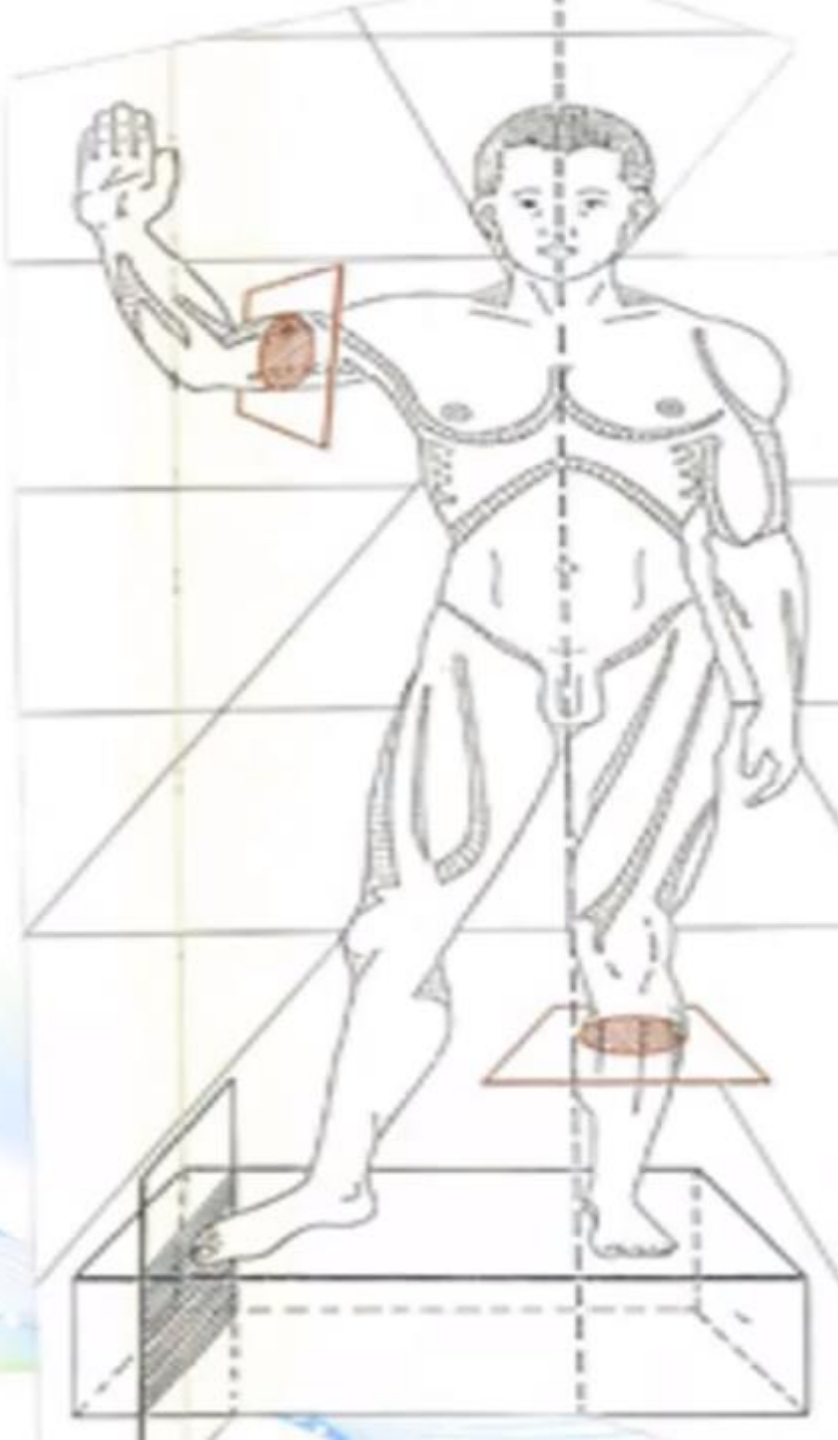
SUPERIOR VENA CAVA



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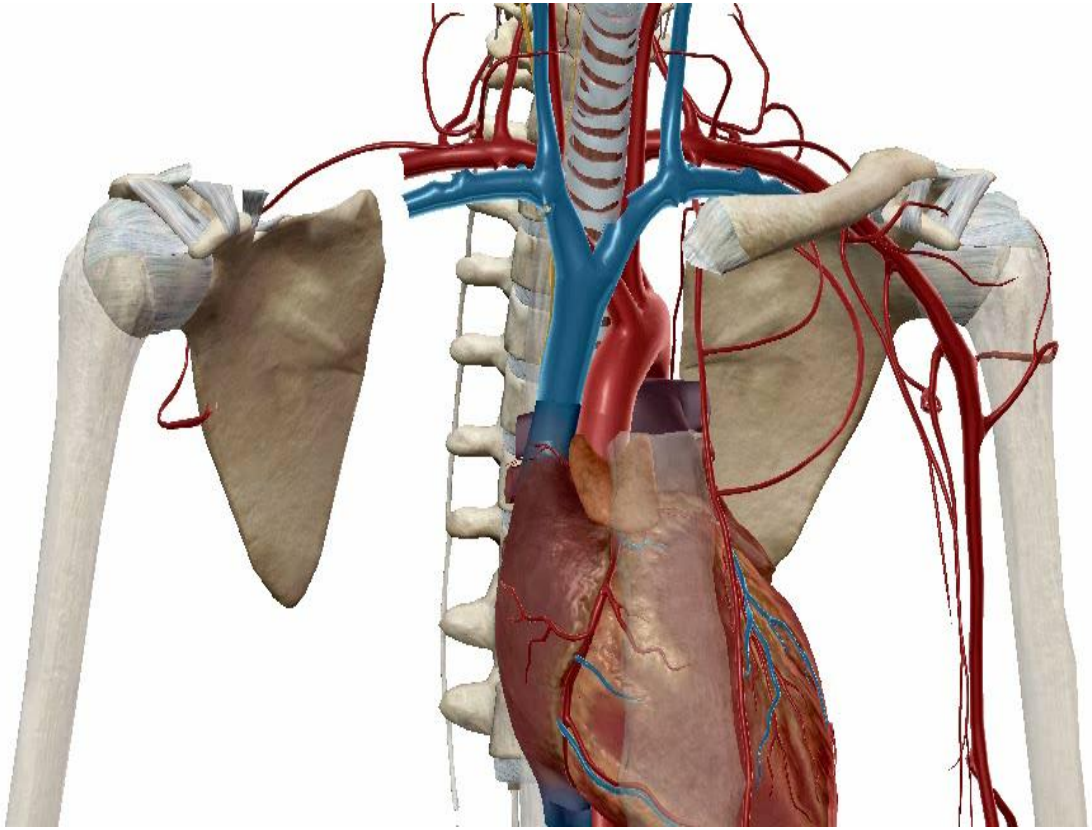
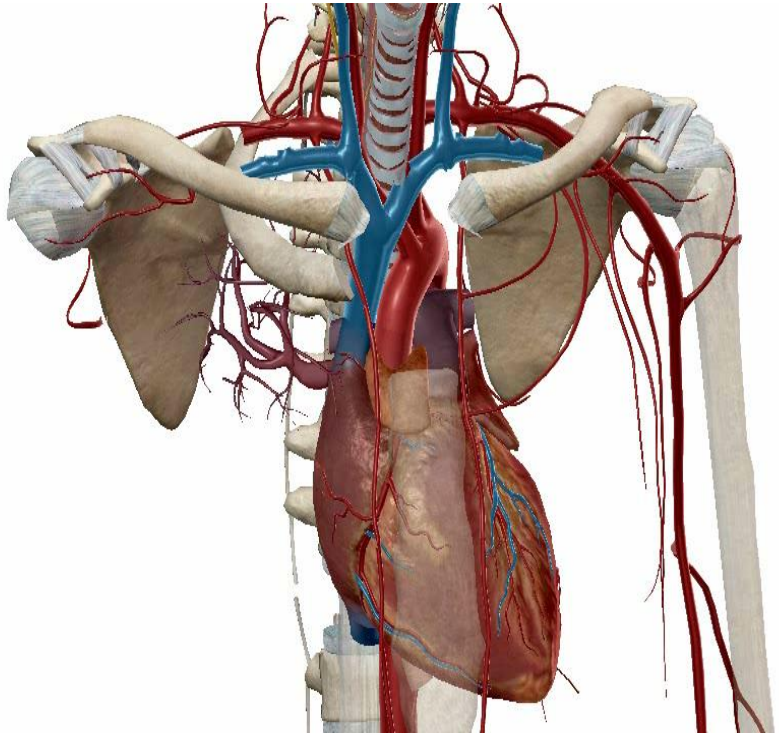


I-INTRODUCTION

- The superior vena cava is a large vein, formed by the union of the right and left brachiocephalic veins.

- It drains venous blood from the supradiaphragmatic regions of the body to the right atrium.



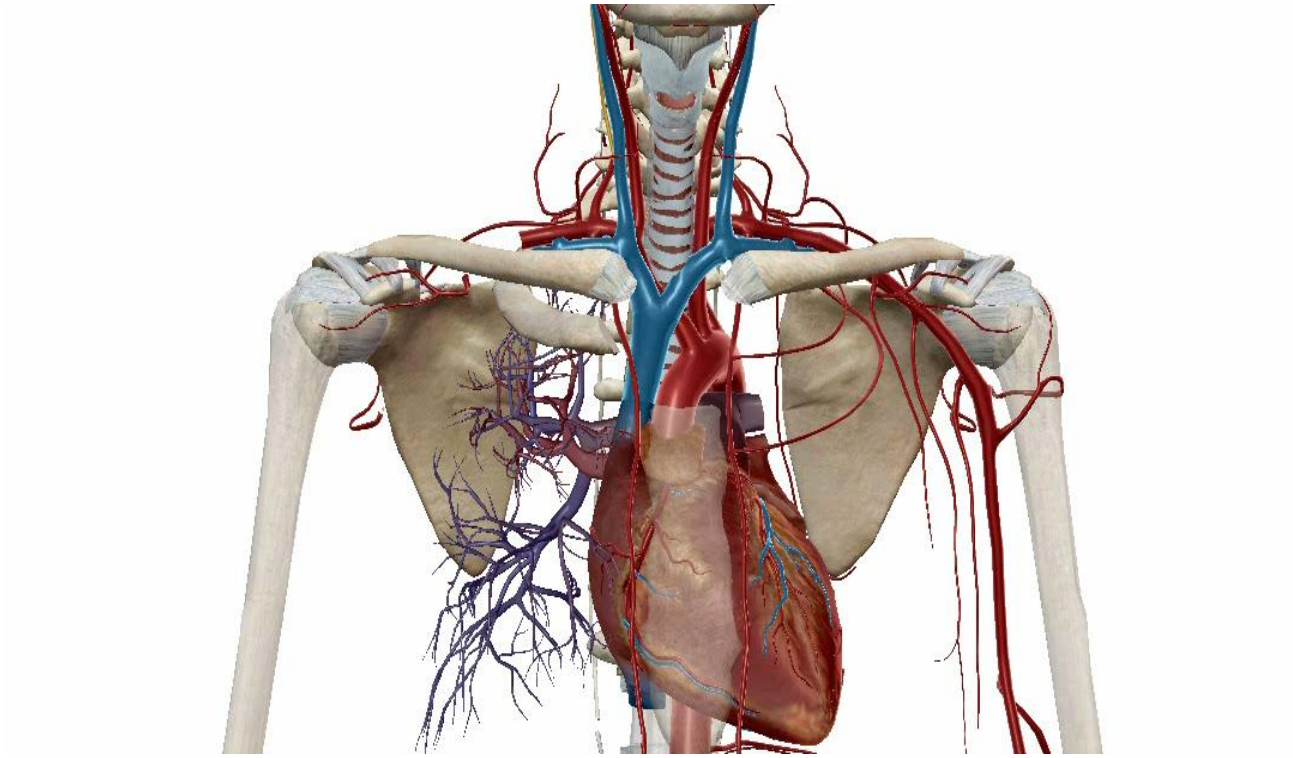
II- DESCRIPTIVE ANATOMY:

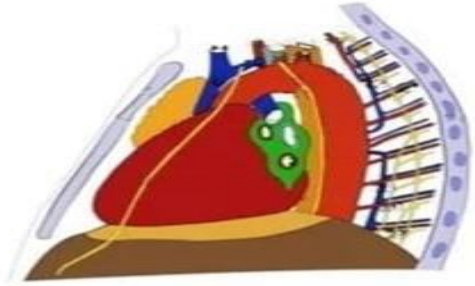
Location:

Located in the anterior and superior mediastinum.

Origin:

- It arises from the junction of the right and left brachiocephalic venous trunks.
- The point of junction is located:
  - Anterior to the brachiocephalic arterial trunk,
  - Posterior to the first chondro-costal joint,
  - At the level of T3.





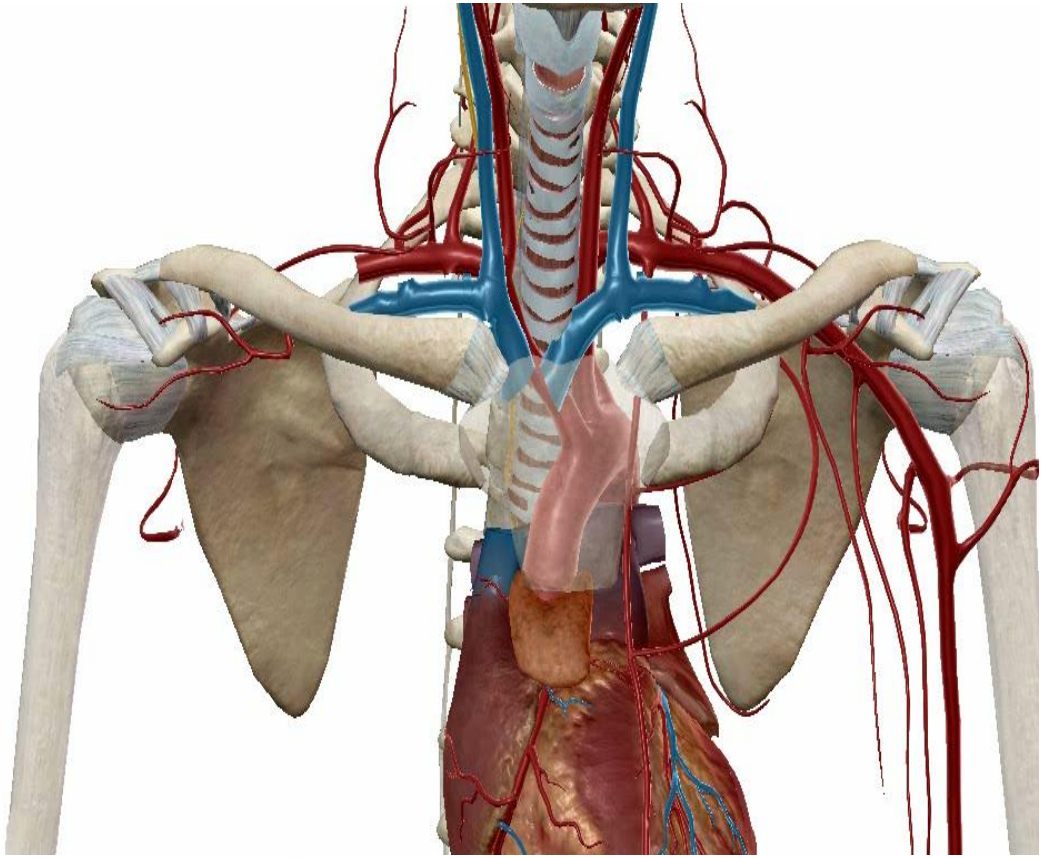
Anterior view of the thorax

III- BRANCHES OF ORIGIN:

Right venous brachiocephalic trunk

Origin - course - termination:

- It arises from the right internal jugular vein and the right subclavian vein.
- At the level of the medial end of the right clavicle.
- It then runs almost vertically downward and to the left, while remaining on the right side of the midline.
- It terminates opposite the first right sternocostal joint.



Anatomical relations

- **Anteriorly :**

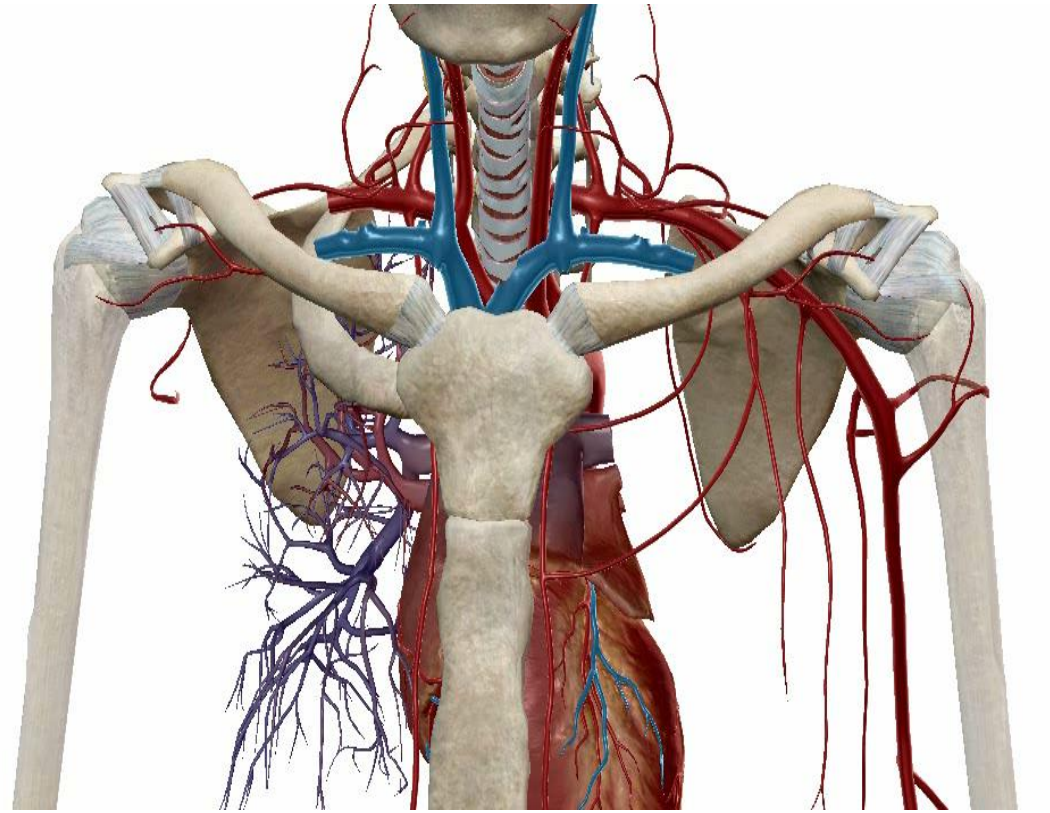
The sternal end of the clavicle and the sternal part of the first costal cartilage.

- **Posteriorly :**
  - the right brachiocephalic arterial trunk,
  - the right vagus nerve,
  - the internal thoracic artery at its origin.

- **To the right:**
  - the pleura and right lung,
  - the right phrenic nerve.

- **To the left and toward the midline:**

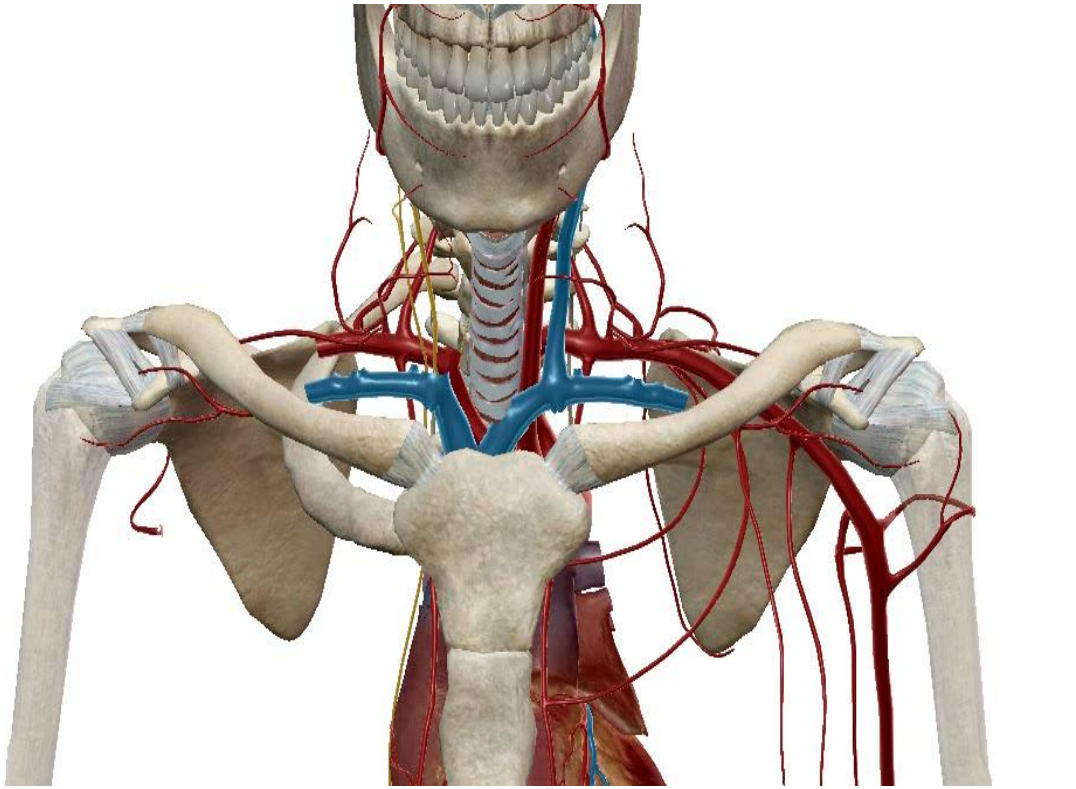
the trachea.



Left venous brachiocephalic trunk

Origin – trajectory - termination

- It arises from the union of the left internal jugular vein and the left subclavian vein.
- It originates opposite the medial end of the left clavicle.
- It measures 6 cm in length.
- It follows a horizontal course, directed downwards and to the right.
- It then crosses the midline.
- It joins its right counterpart opposite the first right sternocostal joint.



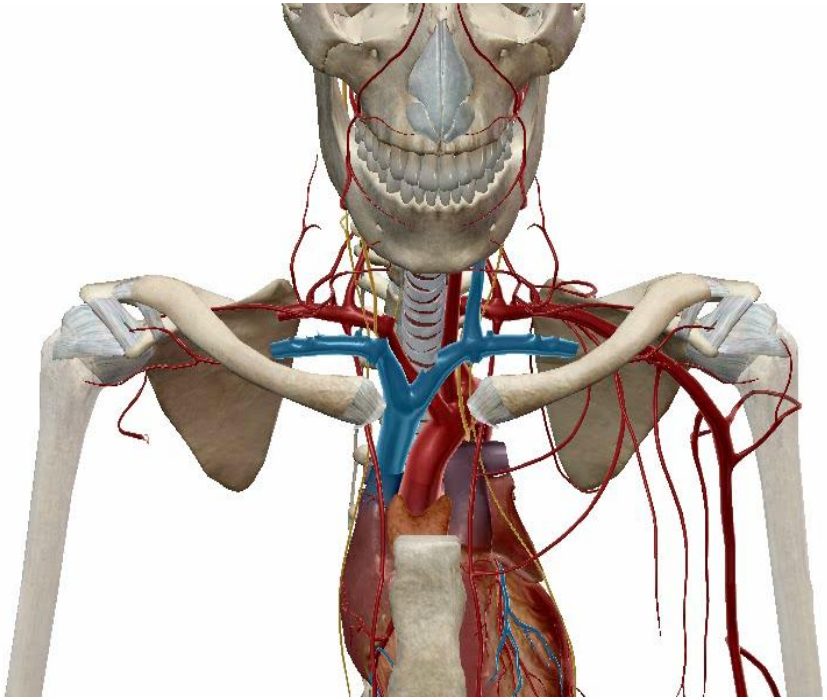
Anatomical relations:

- **Anteriorly :**
  - The thymus or its remnants,
  - The left sternoclavicular joint,
  - The manubrium of the sternum.

- **Posteriorly :**
  - The brachiocephalic trunk,
  - The left common carotid artery,
  - The left subclavian artery.

  - The left phrenic nerve,
  - The left vagus nerve,
  - The left internal thoracic artery.

- **Inferiorly:**
  - The second segment of the aorta.



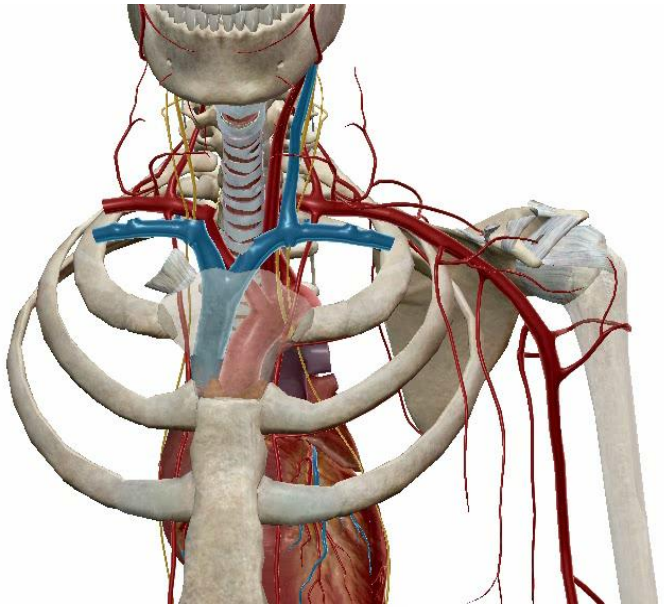
SUPERIOR VENA CAVA

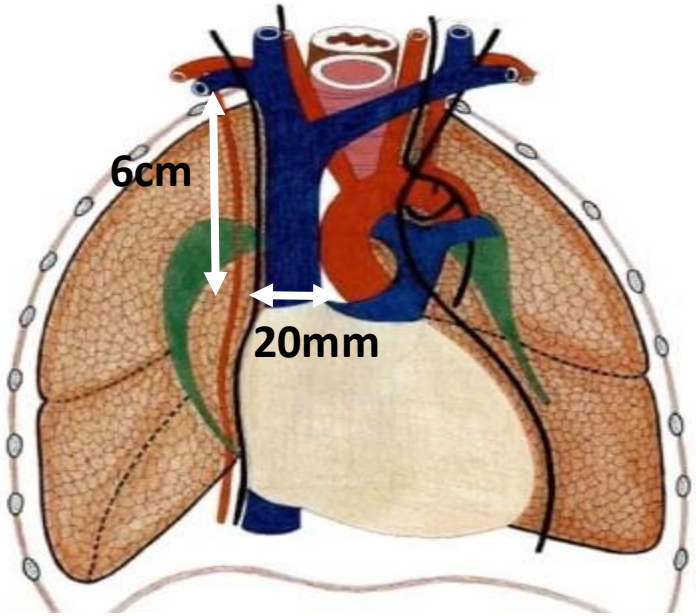
Trajectory and termination:

- The superior vena cava follows an oblique course downwards and backwards, curving around the ascending part of the aortic arch.
- It ends at the superior wall of the right atrium, opposite the third costal cartilage and T6.

Dimensions:

- Length: 6 to 8 cm.



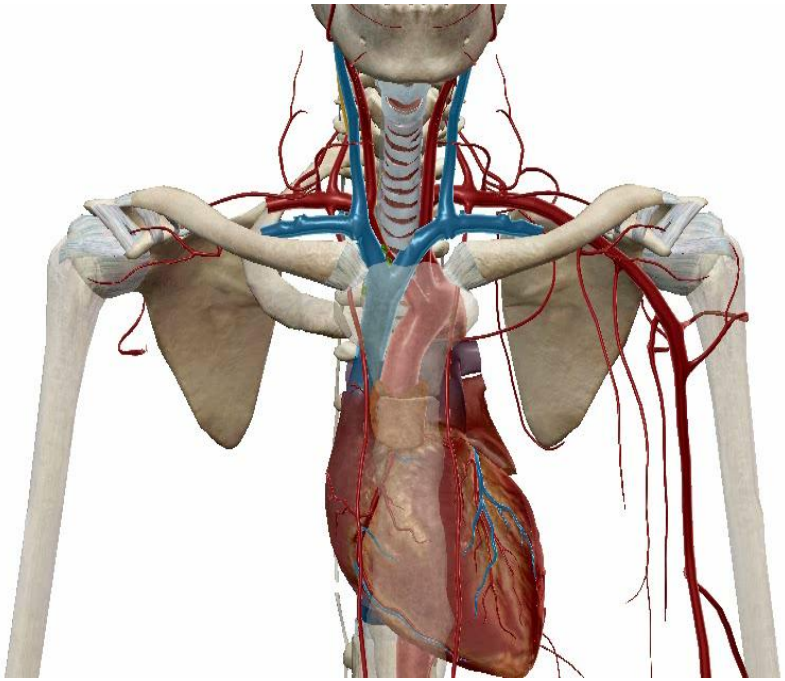


Diaphragm showing the contents of the thorax

IV- ANATOMICAL RELATIONS OF THE SUPERIOR VENA CAVA

Extra-pericardial or supra-pericardial relations:

- **Anteriorly :**
  - The right anterior mediastinal lymphatic chain,
  - The thymus or its remnants,
  - The anterior costo-mediastinal pleural recess on the right,
  - The anterior border of the right lung,
  - The sterno-costal junction.



- **Posteriorly, from top to bottom:**
  - The azygos vein arch,
  - The right phrenic nerve,
  - The right vagus nerve.

- **Anteriorly:**
  - Manubrium sterni,
  - 1st right chondro-sternal joint.

- **To the left :**
  - The aortic arch,
  - The left venous brachio-cephalic trunk.

- **To the right :**

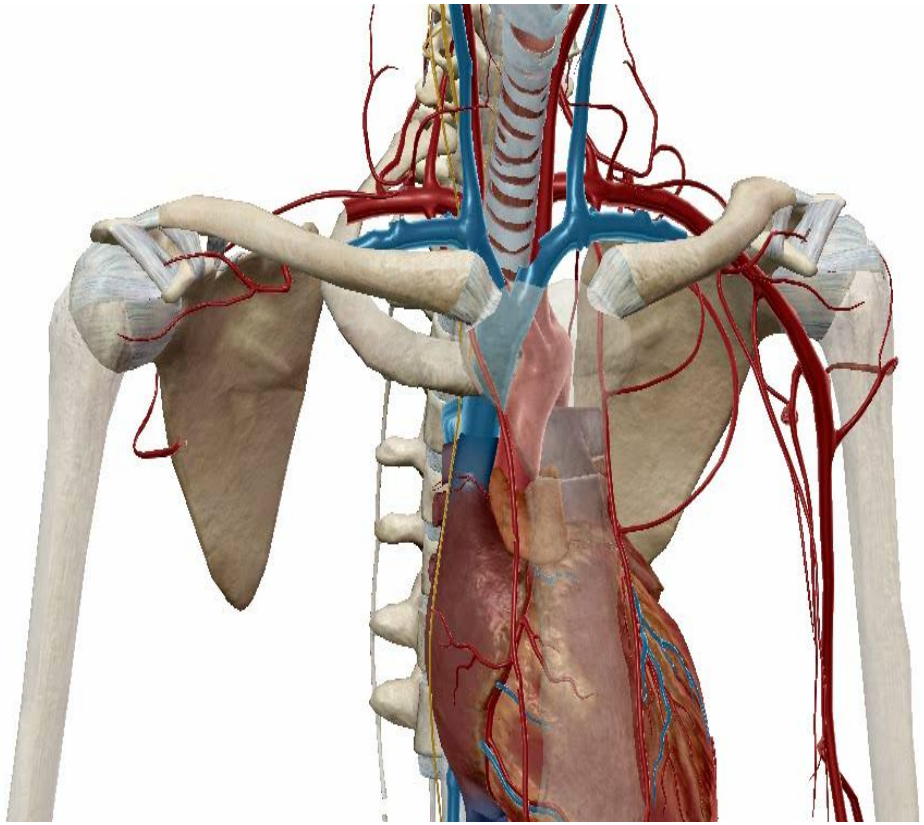
The right mediastinal pleura and the right lung.

- **Inferiorly :**

The azygos vein arch.

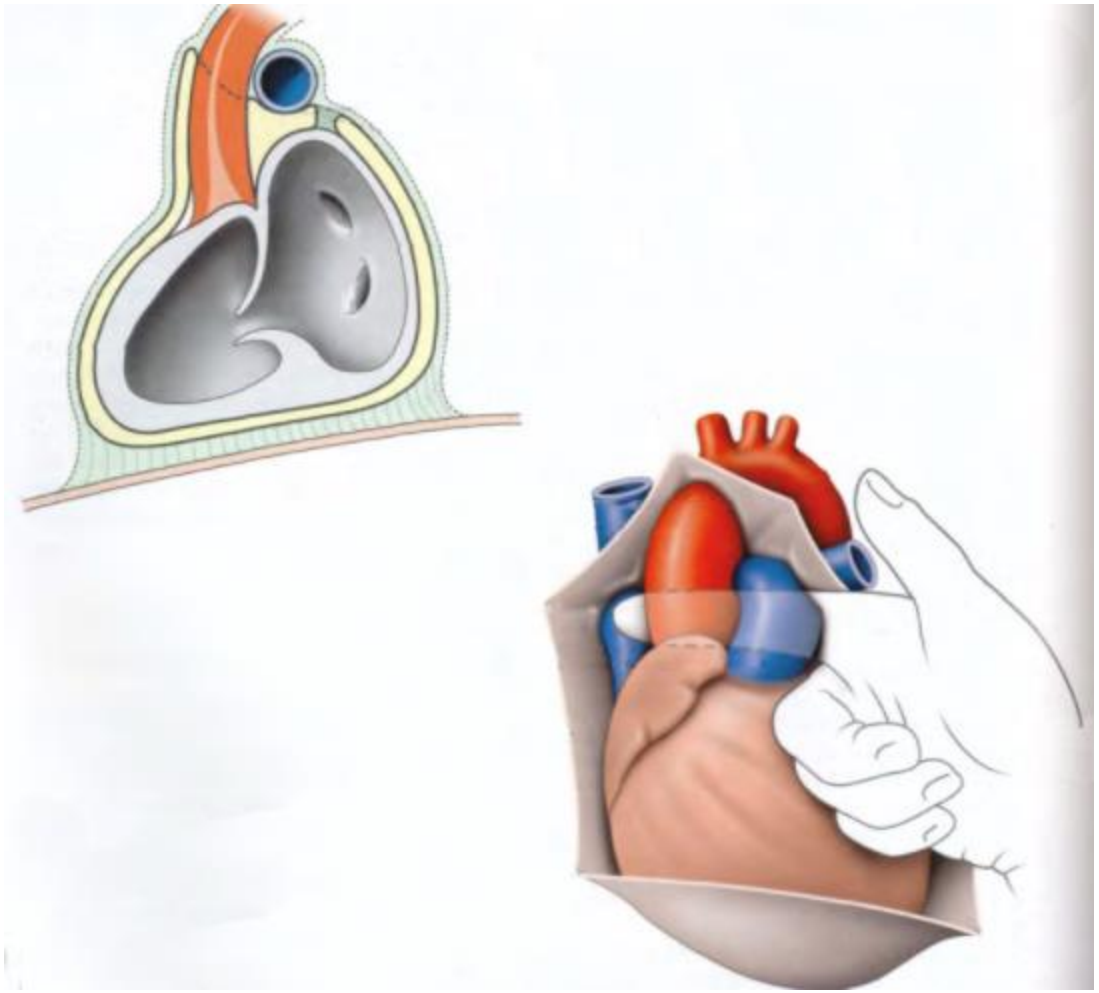
- **Superiorly:**

The right subclavian vein and artery.



The intra-pericardial segment:

- The superior vena cava is shorter (2.5 to 3 cm) and deeper.
- It traverses the pericardium.
- The fibrous pericardium ascends over the superior vena cava and merges with its adventitia.
- The serous pericardium forms an asymmetric sheath that extends higher on the left side of the vein and is incomplete at the back (engaging only the anterior three quarters of the vein).
- The line of reflection of the pericardium creates a recess behind, between the superior vena cava and the right superior pulmonary vein: the retrocaval fossa.



Anterior view and sagittal section of the heart showing the intrapericardial portion of the superior vena cava.

Relations in the pericardial sac:

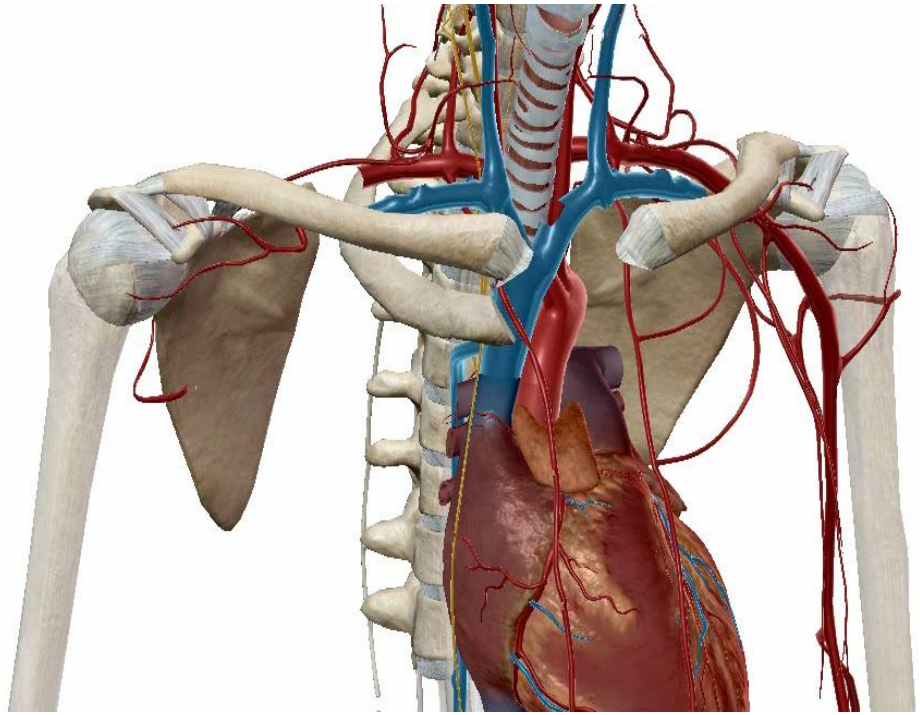
- **Anteriorly :**

The right atrium.

- **To the left**:

The aorta.

- **Posteriorly:**
  - The right superior pulmonary vein.



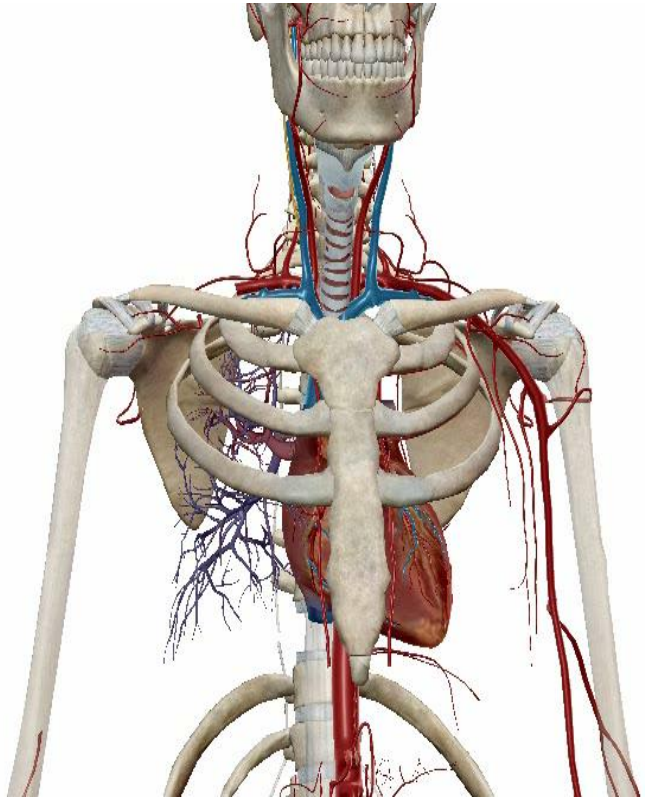
Relations outside the pericardial sac:

- **Anteriorly:**

The sternal extremity of the 2nd intercostal space, at the upper border of the 3rd costal cartilage.

- **Posteriorly:**
  - The right pulmonary artery,
  - The right superior pulmonary vein.

- **To the right:**
  - The right pleura,
  - The right lung,
  - The right phrenic nerve.



V- COLLATERAL BRANCHES:

The main collateral of the superior vena cava is the azygos vein.

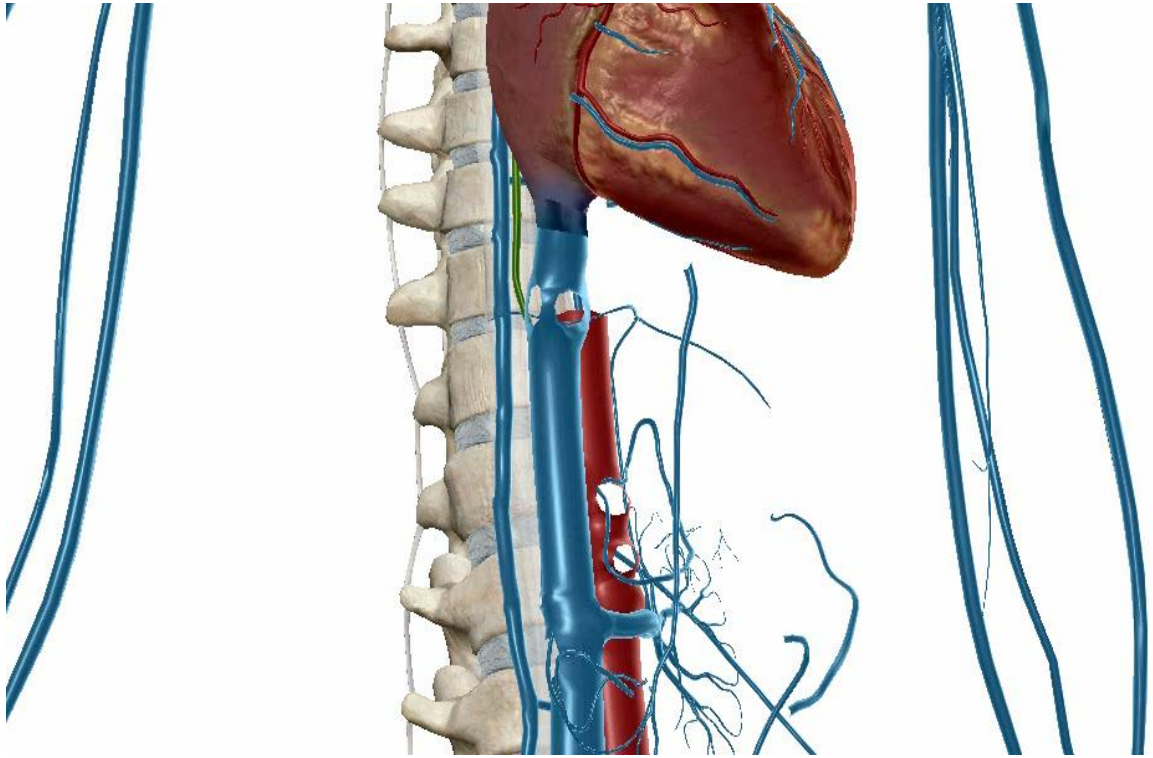
Origin

- The azygos vein originates in the infra-mediastinal posterior space.
- At the level of T11.
- From the junction of its two roots:

➢ External root :

- Constant.
- It is formed by the fusion of the right ascending lumbar vein and the twelfth intercostal vein.

➢ Internal root: inconstant.



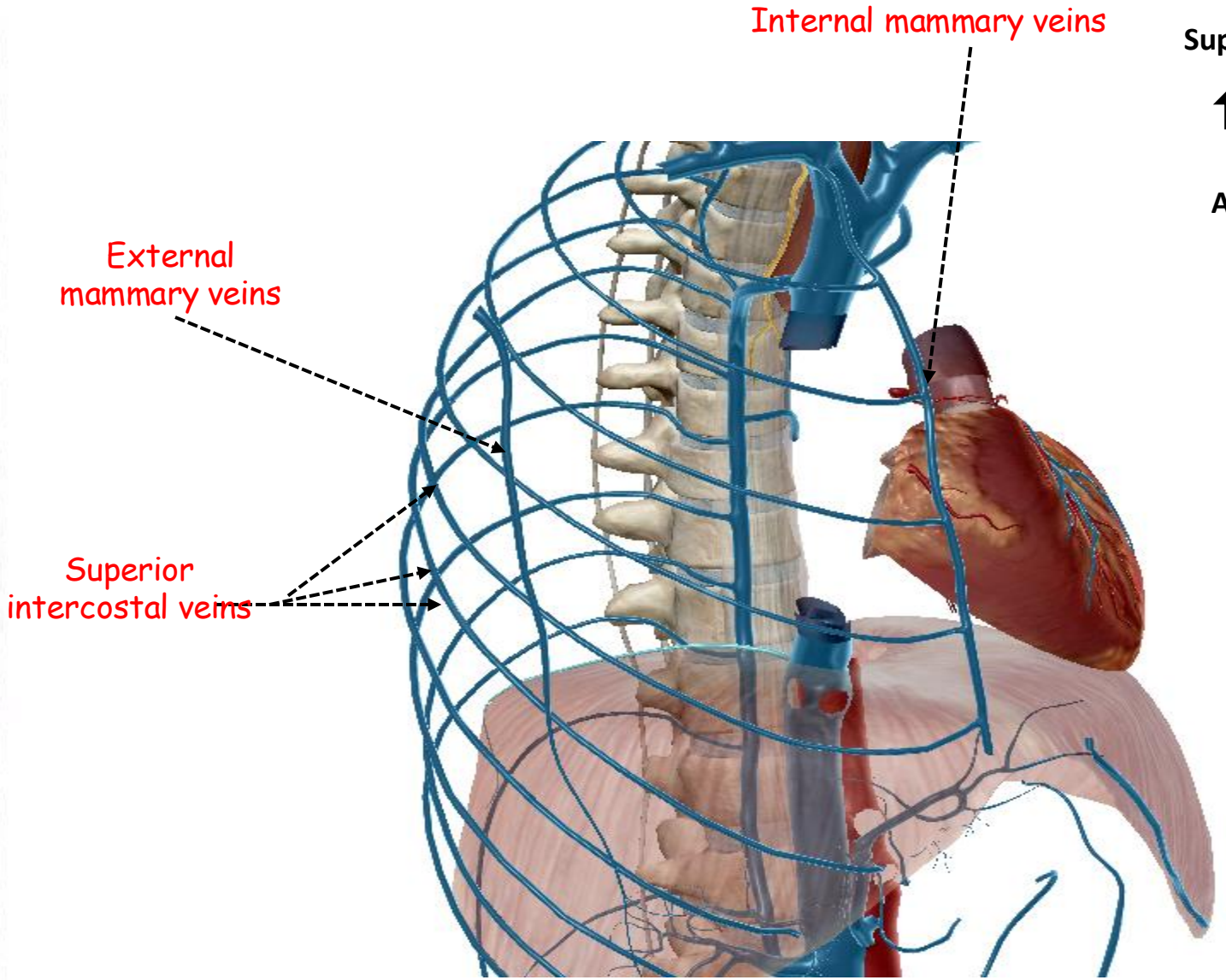
VI- COLLATERAL PATHWAYS

In case of obstruction of the superior vena cava venous system, three anastomotic systems develop depending on the level of interruption:

➢ **Anastomoses between the brachiocephalic trunks and the azygos system :**

In case of obstruction between the confluence of the brachiocephalic trunks and the junction of the azygos vein, the collateral pathways are:

- Internal mammary veins,
- External mammary veins,
- Right and left superior intercostal veins.



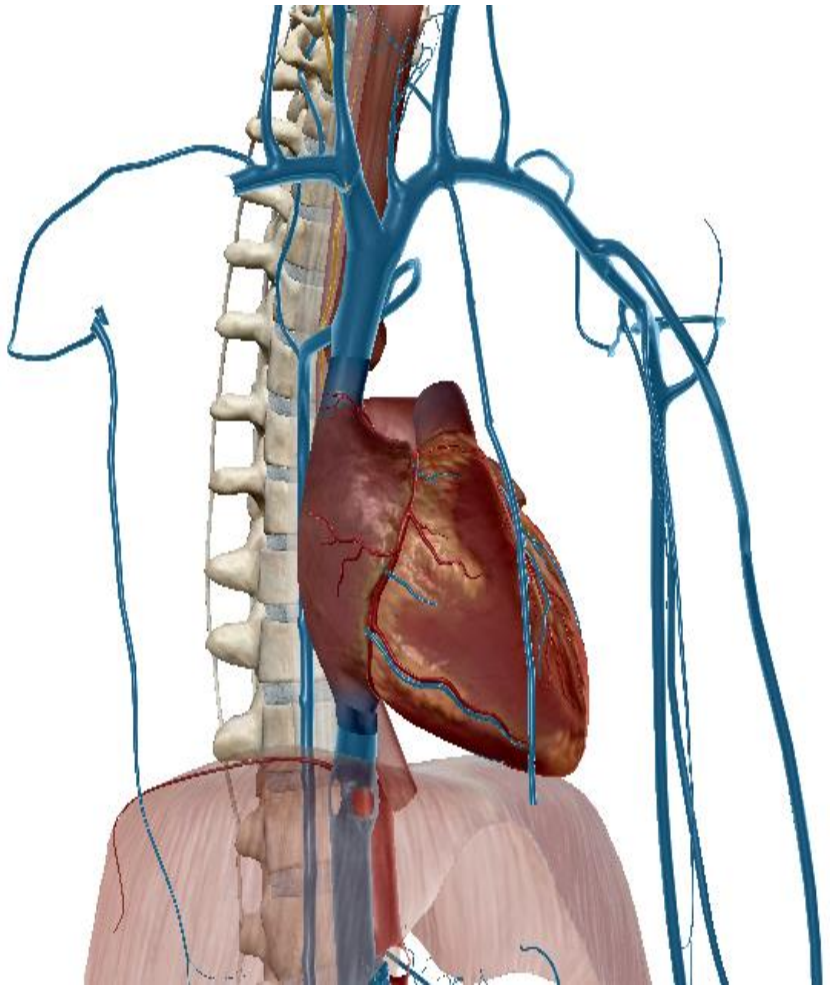
Lateral view of the heart and thorax

- **Anastomoses between the superior vena cava and the inferior vena cava:**

In case of obstruction at or below the junction of the great azygos vein.

- **Transversal anastomoses:**

In case of interruption at the junction of the brachiocephalic trunks.



Lateral view of the heart and thorax

VII- CLINICAL APPLICATIONS:

Superior vena cava syndrome:

- It is the obstruction of the SVC caused by thrombosis or extrinsic compression, leading to venous hypertension in the supradiaphragmatic part of the body.

- It involves:

✓ Vertigo ;

✓ Visual disturbances ;

✓ Eyelid edema ;

✓ Swelling of the supraclavicular fossae ;

✓ Facial cyanosis ;

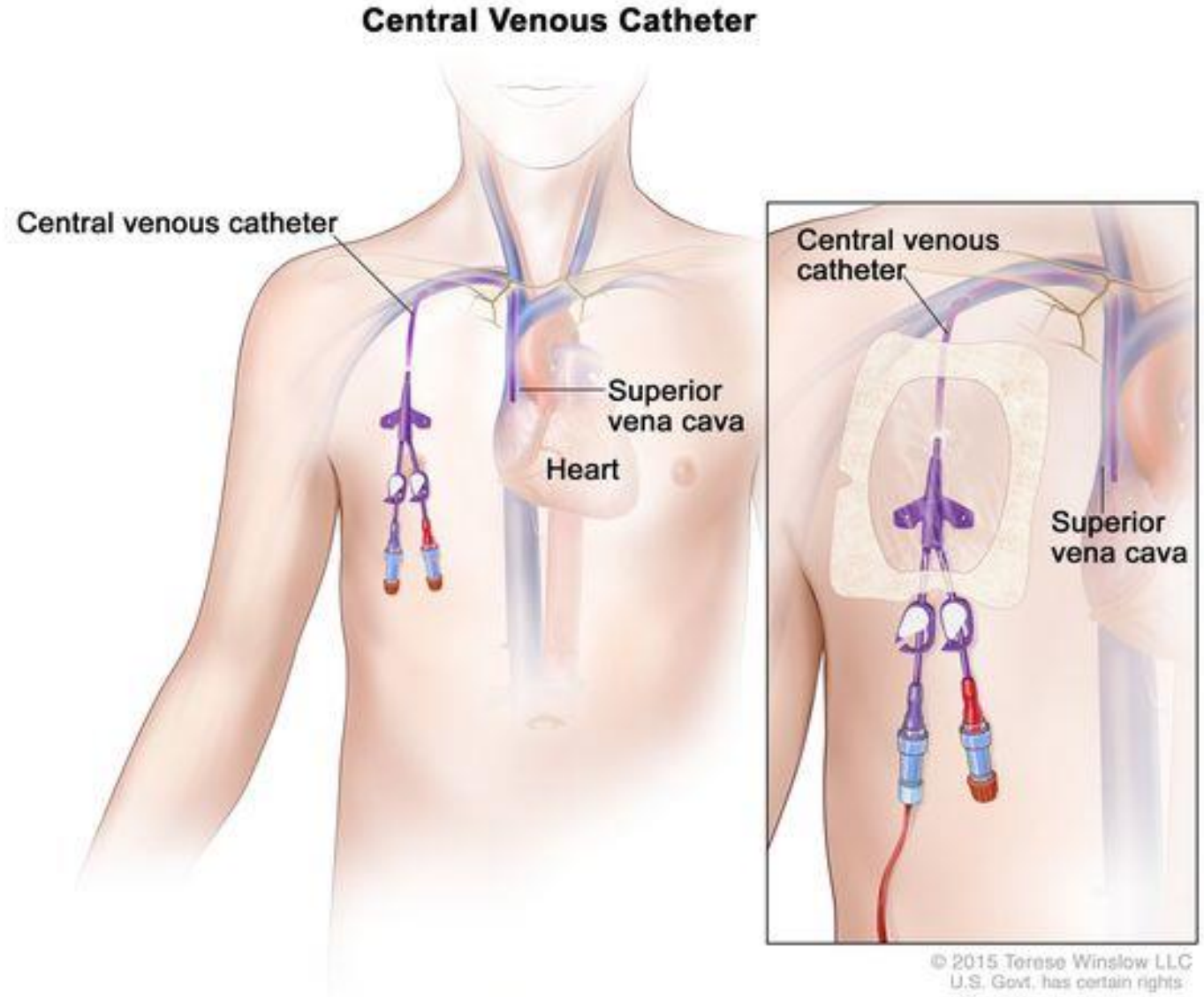
✓ Edema of the jugular veins.

Superior vena cava catheterization

- It is a medical procedure in which a catheter (a thin, flexible tube) is inserted into the superior vena cava, typically through a peripheral vein (such as from the arm or groin).

- This procedure is commonly used in several medical contexts, such as:

✓ Medication administration,
✓ Blood sampling,
✓ Hemodynamic monitoring,
✓ Access for implantable devices.

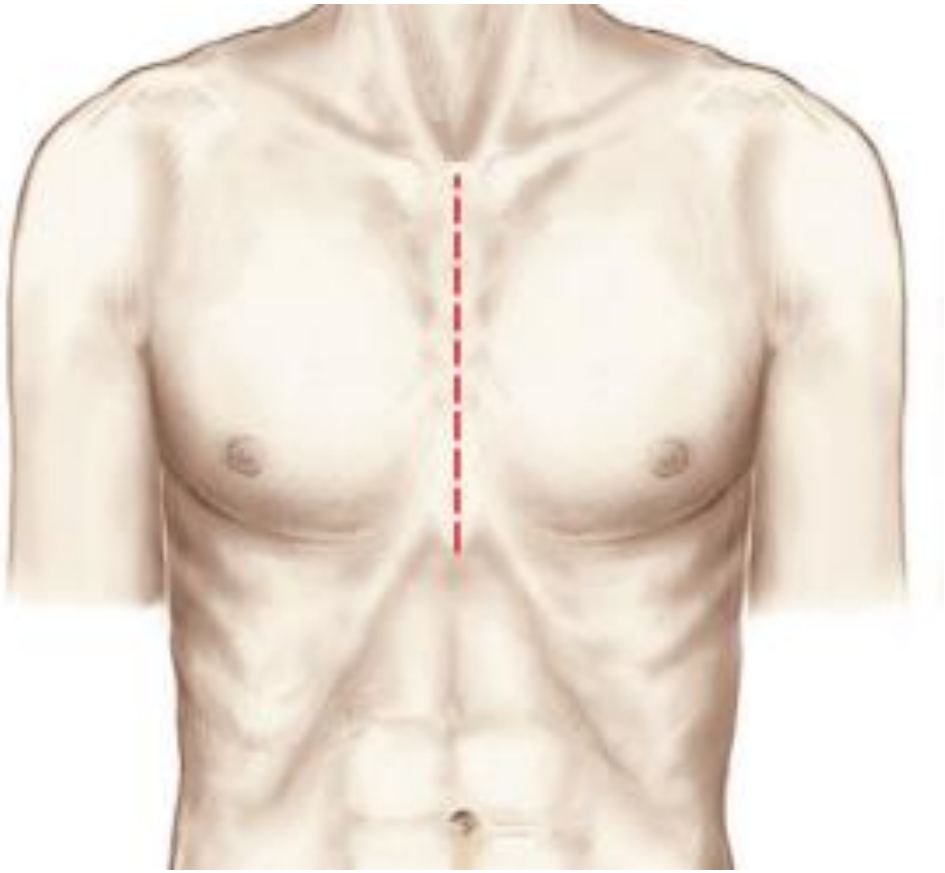


VIII- SURGICAL APPROACH ROUTES:

Total vertical median sternotomy:

- The incision is median and vertical, from the sternal notch to beyond the xiphoid process.

- Access to the entire superior vena cava, both intra- and extrapericardially, requires opening the pericardium along an axis from the diaphragm to its aortic reflection line.

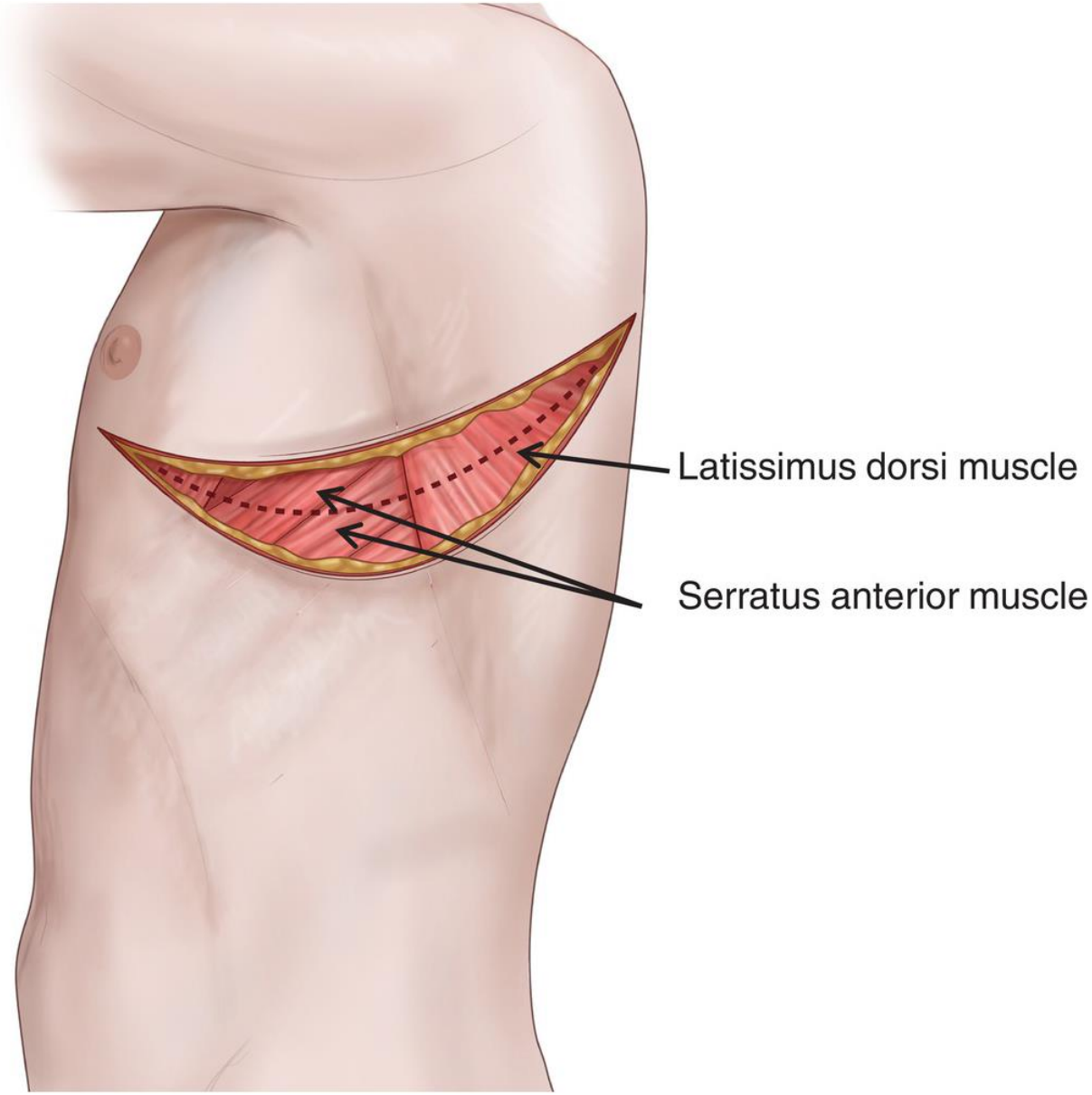


According to Netter's clinical anatomy

Right thoracotomy:

- The thoracotomy is right postero-lateral with the section of the latissimus dorsi muscle.

- The incision is made in the fourth intercostal space, which provides the best exposure of the superior vena cava.



Bithoracotomy :

- It is a surgical procedure that combines a bilateral anterior submammary thoracotomy with a transverse sternotomy.

- This approach provides an excellent exposure to both brachiocephalic trunks and the superior vena cava trunk, making it particularly useful in surgeries requiring access to these vascular structures.

XI- CONCLUSION:

The pathological phenomena of the superior vena cava can be explained by its structure, location, and anatomical relations, which highlights the importance of understanding its anatomy.