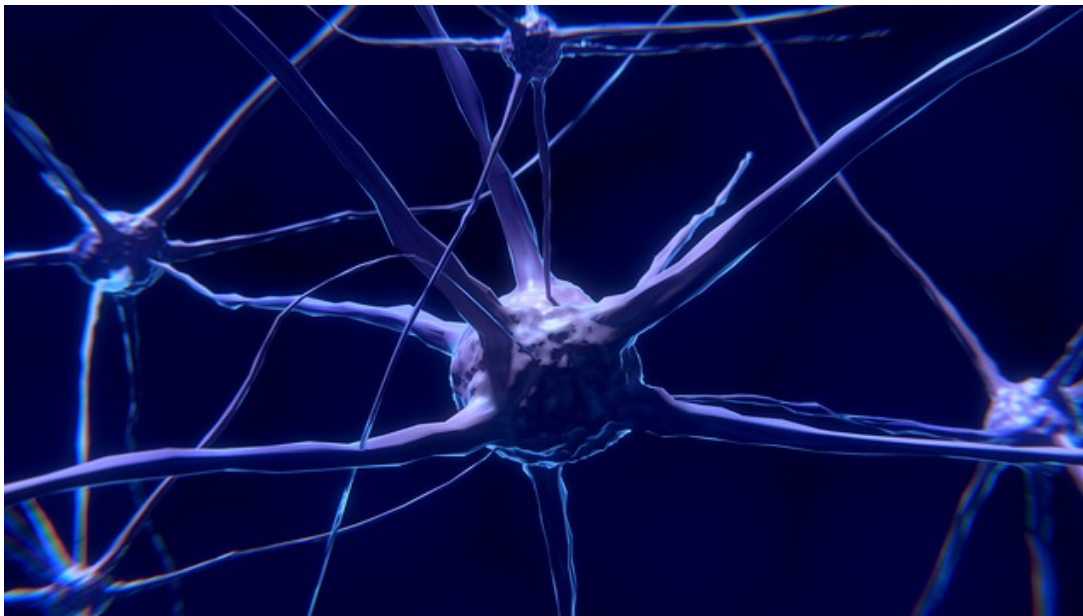


Thoracic Vessels and Nerves

[See online here](#)

The thorax consists of two major organs: the heart and lungs. These are supplied by an extensive network of blood vessels, nerves, and lymphatic vessels. The rib cage surrounds the thorax and provides protection to the delicate organs.



The Pulmonary Circulation

The pulmonary circulation consists of the **pulmonary trunk**, which extends from the **right ventricle** and divides into **right and left pulmonary arteries**. The **right pulmonary artery** is wider and longer than the left. Each artery enters the hilum of the lung, where it further divides into smaller branches.

The **left pulmonary artery** is attached to the **aorta** through the **ligamentum arteriosum**, a fibrous remnant of **ductus arteriosus**. If the **ductus arteriosus** remains patent after birth, this condition is known as **patent ductus arteriosus (PDA)**. In this case, the deoxygenated blood bypasses the **lung** and enters directly into the **aorta**. Babies with PDA are cyanosed and need an urgent medical or surgical intervention.

Pulmonary veins arise from each lobe of the lung. The veins from the right upper and middle lobe unite, and a total of **four pulmonary veins** enter the **left atrium**.

The Systemic Circulation

The systemic **blood vessels** present in the thorax include: **aorta**, **brachiocephalic**

trunk, brachiocephalic veins, superior and inferior vena cava, azygous vein and the **vertebral veins**. These are discussed individually, below.

The **aorta** is the largest artery in the human body. It is divided into three major parts: the **ascending aorta**, the **arch of aorta**, and the **descending aorta**. The part of the descending aorta within the thorax is known as **thoracic aorta**. The ascending aorta gives off **right and left coronary arteries**. It ascends up to the level of sternal angle.

The **arch of aorta** has three branches:

- **Brachiocephalic trunk** which divides into the **right carotid artery** and the **right subclavian artery**. The right subclavian artery may also arise from the descending aorta and lies posterior to the **esophagus**. This may lead to dysphagia (difficulty in swallowing).
- **Left carotid artery**
- **Left subclavian artery**

The **thoracic aorta** is situated in the posterior mediastinum. It crosses the diaphragm to become the **abdominal aorta**. In the thorax, it gives off **parietal and visceral branches**.

Parietal branches are:

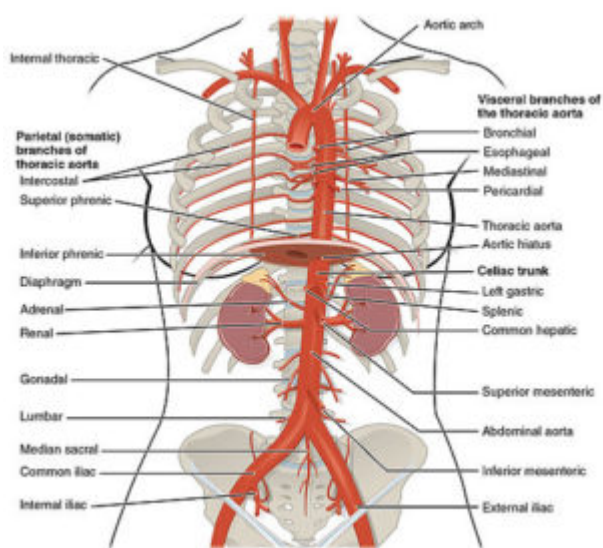


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- Posterior intercostal arteries
- Subcostal arteries
- Phrenic arteries

Visceral branches are:

- Bronchial
- Pericardial
- Mediastinal
- Esophageal

The **internal** and **external jugular vein**, the **vertebral vein** and the **subclavian vein**

drain into the **brachiocephalic vein** on each side. The right brachiocephalic vein has a vertical orientation while the left brachiocephalic vein lies obliquely. Both of them drain into the **superior vena cava**. The superior vena cava receives the **azygous vein** and ends in the **right atrium**. The inferior vena cava receives blood from the lower part of the body and empties into the **right atrium**.

The **azygous vein** receives blood from smaller veins on each side of the vertebral column, draining the back of the thorax. The **hemiazygous vein**, **accessory vein** and a number of **posterior intercostal veins** also drain into the azygous vein, as shown in the figure below.

The vertebral venous system comprises **venous plexuses**, which drain the back and the components of the vertebral canal. These are valveless veins, which communicate with **intracranial veins** above and **portal veins** below. The **blood** can flow in either direction and is the main reason for **tumor** spread.

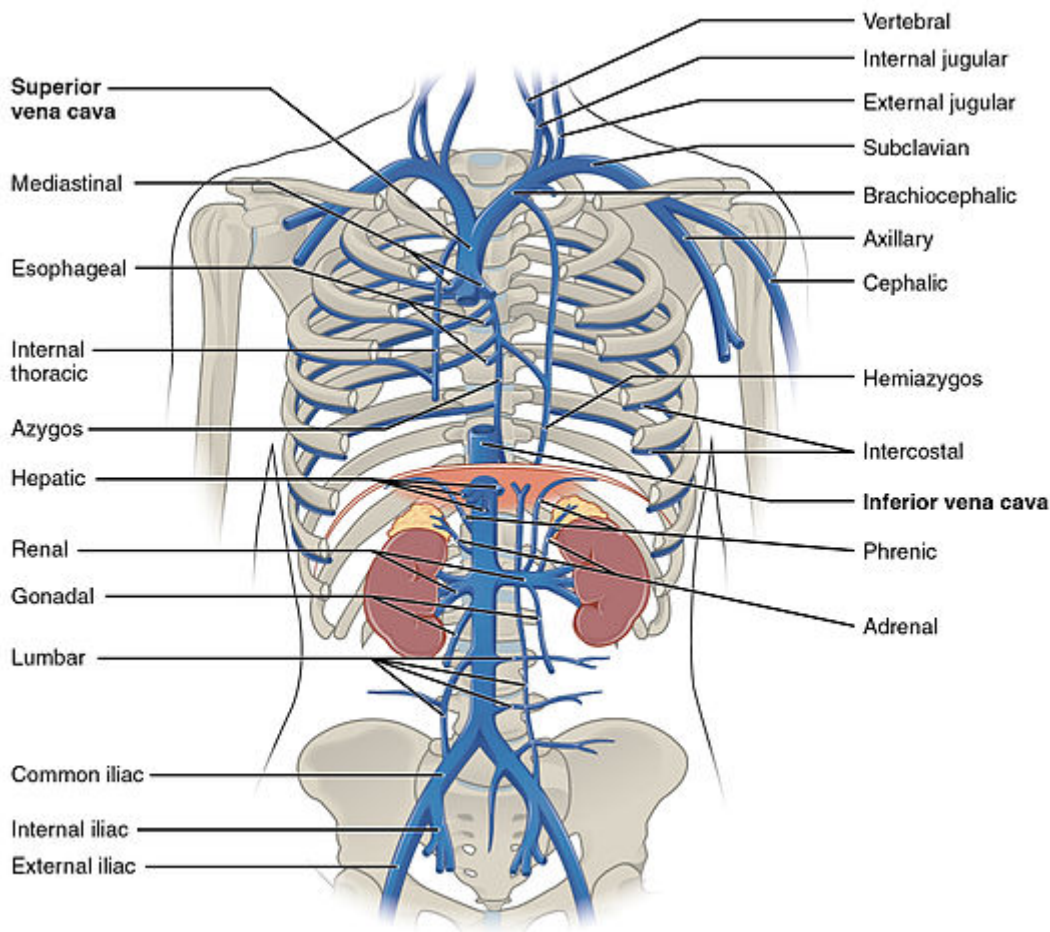


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Phrenic Nerve

The phrenic nerve arises from **cervical spinal nerves C3-C5**, and is a paired structure. **The phrenic nerves** innervate the **diaphragm**. The phrenic nerves contain:

- **Motor fibers** to the diaphragm
- **Pain fibers** innervating the pericardium and pleura in the thorax

- **Sympathetic vasomotor fibers.**

Vagus Nerve

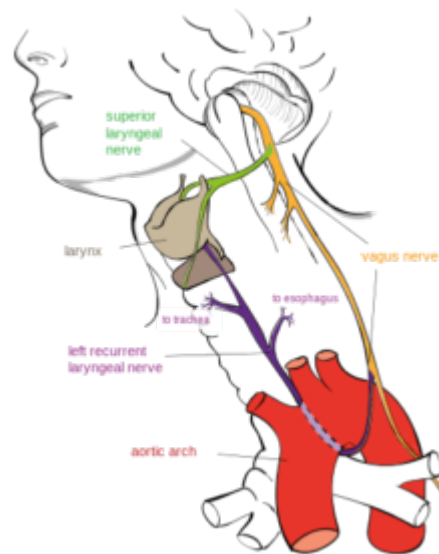


Image: "Vagus nerve and left recurrent laryngeal branch" by Jkwchui - Based on drawing by Truth-seeker2004. License: [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)

The vagus nerve is a paired structure. On each side, the vagus nerve descends through the neck into the thorax. There, they form the **pulmonary** and **esophageal plexuses**. These consist of an **anterior** and a **posterior trunk**. Each vagus nerve gives off a **recurrent laryngeal branch**.

Fiber types are:

- Somatic afferents
- Somatic efferents
- General visceral efferents
- Special visceral efferents

The **left recurrent laryngeal nerve** hooks round the arch of aorta as shown in the figure beside. In the case of a mediastinal tumor or an **aortic aneurysm**, the left recurrent laryngeal nerve is at risk for damage, which may result in **hoarseness**.

The vagus nerve consists of:

- **Parasympathetic fibers**
- **Sensory fibers** responsible for cardiovascular and pulmonary reflexes
- **Motor fibers** to the pharynx and **larynx**.

Sympathetic Trunk

The sympathetic trunks enter the thorax and lie anterior to the neck of the ribs.

Stellate ganglia are formed when the ganglion of the thoracic trunk, fuses with the inferior cervical ganglion. The sympathetic trunks traverse the **diaphragm**, to enter the abdomen. The trunk communicates with the thoracic ventral rami by rami communicantes, which send **preganglionic and postganglionic fibers**.

Preganglionic fibers from segments T1-T6 of the spinal cord supply the [heart](#), **coronary vessels**, and **bronchial tree**. Other main visceral branches are the three **splanchnic nerves**. The sympathetic trunks and their branches contain **pain fibers** for the thoracic and abdominal viscera and blood vessels.

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Notes