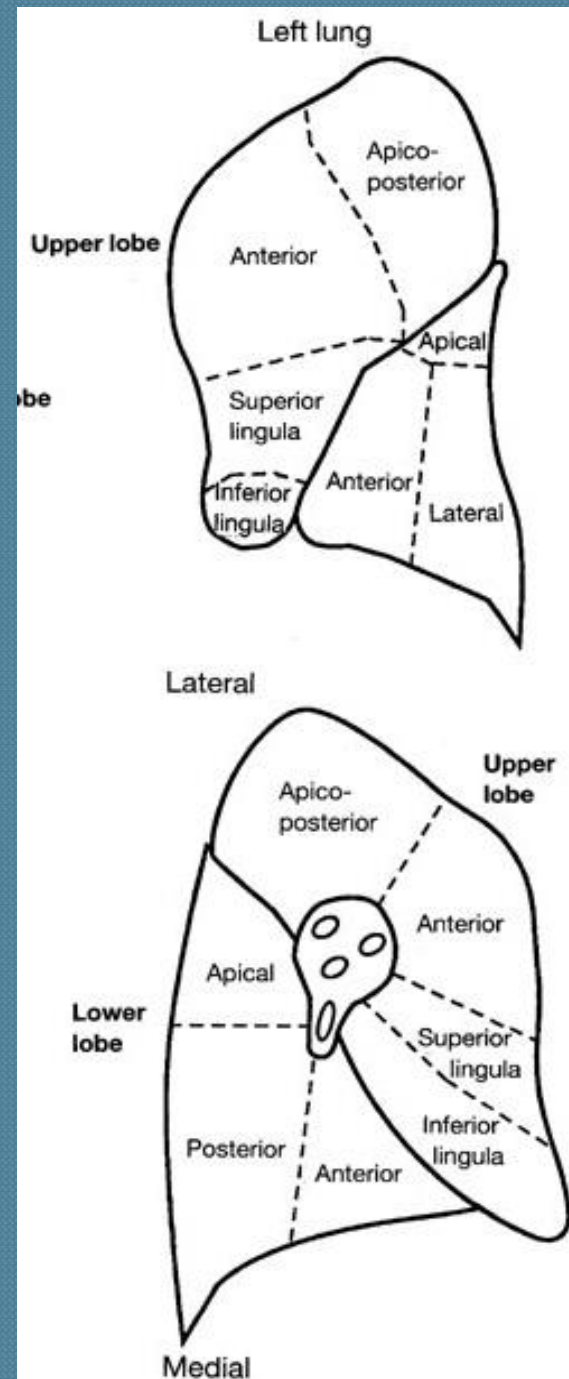
# The Left lung.

## A. Superior lobe

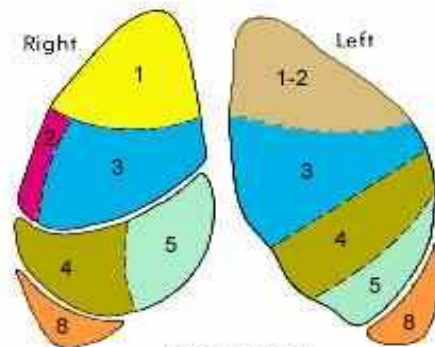
- **Culmen**
  1. Apical.
  2. Posterior.
  3. Anterior.
- **Lingula**
  4. Superior lingular.
  5. Inferior lingular.

## B. Inferior lobe

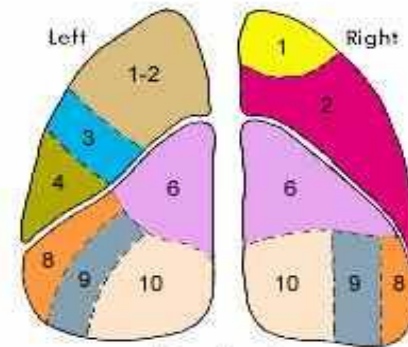
- 6. Basal apical.
- 7. Basal medial.
- 8. Basal anterior.
- 9. Basal lateral.
- 10. Basal posterior.



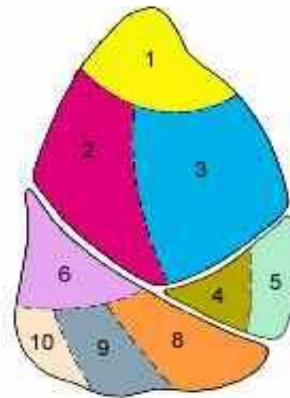




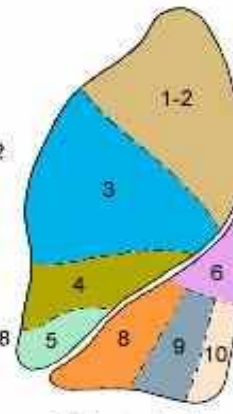
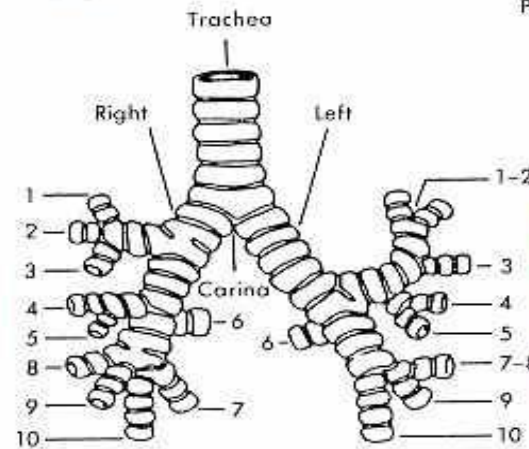
Anterior view



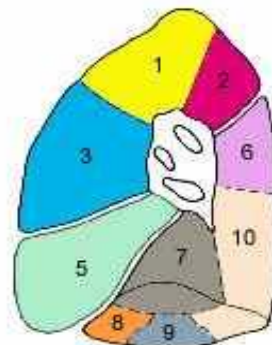
Posterior view



Right lateral view

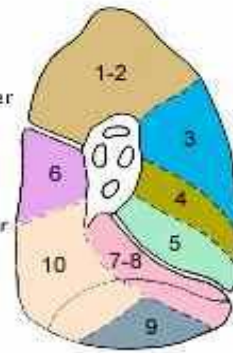


Left lateral view



Right medial view

- |             |                 |                       |            |
|-------------|-----------------|-----------------------|------------|
| Upper lobe  | 1. Apical       | 1-2. Apical-posterior | Upper lobe |
|             | 2. Posterior    | 3. Anterior           |            |
|             | 3. Anterior     | 4. Superior           | Lingula    |
| Middle lobe | 4. Lateral      | 5. Inferior           |            |
|             | 5. Medial       | 6. Superior           |            |
|             | 6. Superior     | 7-8. Ant. basal       | Lower lobe |
| Lower lobe  | 7. Med. basal   | 9. Lat. basal         |            |
|             | 8. Ant. basal   | 10. Post. basal       |            |
|             | 9. Lat. basal   |                       |            |
|             | 10. Post. basal |                       |            |

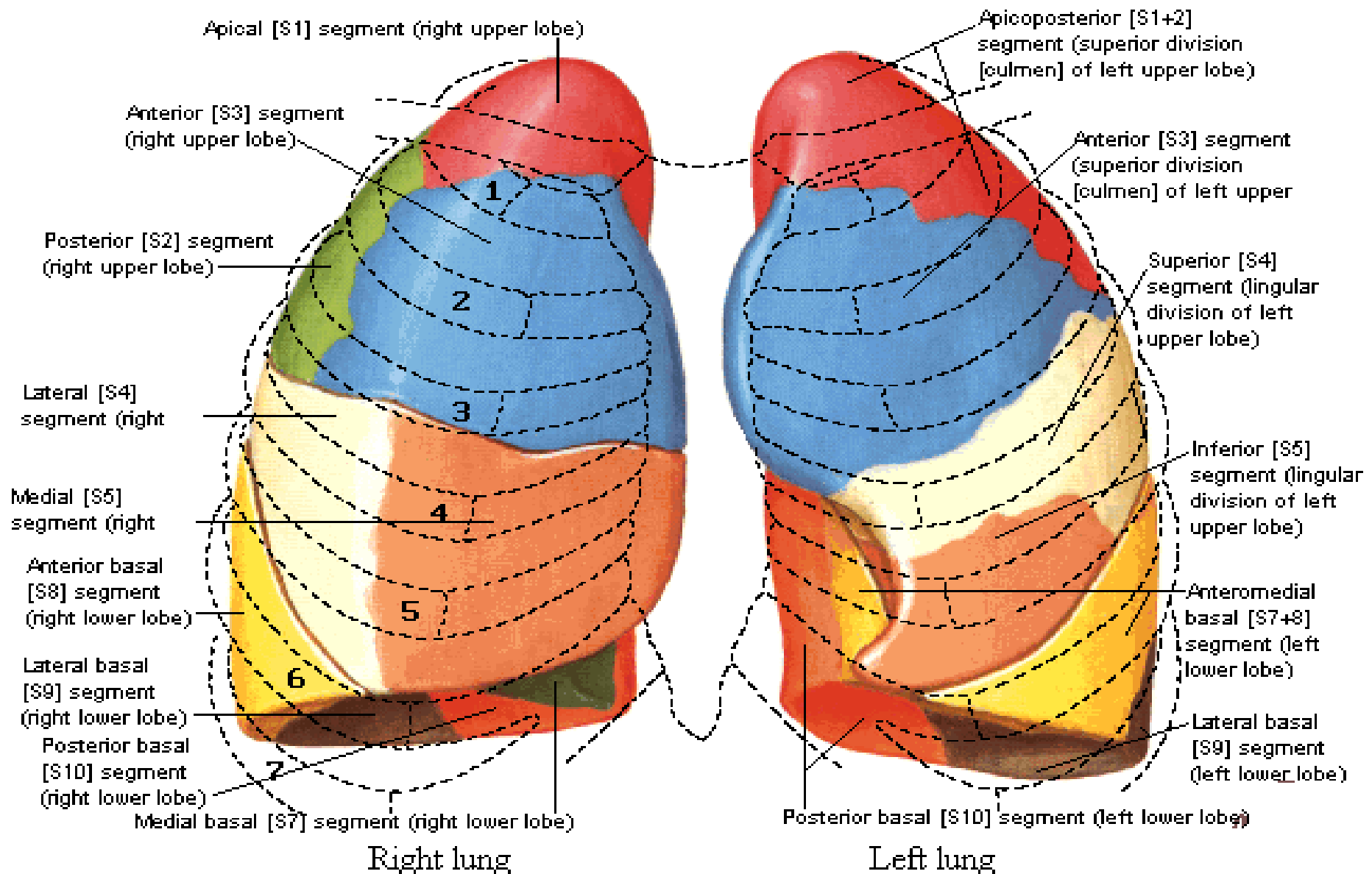


Left medial view



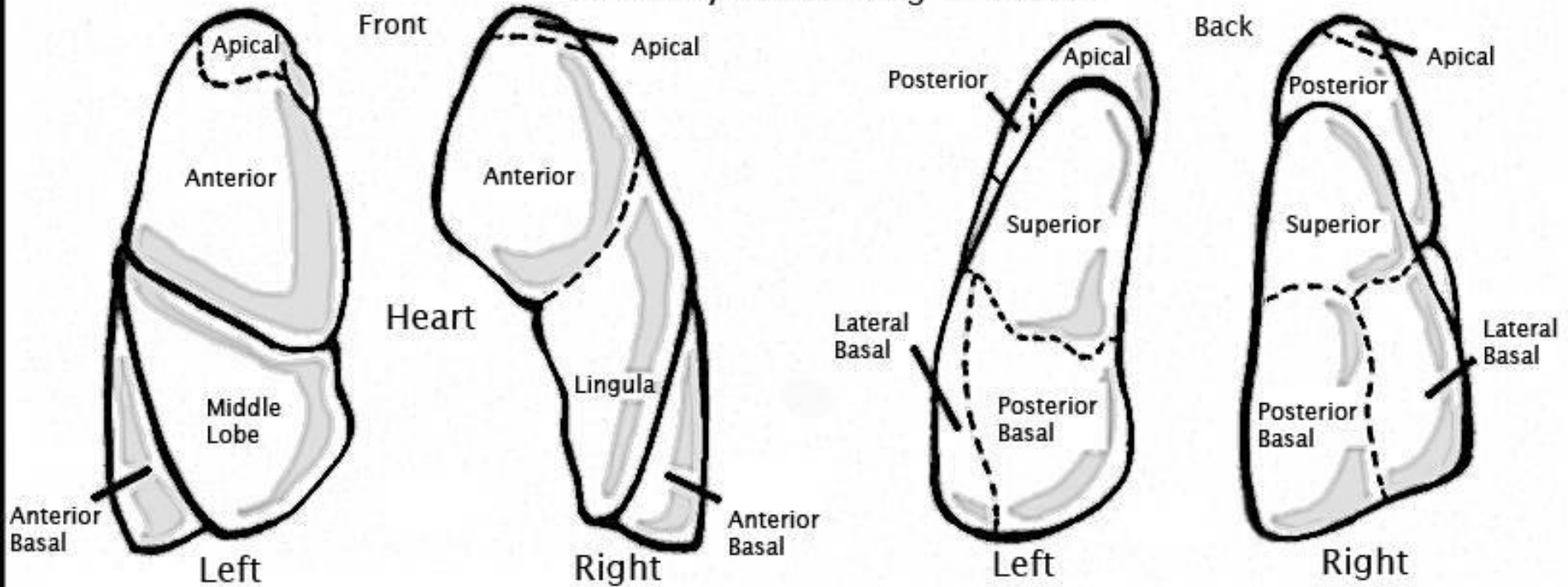
# Bronchopulmonary Segments

## Anterior View





## Anatomy of the Lung - External

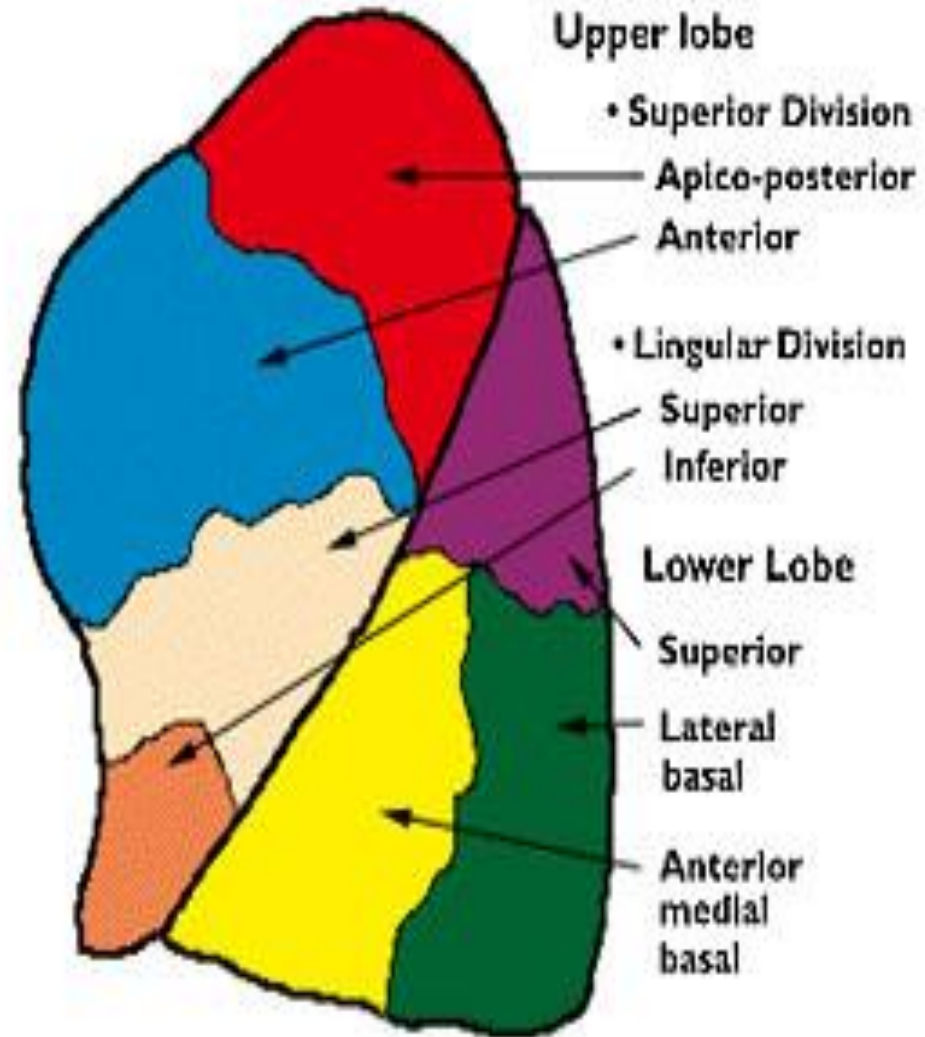
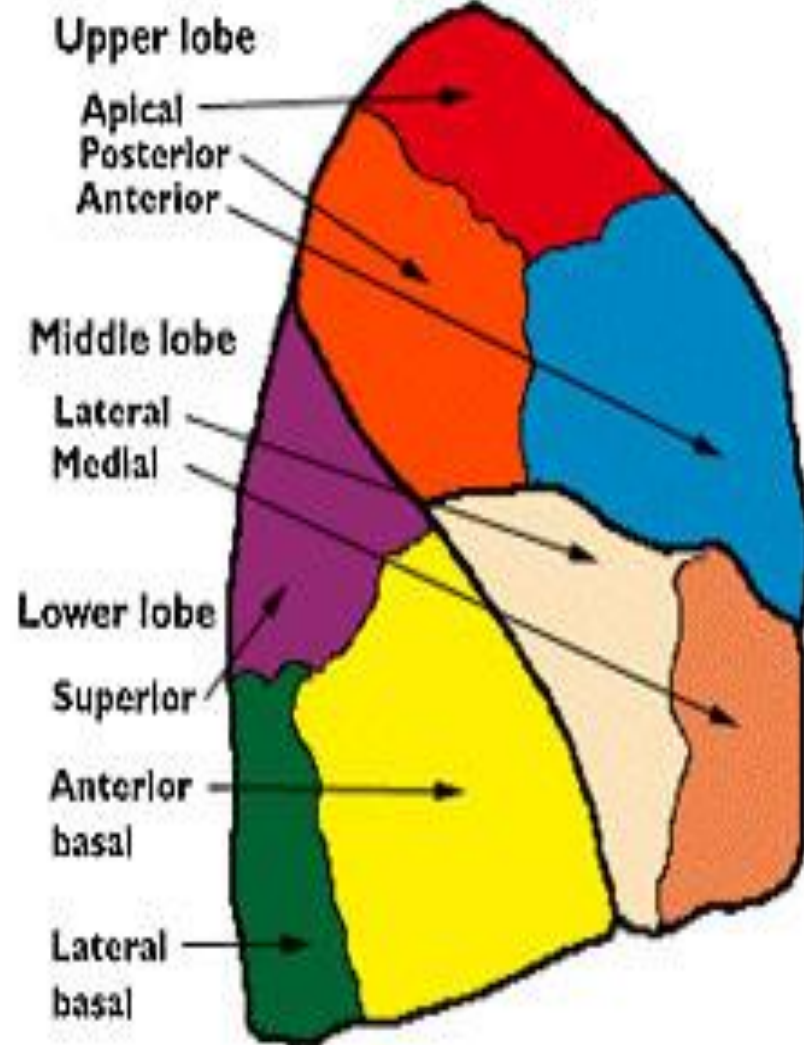




## Segmental Views

Right Lung

Left Lung





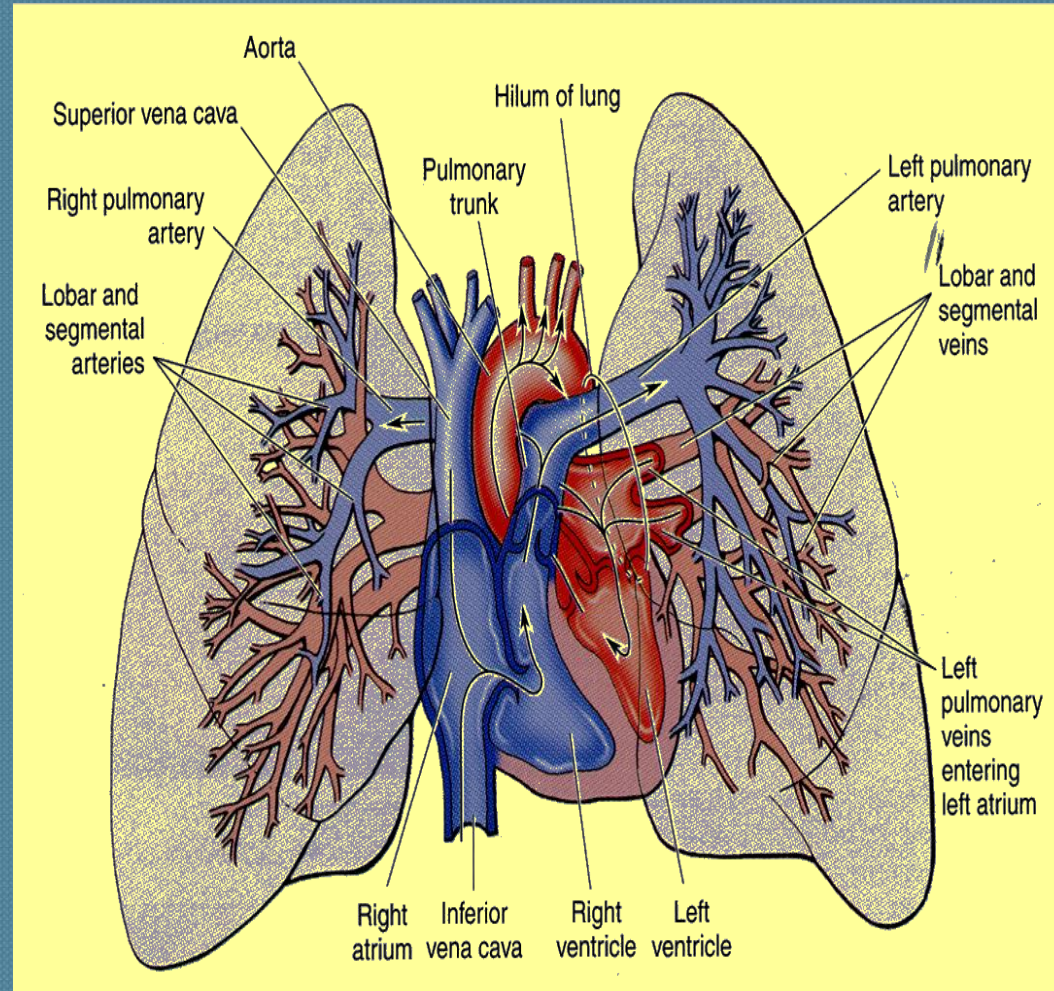
## Arterial and venous supply

Bronchial arteries arise from systemic circulation, supply lung; its associated tissues with nutrients

Left bronchial artery arises from descending thoracic aorta;

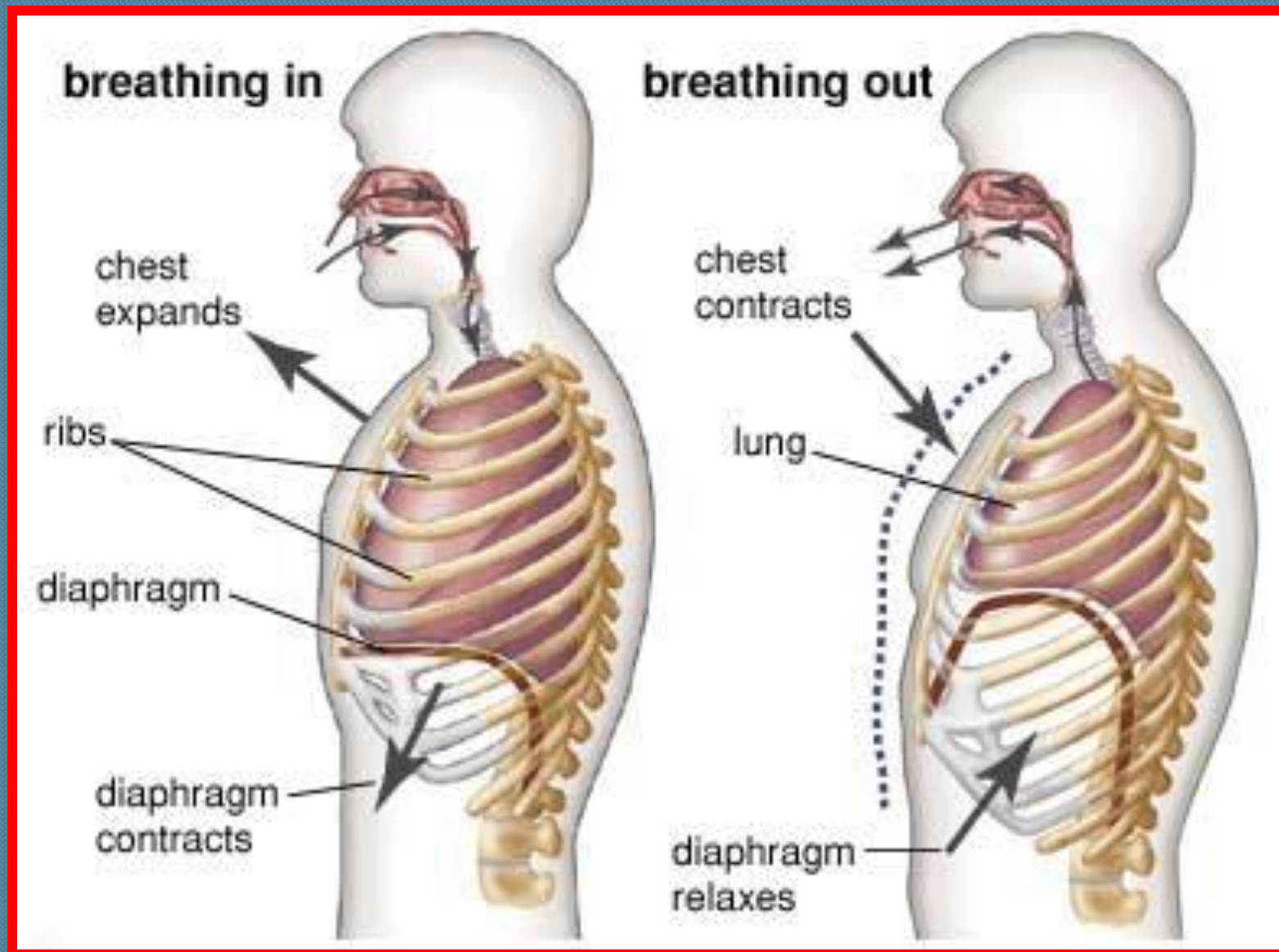
Right bronchial artery arises from 3<sup>rd</sup> posterior intercostal artery

- Bronchial veins drain lung tissues
- Right bronchial vein drains into azygos vein;
- Left bronchial vein drains into accessory hemiazygos vein or left superior intercostal vein

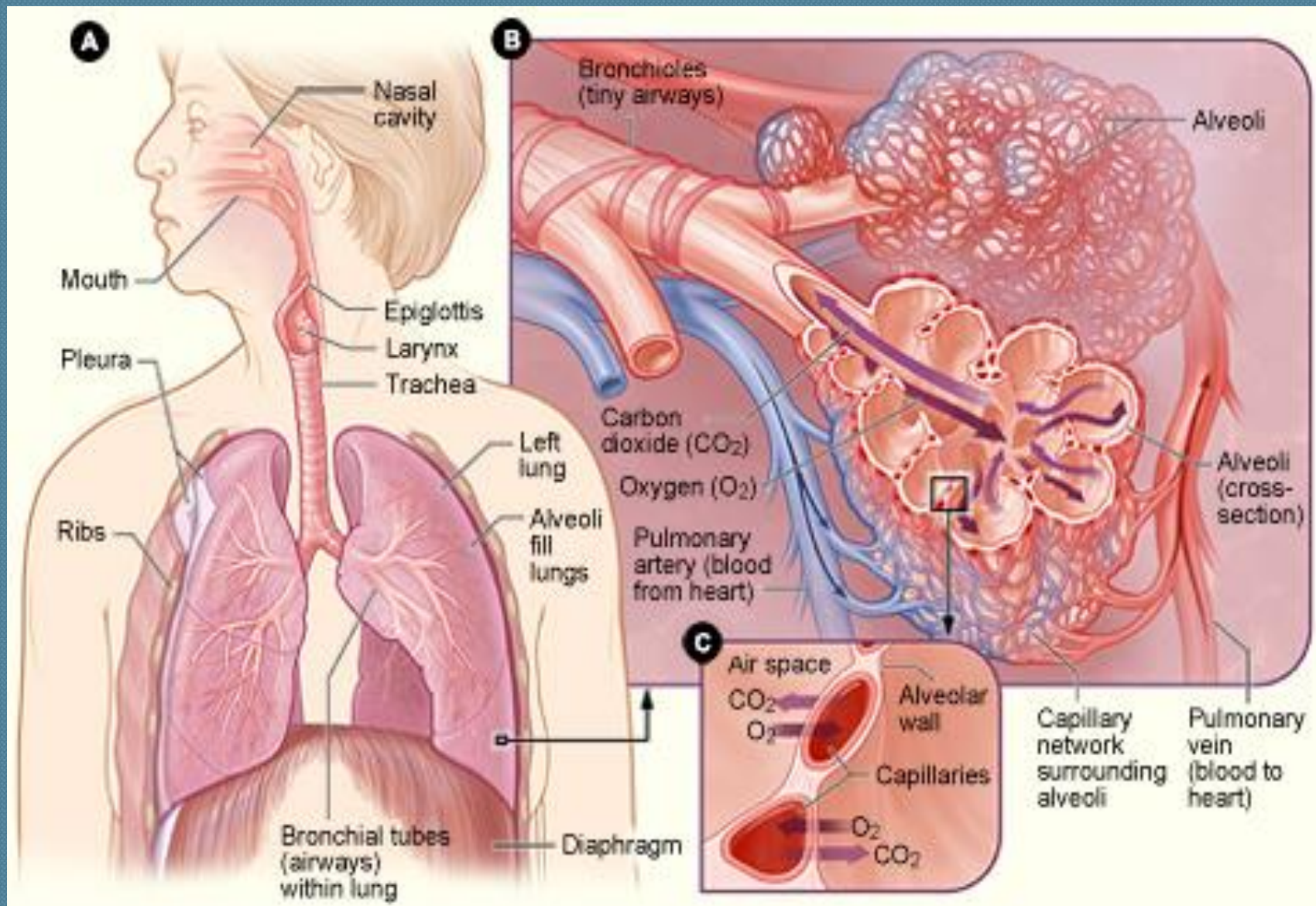




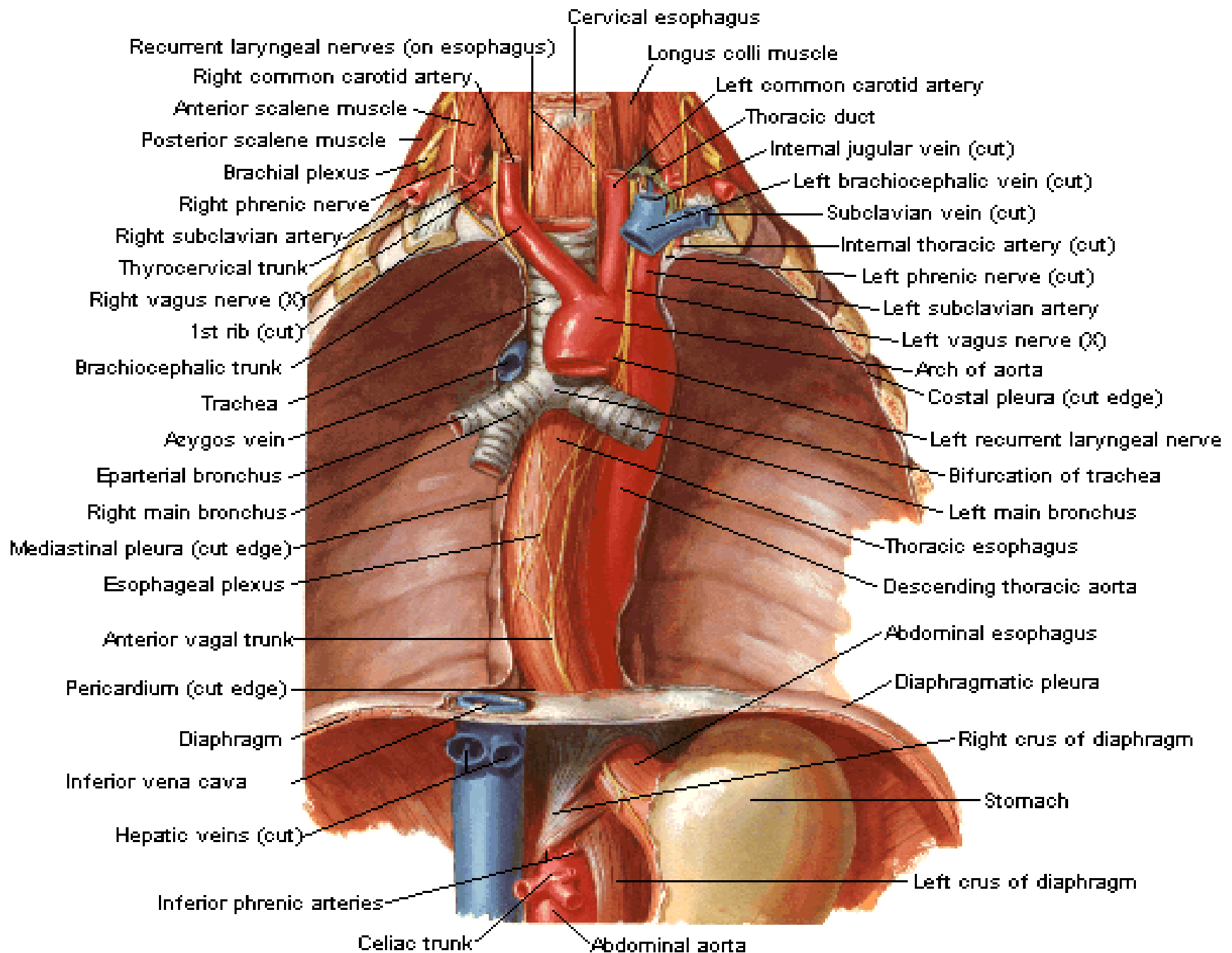
# The respiratory mechanism











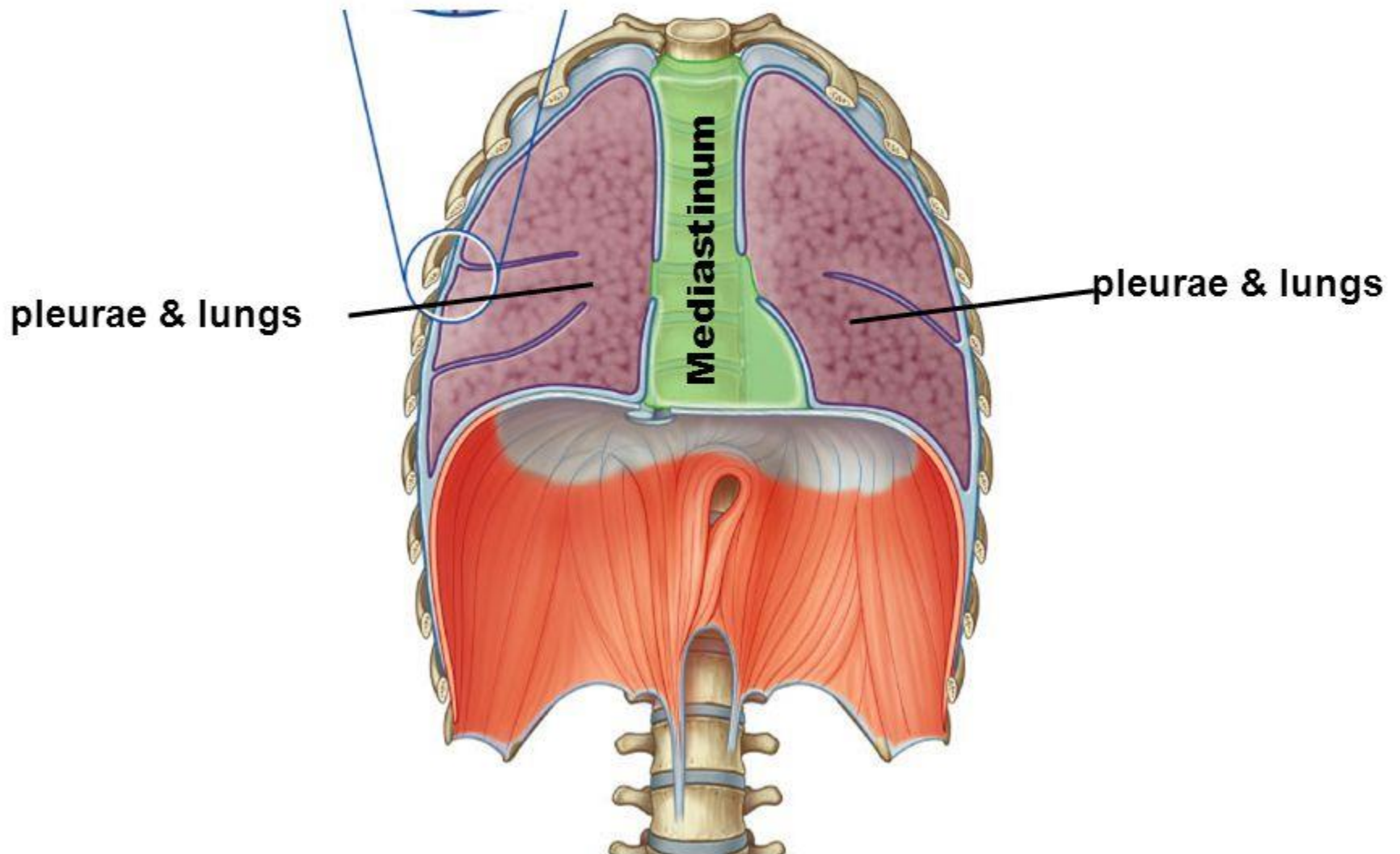


# The Mediastinum

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# Chest Cavity





# Divisions of the Mediastinum

## SUPERIOR MEDIASTINUM

Superior - thoracic inlet

Inferior - transverse thoracic plane

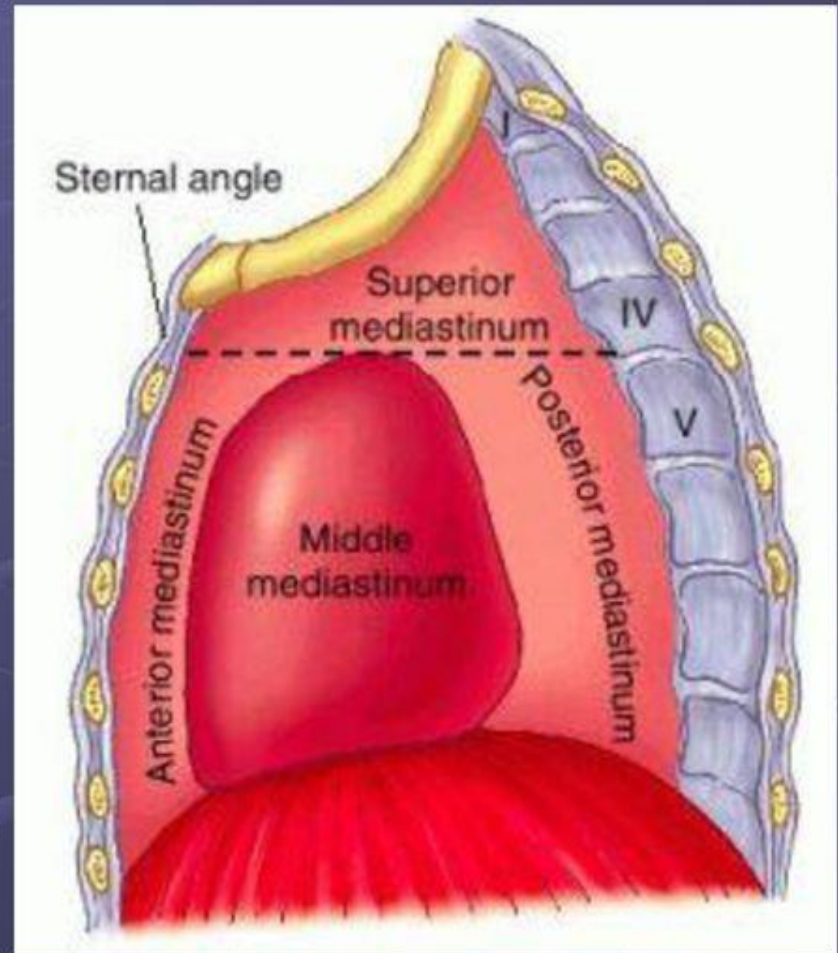
Anterior - sternal angle

Posterior - IV disc T4 & T5

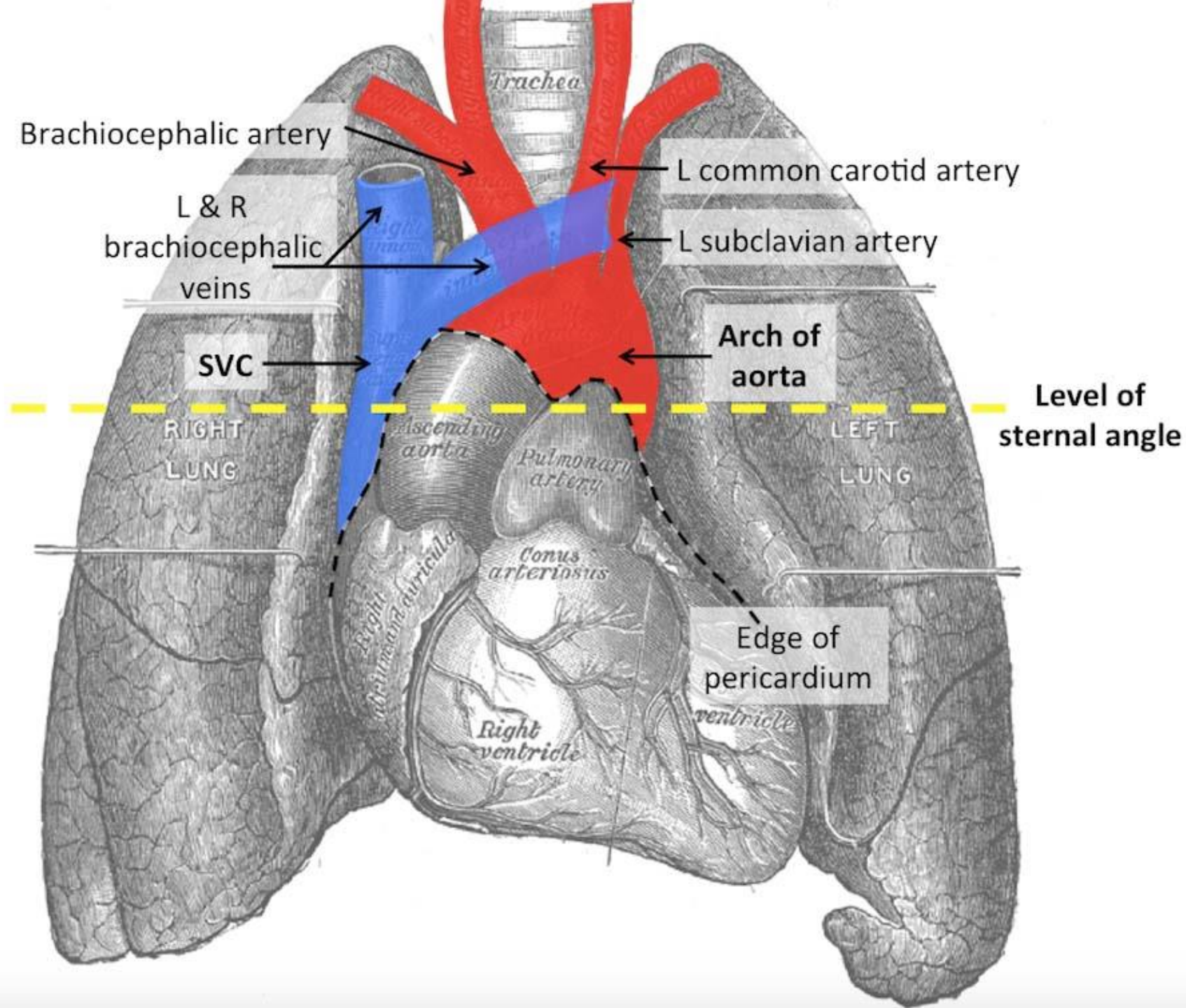
## INFERIOR MEDIASTINUM

Superior - transverse thoracic plane

Inferior - diaphragm

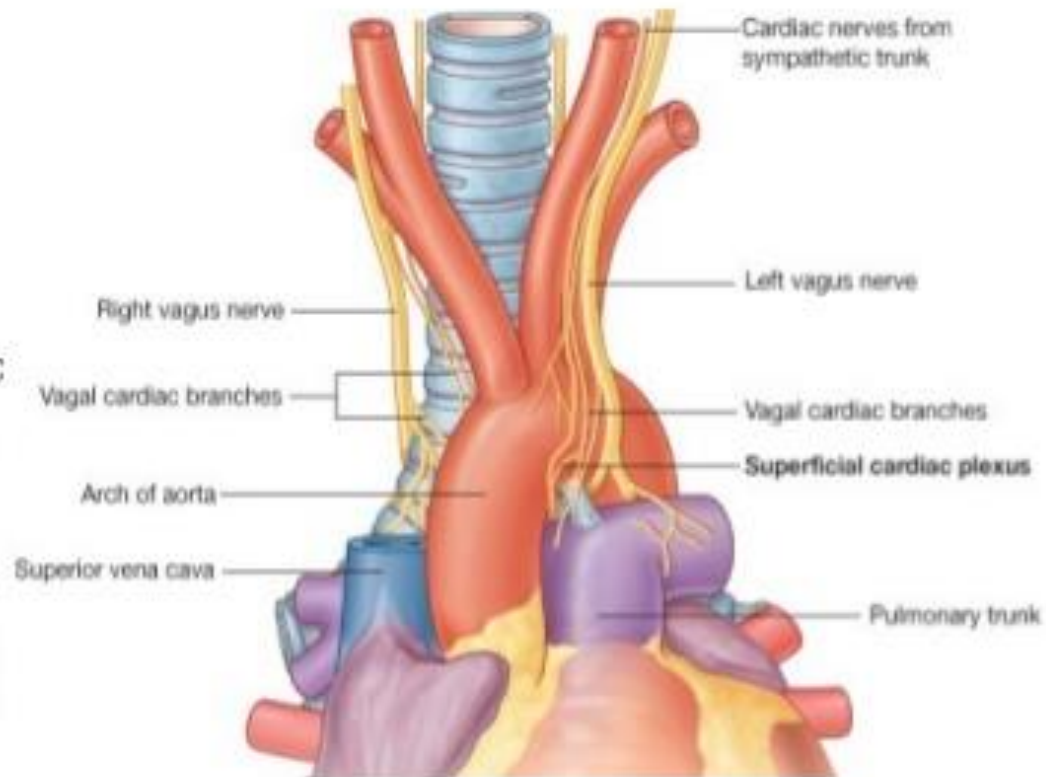
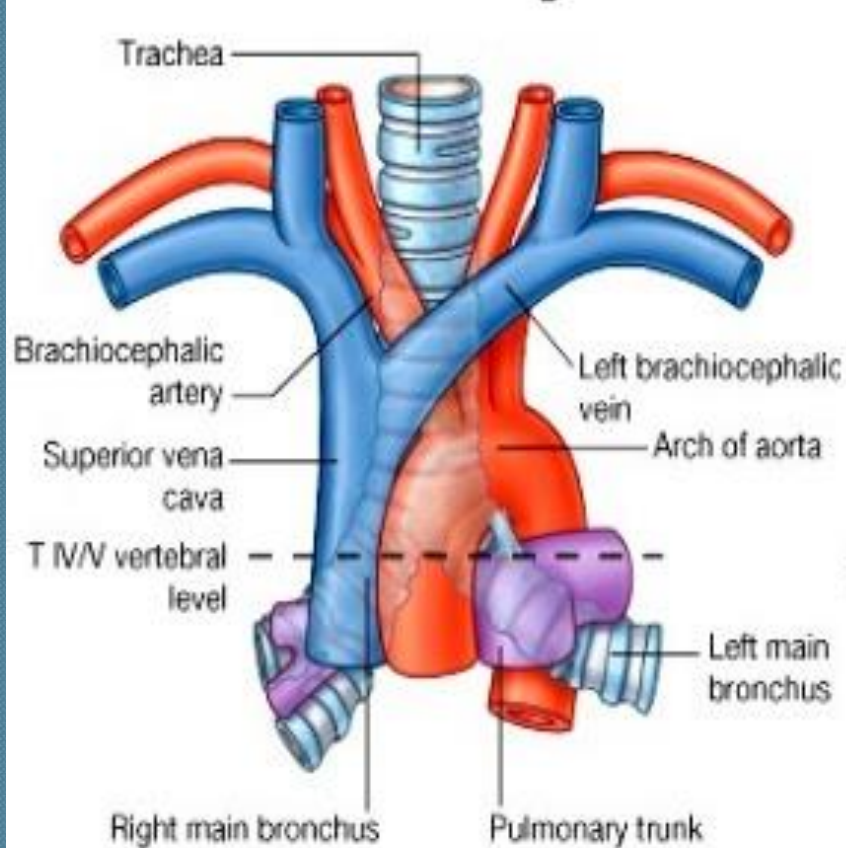








# Superior Mediastinum

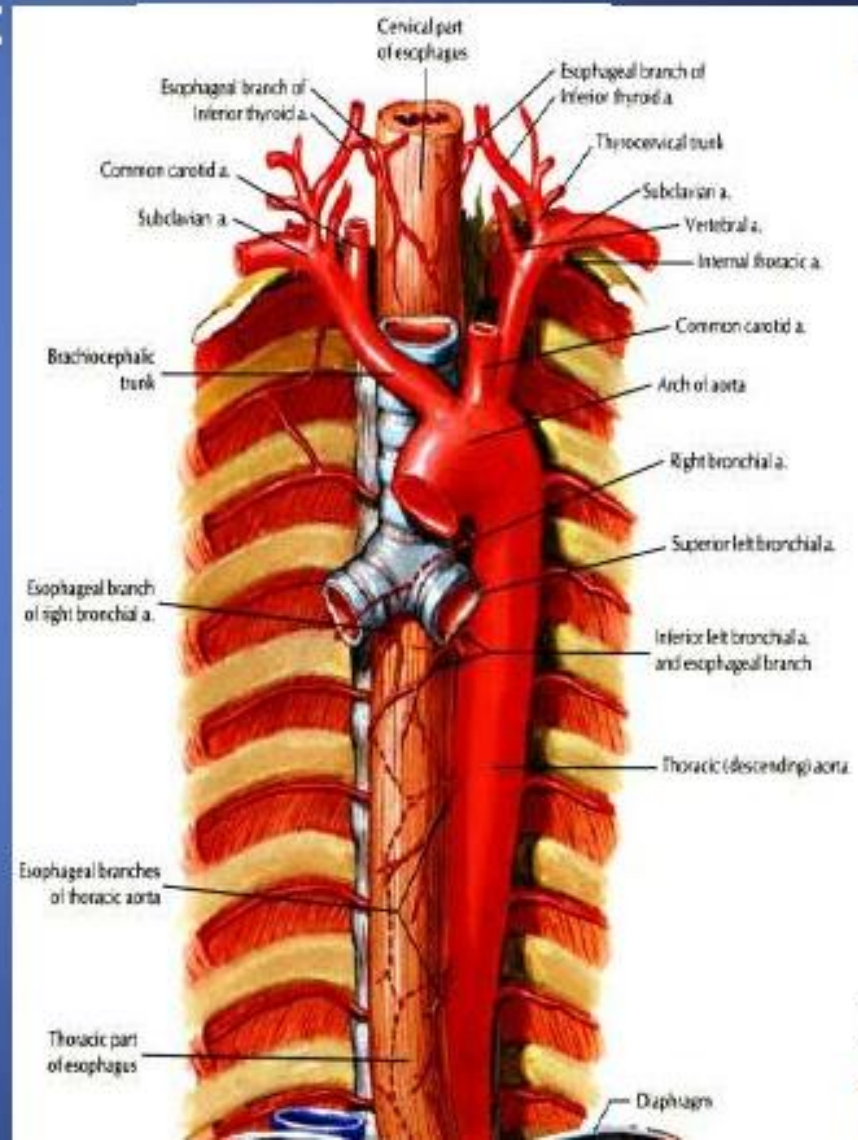




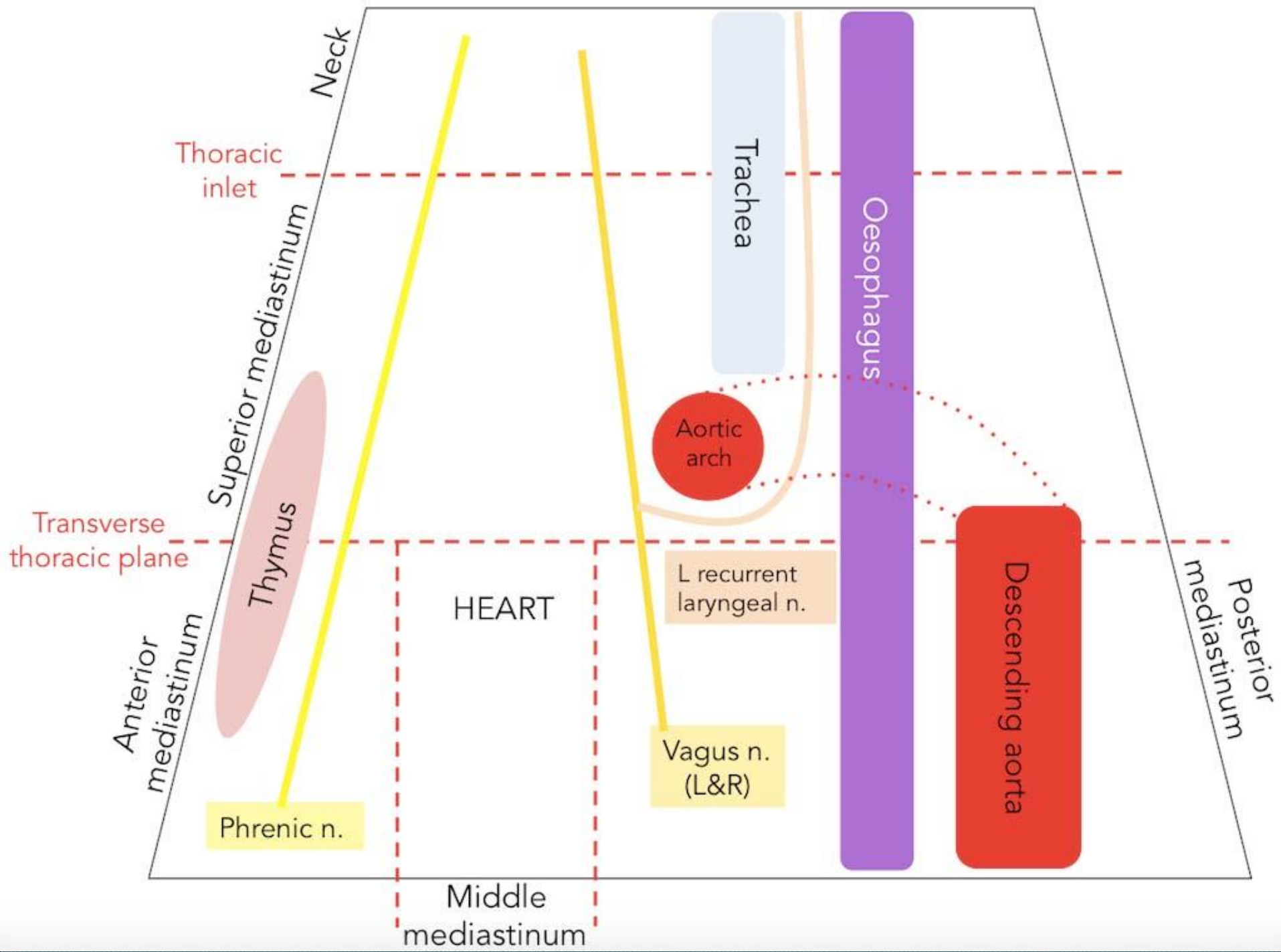
# ANATOMY OF MEDIASTINUM

## The posterior compartment

- The vertebrae
- Descending aorta,
- Oesophagus,
- Thoracic duct,
- Azygous and Hemizygous veins
- Lower portion of the vagus,
- Sympathetic chains, and
- Posterior mediastinal nodes.









Is the median region of the thorax, limited by :

- anterior: sternum
  - posterior: vertebral column
  - superior: superior orifice of the thorax
  - inferior: diaphragm
  - lateral: pleuropulmonary regions
-



# Anterior mediastinum

## Superior compartment

1. Thymic compartment
  2. Venous compartment
  3. Arterial compartment
  4. Tracheal compartment
- 

## Inferior compartment

1. Prepericardial compartment
2. Pericardial compartment



# Posterior mediastinum

1. Oesophageal compartment
  2. Prevertebral and laterovertebral compartment
-



# Thoracic aorta

Branches:

Parietal: - intercostal arteries – 9 pairs  
- phrenic or inferior diaphragmatic

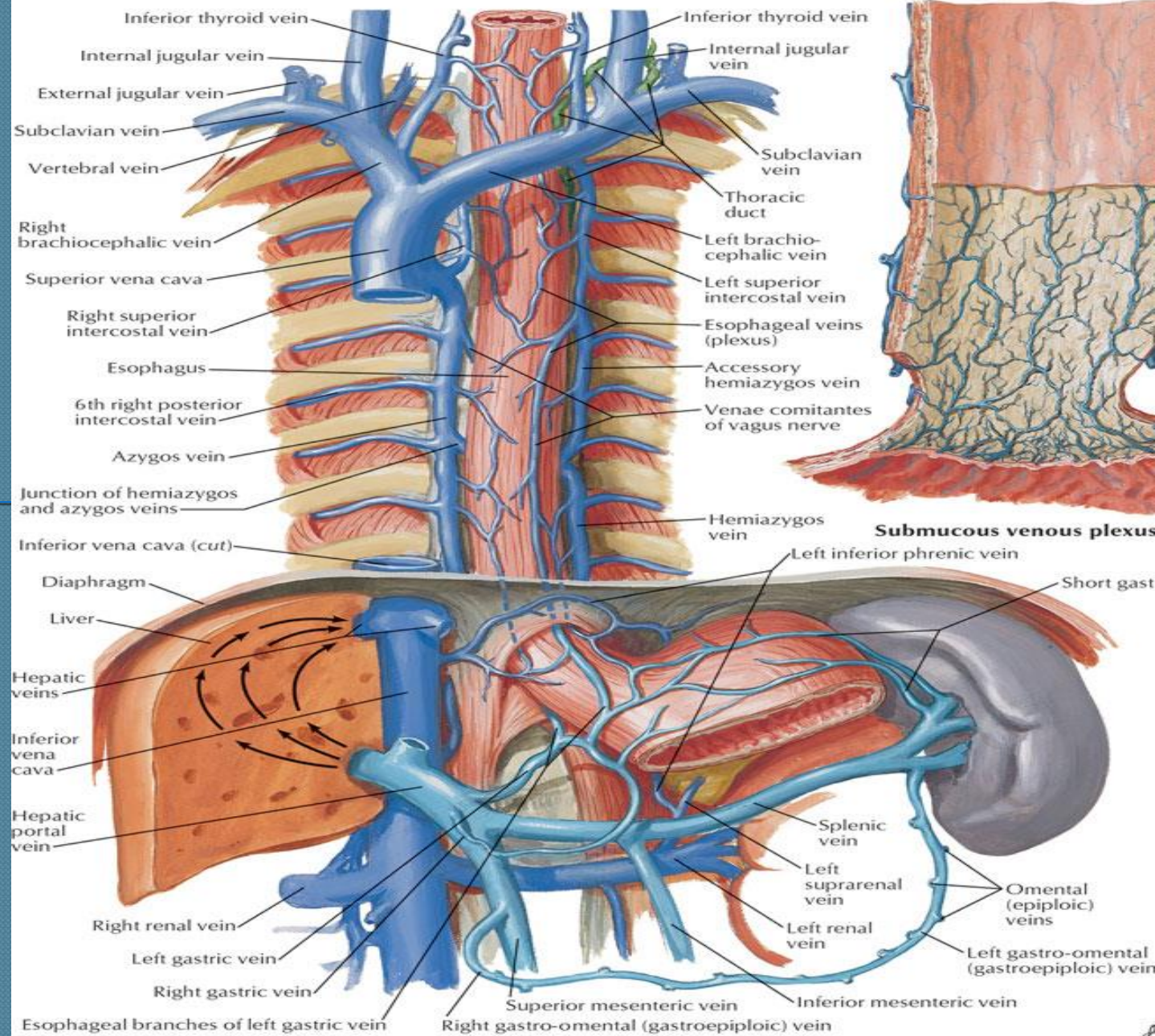
Visceral: - pericardial  
- oesophageal  

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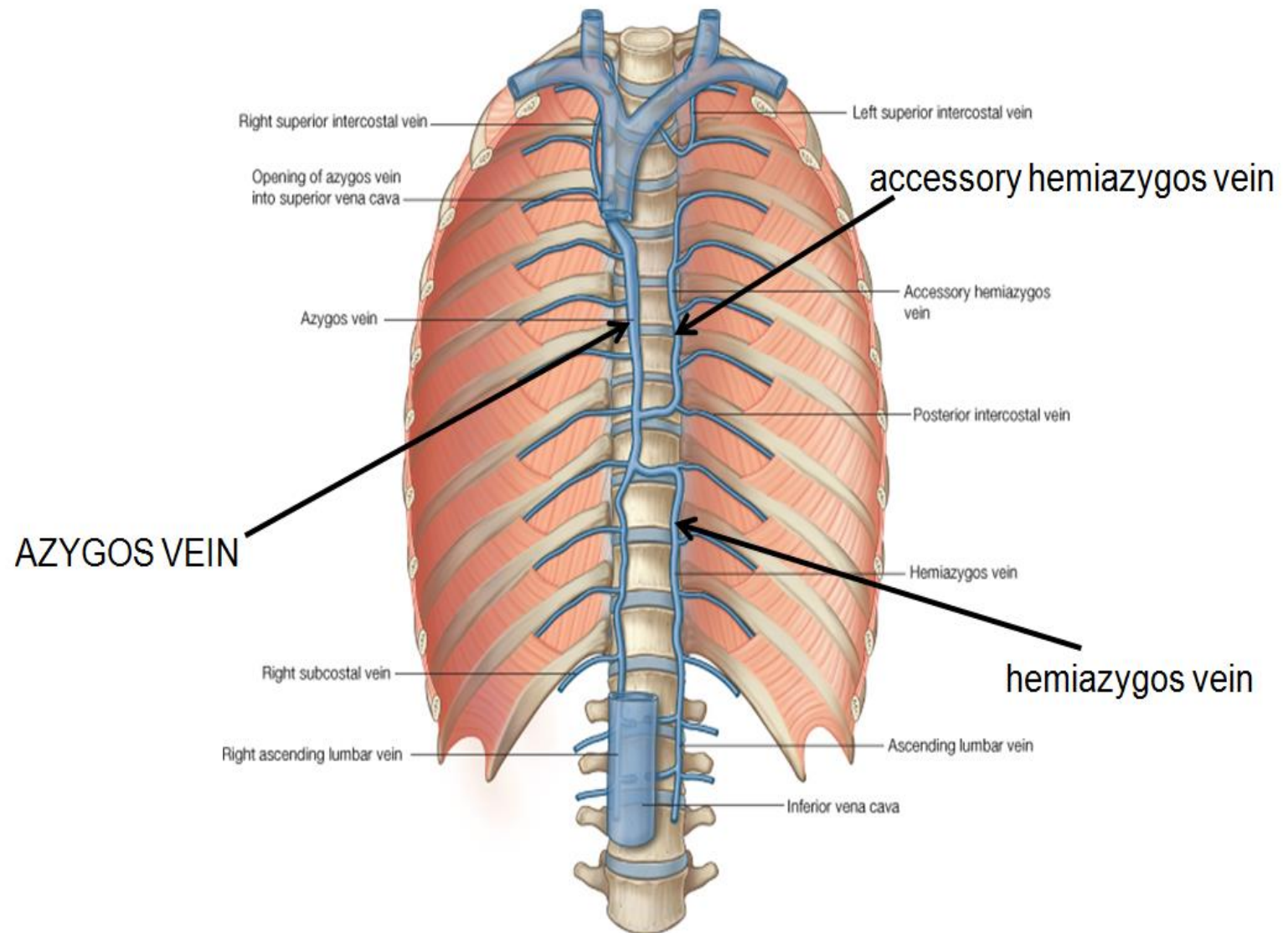
- bronchial  
- mediastinal



# Veins of Esophagus









The **azygos vein** (*v. azygos; vena azygos major*) begins opposite the first or second lumbar vertebra, by a branch, the **ascending lumbar vein**; sometimes by a branch from the right renal vein, or from the inferior vena cava.

It enters the thorax through the aortic hiatus in the diaphragm, and passes along the right side of the vertebral column to the fourth thoracic vertebra, where it arches forward over the root of the right lung, and ends in **the superior vena cava**, just before that vessel pierces the pericardium.

In the aortic hiatus, it lies with the thoracic duct on the right side of the aorta; in the thorax it lies upon the intercostal arteries, on the right side of the aorta and thoracic duct, and is partly covered by pleura.



## Tributaries

It receives

1. the right subcostal and intercostal vein
2. the upper three or four of these latter opening by a common stem,
3. the highest superior intercostal vein.
4. the hemiazygos veins,
5. oesophageal,
6. mediastinal,
7. pericardial veins,
8. the right bronchial vein.
9. A few imperfect valves are found in the azygos vein; but its tributaries are provided with complete valves.



The intercostal veins on the left side, below the upper three intercostal spaces, usually form two trunks, named the **hemiazygos** and **accessory hemiazygos veins**.

The **Hemiazygos Vein** (*v. hemiazygos; vena azygos minor inferior*) begins in the left ascending lumbar or renal vein.

It enters the thorax, through the left crus of the diaphragm, and, ascending on the left side of the vertebral column, as high as the ninth thoracic vertebra, passes across the column, behind the aorta, oesophagus, and thoracic duct, to end in the azygos vein.

It receives the lower four or five intercostal veins and the subcostal vein of the left side, and some esophageal and mediastinal veins



# The trachea and the bronchi

The trachea or windpipe is a cartilaginous and membranous tube, extending from the lower part of the larynx, on a level with the sixth cervical vertebra, to the upper border of the fourth thoracic vertebra, where it divides into the two bronchi, one for each lung.

The trachea is nearly but not quite cylindrical, being flattened posteriorly; it measures about 11 cm. in length; its diameter, from side to side, is from 2 to 2.5 cm., being always greater in the male than in the female. In the child the trachea is smaller, more deeply placed, and more movable than in the adult.

## Relations

**The anterior surface** of the trachea is convex, and covered, **in the neck**, from above downward, by the isthmus of the thyroid gland, the inferior thyroid veins, the *arteria thyroidea ima*, the *Sternothyreoideus* and *Sternohyoideus* muscles, the cervical fascia, and, more superficially, by the anastomosing branches between the anterior jugular veins;

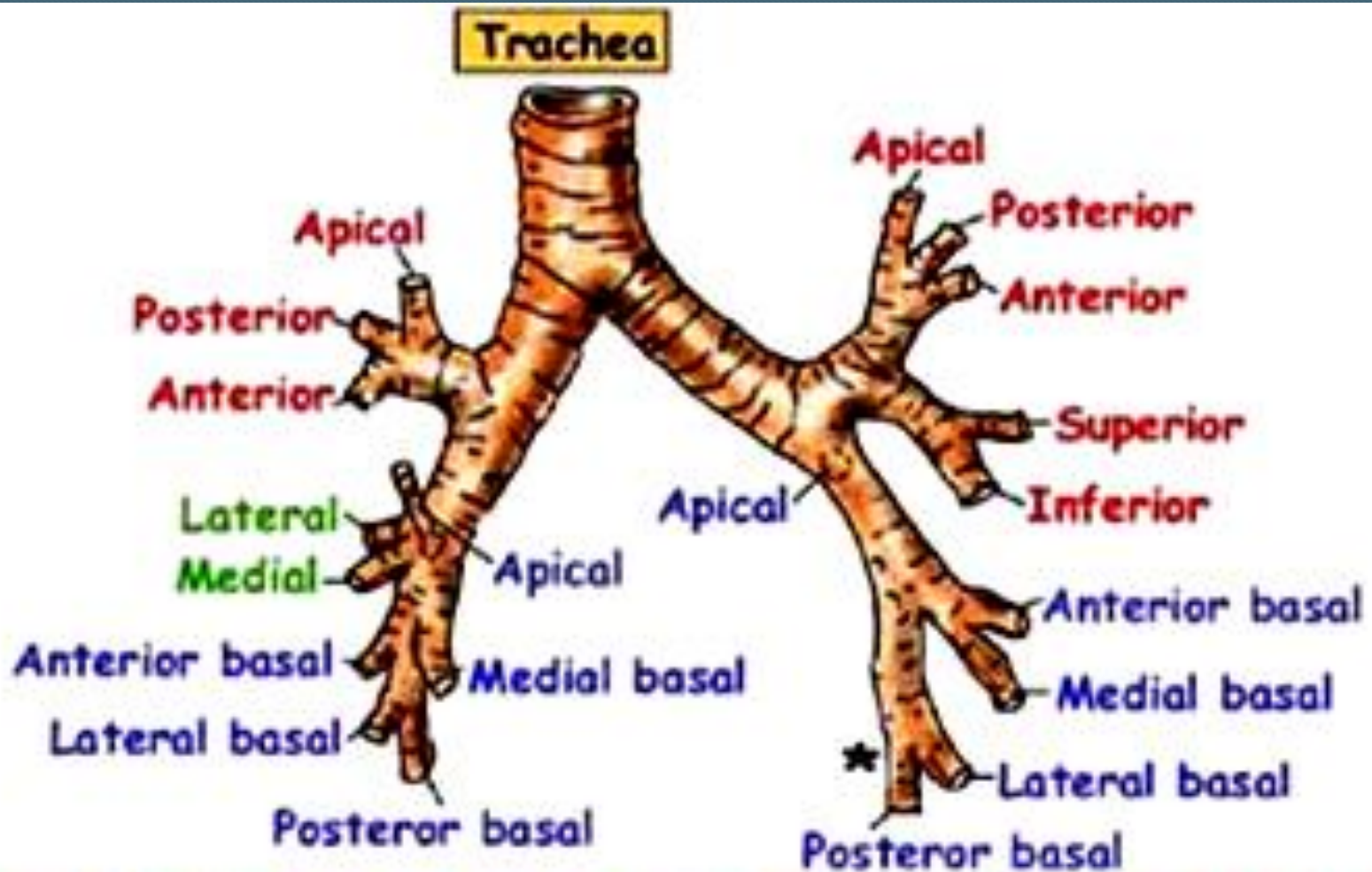
**in the thorax**, it is covered from anteroposterior by the *manubrium sterni*, the remains of the thymus, the left innominate vein, the aortic arch, the innominate and left common carotid arteries, and the deep cardiac plexus.

**Posteriorly** it is in contact with the oesophagus.

**Laterally**, **in the neck**, it is in relation with the common carotid arteries, the right and left lobes of the thyroid gland, the inferior thyroid arteries, and the recurrent nerves; **in the thorax**, it lies in the superior mediastinum, and is in relation on the right side with the pleura and right vagus nerve, and near the root of the neck with the innominate artery; on its left side are the left recurrent nerve, the aortic arch, and the left common carotid and subclavian arteries.



# Tertiary brochi



Red = Upper lobe    Blue = Lower lobe    Green = Middle lobe



**The Right Bronchus (*bronchus dexter*)**, wider, shorter, and more vertical in direction than the left, is about 2.5 cm. long, and enters the right lung nearly opposite the fourth thoracic vertebra.

The azygos vein arches over it from posterior; and the right pulmonary artery lies at first inferior and then anterior of it.

About 2 cm. from its commencement it gives off a branch to the superior lobe of the right lung.

This is termed the eparterial branch of the bronchus, because it arises above **the right pulmonary artery**.

The bronchus now passes inferior the artery, and is known as the hyparterial branch; it divides into two branches for the middle and inferior lobes.

**The Left Bronchus (*bronchus sinister*)** is smaller in caliber but longer than the right, being nearly 5 cm. long.

It enters the root of the left lung opposite the sixth thoracic vertebra.

It passes inferior the aortic arch, crosses anterior of the oesophagus, the thoracic duct, and the descending aorta, and has the left pulmonary artery lying at first superior, and then anterior of it.

The left bronchus has no eparterial branch, and therefore it has been supposed by some that there is no upper lobe to the left lung, but that the so-called upper lobe corresponds to the middle lobe of the right lung.



If a transverse section be made across the trachea a short distance above its point of bifurcation, and a bird's-eye view taken of its interior the septum placed at the bottom of the trachea and separating the two bronchi will be seen to occupy the left of the median line, and the right bronchus appears to be a more direct continuation of the trachea than the left, so that any solid body dropping into the trachea would naturally be directed toward the right bronchus.

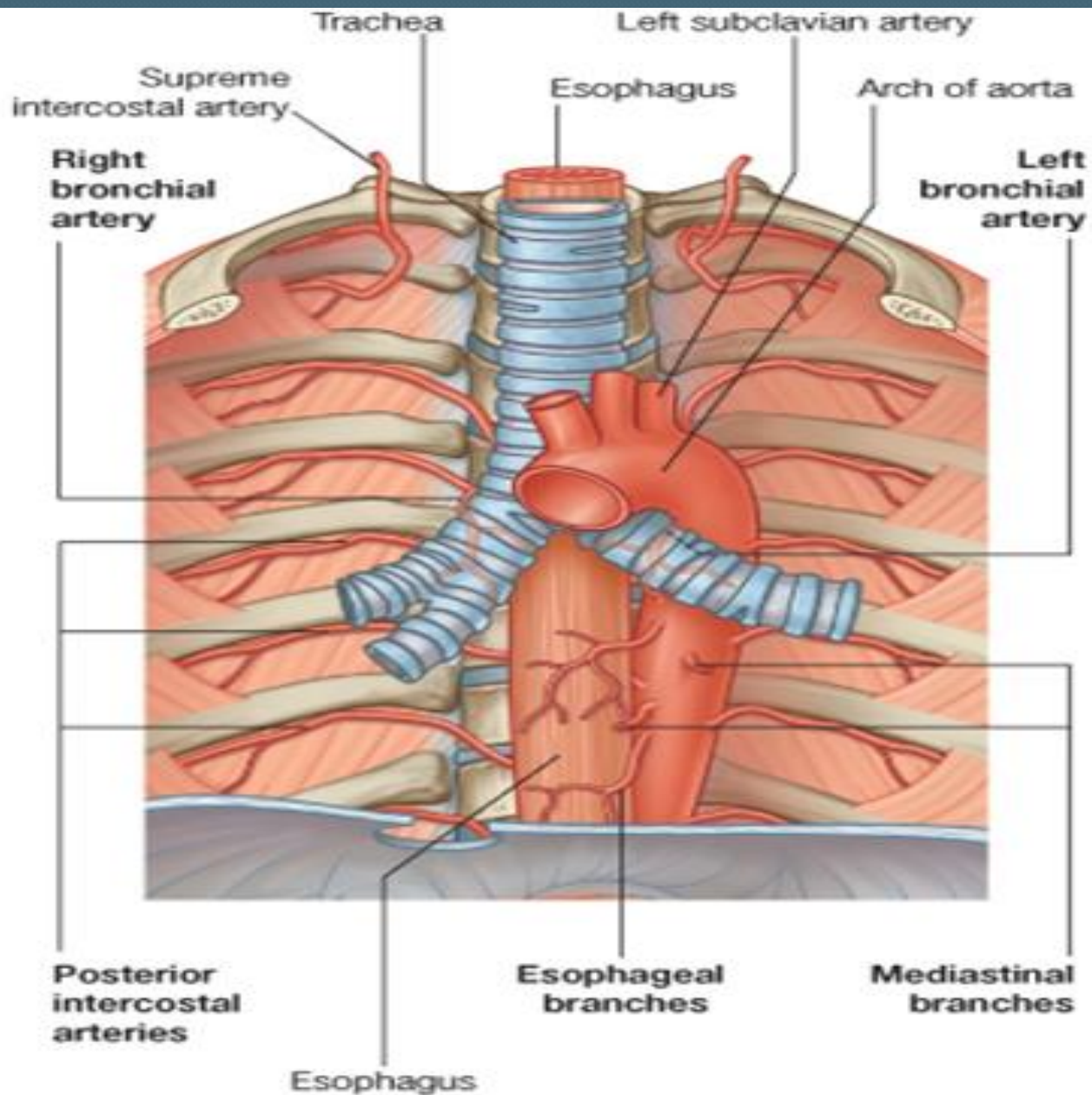
This tendency is aided by the larger diameter of the right tube as compared with its fellow.

This fact serves to explain why a foreign body in the trachea more frequently falls into the right bronchus.

### **Structure**

The trachea and extrapulmonary bronchi are composed of imperfect rings of hyaline cartilage, fibrous tissue, muscular fibers, mucous membrane, and glands.







The cartilages of the trachea vary from sixteen to twenty in number: each forms an imperfect ring, which occupies the anterior two-thirds or so of the circumference of the trachea, being deficient behind, where the tube is completed by fibrous tissue and unstripped muscular fibers.

The cartilages are placed horizontally above each other, separated by narrow intervals.

Their outer surfaces are flattened in a vertical direction, but the internal are convex, the cartilages being thicker in the middle than at the margins.

Two or more of the cartilages often unite, partially or completely, and they are sometimes bifurcated at their extremities.

They are highly elastic, but may become calcified in advanced life.

In the right bronchus the cartilages vary in number from six to eight; in the left, from nine to twelve.

They are shorter and narrower than those of the trachea, but have the same shape and arrangement.

The peculiar tracheal cartilages are the first and the last.

The first cartilage is broader than the rest, and often divided at one end; it is connected by the cricotracheal ligament with the lower border of the cricoid cartilage, with which, or with the succeeding cartilage, it is sometimes blended.



**The last cartilage is thick and broad in the middle, in consequence of its lower border being prolonged into a triangular hook-shaped process, which curves downward and backward between the two bronchi.**

**It ends on each side in an imperfect ring, which encloses the commencement of the bronchus.**

**The cartilage above the last is somewhat broader than the others at its center.**



## Vessels and Nerves

The trachea is supplied with blood by **the inferior thyroid arteries**.

The veins end in **the thyroid venous plexus**.

The nerves are derived from **the vagus and the recurrent nerves, and from the sympathetic**;  
they are distributed to the *Trachealis* muscles and between the epithelial cells.



A

