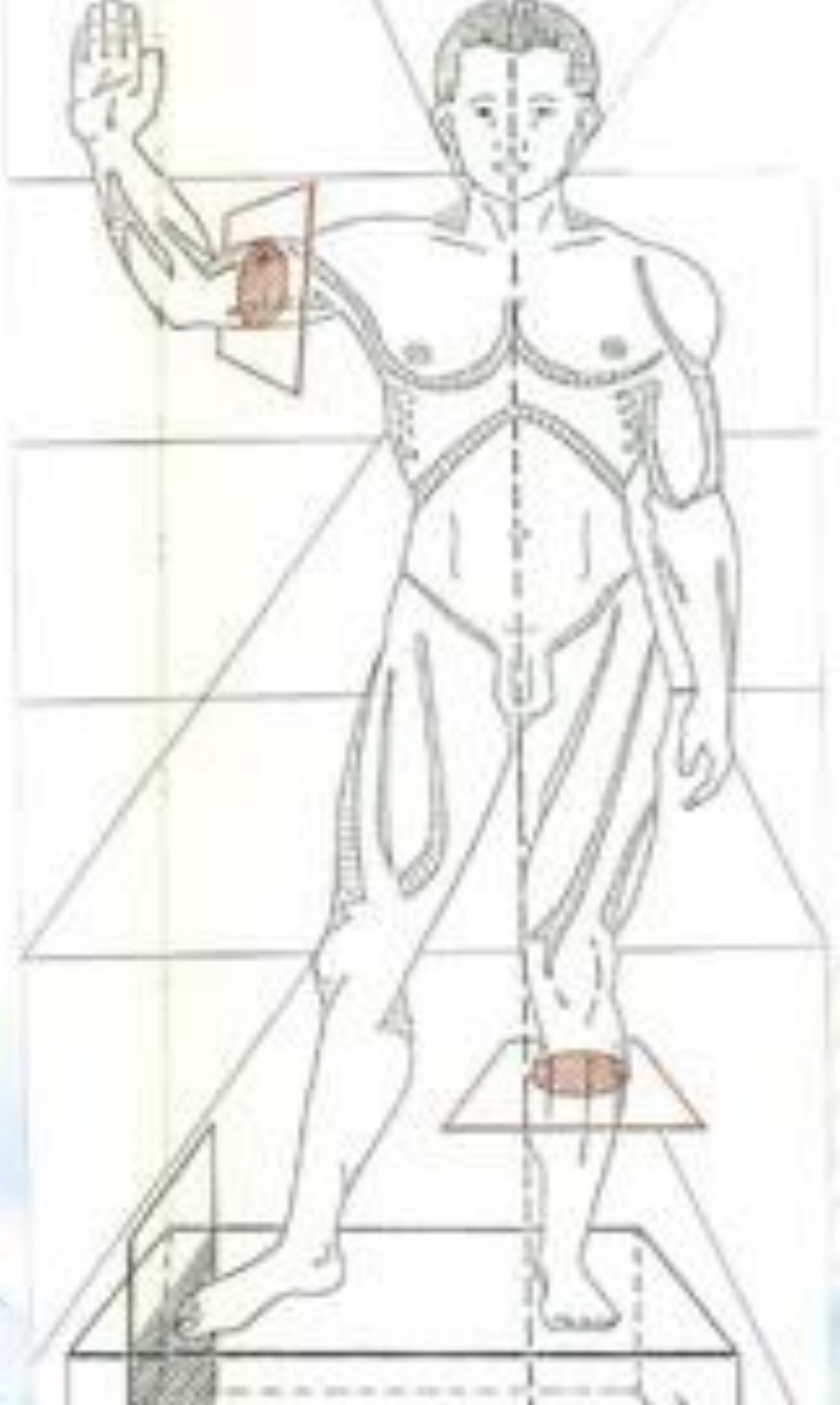
THORACIC AORTA



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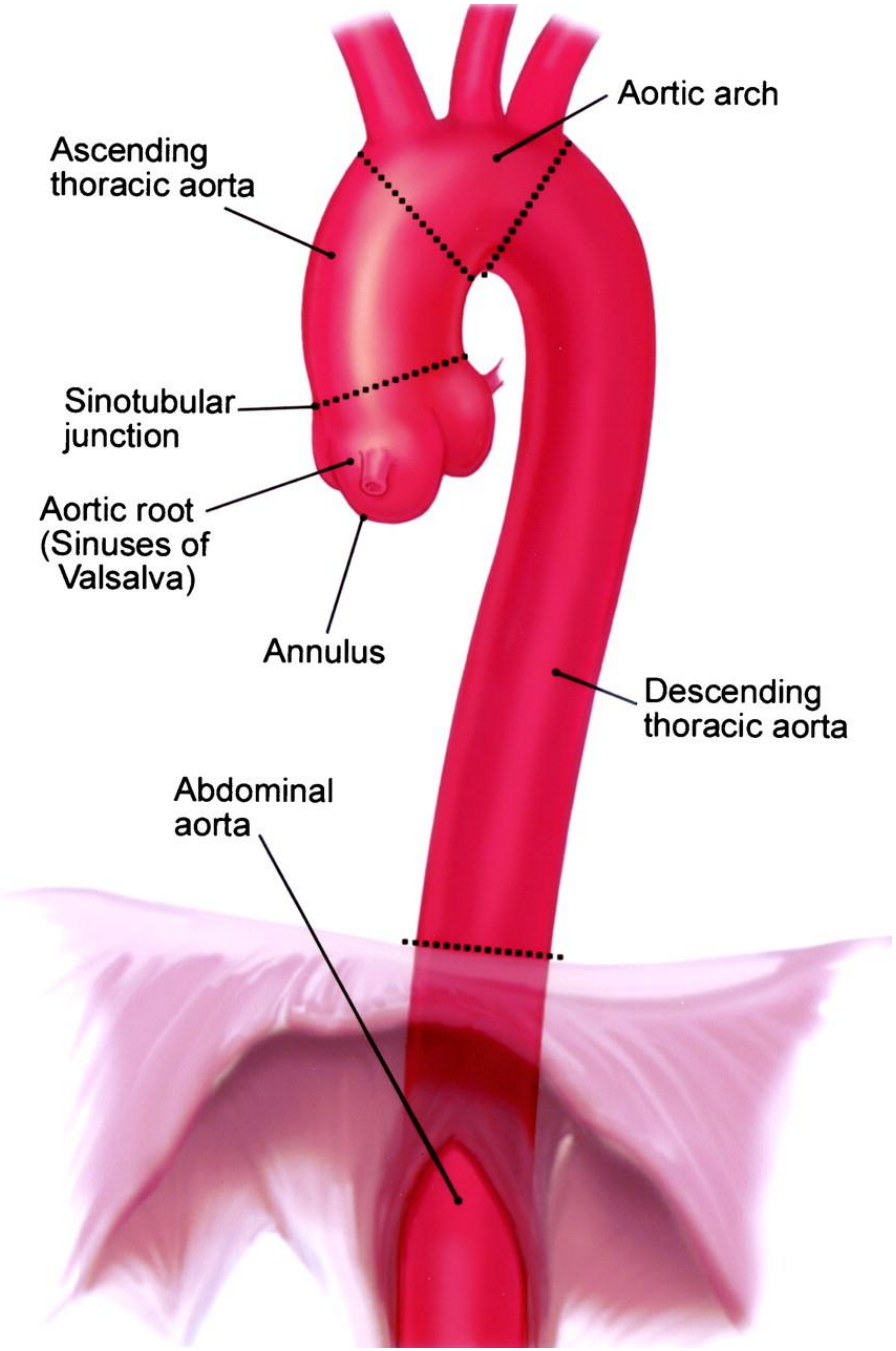
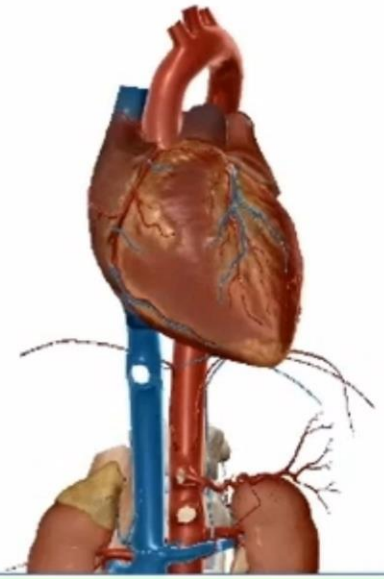


I. INTRODUCTION

- The thoracic aorta is the main trunk from which all the arteries of the body originate.

- It consists of three segments:
  - the ascending aorta,
  - the horizontal (or arch) segment,
  - and the descending aorta.

- It arises from the aortic orifice of the left ventricle, then forms an arch with an inferior concavity, and subsequently takes a descending course until it reaches the aortic opening of the diaphragm at the level of T12.



II. DESCRIPTIVE ANATOMY:

1. Origin – trajectory – termination:

The thoracic aorta follows the aortic orifice of the left ventricle

It is composed of three segments:

○ Ascending aorta :

- ✓ Entirely intrapericardial.
- ✓ Courses upwards, forwards, and to the right, forming a leftward concavity.
- ✓ Projects posteriorly to the first left sternocostal joint.

○ Horizontal aorta :

- ✓ Extrapericardial,
- ✓ Extends from the origin of the brachiocephalic trunk to the origin of the left subclavian artery.

○ Descending thoracic aorta :

- ✓ Continues from the aortic arch, distal to the origin of the left subclavian artery, opposite the left side of T4.
- ✓ Runs almost vertically, in close contact with the vertebral column, following its curvature.
- ✓ Crosses the diaphragm at the level of T9 and continues as the abdominal aorta, opposite the T12 vertebra.

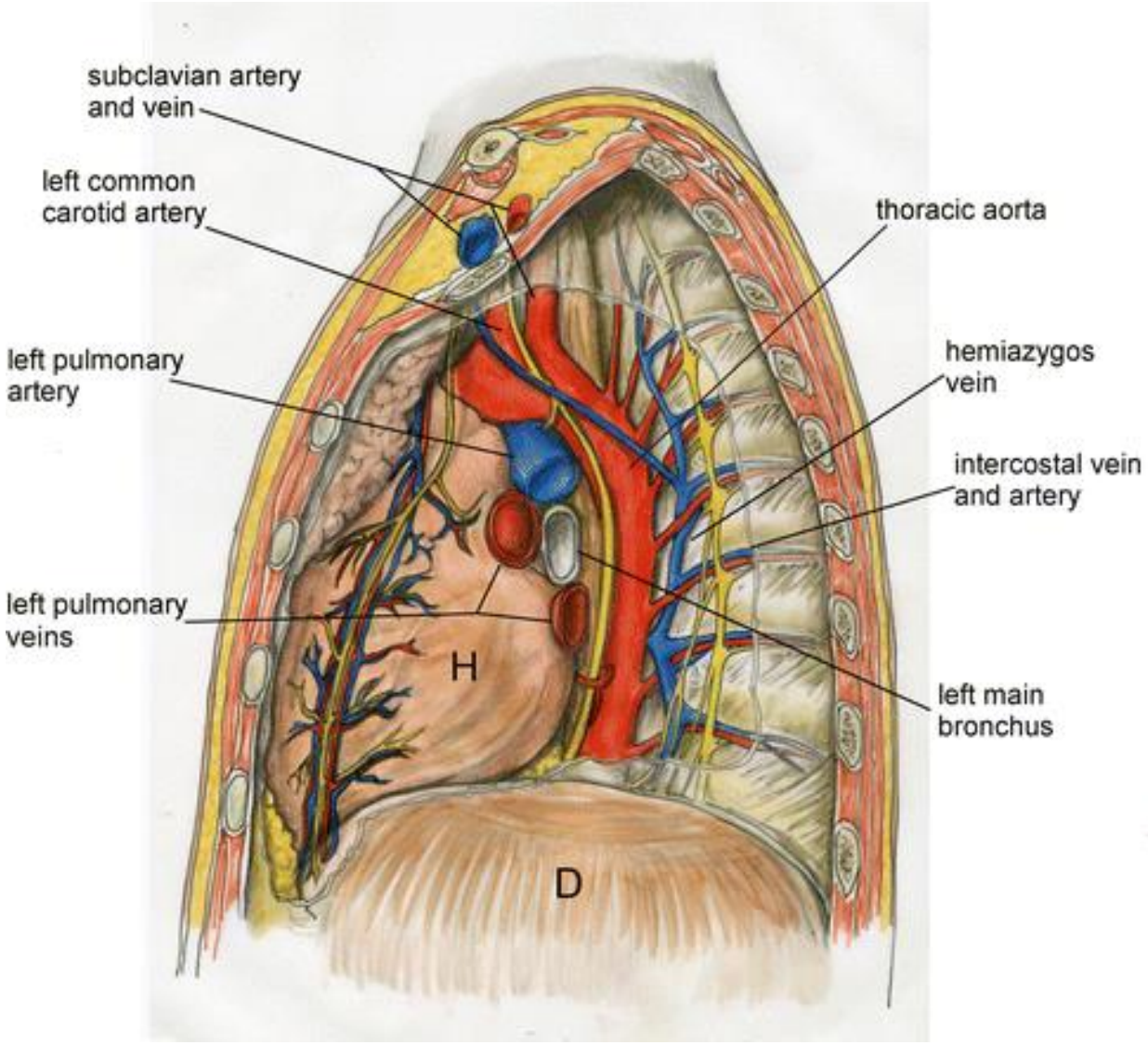
2. Location:

- The ascending aorta is located in the anterior mediastinum.
- The horizontal aorta is located in the middle mediastinum, it crosses over the left pulmonary pedicle from front to back.
- The descending thoracic aorta: Descends through the posterior mediastinum, then continues into the posterior inframediastinal space.

3. Dimensions :

- **Length :**
  - ✓ Ascending aorta : 6 cm,
  - ✓ Horizontal aorta : 5 cm,
  - ✓ Descending aorta : 25 cm.

- **Diameter :**
  - ✓ Is between 25 and 30 mm at the level of the ascending aorta.
  - ✓ Decreases after the origin of the major brachiocephalic trunks,
  - ✓ Stabilises at 18–20 mm at the level of the descending aorta.



Lateral view of the mediastinum and its components

III. ANATOMICAL RELATIONS:

❖ ASCENDING AORTA

➢ Intra-pericardial relations :

- The ascending aorta is enclosed within the same epicardial sheath as the pulmonary trunk.

- It is related to :

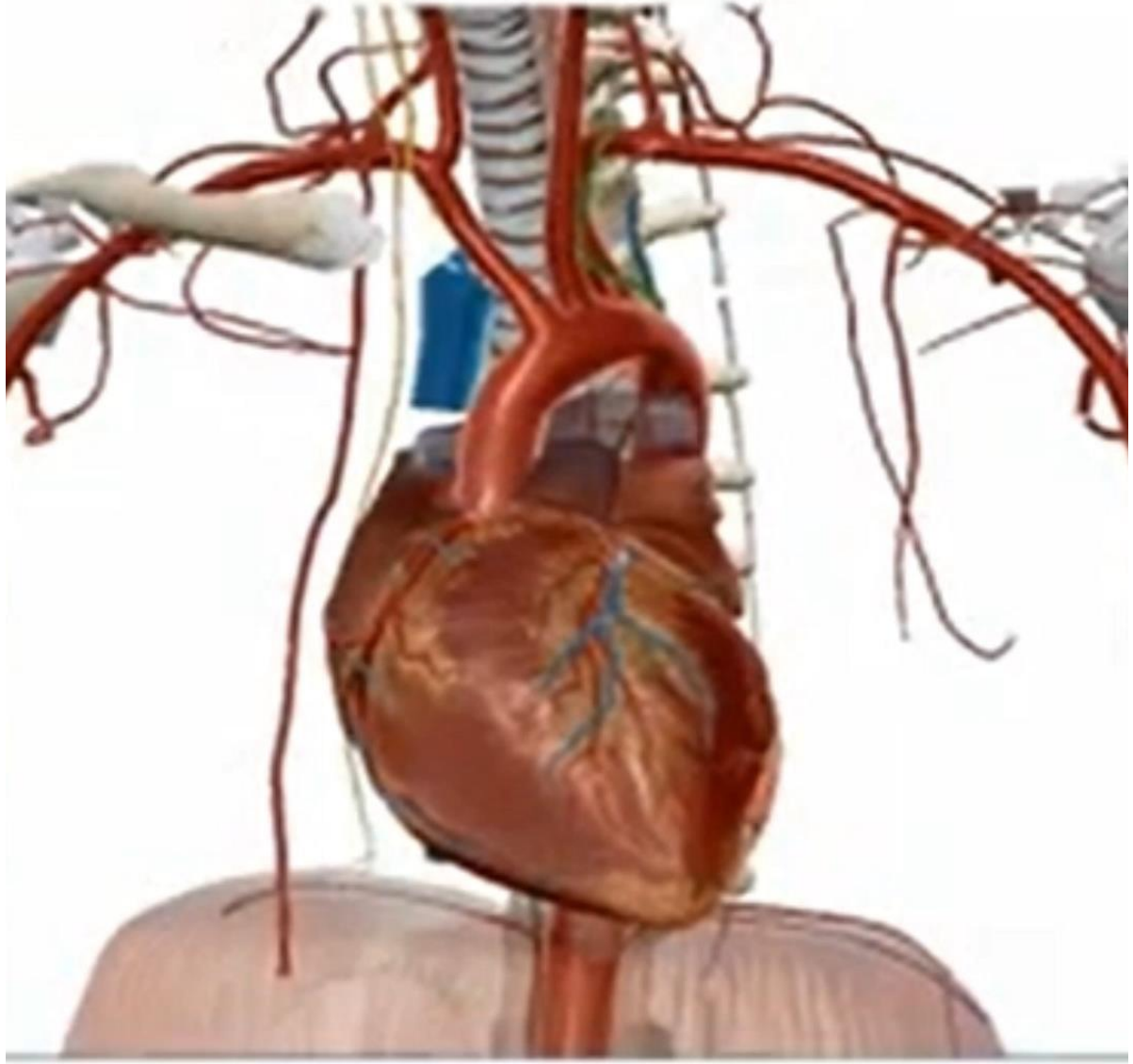
- **Anteriorly:** the right auricle.

- **Posteriorly:** the right pulmonary artery.

- **To the right:**

✓ The right opening of the transverse sinus,

✓ The superior vena cava.



➢ Extra-pericardial relations :

- **Anteriorly:**
  - ✓ The thymus in children,
  - ✓ The sternum.

- **Posteriorly:** the carina.

- **To the right:**
  - ✓ The superior vena cava,
  - ✓ The right phrenic nerve.

- **To the left:**
  - ✓ The cardiac plexus,
  - ✓ Wrisberg's cardiac ganglia.

❖ HORIZONTAL AORTA

The horizontal aorta is extra-pericardial and presents four surfaces:

- The antero-left surface,
- The postero-right surface,
- The superior surface,
- And the inferior surface.

➢ **Antero-left surface :** is crossed from front to back by:

✓ The left phrenic nerve,

✓ The left vagus nerve,

✓ The left superior intercostal vein runs along this surface, posterior to the phrenic nerve.

➢ **Superior surface:** is crossed by a venous plane (the left brachiocephalic vein).

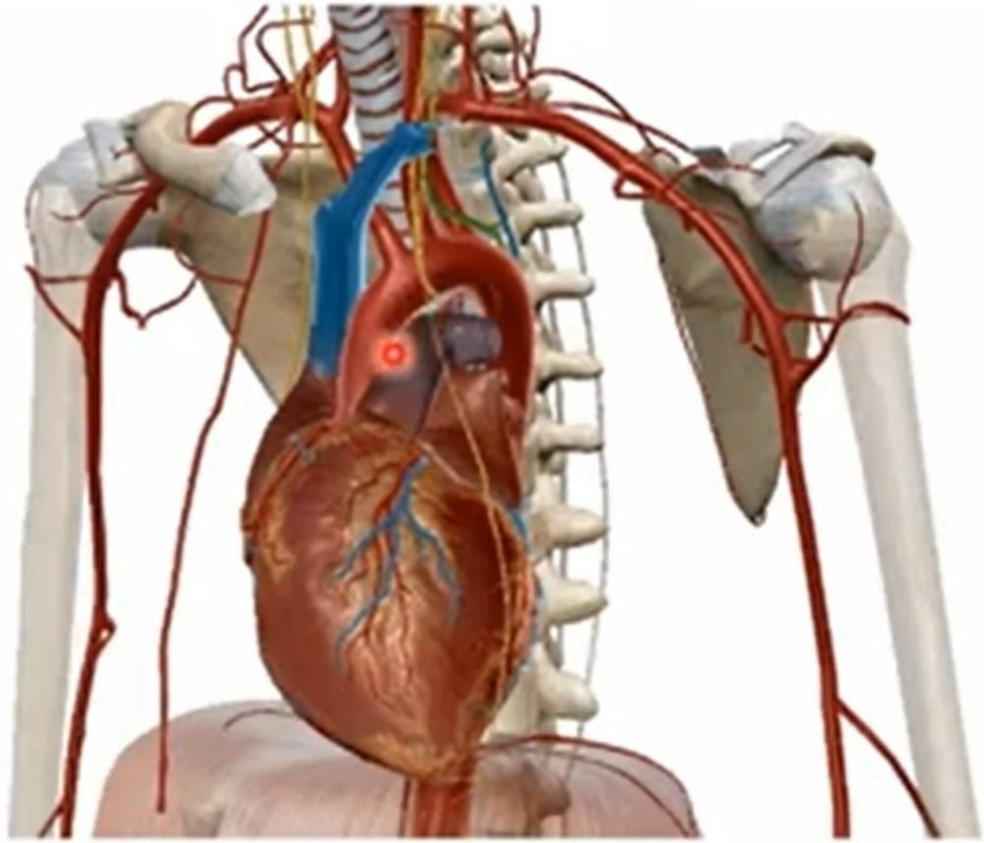
➢ **Postero-right surface:** is related from front to back to:

✓ The trachea,

✓ The left recurrent laryngeal nerve,

✓ The thoracic esophagus,

✓ And the thoracic duct.



❖ DESCENDING AORTA

- **Anteriorly (from top to bottom):**

✓ The left pulmonary pedicle,

✓ The left vagus nerve.

- **Posteriorly:**

✓ The thoracic duct inferiorly,

✓ The horizontal portion of the hemi-azygos veins,

✓ The left pleura and lung.

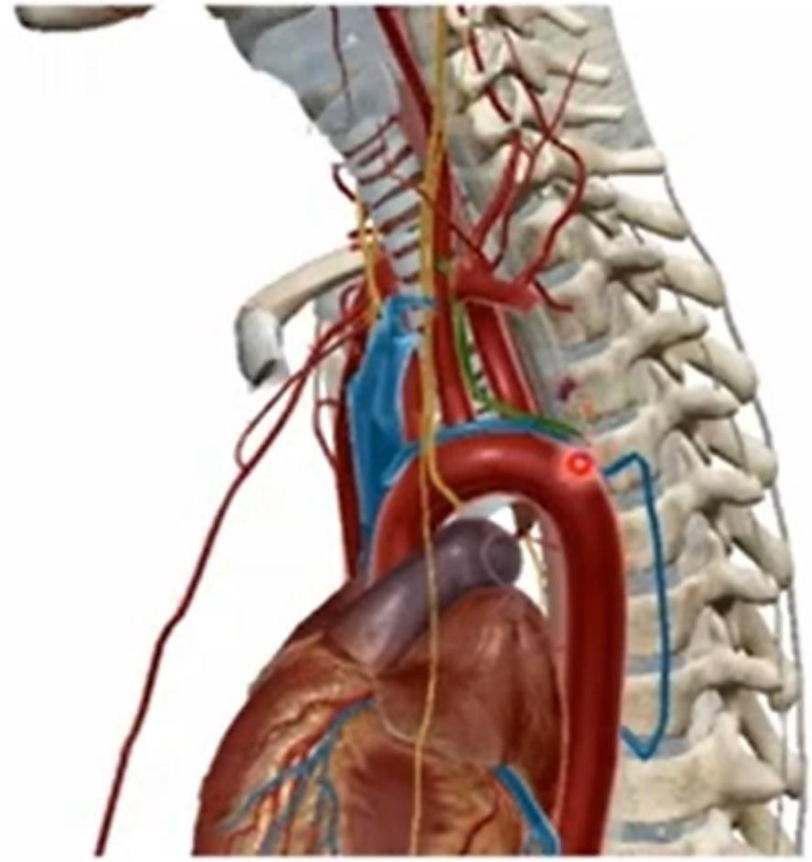
- **To the right:**

✓ The lateral surface of the thoracic spine,

✓ The thoracic duct,

✓ The thoracic esophagus.

✓ And the azygos vein.



IV. COLLATERAL BRANCHES :

The ascending aorta gives rise to the two coronary arteries:

LEFT CORONARY ARTERY

Originates from the posterior-left aspect of the aorta, and gives rise to:

- **The circumflex artery:**

It runs in the left atrioventricular sulcus, curves around the left border of the heart, and ends just before on the inferior surface of the left ventricle.

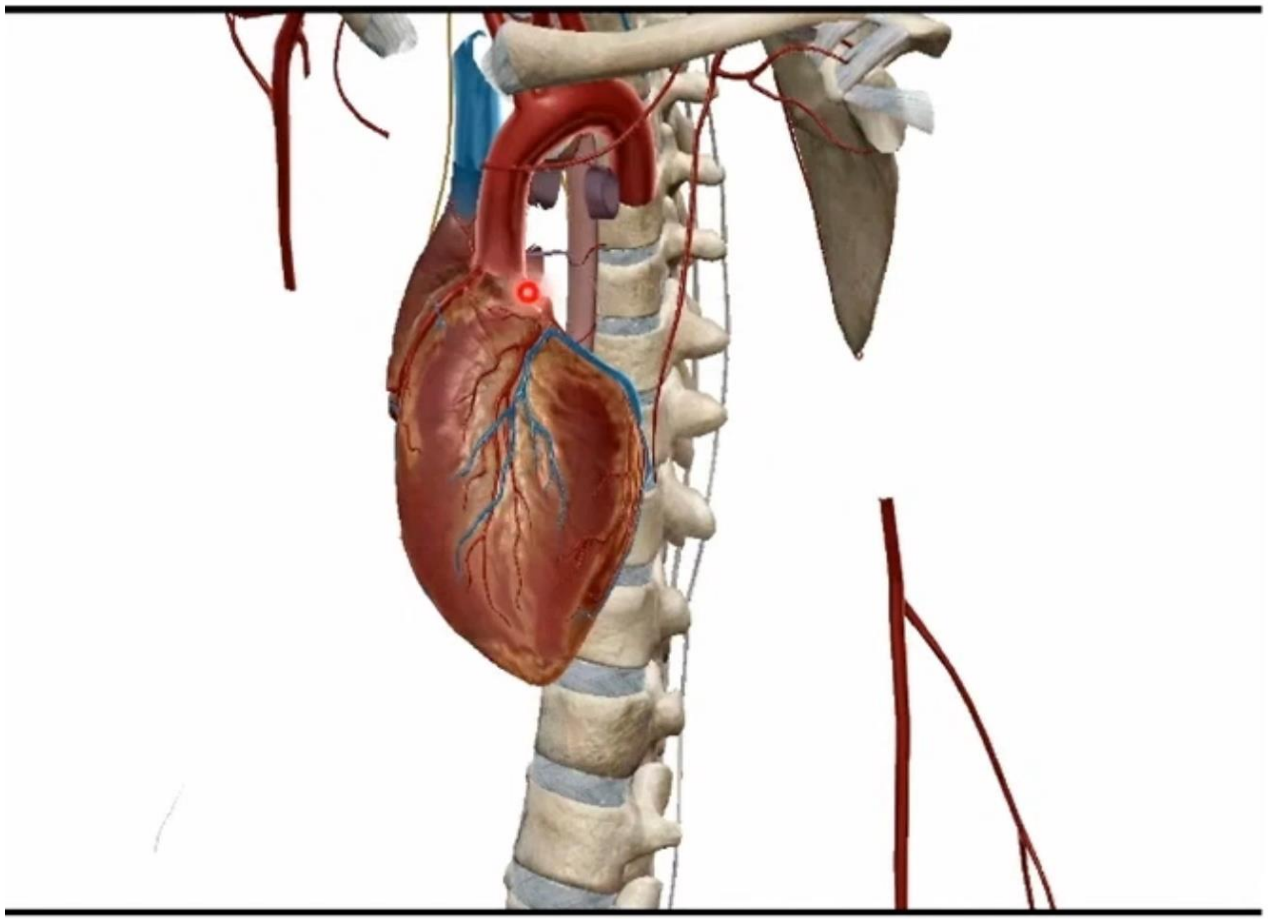
- **The anterior interventricular artery:**

It runs in the anterior interventricular sulcus, curves around the apex of the heart, and ends in the posterior interventricular sulcus.

RIGHT CORONARY ARTERY

- It is concealed at its origin by the right auricle.
- It has three segments:

✓ The first segment.
✓ The second segment.
✓ The third segment.



The horizontal aorta gives rise to three major collateral arteries:

BRACHIOCEPHALIC TRUNK

- It originates from the superior aspect of the aortic arch.
- It ascends obliquely upwards, to the right, and bifurcates into two branches:

✓ The right subclavian artery,

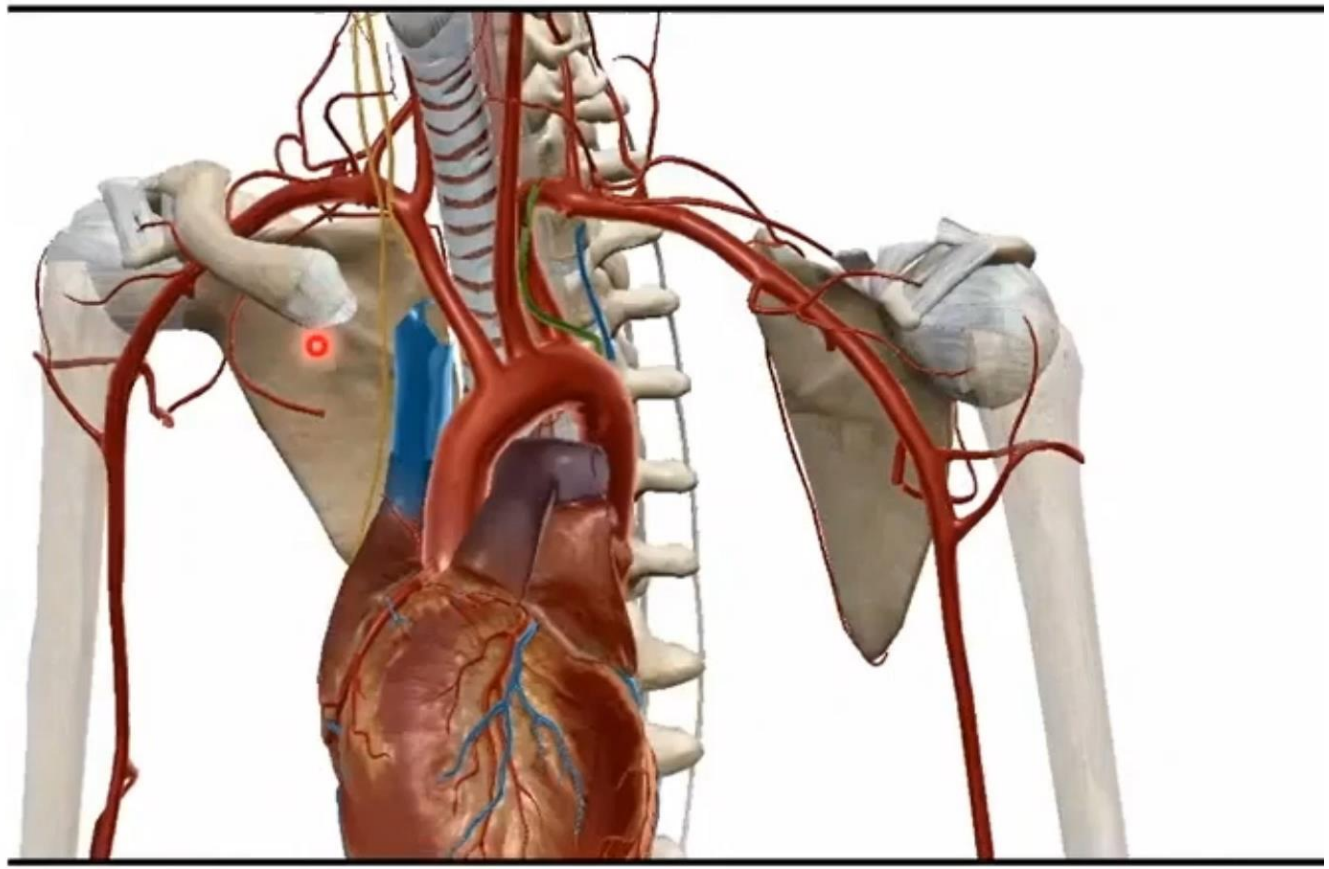
✓ And the right common carotid artery.

LEFT COMMON CAROTID ARTERY

- It arises from the superior aspect of the horizontal aorta.
- Then ascends obliquely upwards, positioning itself on the left lateral side of the trachea.

SUBCLAVIAN ARTERY

- It originates from the superior aspect of the horizontal aorta, posterior to the left common carotid artery.
- It ascends almost vertically upwards to the base of the neck.



The collateral arteries of the descending thoracic aorta are divided into two groups: visceral and parietal arteries.

VISCERAL BRANCHES

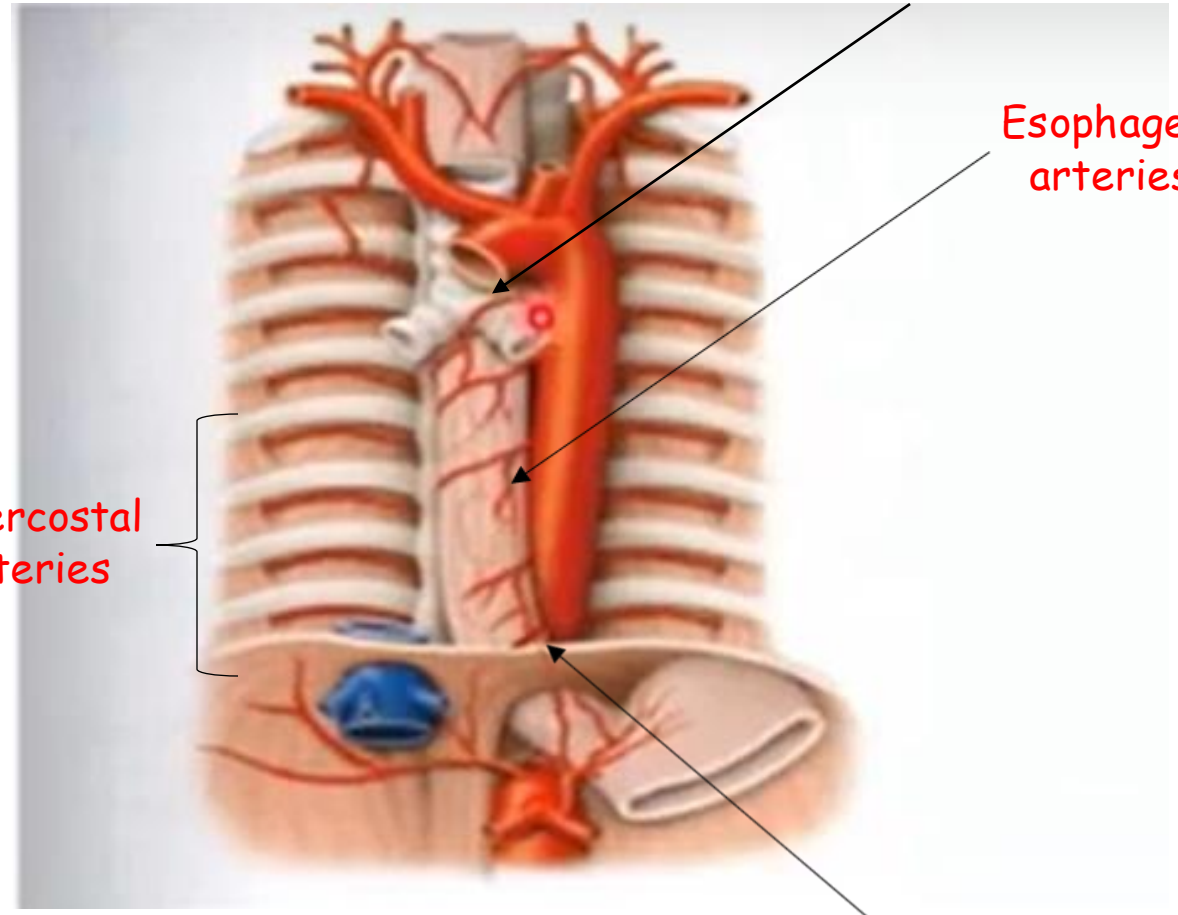
- **Bronchial arteries:**
  - ✓ There are two of them.
  - ✓ They arise from the lateral aspects of the upper part of the descending aorta and terminate in the pulmonary parenchyma.
- **Esophageal arteries:**
  - ✓ There are between two and four of them.
  - ✓ They originate from the anterior surface of the aorta at varying levels.

PARIETAL BRANCHES

- **The superior phrenic arteries,**
- **The last nine intercostal arteries**: They arise from the posterior surface of the aorta and they bifurcate into two terminal branches:

o The dorsospinal artery,

o And the true intercostal artery

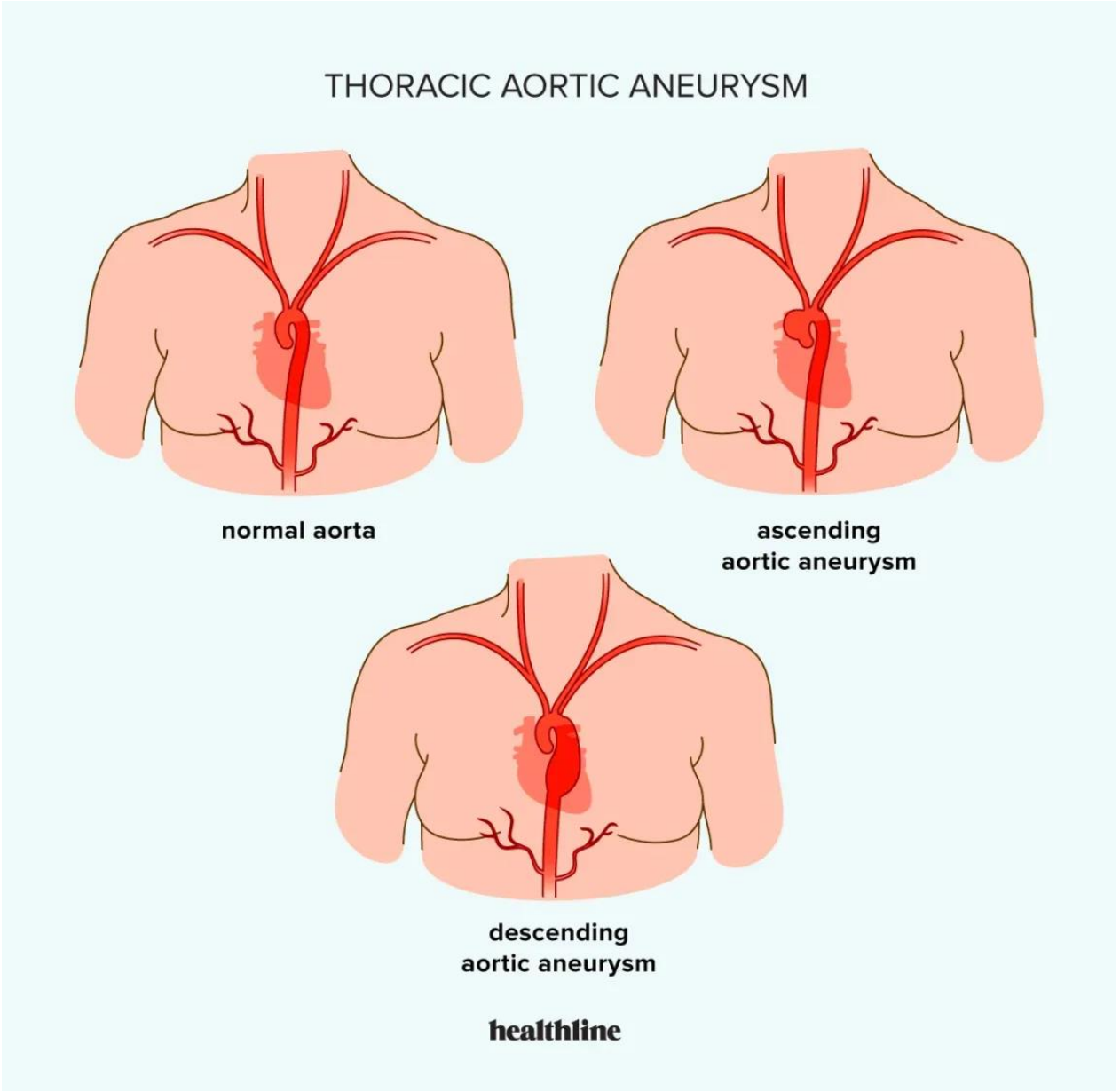


Anterior view of the thorax

V. CLINICAL APPLICATIONS:

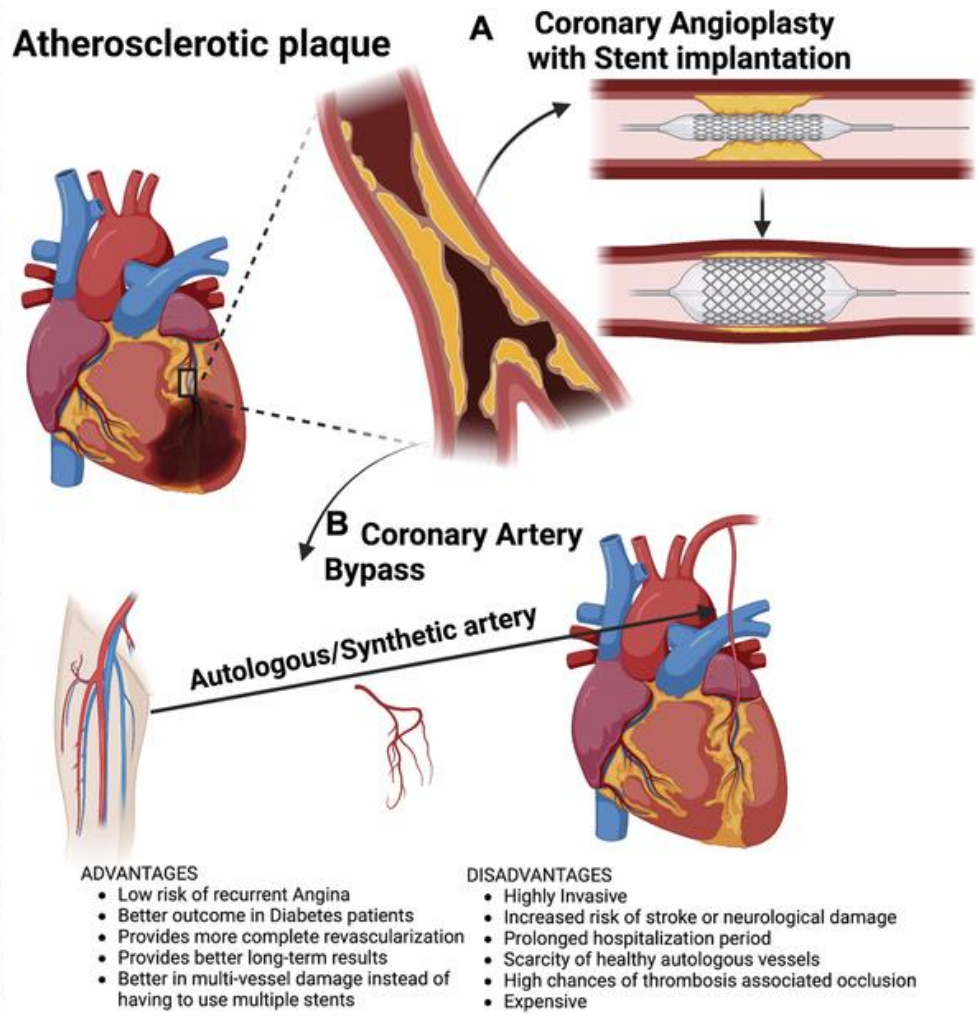
❖ Aortic aneurysm of the ascending aorta :

- When the left ventricle contracts, the distal part of the ascending aorta is subjected to a strong surge of blood.
- An aneurysm (dilatation) may develop at this site.
- An aortic aneurysm exceeding 5 cm in diameter is considered surgical, in order to prevent potentially fatal complications.
- This treatment involves replacing the diseased portion of the aorta with a vascular graft anchored to the aneurysmal wall.



❖ Coronary artery thrombosis:

- Coronary artery thrombosis occurs when a blood clot forms within one of the coronary arteries, usually at the site of an atherosclerotic plaque.
- This can lead to a partial or complete blockage of blood flow to the heart muscle, resulting in a myocardial infarction (heart attack).
- To manage this condition, a procedure called coronary angioplasty can be performed. It involves the insertion of a balloon-tipped catheter into the narrowed segment of the artery.
- The balloon is then inflated to widen the artery and restore proper blood circulation to the myocardium. In many cases, a stent is also placed to keep the artery open and reduce the risk of re-narrowing.



ADVANTAGES
- Minimally invasive
- Fast recovery period
- More practical, fast procedure (within 1-2 hours) and quickly restores blood flow to the heart
- Reduction of the risk of stroke
- Improvement of organ function, including the kidneys

DISADVANTAGES
- Allergic reaction to stent material
- Blood clot formation on the stent
- Risk of restenosis
- Procedure related issues including damage to blood vessels
- Scar tissue formation around the stent
- Side effects of medicated coating on the stent
- Bypass grafts may still be necessary in some cases
- The blood vessel may collapse

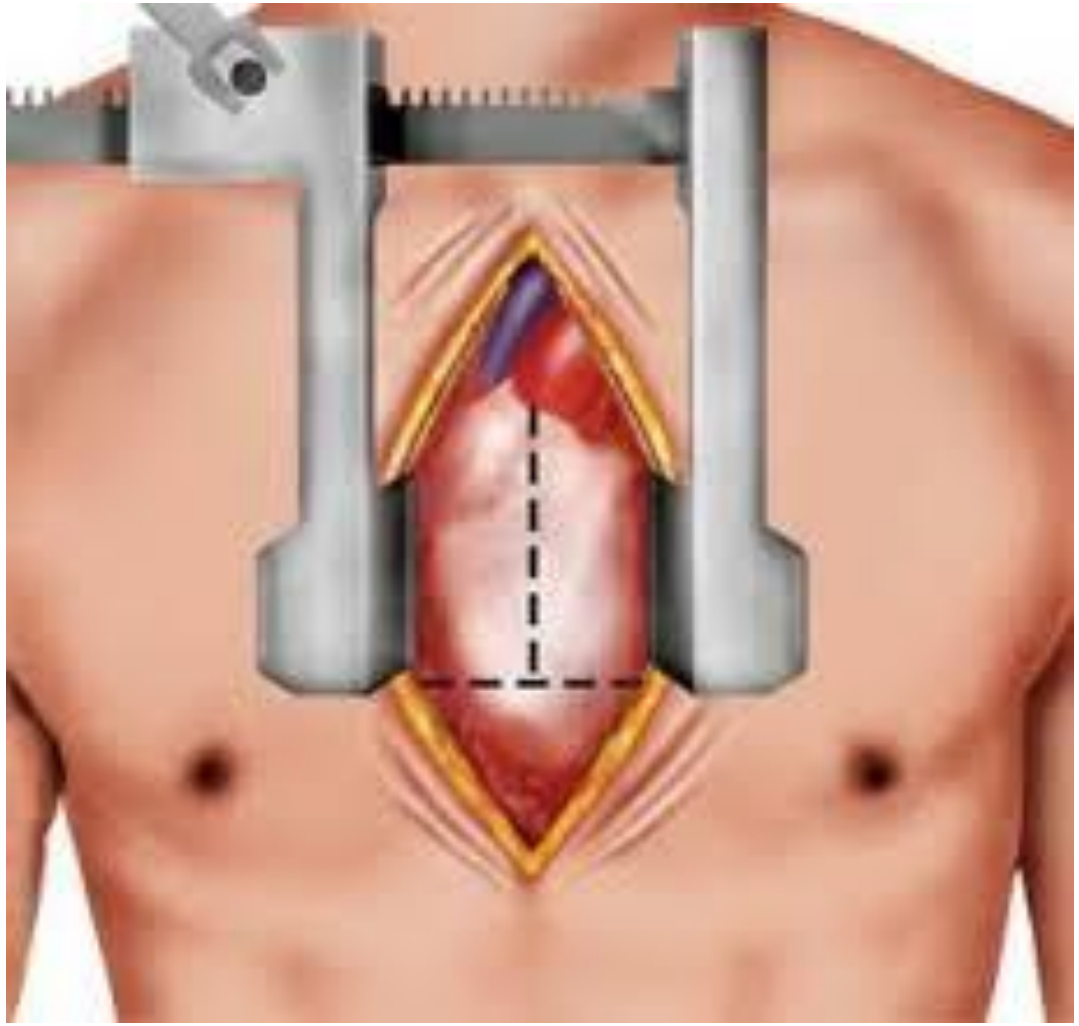
ADVANTAGES
- Low risk of recurrent Angina
- Better outcome in Diabetes patients
- Provides more complete revascularization
- Provides better long-term results
- Better in multi-vessel damage instead of having to use multiple stents

DISADVANTAGES
- Highly Invasive
- Increased risk of stroke or neurological damage
- Prolonged hospitalization period
- Scarcity of healthy autologous vessels
- High chances of thrombosis associated occlusion
- Expensive

VI. SURGICAL APPROACH ROUTES:

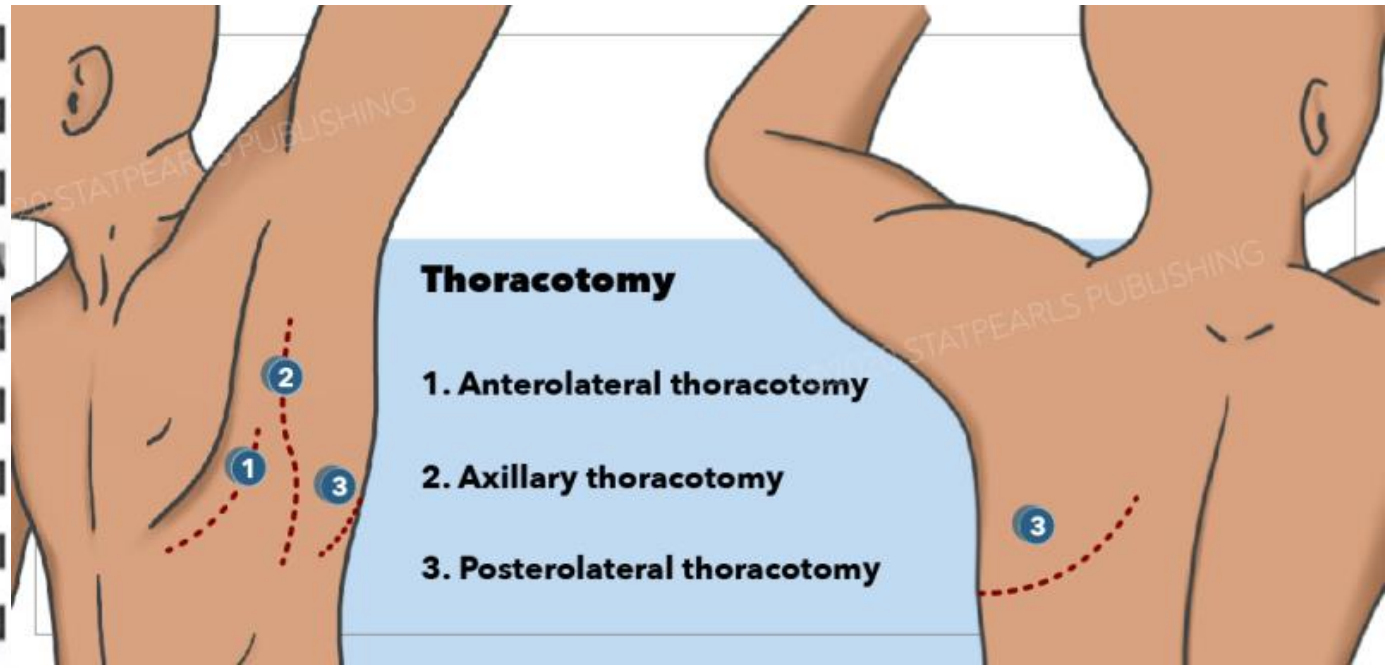
- **Median sternotomy:**

This allows excellent access to the aortic arch up to the aortic isthmus.



❖ Left postolateral thoracotomy :

- This is the reference approach for accessing the descending thoracic aorta.
- It is the only approach that provides direct exposure of the entire descending thoracic aorta in a single step.
- The level of the thoracotomy depends on the location of the aortic lesions.



VII. CONCLUSION:

- Pathologies of the thoracic aorta are considered severe, with a very high surgical risk.

- Anatomical study allows for a better interpretation of clinical signs, as well as paraclinical tests, resulting in a more accurate diagnostic and therapeutic approach.