Aorta and the Vasculature of the Thorax

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THE AORTA

After originating from left ventricle, it ascends for a short distance, arches backward and to the left side, descends within the thorax on the left side of the vertebral column

The aorta is the main arterial trunk that delivers oxygenated blood from the left ventricle of the heart to the tissues of the body.

It is divided for purposes of description into:

Ascending aorta

Arch of the aorta and

Descending aorta

(thoracic and abdominal aorta)

Ascending Aorta

- The ascending aorta begins at the base of the left ventricle
- runs upward and forward at the level of the sternal angle, where it becomes continuous with the arch of the aorta
- it possesses three bulges, the sinuses of the aorta

Branches

Right coronary artery

Left coronary artery

ARCH OF THE AORTA

The aortic arch is a continuation of the ascending aorta and begins at the level of the second sternocostal joint.

• It arches superiorly, posteriorly and to the left before moving inferiorly.

• The aortic arch ends at the level of the T4 vertebra / at level of sternal angle.

Branches;

- **Brachiocephalic artery** (Innominate artery)
- **Left common carotid artery**
- **Left subclavian artery**

It begins when the ascending aorta emerges from the pericardial sac and courses upward, backward, and to the left as it passes through the superior mediastinum, ending on the left side at vertebral level TIV/V. Extending as high as the midlevel of the manubrium of the sternum, the arch is initially anterior and finally lateral to the trachea.

- Three branches arise from the arch of the aorta;
- **Brachiocephalic trunk:** Beginning on the right, the first branch of the arch of the aorta. At its point of origin behind the manubrium of the sternum, is slightly anterior to the other two branches. At the level of the upper edge of the right sternoclavicular joint, the brachiocephalic trunk divides into: the **right common carotid artery and** the **right subclavian artery**
- **Left common carotid artery:** It arises from the arch slightly posterior to the brachiocephalic trunk and ascends through the superior mediastinum along the left side of the trachea. The left common carotid artery supplies the left side of the head and neck.
- **Left subclavian artery**: It arises from the arch of the aorta and slightly posterior to the left common carotid artery and ascends through the superior mediastinum along the left side of the trachea. The left subclavian artery is the major blood supply to the left upper limb.

DESCENDING AORTA;

Originates leveled along with the lower boundary of the T4 vertebra, consistent with the aortic arch, and terminates on the L4 vertebra.

THORACIC AORTA /T4-T12
ABDOMINAL AORTA / T12-L4

Thoracic aorta is exist in thoracal cavity between fourth to twelfth thoracal vertebraes. Than it pass from diaphragma and enter the abominal cavity, we called this part is abdominal aorta. It course till forth lumbal vertebrae and divided into terminal two terminal branches. Left and right Common iliac arteries.

Thoracic aorta

The thoracic aorta is contained in the **posterior mediastinal cavity.**

It begins at the lower border of the fourth thoracic vertebra where it is continuous with the aortic arch, and ends in front of the lower border of the twelfth thoracic vertebra, at the **aortic hiatus** in the diaphragm where it becomes the abdominal aorta.

Thoracic aorta

Branches

- Left bronchial arteries (sometimes right also)
- Pericardial branches
- Posterior intercostal arteries (3rd-12th)
- Esophageal branches
- Mediastinal branches
- Subcostal artery (last intercostal artery)
- Superior phrenic arteries

Bronchial arteries

Vary in number, size, and origin-
usually, two left bronchial arteries
from the thoracic aorta and
one right bronchial artery from the
third posterior intercostal artery or the
upper left bronchial artery

Eusophagial arteries

Four or five vessels from the anterior aspect of the thoracic aorta, which form a continuous anastomotic chain- anastomotic connections include esophageal branches of the inferior thyroid artery superiorly, and esophageal branches of the left inferior phrenic and the left gastric arteries inferiorly

Pericardial arteries
A few small vessels to the posterior surface of the pericardial sac

Mediastinal arteries
Several small branches supplying lymph nodes, vessels, nerves, and areolar tissue in the posterior mediastinum

Superior phrenic arteries
Small vessels from the lower part of the thoracic aorta supplying the posterior part of the superior surface of the diaphragm-they anastomose with the musculophrenic and pericardiacophrenic arteries

Posterior intercostal arteries

Usually nine pairs of vessels branching from the posterior surface of the thoracic aorta-usually supply lower nine intercostal spaces (first two spaces are supplied by the supreme intercostal artery-a branch of the costo-cervical trunk of the subclavian artery)

Subcostal arteries

The lowest pair of branches from the thoracic aorta located inferior to rib XII

ARTERİES OF THE THORACİC WALL

Arise mainly from the following sources

- Posterior intercostal and subcostal arteries (branches of the thoracic aorta)
- Internal thoracic artery and highest intercostal artery (branches of the subclavian artery)

Arterial supply of the thorax wall

Vessels that supply the thoracic wall consist mainly of posterior and anterior intercostal arteries, which pass around the wall between adjacent ribs in intercostal spaces. These arteries originate from the aorta and internal thoracic arteries, which in turn arise from the subclavian arteries in the root of the neck. Together, the intercostal arteries form a basket-like pattern of vascular supply around the thoracic wall.

Anterior intercostal arteries

The **anterior intercostal arteries** originate directly or indirectly as lateral branches from the internal thoracic arteries

Each **internal thoracic artery** arises as a major branch of the subclavian artery in the neck. It passes anteriorly over the cervical dome of the pleura and descends vertically through the superior thoracic aperture and along the deep aspect of the anterior thoracic wall. At approximately the level of the sixth intercostal space, it divides into two terminal branches: The **superior epigastric artery** and the **musculophrenic artery**

Anterior intercostal arteries that supply the upper six intercostal spaces arise as lateral branches from the internal thoracic artery, whereas those supplying the lower spaces arise from the musculophrenic artery.

Veins of the thoracic wall

Venous drainage from the thoracic wall generally parallels the pattern of arterial supply.
Centrally, the intercostal veins ultimately drain into the azygos system of veins or into internal thoracic veins, which connect with the brachiocephalic veins in the neck.

Often the upper posterior intercostal veins on the left side come together and form the **left superior intercostal vein**, which empties into the left brachiocephalic vein.
Similarly, the upper posterior intercostal veins on the right side may come together and form the **right superior intercostal vein**, which empties into the **azygos vein**.

The azygos system of veins consists of a series of longitudinal vessels on each side of the body that drain blood from the body wall and move it superiorly to empty into the superior vena cava. Blood from some of the thoracic viscera may also enter the system, and there are anastomotic connections with abdominal veins.

The longitudinal vessels may or may not be continuous and are connected to each other from side to side at various points throughout their course.

The azygos system of veins serves as an important anastomotic pathway capable of returning venous blood from the lower part of the body to the heart if the inferior vena cava is blocked.

The major veins in the system are the azygos vein, on the right; and the hemiazygos vein and the accessory hemiazygos vein, on the left.

Tributaries of the Azygos vein

- the right superior intercostal vein (a single vessel formed by the junction of the second, third, and fourth intercostal veins)

- fifth to eleventh right posterior intercostal veins

- the hemiazygos vein

- the accessory hemiazygos vein

- esophageal veins
- mediastinal veins
- pericardial veins
- right bronchial veins

Tributaries of the Hemiazygos vein

- the lowest four or five left posterior intercostal veins
- esophageal veins
- mediastinal veins

Accessory hemiazygos vein

- the fourth to eighth left posterior intercostal veins
- sometimes, the left bronchial veins