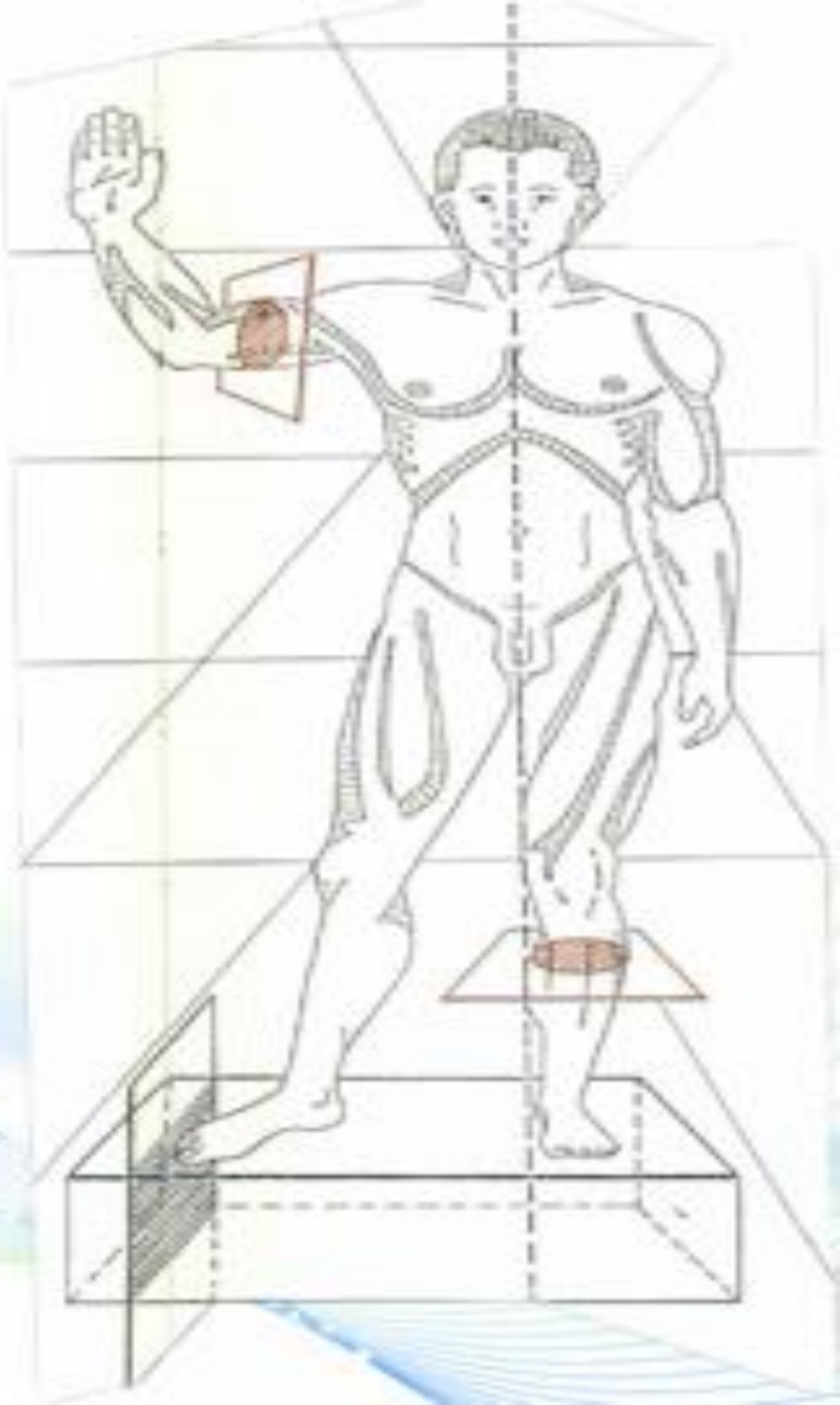
MARRAKECH
جامعة القاضي عياض
UNIVERSITÉ CADI AYYAD
كليـــــة الطب
والصيدلة - مراكش
FACULTÉ DE MÉDECINE
ET DE PHARMACIE - MARRAKECH
ANATOMIE
FMPM

THE MEDIASTINUM



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B- Subdivision

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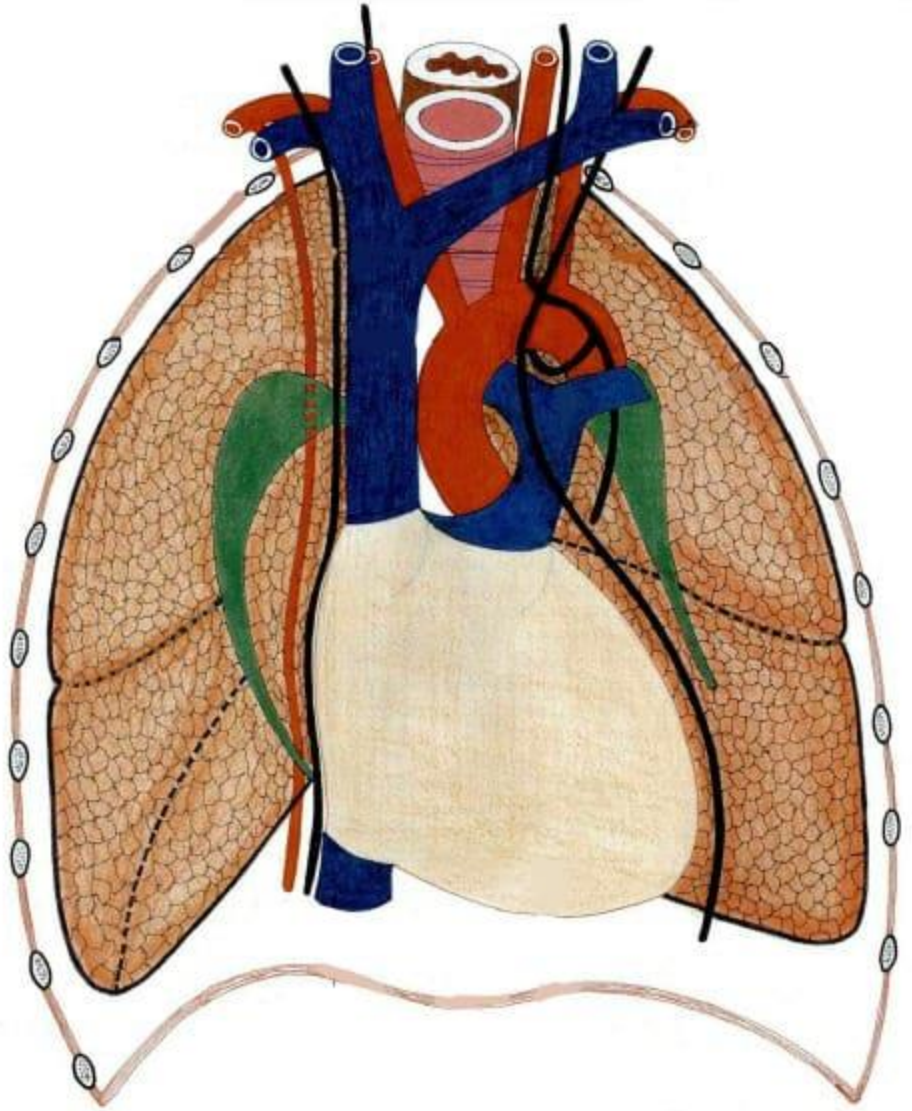
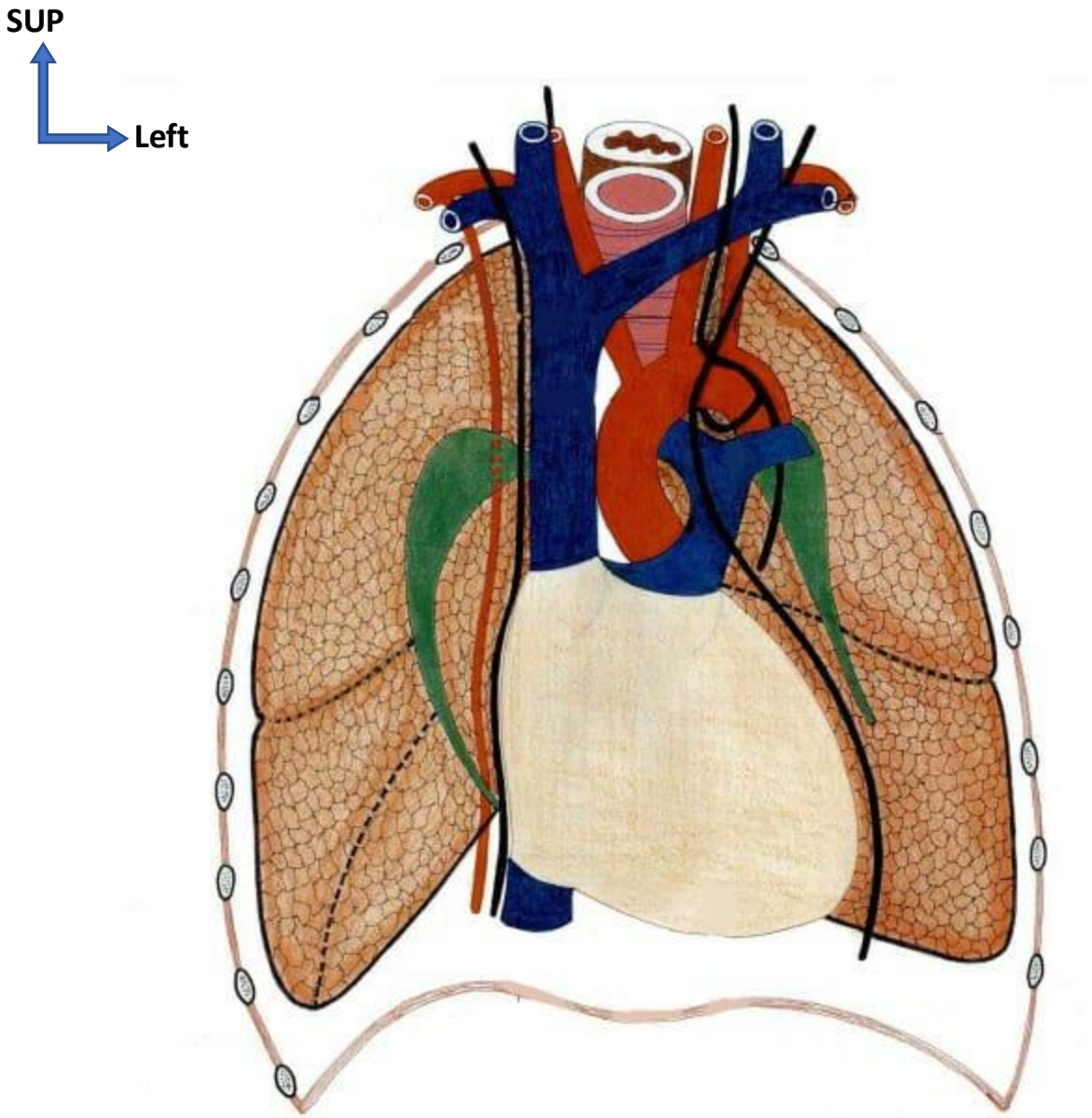


I. DEFINITION :

- The median region of the thorax.
- The mediastinum is the region of the thorax located between the two pleuropulmonary regions.
- It contains numerous organs surrounded by loose connective and adipose tissues.

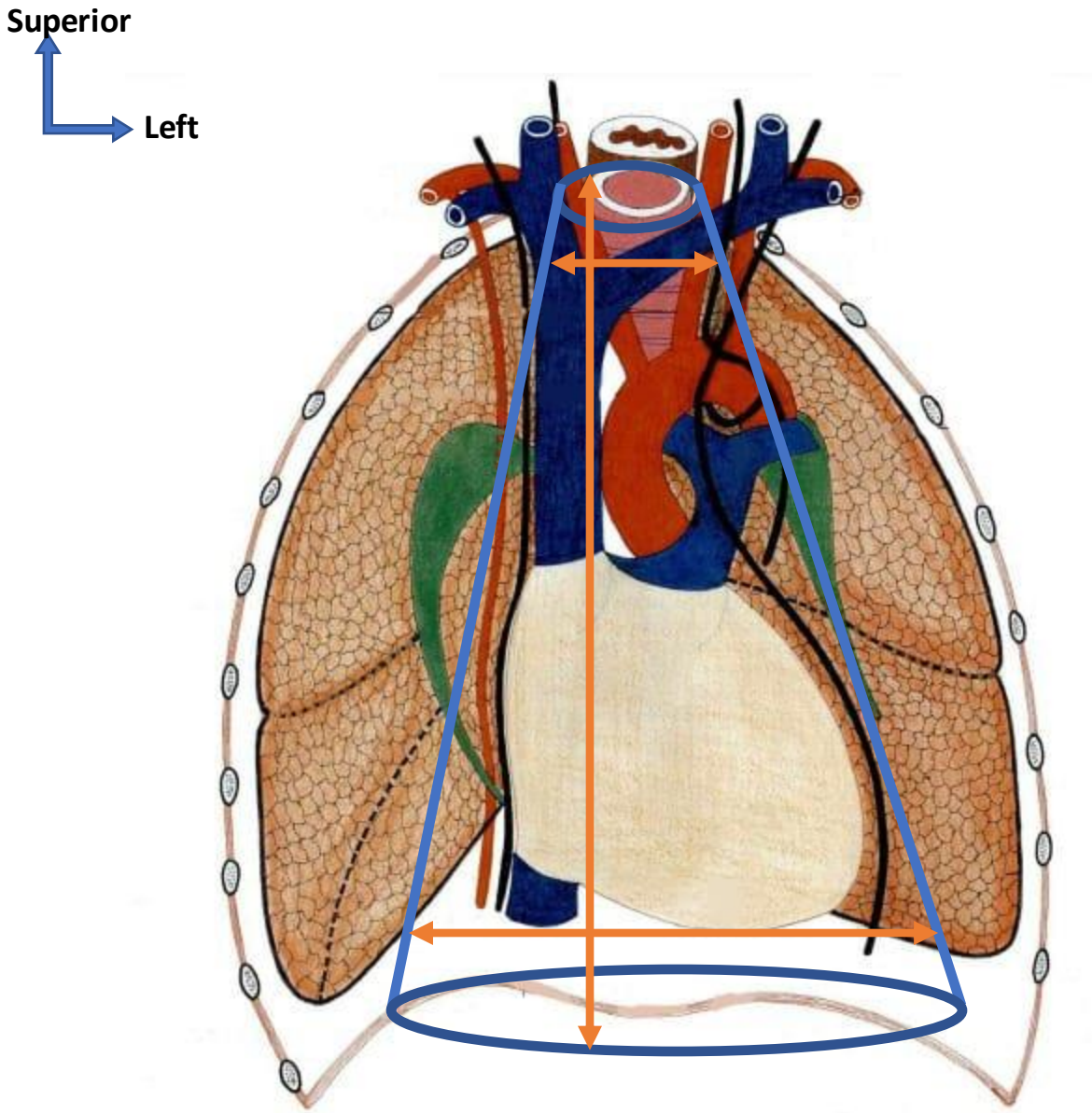


ANTERIOR VIEW OF THE THORAX

II. DESCRIPTIVE ANATOMY:

1. Form:

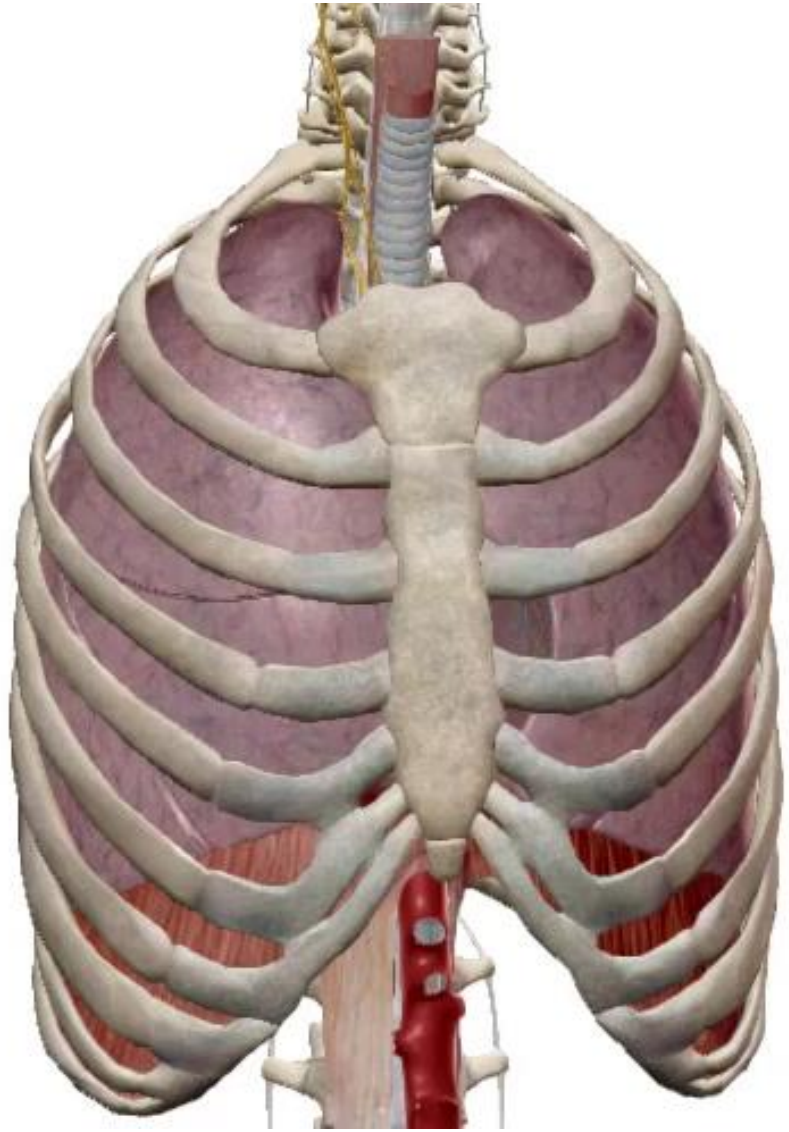
- The mediastinum has the shape of a truncated pyramid with a lower base.
- Height :15 to 20 cm.
- Width : 4 to 5 cm at the top and 12 to 15 cm at the base.



Anterior view of the thorax

2. Boundaries :

- Anteriorly : the sternum.
- Posteriorly : the vertebral column from T1 to T12.
- Superiorly : the superior thoracic aperture.
- Inferiorly : the diaphragm.
- Laterally : the mediastinal pleurae.



3. Subdivision:

1. Anterior mediastinum :

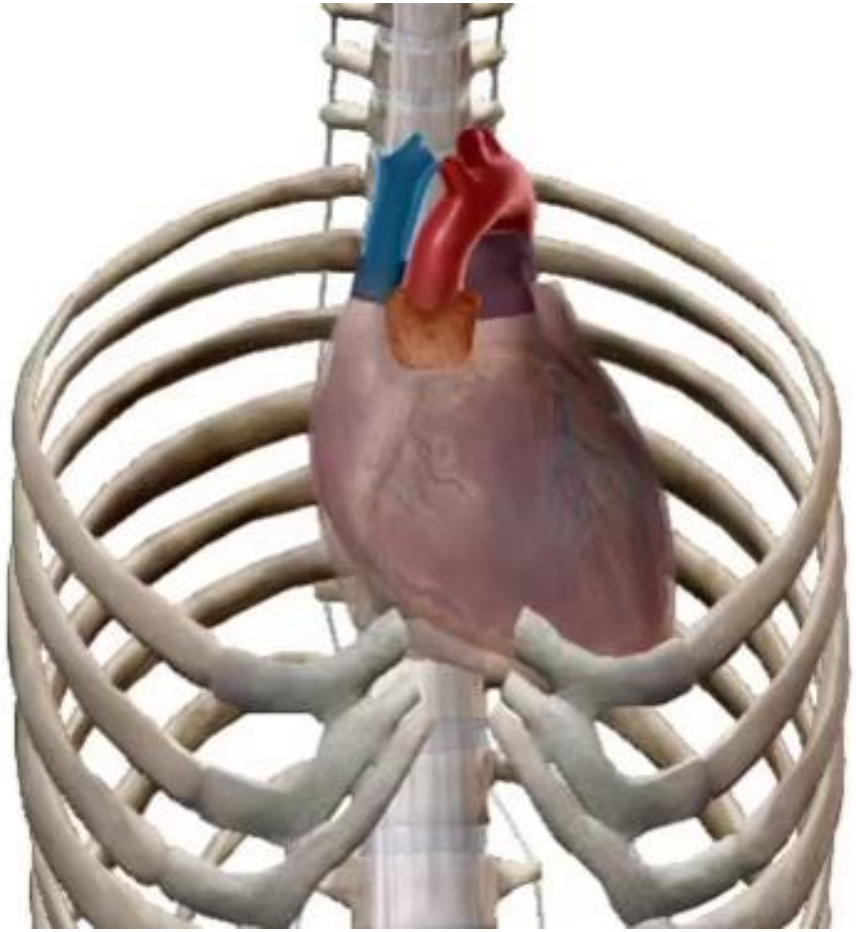
- The thymus.
- The supracardiac vessels.
- The heart.

2. Middle mediastinum :

- The tracheobronchial tree,
- The pulmonary arteries,
- The pulmonary veins,
- The aortic arch,
- The arch of the azygos vein,
- Lymphatics

3. Posterior mediastinum :

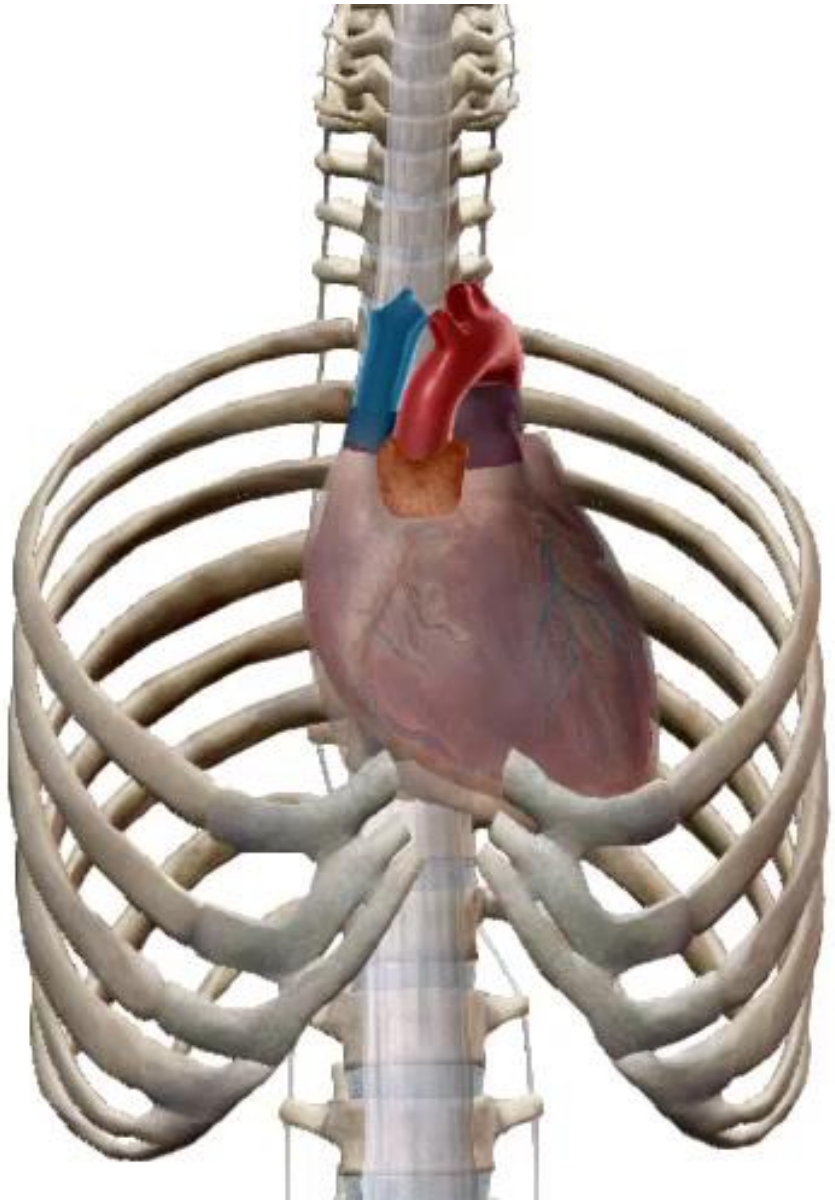
- The descending thoracic aorta,
- The thoracic esophagus,
- The thoracic duct,
- The azygos system,
- The vagus nerves,
- Lymphatic nodes.



III. TOPOGRAPHIC ANATOMY:

1. Anterior mediastinum :

- The thymus,
- The supracardiac vessels :
  - ✓ The ascending aorta,
  - ✓ The pulmonary artery trunk,
  - ✓ Superior vena cava.
- The heart and its pericardium.



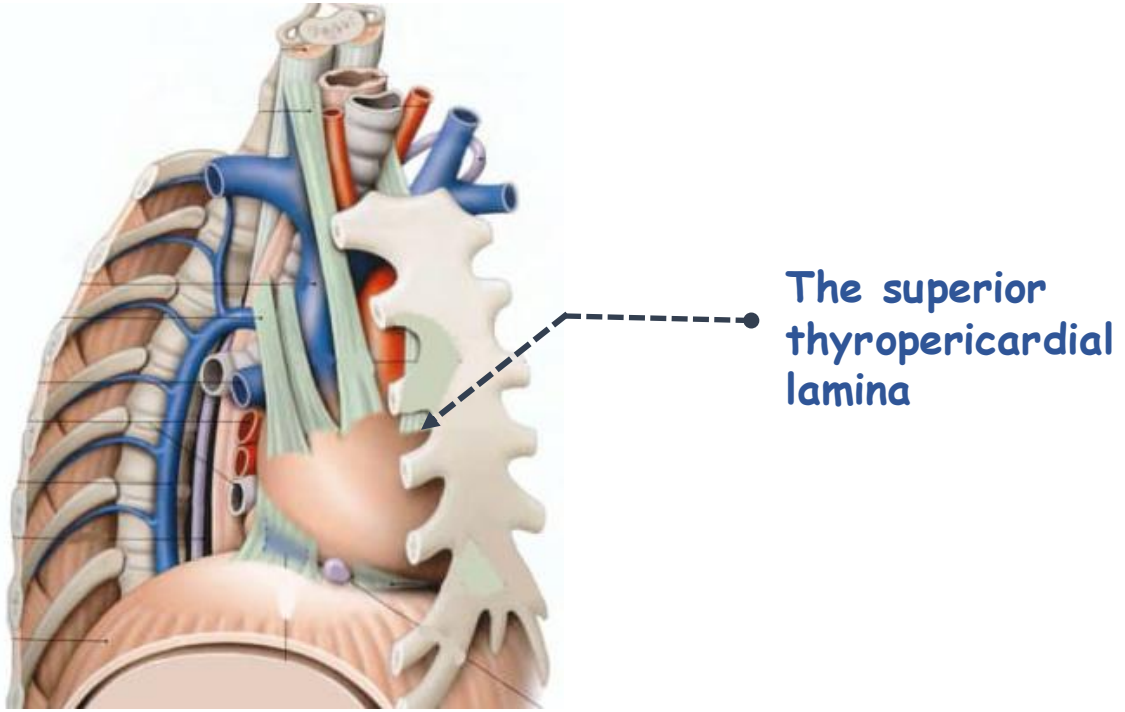
A. The thymus :

❖ Location :

- The thymus is a cervicothoracic organ located within a fibrous cavity : the thymic cavity, in the most anterior of the superior mediastinum.

- The boundaries of the thymic cavity are :

- Anteriorly :
  - ✓ The sternum superiorly,
  - ✓ The superior sternopericardial ligament inferiorly.
- Posteriorly :
  - ✓ The thyropericardial lamina superiorly.
  - ✓ The fibrous pericardium inferiorly.
- Laterally :
  - ✓ The lungs.



RIGHT ANTERO-LATERAL VIEW OF THE THORAX WITH LUNG RESECTION (according to KAMINA)

A. The thymus :

❖ Dimensions :

- In the newborn, it weights 5 grams, measures 5 cm in length and 1 to 2 cm in width and thickness.
- By the age of 3 years, the thymus reaches its maximum volume with a weight of 25 to 40 grams.
- After the puberty, the involution of the organs begins and it gradually regresses although it does not completely disappear.
- In adults, its vestiges form scattered lymphoid nodules within the pericardial adipose tissue.

ANTERIOR VIEW OF THE THORAX

❖ Consistensy :

- Soft.

❖ Color :

- Gray-pinkish.

❖ Form

- 2 lobes : left and right.
- For each lobe, there is :
  - ✓ A body,
  - ✓ 2 extremities : upper and lower.

Anterior view of the thorax

❖ Vascularization – innervation - lymphatic drainage system :

Arterial vascularization:

- Internal thoracic artery,
- Inferior thyroid artery.

Venous vascularization:

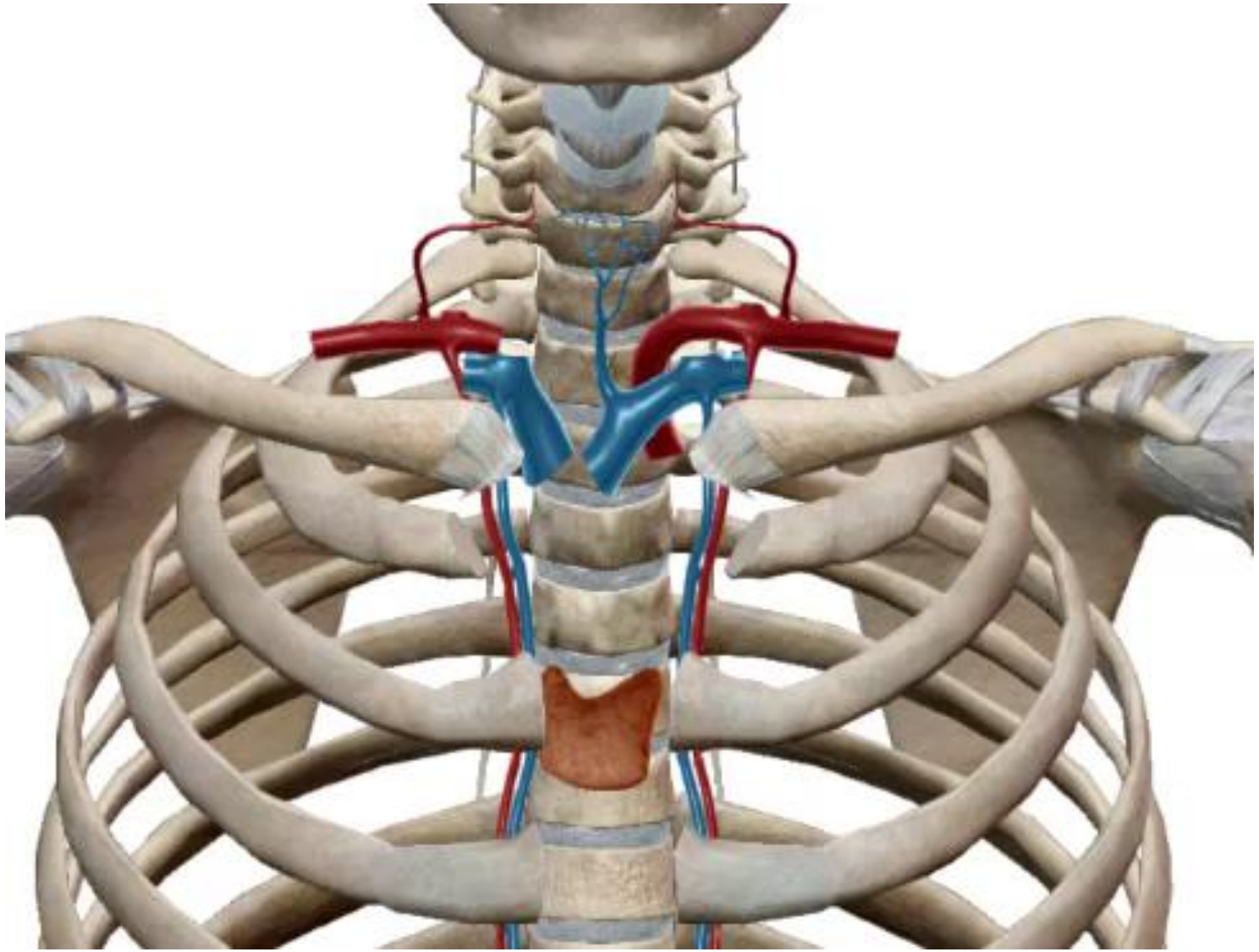
- The inferior thyroid veins,
- The internal thoracic vein,
- The left brachiocephalic vein.

Lymphatic drainage system:

- Anterior mediastinal lymphocenters.

Innervation:

- Branches of the inferior and superior mediastinal sympathetic plexus,
- The peri-arterial parasympathetic system.



B. The superior vena cava :

❖ Situation :

- It is located in the thoracic cavity, occupying the upper paramedian right part of the superior mediastinum.

❖ Origin :

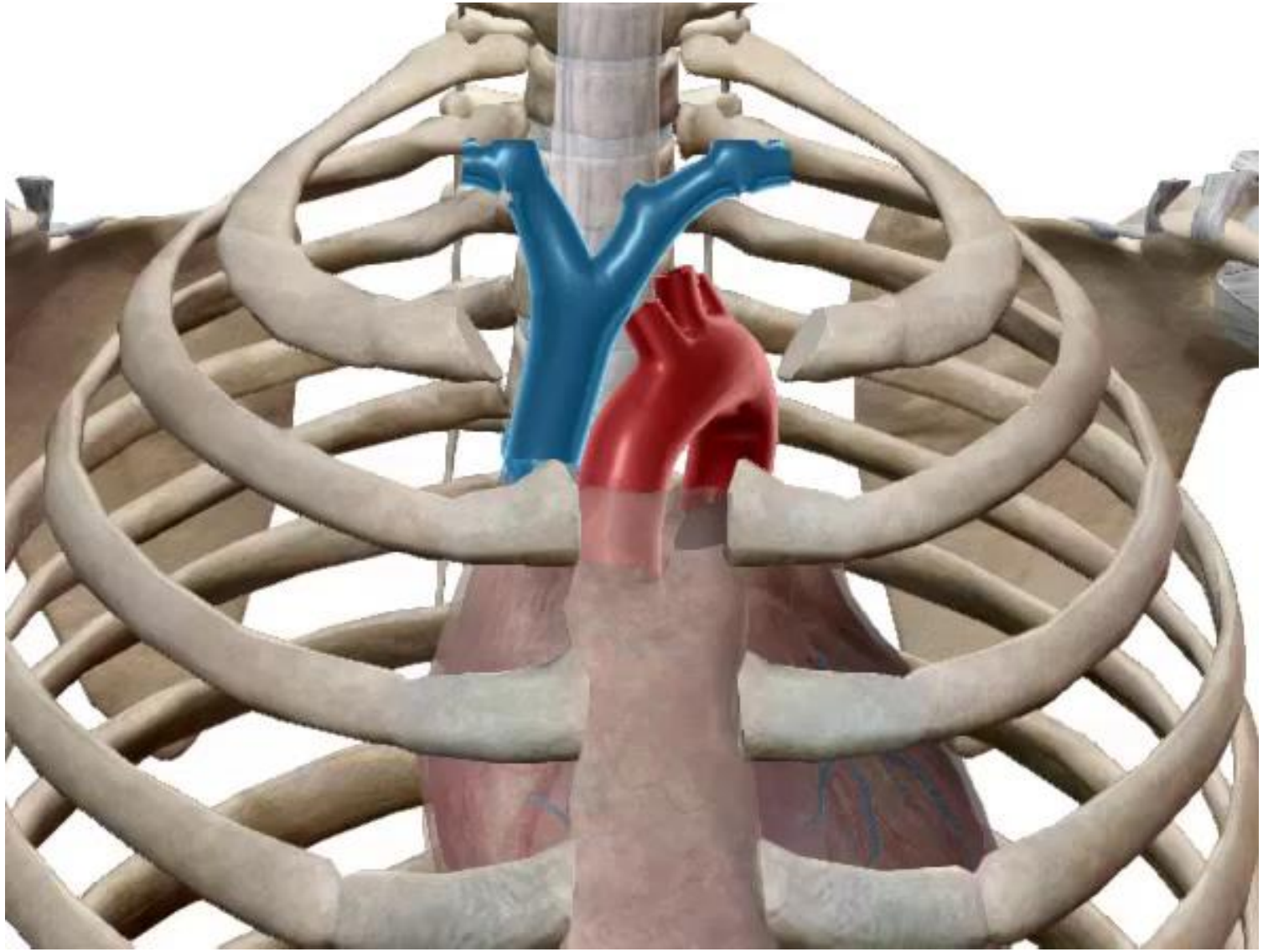
- It results from the fusion of the right and left brachiocephalic veins.

❖ Course :

- The superior vena cava descends obliquely backward and to the right side of the ascending aorta. It penetrates the pericardial sac and opens into the right atrium through a non-valvular orifice.

❖ Collateral branches :

- The azygos vein.



C. The ascending aorta :

❖ Origin :

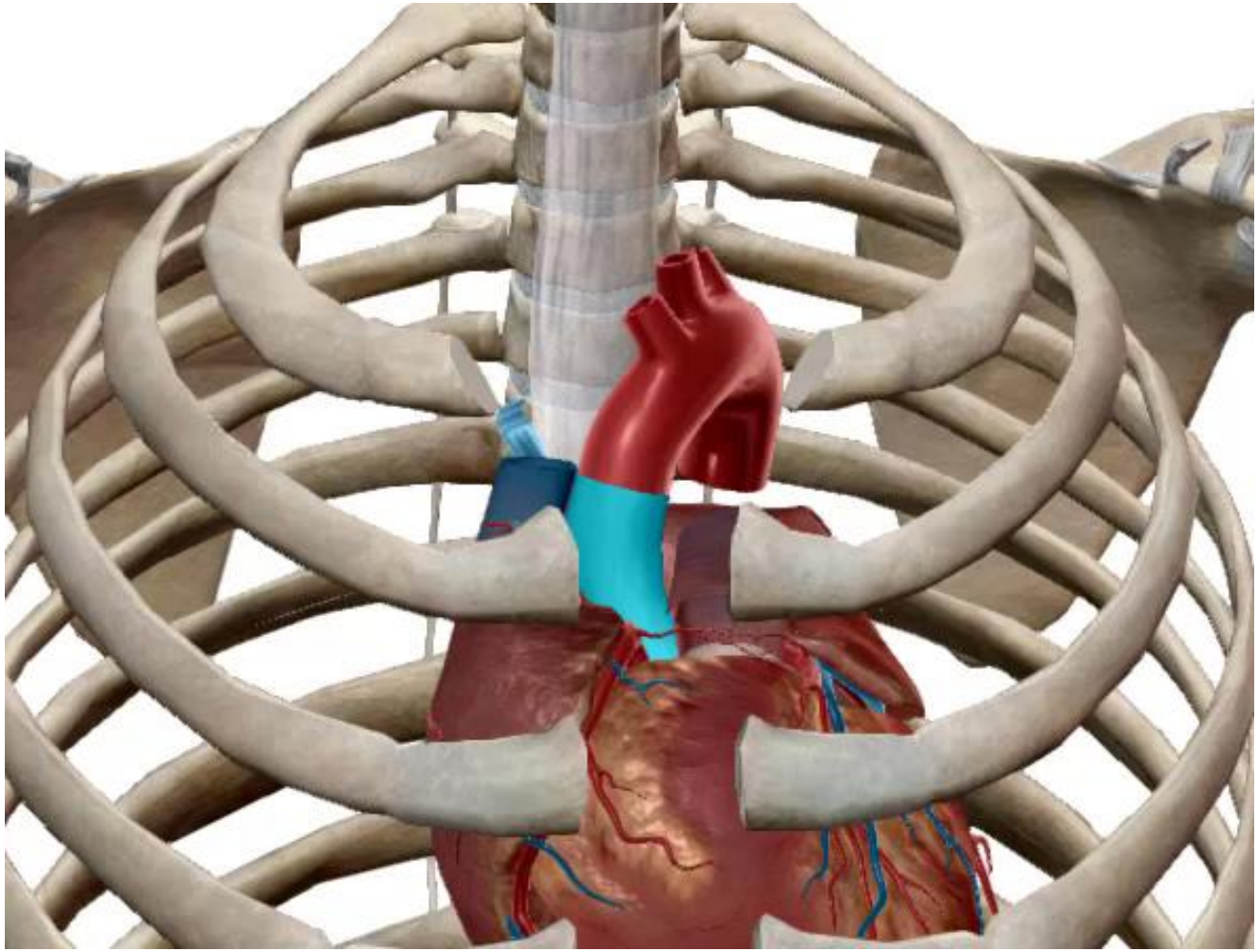
- The ascending part of the aortic arch originates at the base of the left ventricle, at the aortic orifice.

❖ Course and termination :

- It initially ascends obliquely upward, forward and to the right about 3 to 4 cm. Then continues vertically upwards for approximately 3 cm until it reaches the level of the first chondrosternal junction, where it changes direction and becomes the aortic arch.

❖ Dimensions :

- Length : 6 cm.
- Caliber : 2.5 to 3 cm.



D. Pulmonary artery trunk :

❖ Origin :

- It arises at the pulmonary orifice, at the base of the right ventricle.

❖ Course :

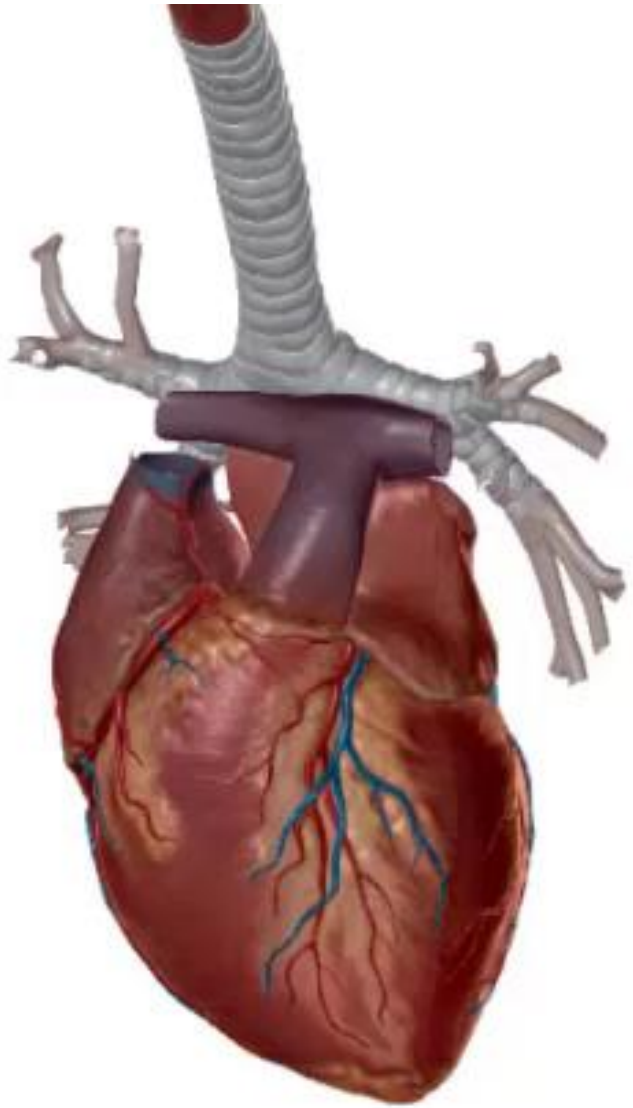
- It runs obliquely upward, to the left and backward.

❖ Terminaison and collaterals :

- It divides into 2 branches : the right and left pulmonary arteries.

❖ Dimensions

- Length : 5 cm.
- Diameter : 3,5 cm.



E. Phrenic nerves :

❖ Origin:

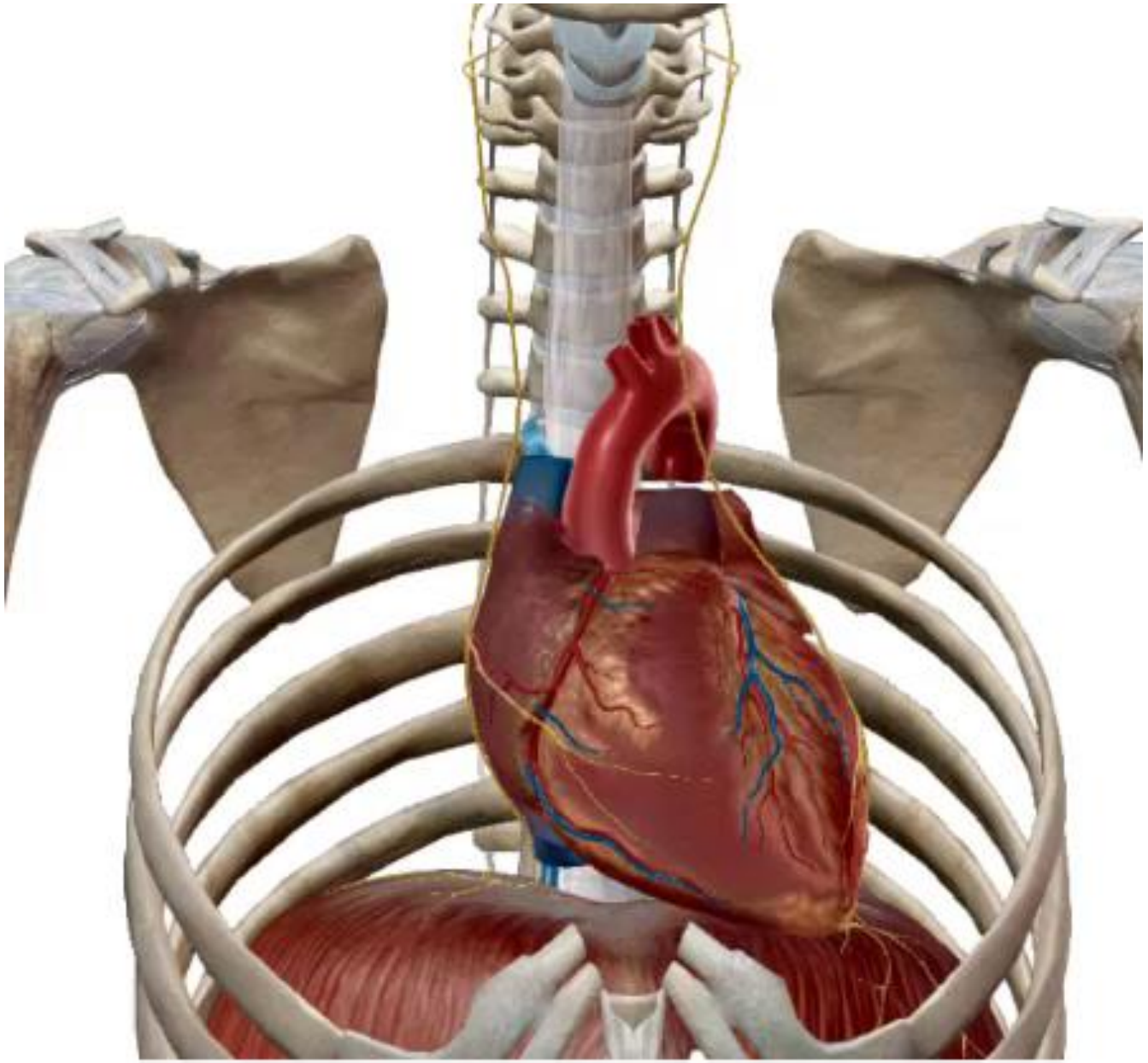
- It originates in the neck, at the level of C4.

❖ Course :

- The right phrenic descends almost vertically between the pleura and the pericardium.
- The left phrenic nerve follows a curved path with an internal concavity, to bypass the apex of the heart.

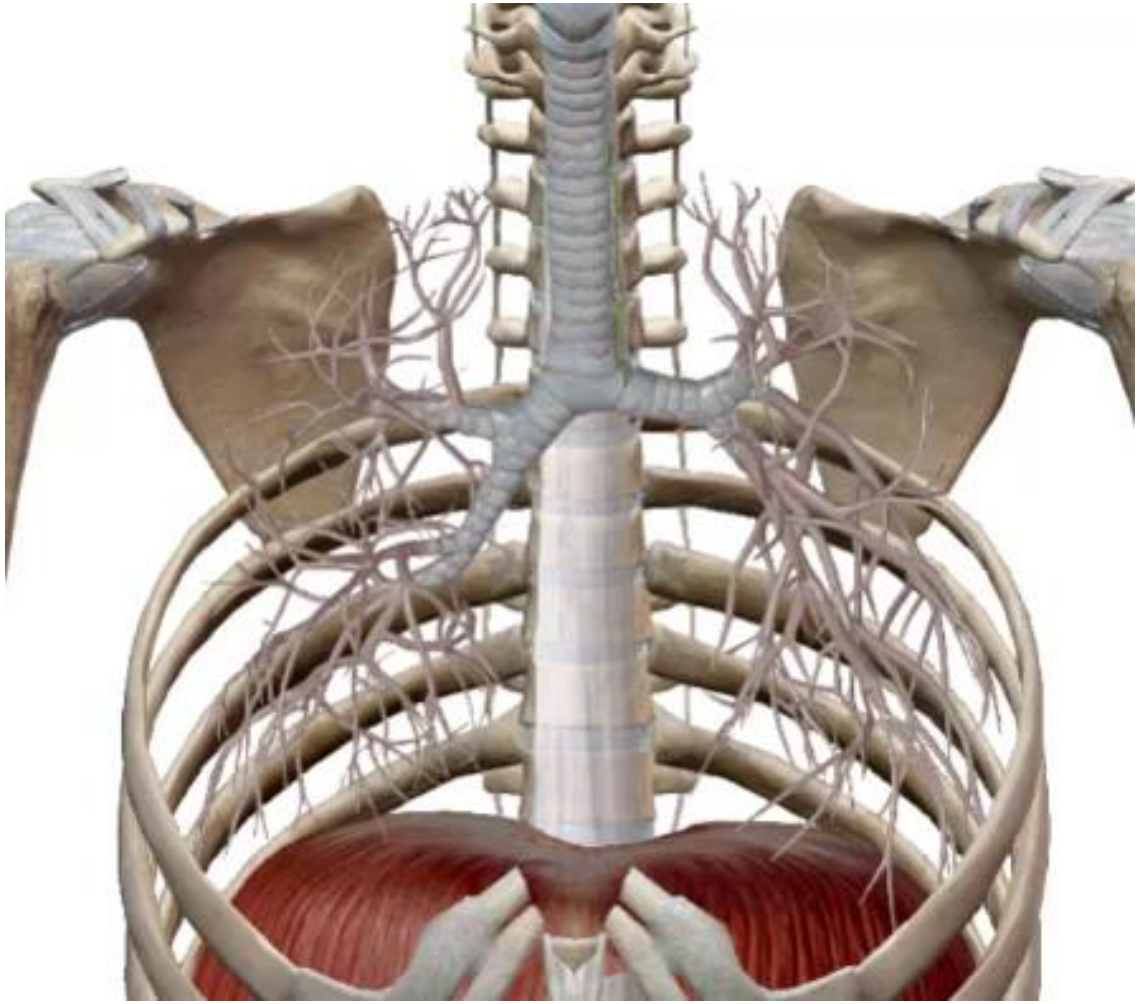
❖ Termination :

- The right phrenic nerve reaches the diaphragm laterally and slightly anterior to the foramen of the inferior vena cava.
- The left phrenic nerve reaches the diaphragm slightly posterior to the apex of the heart.



2. Middle mediastinum :

- The tracheobronchial tree,
- The pulmonary arteries,
- The pulmonary veins,
- The aortic arch,
- The azygos arch,
- The lymphatics.



A. The tracheobronchial tree :

a. The trachea :

❖ Origin :

- It begins as a continuation of the larynx at the level of C6 and the lower border of the cricoid cartilage, to which is attached by the cricotracheal membrane.

❖ Course :

- It descends obliquely downward and backward, following the direction of the thoracic spine.

❖ Termination :

- It ends at the level of the 5th thoracic vertebra, where it bifurcates into the right and left main bronchi.

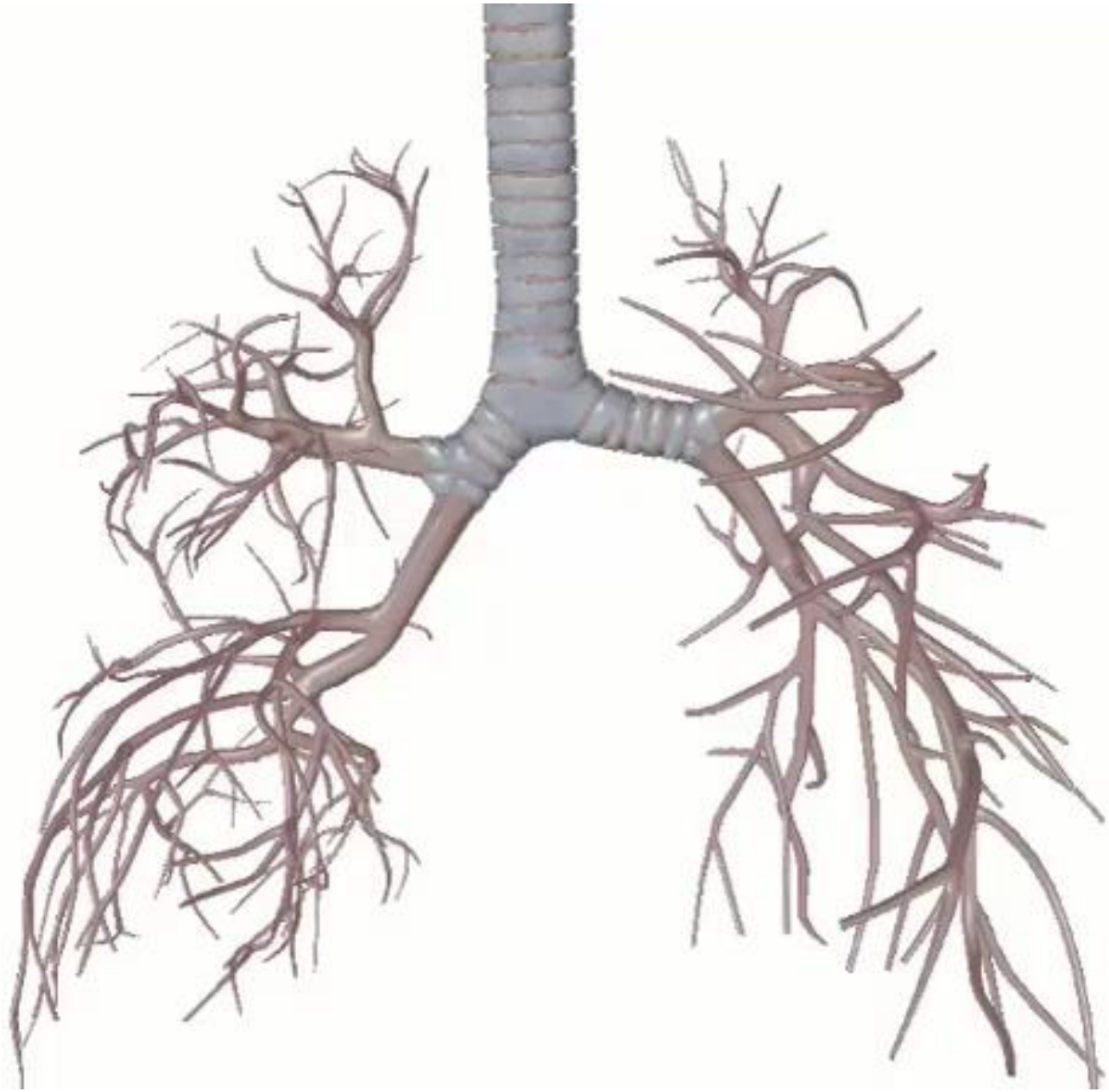
❖ Dimensions

- Length : [12 to 14 cm]
- Caliber : [12 to 16 mm]

b. Main bronchi :

- Right main bronchus :
  - ✓ Upper lobar bronchus,
  - ✓ Middle lobar bronchus,
  - ✓ Lower lobar bronchus.

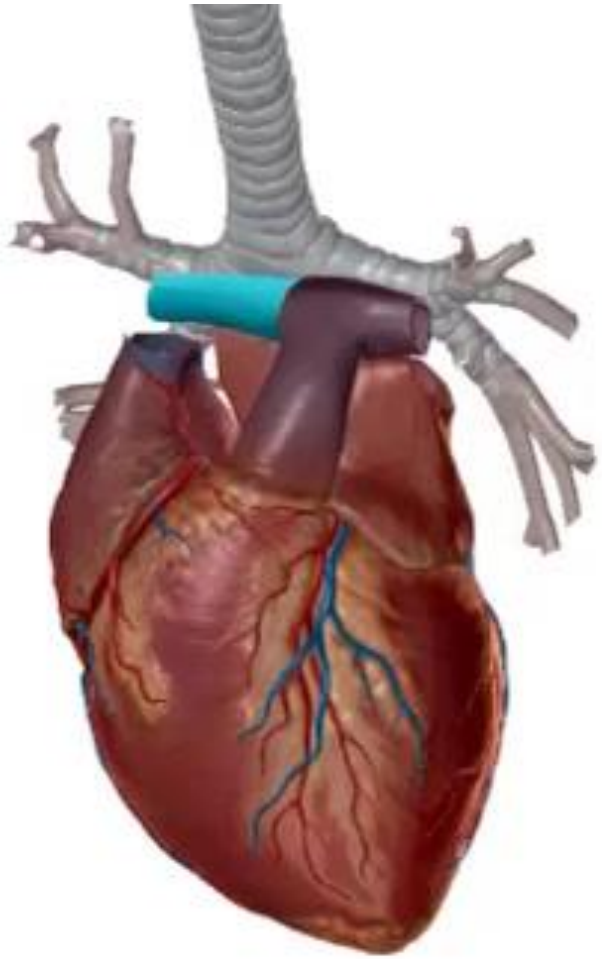
- Left main bronchus :
  - ✓ Upper lobar bronchus,
  - ✓ Lower lobar bronchus.



B. Pulmonary arteries :

- Pulmonary trunk
- Terminal branches :

- Right pulmonary artery :
  - ✓ It is longer and larger than the left one.
  - ✓ It measures 5 to 6 cm in length and 20 mm in diameter.
  - ✓ Its course is horizontal.
- Left pulmonary artery :
  - ✓ It is on average 3 cm long and 18 mm in diameter.



C. Pulmonary veins :

- There are 4 terminal pulmonary veins :
  - ✓ 2 right pulmonary veins : superior and inferior.
  - ✓ 2 left pulmonary veins : superior and inferior.

D. The aortic arch :

❖ Location :

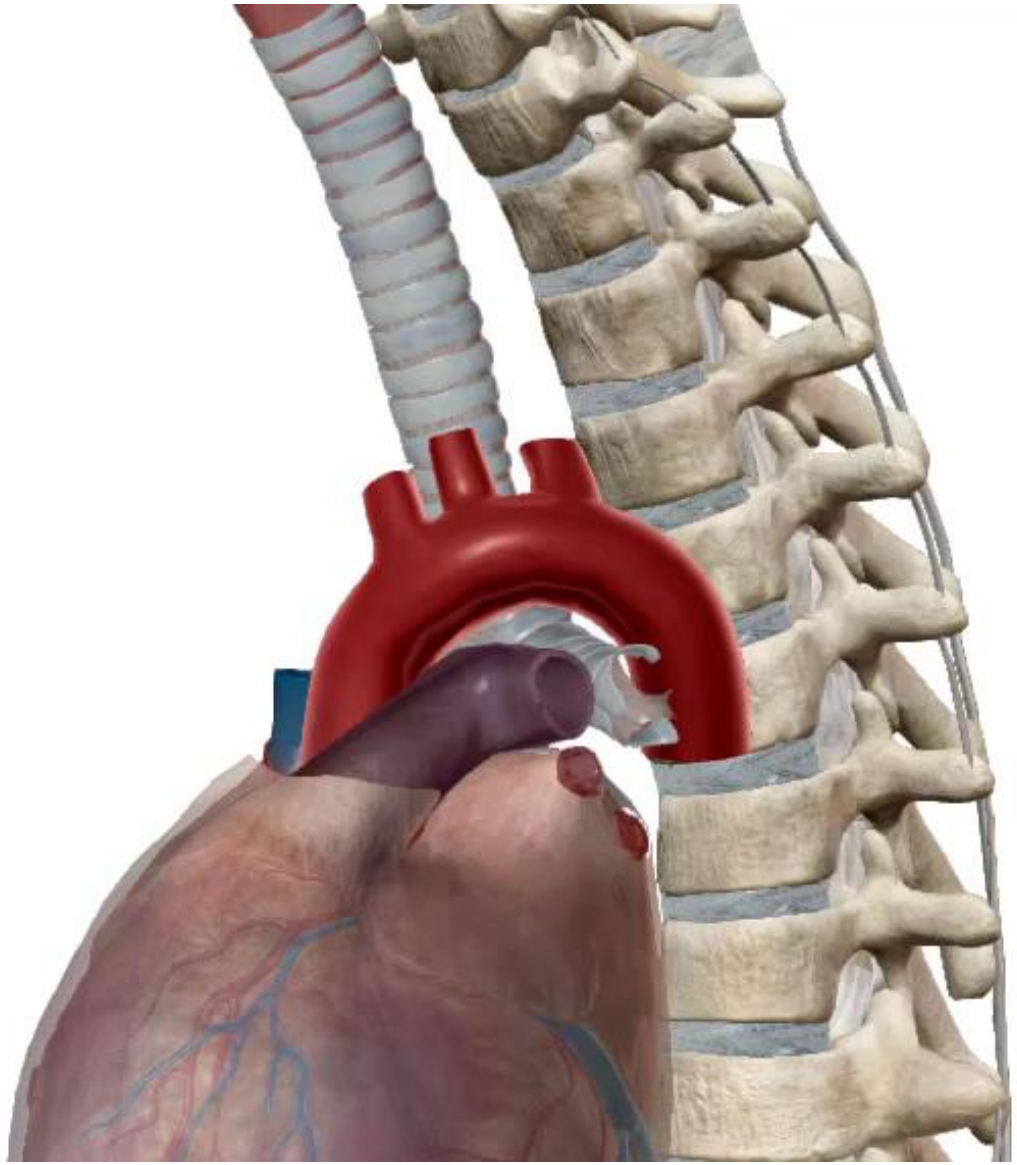
- It is located at the level of T4, above the left pulmonary pedicle and the bifurcation of the pulmonary artery.

❖ Course :

- It is directed backward and to the left, in the anterior and superior mediastinum and continues to the posterior mediastinum.

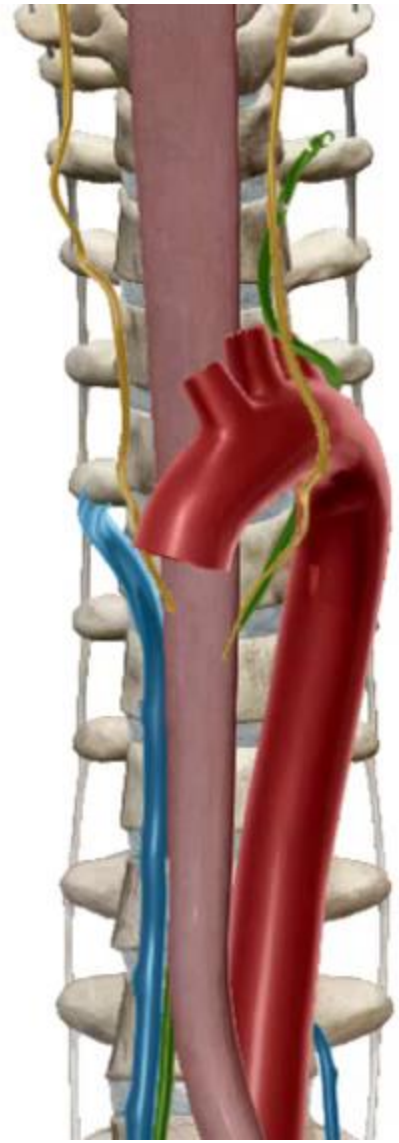
❖ Collaterals

- The arterial brachiocephalic trunk,
- The left common carotid artery,
- The left subclavian artery.



3. Posterior mediastinum :

- The descending thoracic aorta,
- The thoracic esophagus,
- The thoracic duct,
- The azygos system,
- The vagus nerves,
- The lymph nodes.



A. The descending aorta :

❖ Origin :

- It continues from the aortic arch, located on the left side of T4.

❖ Course :

- It travels downward and goes slightly inward.

❖ Termination :

- It passes through the diaphragm via a fibrous hiatus between the two pillars.

❖ Dimensions :

- Length : 20 to 25 cm.
- Caliber : 20 mm.

A. The descending aorta :

❖ Collateral branches :

- Parietal branches :
  - ✓ Intercostal arteries,
  - ✓ Superior phrenic arteries.
- Visceral branches :
  - ✓ Esophageal arteries,
  - ✓ Bronchial arteries,
  - ✓ Posterior mediastinal arteries.

B. The thoracic esophagus :

❖ Origin :

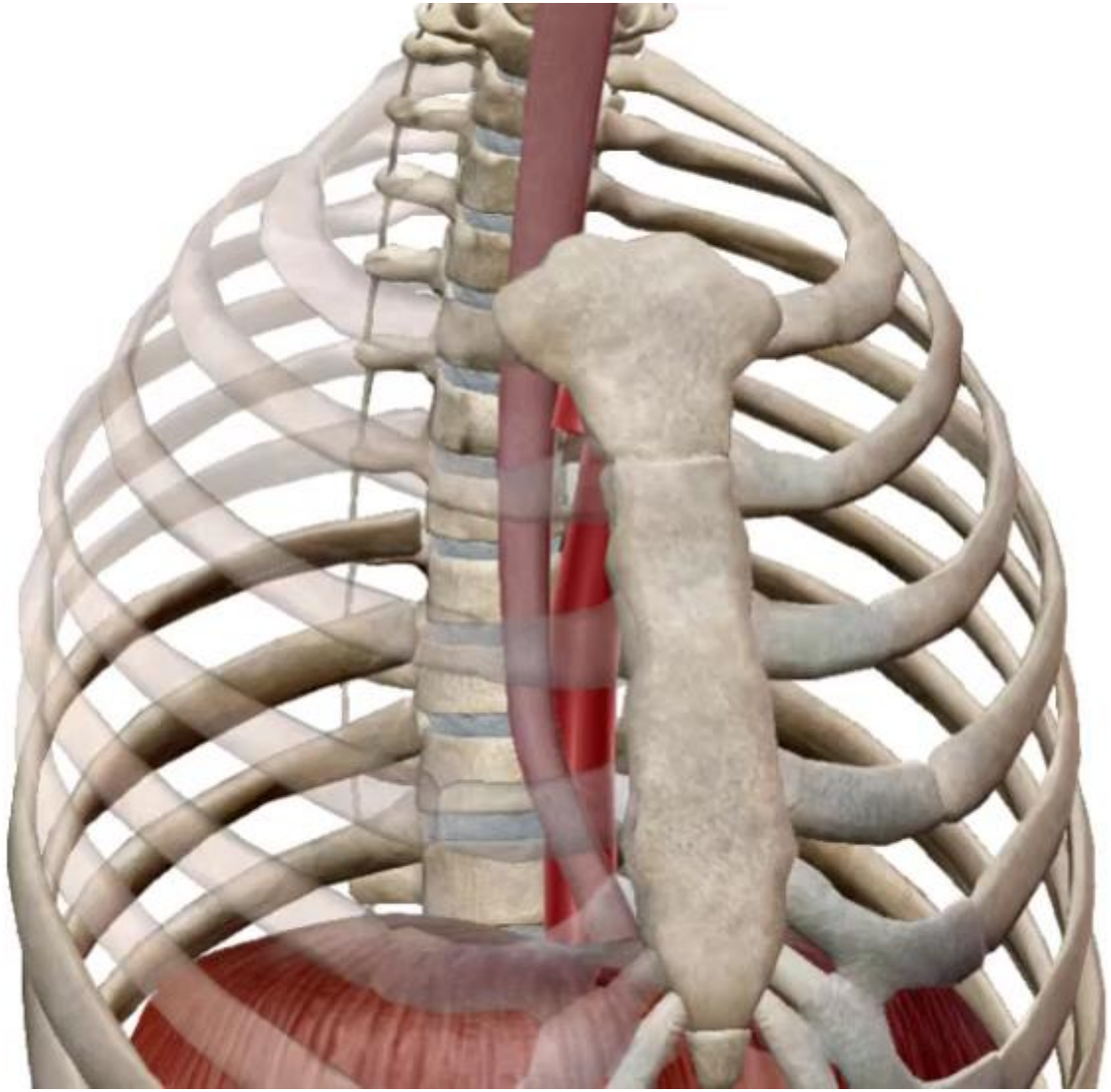
- It continues from the cervical esophagus, beginning at the superior thoracic aperture at the level of T2.

❖ Course :

- It follows an italic S shape, being displaced to the right by the aortic arch.

❖ Termination :

- At the level of T10 through the diaphragm.



C. The thoracic duct :

❖ Origin :

➢ The thoracic duct originates from the junction of :

- Two right and left lumbar lymphatic trunk,
- The intestinal trunk.

- The level of origin is variable :

✓ Either high, at T11 or T12,

✓ Or low at L1 or L2, in a dilated area known as the cisterna chyli.

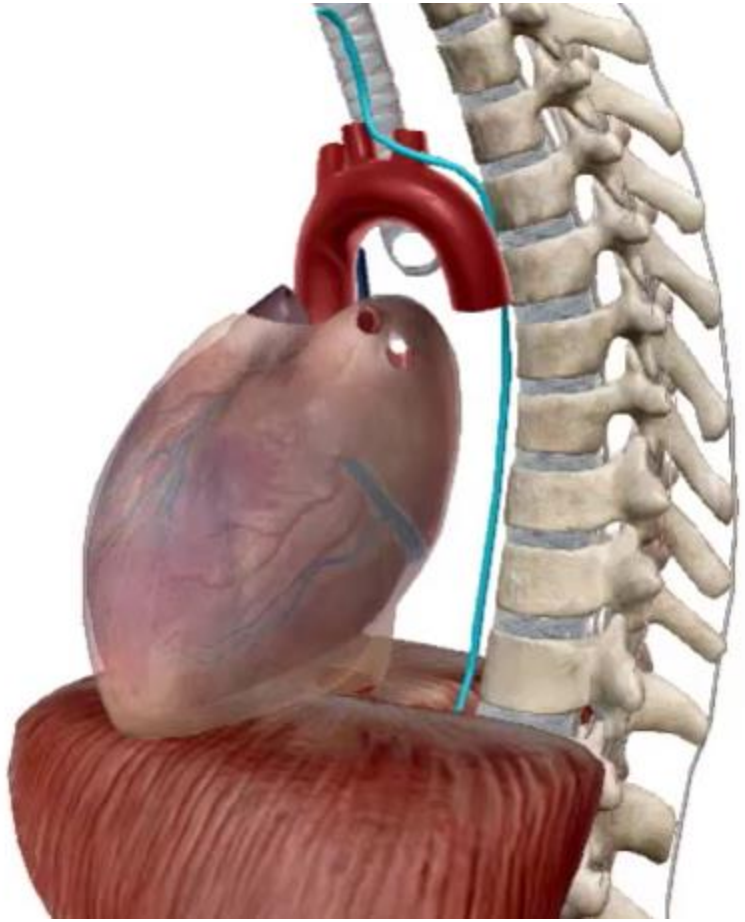
❖ Course :

- It had mostly a vertical course.

C. The thoracic duct :

D. Termination :

- It empties into the venous confluence at the left jugulo-subclavian junction, where the left jugular vein and the left subclavian vein meet.



D. The azygos system :

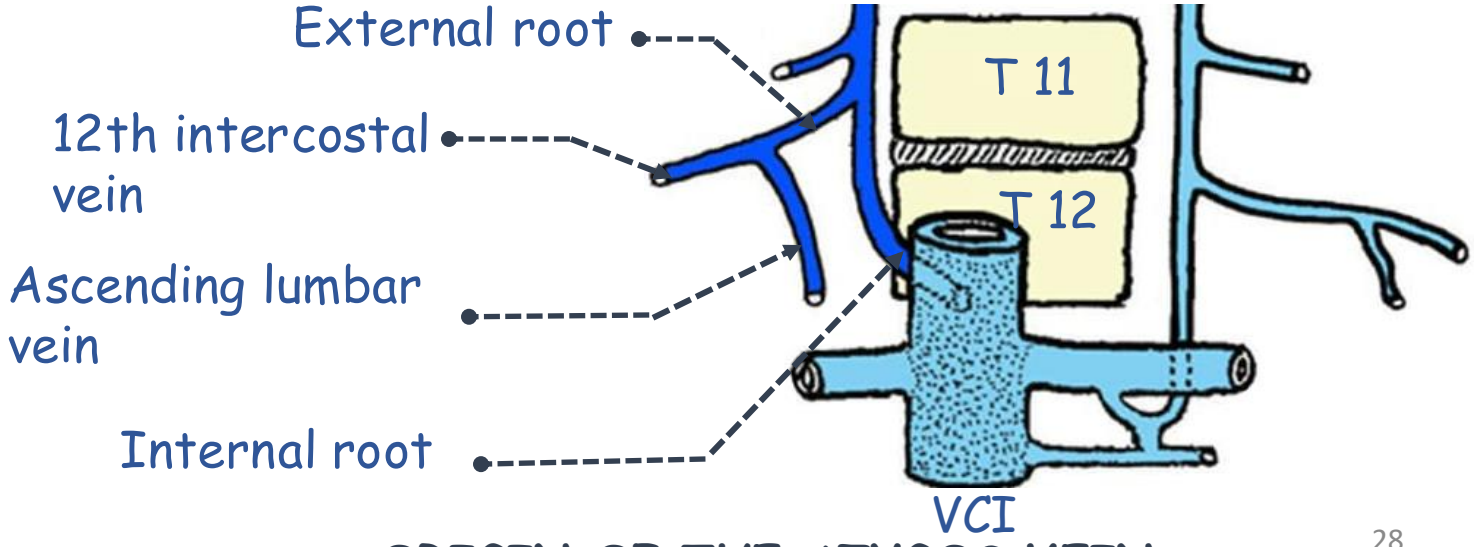
a. The azygos vein :

❖ Location :

- The azygos vein is positioned against the right side of the thoracic spine.
- It is exclusively located within the thoracic cavity and occupies the deepest part of the posterior mediastinum.

❖ Origin :

- The azygos vein originates from the fusion of two roots at the level of T11:
  - ✓ An external root,
  - ✓ An internal root.



ORIGIN OF THE AZYGOS VEIN

D. The aygos system:

a. The azygos vein:

❖ Course :

- The azygos vein has two segments:
  - ✓ Vertical or ascending segment,
  - ✓ Arciform segment or the azygos arch.

❖ Termination :

- It drains into the posterior part of the superior vena cava, in its extrapericardial segment.

D. The azygos system :

a. The azygos vein :

❖ Dimensions :

- Length : 20 to 25 cm.
- Caliber : - at its origin :4 mm

  - at its end: 10 mm.

Veine azygos

b. The hemiazygos vein :

❖ Origin :

It originates in the lower thorax through two roots :

- ✓ The external root,
- ✓ The internal root.

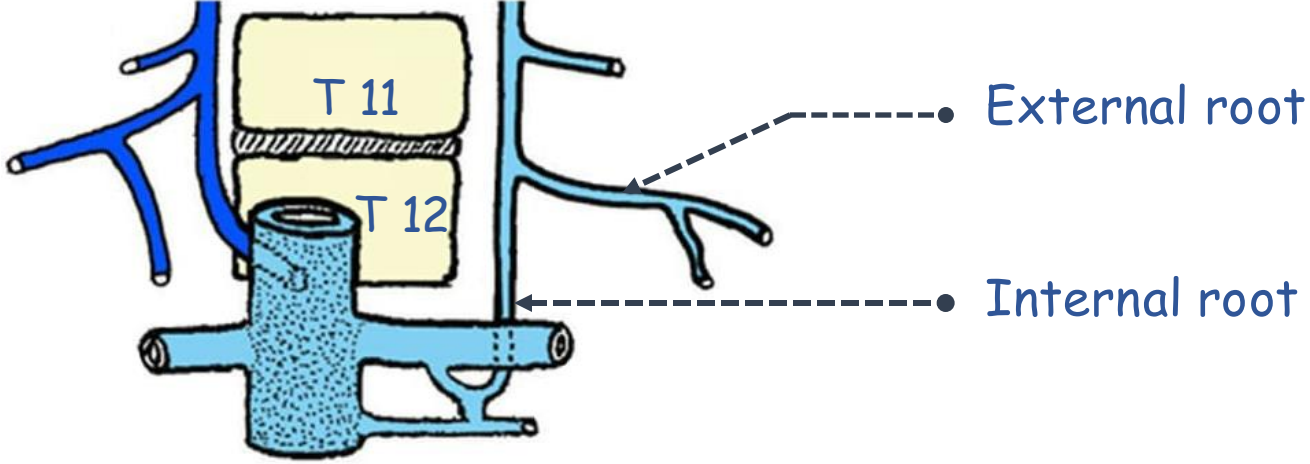
The union of these two roots occurs at the level of T12,

❖ Course :

- In the posterior mediastinum, it ascends vertically along the left side of the vertebral column.
- At the level of T8 or T9, it inclines to the right, and proceeds obliquely upwards and to the right.
- It passes behind the descending aorta and the thoracic duct.

❖ Termination :

- It ends in an acute angle into the azygos vein.



ORIGIN OF THE HEMIAZYGOS VEIN

b. The accessory hemiazygos vein:

❖ Origin :

It has a variable origin :

- ✓ Either at the termination of the first left intercostal vein,
- ✓ Or below the third left rib.

❖ Course :

- ✓ The accessory hemiazygos vein descends vertically along the left side of the vertebral column.

❖ Termination :

- ✓ It empties perpendicularly into the azygos vein at the level of T7.

E. Vagus nerve:

❖ Origin :

- It originates in the skull, posteriorly to the bulbar olive.

❖ Course :

- It runs along the posterolateral border of the trachea until its bifurcation.
- It passes behind the pulmonary pedicle.

❖ Termination :

- It passes through the esophageal hiatus right behind the esophagus, and then enters the abdominal cavity.

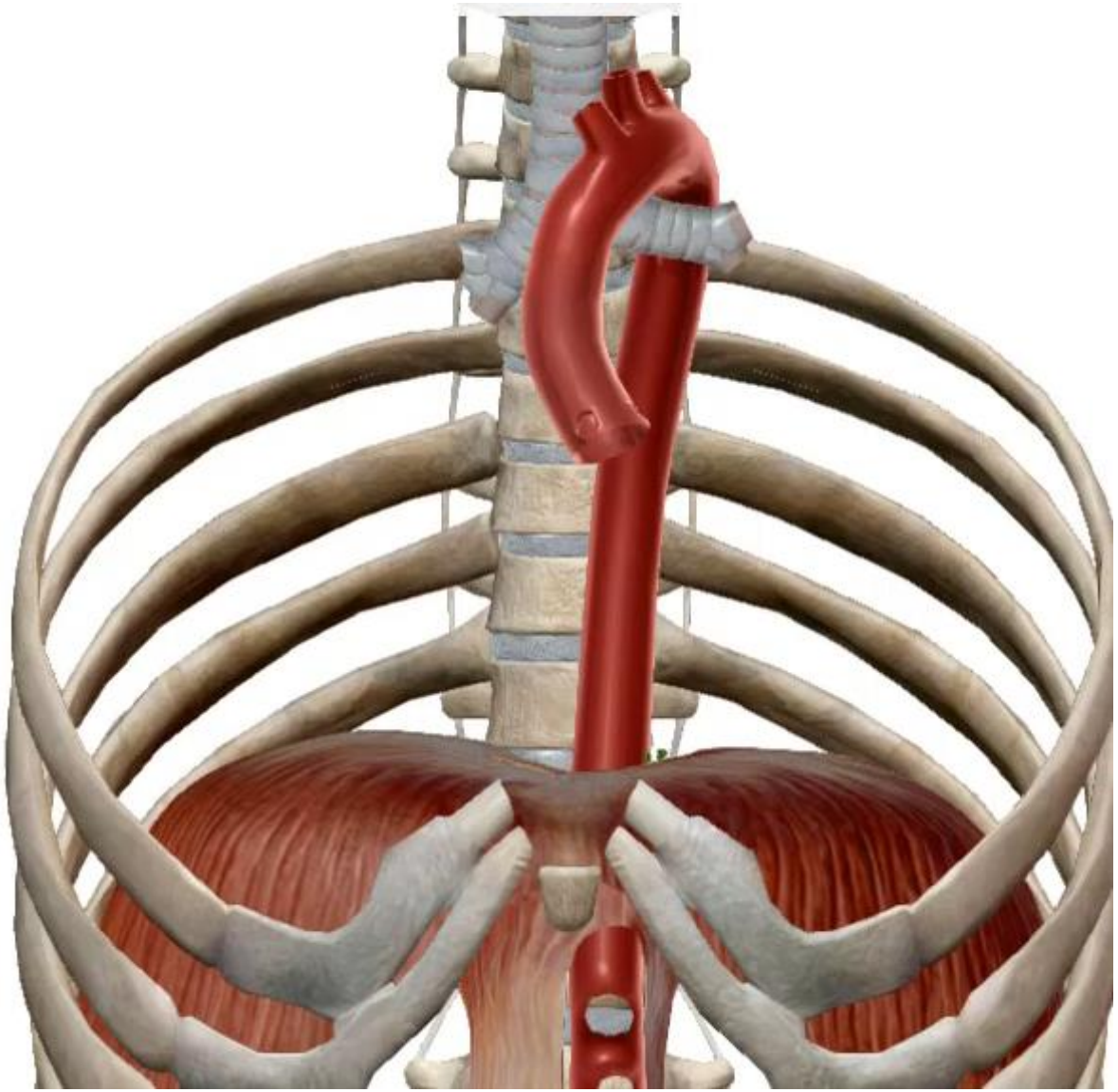
F. Lymphatics :

Mediastinal ganglia:

- Diaphragmatic ganglia,
- Anterior mediastinal ganglia,
- Intertracheobronchial ganglia,
- Posterior mediastinal ganglia.

Collector lymphatic trunks :

- Jugular trunk,
- Mediastinal trunk,
- Thoracic duct.



IV. CLINICAL APPLICATIONS:

The pneumomediastinum

- The pneumomediastinum refers to the presence of air within the mediastinum.

- Main causes include :
  - ✓ Alveolar rupture,
  - ✓ Esophageal perforation,
  - ✓ Rupture of the intestine.

- The primary symptom is retrosternal chest pain.

- Clinical examination might reveal :
  - ✓ Subcutaneous emphysema,
  - ✓ Crepitus.

The pneumomediastinum

- The diagnosis is confirmed by a chest X-ray which reveals presence of the air in the mediastinum.
- Treatment is generally not required.
- However, compressive pneumomediastinum with pressure on mediastinal structures may be relieved by needle aspiration.
- Hospitalization is necessary if the pneumomediastinum is secondary to an esophageal or intestinal rupture, but not necessarily if it's secondary to alveolar rupture.

Thymoma

- A thymoma is a rare epithelial neoplasm of the thymus, derived from the epithelium of the thymic gland.

- Half of the patients are asymptomatic while the other half presents symptoms such as :

- Dyspnea,
- Chest pain,
- Upper respiratory tract infections,
- Fatigue,
- Weight loss,
- Cough or pneumonia.

- Thymomas are often associated with autoimmune myasthenia.

ANTERIOR VIEW OF THE THORAX

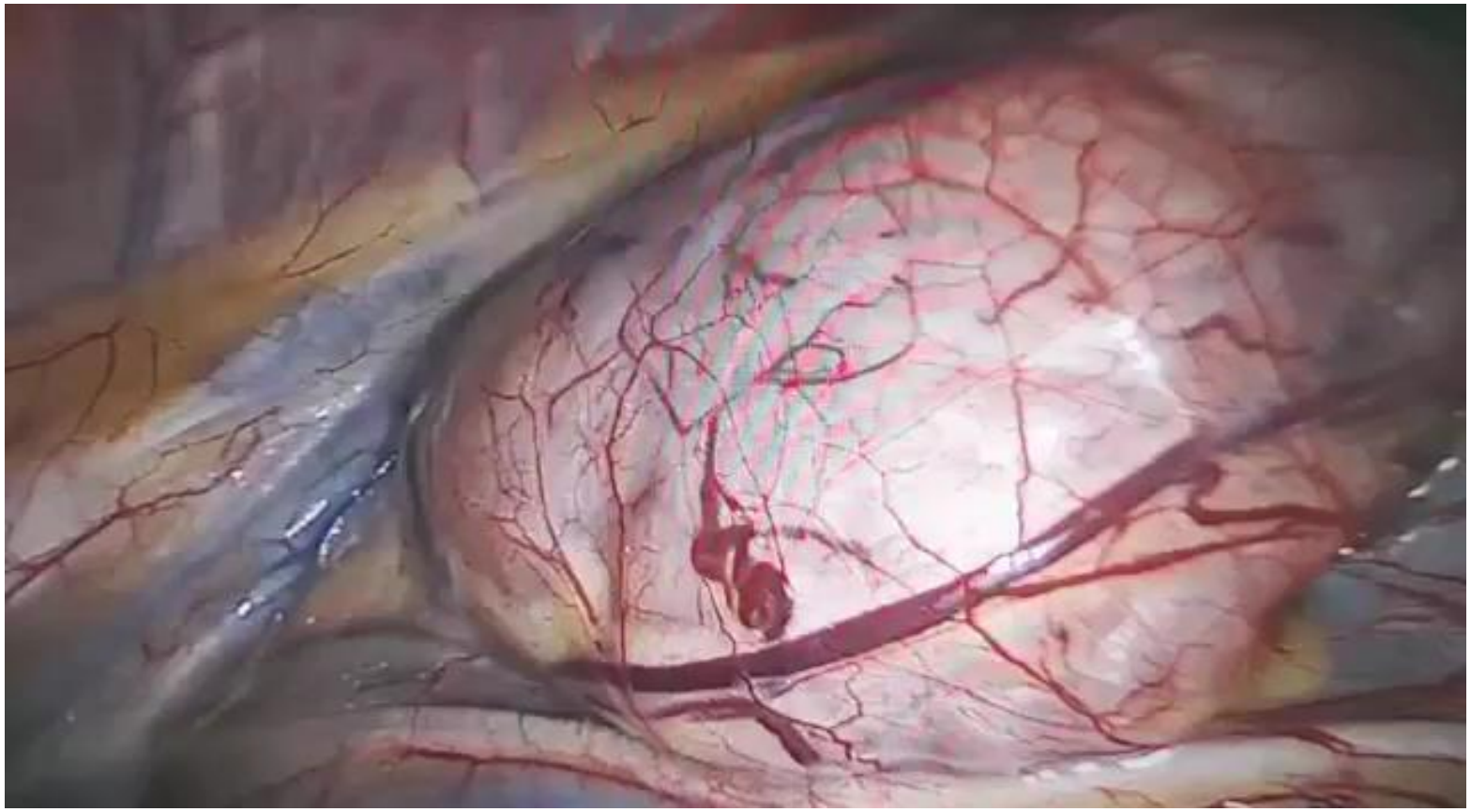
Thymoma

- The diagnosis is based on:
- Clinical examination,
- Radiological investigations,
- Histopathological examination of the surgical specimen.

- The treatment of tumors at an early stage is complete surgical resection.

- At an advanced stage, an at high-risk histological subtypes, surgical resection is followed by adjuvant or neoadjuvant therapy.

- Total thymectomy improves myasthenic symptoms.



V. CONCLUSION

- The mediastinum is a region that contains vascular, nervous, respiratory, digestive, and glandular structures, as well as significant lymphatic crossroads.

- It is continuous and contiguous with the cervical, abdominal, and retroperitoneal regions.

- Its contents, relationships and central location within the thoracic cage contribute to its complexity.