

SUPERIOR MEDIASTINUM / NERVES AND ARTERIES OF MEDIASTINUM

Thymus: Anterior most structure in posterior mediastinum. Atrophied in adults but prominent in children.

Ligamentum Arteriosum: Connective tissue connecting the Aorta to the Pulmonary Trunk, helping to hold both structures in place. Left side of heart, superior to the Pulmonary Trunk.

- Developmentally, it is the former Ductus Arteriosus (Left 6th Aortic Arch) in the embryonic heart.

The Great Veins: Anterior to the great arteries, in the superior mediastinum.

- **Superior Vena Cava:** Formed by the combining of the right brachiocephalic vein and left brachiocephalic vein.
 - Combination of Right and Left Brachiocephalic Vein occurs at the articulation of the 1st rib.
- **Right Brachiocephalic Vein:** Right branch of Superior Vena Cava.
 - **Right Internal Jugular Vein:** Converges on the Right Brachiocephalic Vein.
 - **Right Subclavian Vein:** Converges on the Right Brachiocephalic Vein, and runs anterior to the Subclavian Artery.
- **Left Brachiocephalic Vein:** Left branch of Superior Vena Cava.
 - **Left Internal Jugular Vein:** Converges into the Left Brachiocephalic just lateral to the Common Carotid Artery.
 - **Left Subclavian Vein:** Converges into the Left Brachiocephalic Vein and runs anterior to the Subclavian Artery.

The Great Arteries: Posterior to the great veins.

- **Aorta:** Ascending Aorta curves posteriorly and a bit to the left. It has three branches:
 - **Brachiocephalic Trunk:** Right-most branch off of the Aortic Arch.
 - **Right Subclavian Artery:** Branches off the brachiocephalic trunk.
 - **Left Common Carotid Artery:** The center of the three branches off the Aortic Arch.
 - **Left Subclavian Artery:** The left-most branch off the Aortic Arch.

Internal Thoracic Arteries: Continue off of each of the Subclavian Arteries. They move down the Thorax into the abdomen, lateral to the Sternum.

Phrenic Nerves: Both originate from C3, C4, C5. Both Phrenic Nerves are more lateral than the Vagus nerves.

- **Right Phrenic Nerve:**
 - Runs laterally along the Right Internal Jugular Vein.
 - Continues lateral to the Superior Vena Cava.
 - Then runs along the Fibrous Pericardium.
 - Finally into the diaphragm.
- **Left Phrenic Nerve:**
 - Runs laterally along the Left Internal Jugular Vein.
 - Anterior to the Arch of the Aorta
 - Then along the Fibrous Pericardium
 - Into the diaphragm.
- Both Phrenic Nerves:
 - They run *anterior* to the roots of the lungs

Vagus Nerves: Both Vagus Nerves are more medial than the Phrenic Nerves.

- **Left Vagus Nerve:**
 - Runs lateral to the Aortic Arch.
 - Gives off a branch for the Left Recurrent Pharyngeal Nerve.
 - Runs anterior to the subclavian, then posterior to vena cava and brachiocephalic veins.
 - Continues medially and runs toward the diaphragm lateral to the Esophagus. In the thorax, it tends to go to the anterior portion of the esophagus.
- **Right Vagus Nerve:**
 - Runs lateral to the Right Common Carotid Artery (medial to Phrenic Nerve).
 - Gives off a branch for the Right Recurrent Laryngeal Nerve.
 - In the thorax, it tends to go to the posterior part of the esophagus.
- Both Vagus Nerves:
 - Run *posterior* to the roots of the lungs.
 - Both give off branches for the **Pulmonary Plexus**, **Cardiac Plexus**, and **Esophageal Plexus**.
 - Right and left fibers mix to form the esophageal plexus.

Recurrent Laryngeal Nerves: Both branch off the Vagus nerves and go back superiorly toward the larynx.

- **Left Recurrent Laryngeal Nerve:** Off of the Left Vagus.
 - Runs back up, lateral to the Trachea, into the Larynx.
 - Is different in position than the Right Laryngeal, due to the degeneration of the right 6th Aortic Arch (see below),
- **Right Recurrent Laryngeal Nerve:** Off of the right vagus.
 - Passes back up posterior to the Right Subclavian.
 - Runs back up, lateral to the Trachea, to the Larynx.
- CLINICAL: Carcinoma of the Lungs can affect the Recurrent Pharyngeals, causing a hoarse voice. They must be watched in surgery.

Pericardiophrenic Artery and Vein: Run on either side of the Phrenic nerve all along its path in the Thorax.

Cardiac Plexus: Grouping of Vagal nerves innervating the heart.

Pulmonary Plexus: Grouping of Vagal nerves innervating the lungs.

Aortic Arches: The development of the Aortic Arches effected the positioning of the Right and Left Recurrent Laryngeal nerves. They are *not* symmetric with respect to each other.

- There are six Aortic Arches. The 1st, 2nd, and 5th degenerate, while the 3rd, 4th, and 6th remain behind.
- Initially the right and left laryngeal nerves pass inferior to the 6th Aortic arch, on both sides.
- Right 6th Aortic Arch degenerates! Consequently, the right 6th Laryngeal Nerve catches onto the 4th arch on the right side, which subsequently becomes the Right Subclavian Artery.
- The Left 6th Aortic Arch sticks around in the embryonic heart, as the **Ductus Arteriosus**, a failsafe shunt in case the foramen ovale passage fails.
 - After birth the Ductus Arteriosus becomes the Ligamentum Arteriosum.

Bifurcation of the Trachea:

- **Carina:** The cartilage that sticks out at the bifurcation.
- **Right Bronchus:** Fatter and shorter than the left bronchus. It branches off at a straighter angle, so things tend to lodge in the right Bronchus as opposed to the left.
- **Left Bronchus:** Branches off at a sharper angle than the right bronchus.\

Esophagus: Displaced to the right in the Thoracic Cavity. It returns to the left after it crosses the diaphragm and goes into the abdomen.

- **Esophageal Plexus:** Formed of Vagus nerve, innervates the esophagus.
 - When the plexus enters the abdomen, it coalesces back into two Vagus Nerves.

Thoracic Duct: The largest lymph vessel in the body.

- To the right of the Thoracic Vertebra, posterior to the esophagus.
- It empties into Left Brachiocephalic and Internal Jugular veins.
- This duct drains the lower half of the body and the left side of the upper body.
- **Right Subclavian Lymphatic Duct** empties the right half of the upper body.

Azygos Vein: Posterior to Esophagus, to the right of the Thoracic Duct.

- It is an alternate route for the return of venous blood to the heart, rather than through the inferior vena cava.
- Intercostal veins empty into the azygos system, from both left and right (via Hemiazygous system) sides.
- Azygos vein connects to the inferior vena cava at the level of the kidneys.

Hemiazygos Vein System: Posterior to the descending Aorta on the left side of the vertebral column.

- It drains the left intercostal veins.
- It drains into the Azygos Vein.

Sympathetic Chain Ganglia: Lateral to the spinal column, from Cervical to Sacral.

- **Intercostal Nerves:** Come off of the Sympathetic Chain Ganglia in the thorax.
- Splanchnic Nerves:
 - **Greater Splanchnic Nerve:** Comes off of the sympathetic chain at T5 to T9.
 - **Lesser Splanchnic Nerve:** Comes off of the sympathetic chain at T10 and T11.
 - **Least Splanchnic Nerve:** Comes off of the sympathetic chain at T12.
- Autonomic Nervous System: Location of cell bodies
 - **Sympathetic Nerves:** The cell body is close to the spinal column. The synapse between pre-ganglionic and post-ganglionic nerves occurs in the Chain Ganglia near the spinal chord.
 - **Parasympathetic Nerves:** The cell body is close to the target organ. The synapse occurs near the target organ, with short axons innervating the target.
- **Rami Communicans:** The junctions where the pre-ganglionic nerves synapse with the post-ganglionic nerves, in the sympathetic chain ganglia.