

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 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. It consists of three segments:

- the ascending aorta,
- o the horizontal (or arch) segment,
- \circ $\;$ and the descending aorta.



II – DESCRIPTIVE ANATOMY:

1. Origine – course – termination :

The thoracic aorta follows the aortic orifice of the left ventricle and is composed of three segments:

• Ascending aorta:

- The ascending aorta is entirely intrapericardial. It courses upwards, forwards, and to the right, forming a leftward concavity.
- It projects posteriorly to the first left sternocostal joint.

• Horizontal aorta:

The horizontal aorta is extrapercardial. It extends from the origin of the brachiocephalic trunk to the origin of the left subclavian artery.

• Descending thoracic aorta:

- It continues from the aortic arch, distal to the origin of the left subclavian artery, opposite the left side of T4.
- It runs almost vertically, in close contact with the vertebral column, following its curvature.
- After crossing 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. <u>Dimensions</u>:

Length :

- Ascending aorta: 6 to 8 cm.
- Horizontal aorta: 4 to 5 cm.
- Descending aorta: 20 to 25 cm.

Diameter :

The diameter measures between 25 and 30 mm at the level of the ascending aorta. It decreases after the origin of the major cephalobrachial trunks, stabilising at 18–20 mm at the level of the descending aorta.

III – ANATOMICAL RELATIONS:

1. Ascending aorta :

a. Intra-pericardial relations :

The ascending aorta is enclosed within the same epicardial sheath as the pulmonary trunk. The pulmonary trunk initially lies anterior to the aorta, then curves to the left and upwards. Its anatomical relations are as follows:

- Anteriorly: In contact with the right auricle.
- **Posteriorly:** In relation to the right pulmonary artery.
- To the right:
 - At the right opening of the transverse sinus,
 - And the superior vena cava.

b. Extra-pericardial relations :

Through the fibrous pericardium, the ascending aorta is related to:

• Anteriorly:

- The thymus in children,
- The sternum,
- **Posteriorly :** The carina.

• To the right:

- The supra-pericardial superior vena cava,
- The right phrenic nerve,

• To the left:

- The cardiac plexus,
- And Wrisberg's cardiac ganglia.

2. 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:

It 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:

It is crossed by a venous plane (the left brachiocephalic vein).

→ Postero-right surface:

It is related from front to back to:

- The trachea,
- The left recurrent laryngeal nerve,
- The thoracic esophagus,
- And the thoracic duct.



Note : The thoracic aorta can be the site of an aneurysm, which may compress surrounding structures such as the trachea, the oesophagus, and nearby nerves.

2. Descending aorta:

The descending aorta is related:

• 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:



1. Ascending aorta:

The ascending aorta gives rise to the two coronary arteries:

Left coronary artery:

It 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 is oblique, descending, anterior, and to the right, reaching the anterior atrioventricular sulcus.
- The second is vertical, running along the entire length of this sulcus.
- The third segment, after curving around the right border of the heart, travels along the inferior part of the atrioventricular sulcus.

2. Horizontal aorta:

The horizontal aorta gives rise to three major collateral arteries:

The 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.

The left common (primitive) 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.

The left 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.

3. Descending aorta:

The collateral arteries of the descending thoracic aorta are divided into two groups: visceral arteries 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. They 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. Once they reach the posterior extremity of the intercostal space, they bifurcate into two terminal branches:
 - The dorsospinal artery,
 - And the true intercostal artery.

VI – 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.

V-SURGICAL APPROACH ROUTES:

- **<u>1.</u>** Anterior approach routes:
 - Median sternotomy:

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

2. 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.

VI- 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.