

Anatomy

Faculty of Medicine - JU2017

Sheet

Slides

Number

9

Done by:

Saba Al-Fayoumi & Lujain Hamdan.

Corrected by:

ABDUL AZIZ ALSHAMALI

Doctor

Mahir Hadidi

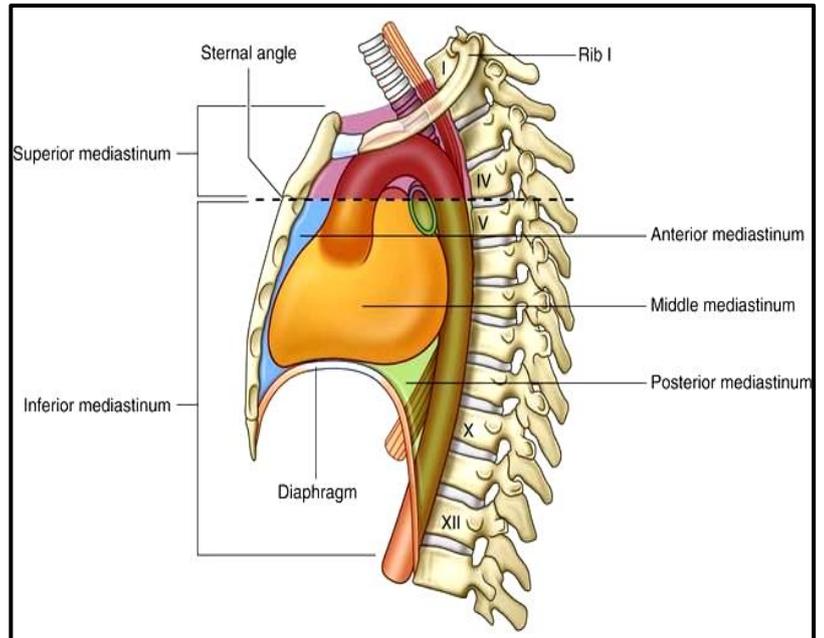
MEDIASTINUM

1. Is an interpleural space (area between the pleural sacs), located in the centre of the thorax and is bounded :

- Anteriorly by the sternum, Posteriorly by All the Thoracic vertebrae (12).
- Superiorly by Thoracic inlet & Inferiorly by Diaphragm.
- Laterally by the pleural cavities.

2. It is divided by an imaginary line extending from the sternal angle to intervertebral disks between T4/T5 into :

- ✓ Superior Mediastinum above the pericardium.
- ✓ Inferior Mediastinum : contains the pericardium, which divides the inferior mediastinum into three subdivisions: **anterior, middle, and posterior**.



☆☆ **Thoracic Vertebrae** are divided into three Fourths : upper, middle, and lower.

- A. Upper 4 Thoracic Vertebrae are the posterior border of the superior mediastinum.
- B. Middle 4 Thoracic Vertebrae are the posterior border of the middle mediastinum.
- C. Lower 8 Thoracic Vertebrae are part of the posterior border of posterior mediastinum.

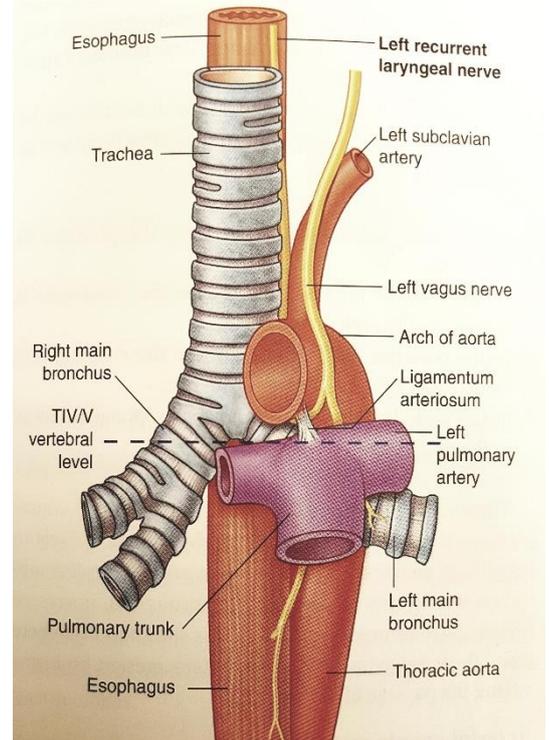
☆☆ **Aorta** is divided into: ascending aorta , arch of aorta, descending aorta.

Superior Mediastinum

- ❖ Bounded Superiorly by the Thoracic Inlet, Inferiorly by the imaginary line, which is running from the sternal angle between the T4/T5 intervertebral disks
- ❖ Bounded Anteriorly by manubrium, Posteriorly by Upper 4 Thoracic Vertebrae.
- ❖ It contains **single structures and paired structures** :

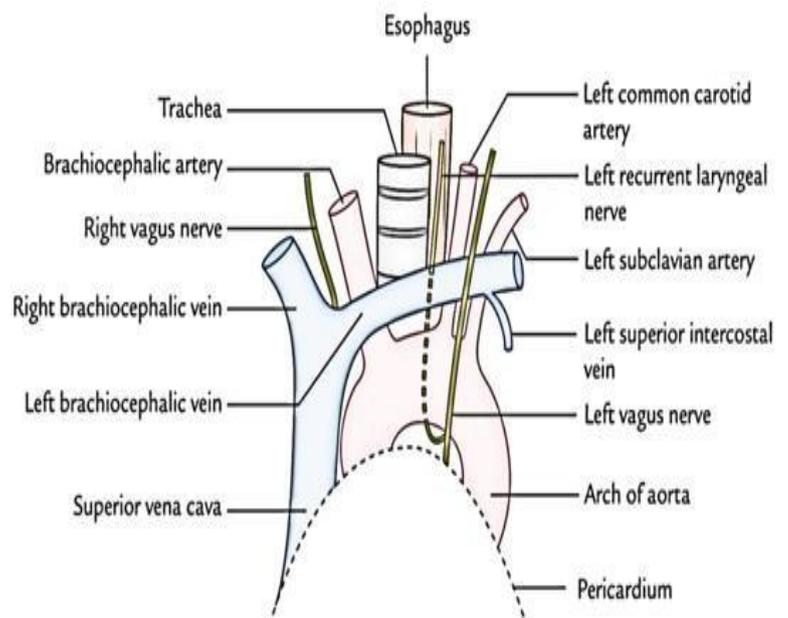
1. **Central Single Structures** : from anterior to posterior :

- A. **Thymus Gland** : a lymphoid organ in the children, whereas in adults it is Remnants of the thymus gland.
- B. **Superior Vena Cava (SVC)** : formed by the union of left and right brachiocephalic veins.
- C. **Arch of Aorta** : starts and ends at the level of sternal angle.
- D. **Thoracic Duct** : drains $\frac{3}{4}$ of the body.
- E. **Trachea** : a part of the respiratory system.
☆ begins at level of C6 as a continuation of Larynx.
- F. **Left Recurrent Laryngeal Nerve** : turns around the arch of aorta.
- G. **Esophagus** : a part of the GI tract. ☆ begins at level of C6, as a continuation of pharynx.



2. **Paired Structures** :

- A. **Three Branches of the Arch of Aorta** : Left Common Carotid Artery, Brachiocephalic Trunk, and Left Subclavian Artery.
- B. **Right and Left Brachiocephalic Veins**.
- C. **Right and Left Vagus nerves**.
- D. **Right and Left Phrenic nerves** : innervate the diaphragm.
- E. **Right and Left Sympathetic Trunks** : at the both sides of the vertebral column.



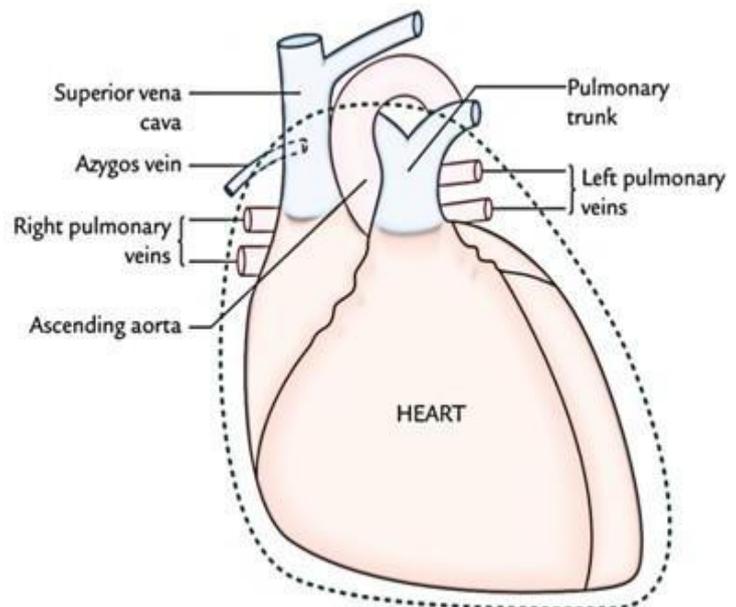
- Actually, there are Right and Left Recurrent Laryngeal Nerves (paired structure). But **ONLY** the **LEFT** that passes the superior mediastinum. **The RIGHT one turns around the Right Subclavian Artery.**

Anterior Mediastinum

- ❖ Bounded Anteriorly by the body of Sternum, Posteriorly by the Pericardium.
- ❖ Bounded Superiorly by the Imaginary line, Inferiorly by the diaphragm.
- ❖ Contains thymus gland or the remnants of the thymus gland, lymph nodes, fat, and connective tissue.

Middle Mediastinum

- ❖ Bounded **Superiorly** by **The Imaginary Line** ,**Inferiorly** by **The Central Tendon of Diaphragm**.
- ❖ Bounded **Anteriorly** by **The Anterior Mediastinum**, **Posteriorly** by **The Middle 4 Thoracic Vertebrae (T5, T6, T7, T8)**.
- ❖ Lies between the right and left pleural cavities.
- ❖ Contains the Heart, Pericardium, Phrenic nerves, Roots of the large vessels (Ascending Aorta, Pulmonary arteries and veins, and Vena Cavae) .



1) Phrenic nerves :

- I. Two nerves moving at the both sides of the heart to innervate the diaphragm muscle and the pericardium.
- II. The only motor nerve of Diaphragm, but it's a sensory nerve for the pericardium from the outer side of peritoneum (= Serosa).
- III. Originates from C3, C4, C5 at the root of neck (*Mainly C4*). Sharing C5 with brachial plexus.

2) **The Ascending Aorta** : sends blood to the body.

3) **Superior Vena cava** : receives blood from the parts of body which is above the diaphragm through left & right brachiocephalic trunks (veins).

☞ Superior Vena Cava = Right Brachiocephalic Vein + Left Brachiocephalic Vein.

☞ Each Brachiocephalic trunk consists of : subclavian vein + internal jugular vein

4) **Pulmonary Trunk** gives pulmonary arteries which carry deoxygenated blood from the heart to the lungs, because the pulmonary trunk is originated from the right ventricle.

5) **Pericardium :**

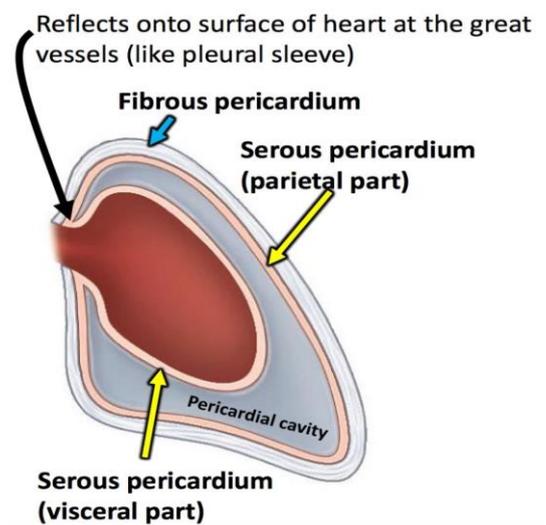
- A double-walled fibroserous conical-shaped sac that encloses the heart and the roots of the large vessels and occupies the middle mediastinum.
- Composed of the fibrous pericardium and serous pericardium.
- Receives blood from the pericardiophrenic, bronchial, and esophageal arteries.
- Innervated by vasomotor and sensory fibers from the phrenic and vagus nerves and the sympathetic trunks.

A. **Fibrous Pericardium :**

- ✓ The outer layer of pericardium, Conical-shaped fibrous sac.
- ✓ A strong, dense, fibrous layer prevents the overextension of the heart.
- ✓ The Apex : attached to the roots of the great vessels

Note: Adventitia = the outer layer of the vessels.

- ✓ The Base : attached to central tendon of the diaphragm.

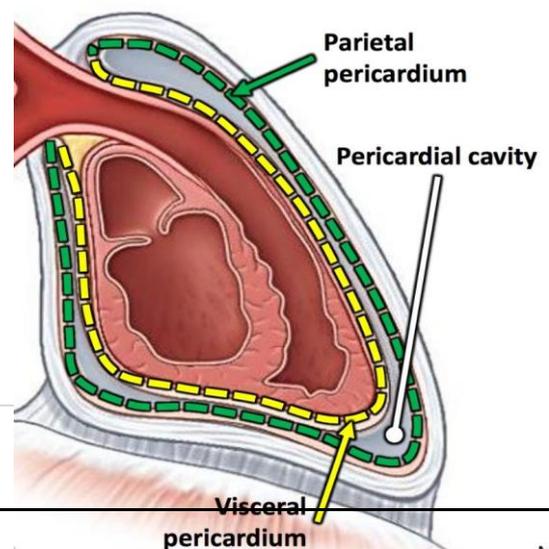


B. **Serous Pericardium :**

- ✓ The inner layer of pericardium, A continuous Serous Sac. It's like pleura.
- ✓ The heart starts as Cardiac Bud and a Serous Sac is found in front of it. The heart starts to invaginate the sac

✓ **Consists of :**

- a) The Parietal Layer : lines the inner surface of the fibrous pericardium.
- b) The Visceral Layer : covers the heart (epicardium) the outer layer of heart wall and the roots of great vessels.



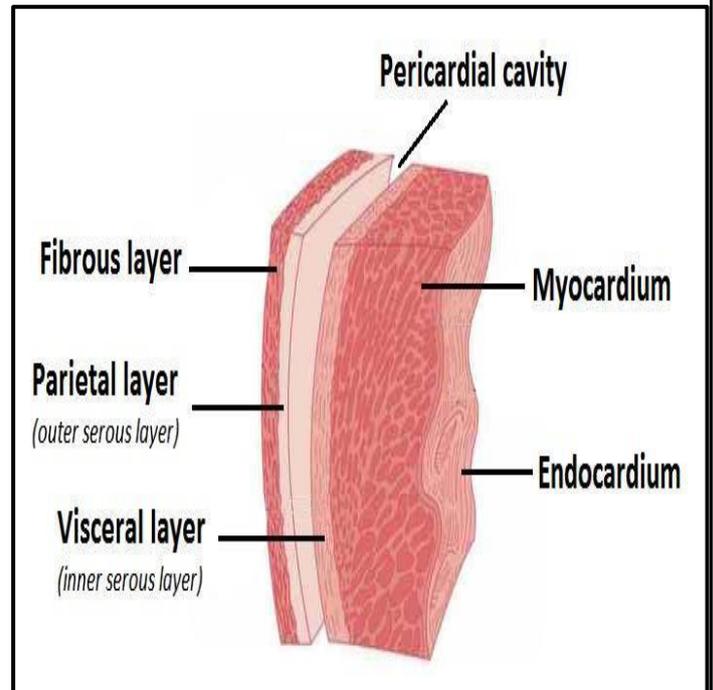
c) Pericardial Cavity :

- The **space** between **visceral** Pericardium and **Parietal** Pericardium.
- A potential space , has no air and no pressure providing soundless and frictionless movement for the heart.
- If there was blood or air in this cavity, it would cause pus or Pyemic in the pericardium. (تقيح أو إنتان في الدم).

6) The Wall of the Heart :

- a. Endocardium : the inner layer of the wall, the *weakest layer*, has trabeculae carnea.
- b. Myocardium : the *largest and toughest layer*.
- c. Epicardium : the outer layer of the wall, yellow in colour, part of the visceral pericardium (loose connective tissue + fat).

☆The heart will be discussed in the following sheet.



Clinical cases

A) Tonsillitis

- A patient with Tonsillitis, eating or drinking leads to swallow a lot of bacteria, not all of them can be degenerated in the stomach. Some of these bacteria will be absorbed into the blood. With circulation, the bacteria transport to the heart, causing injury in the endocardium, and valves are the first structures that will be involved in this injury.
- It may cause Romatic Fever.
- If it happens more than 3 times / year, that is indication for removing them.
- It may cause Endocarditis.

B) Endocarditis

- Infection of the endocardium of the heart, most commonly involving the heart valves causes Adhesion of the cusps of the heart, leaving only a small ostium.
- The Adhesion in the valve causes Stenosis : 70 cc of blood only pass the valve, so 30 cc stay in the atrium, every systole this will occur causing the blood to return back.
- The valve is composed of two or three cusps that close or open together. In normal heart, during contraction, the cusps close together to prevent returning back of the blood to the heart. 100 cc blood should pass the valve.
- In the right side of the heart, there is a tricuspid valve between the atrium and the ventricle, if Adhesion occurs between cusps, it leads to Stenosis in the valve : only 70 cc of blood pass the valve and 30 cc of the blood return back to Superior Vena Cava, then to the internal jugular vein, and this repeats in every systole.
- In the left side of the heart, there is a bicuspid valve (mitral valve), the same may happen, but the blood return to the lungs, that causes a cough with blood : Hemoptysis.
- In the left ventricle, there is an aortic valve, the same will happen, 30 cc + 30 cc + 30 cc this will continue, causing enlargement in the left ventricle, leads the muscle of the left ventricle to Hypertrophy, that leads to Left Heart Failure.
- Adhesion or Stenosis of valves can be medicated by : drugs, opening the valve by laser, or artificial valve.

C) Pericarditis

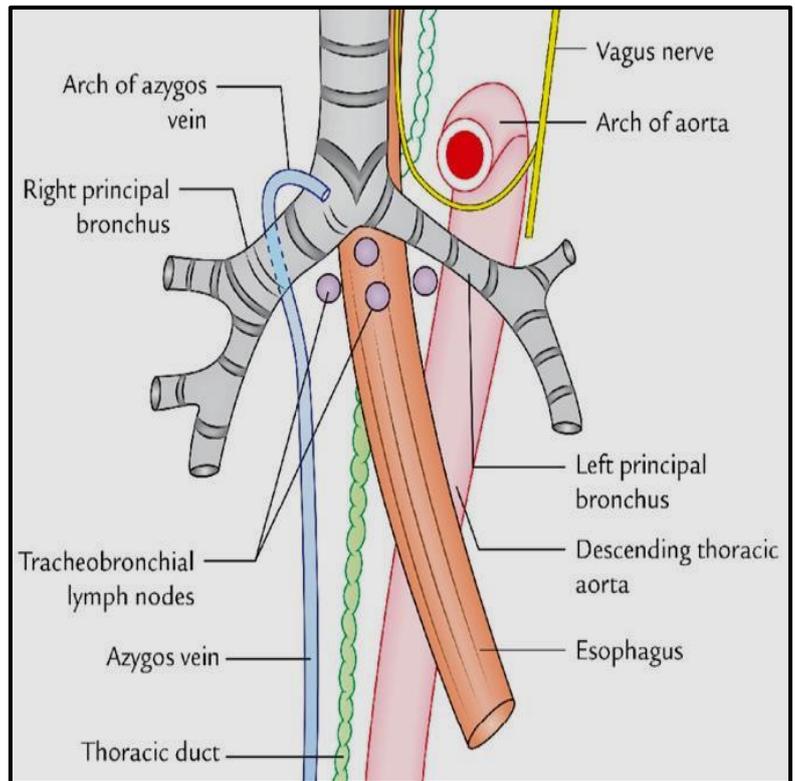
- ✓ An inflammation of the Visceral Pericardium, due to reaching of bacteria to this layer.
- ✓ Results in fluid accumulation in the potential cavity, thickening in the left ventricle wall, because with contraction and relaxation, there is a rub or friction with the fluid.
- ✓ Also causes the pericardial murmur or pericardial friction rub (the surfaces of the pericardium become rough, and the resulting friction sounds like the rustle of silk, which can be heard on auscultation).

Posterior Mediastinum

- ❖ Bounded Anteriorly by pericardium, Posteriorly by the Lower 8 Thoracic Vertebrae.
- ❖ Bounded Superiorly by the Imaginary Line, Inferiorly by The sloping part of the Diaphragm.
- ❖ Lies between the mediastinal pleurae.
- ❖ Contains Esophagus, Thoracic Aorta, Azygous and hemiazygos veins, Thoracic duct, Vagus Nerves, Sympathetic trunk, and splanchnic nerves.

1) Esophagus :

- I. A part of GI as a tube with 25 cm long = 10 inches.
 - GI tract contains glands and tubes. Tubes extend from mouth to anus.
 - Entire GI tube, except for stomach, is formed by : Mucosa, Submucosa, Muscularis, Serosa.
- II. Starts at the level of C6 by the end of pharynx.
- III. Ends at the level of T10 by passing through diaphragm as it reaches the stomach at the Cardiac Opening.
- IV. **Passes in 3 regions : Cervical, Thorax, Abdomen.** The Abdominal part of it is the shortest, so it's divided into Cervical, Thoracic, and Abdominal Esophagus.
- V. Its nerve supply, blood supply, venous draining, and lymphatic drainage depend on the region that esophagus is passing through.
- VI. **During swallowing, a delay in the pathway of food and fluids occurs :**
 - 1) At the beginning of esophagus
 - 2) In the esophagus behind aortic arch and left bronchus.
 - 3) At diaphragm. »» As they are common sites of cancer.



VII. Divided into 3 parts :

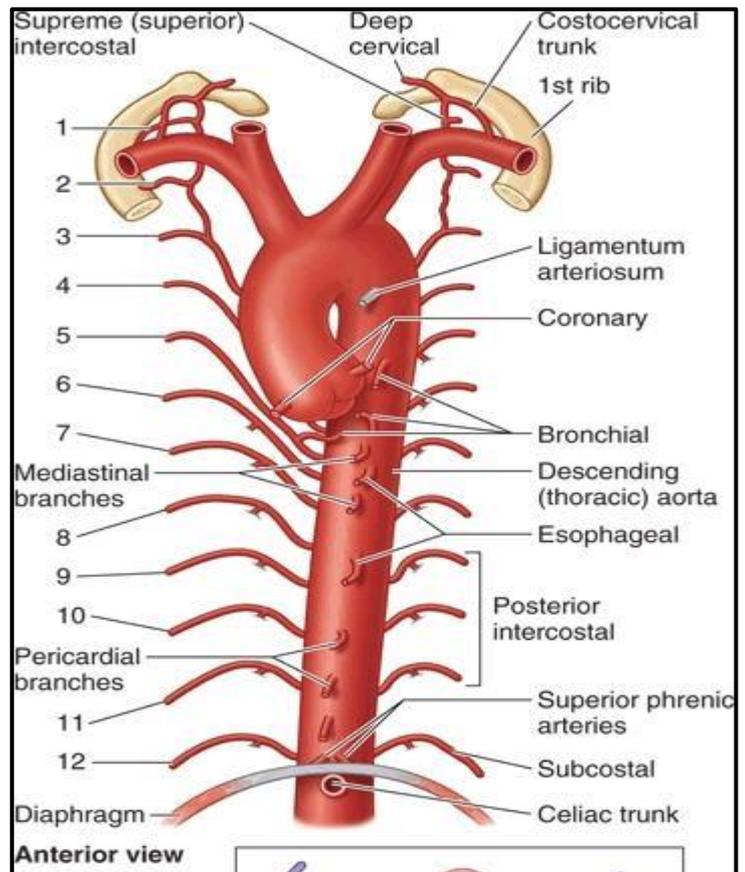
- Upper third : Voluntary, in which we can retract the food.
- Middle third : Mixed
- Lower third : Involuntary, in which we can't retract the food.

VIII. Muscular layer (Musclosa) is divided into :

- inner circular layer : to do Vermiculation "حركة دودية"
- outer longitudinal layer : to form Peristaltic Waves.

2) Thoracic Aorta :

- The direct continuation of arch of the aorta.
- Also, it's called Descending Aorta.
- Begins at the level of T4/T5 (sternal angle) and ends at the level of T12.
- Passes within diaphragm through Aortic Opening.
- Descends on the left side of the vertebral column, then Anteriorly to the vertebral column to enter the aortic hiatus of the diaphragm.
- **Its parietal branches are :**



■ Lower 9 pairs of posterior intercostal arteries, which supply the wall of thorax.

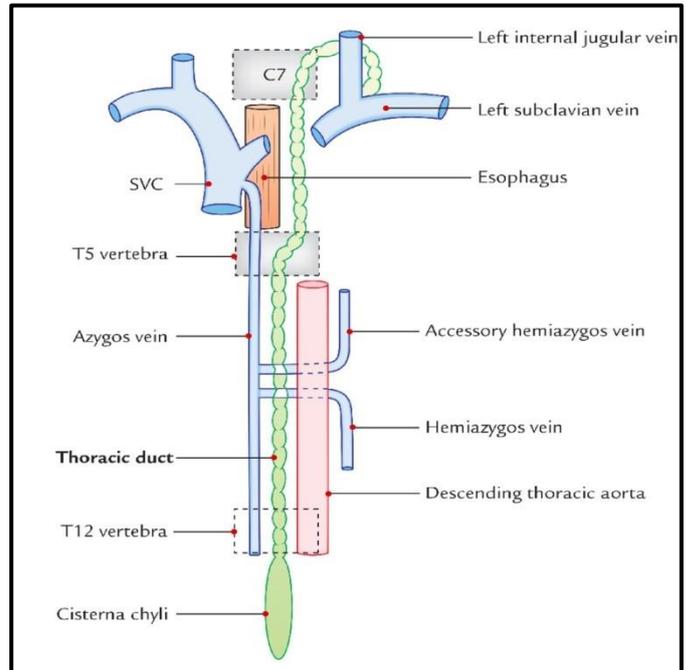
■ 1 pair of subcostal arteries.

■ 2 superior phrenic arteries : supply diaphragm.

- **Its visceral branches are :** Pericardial (supply pericardium), Bronchial (supply lungs), Esophageal (supply esophagus at the thoracic part).

3) Thoracic Duct :

- ✓ It Starts anteriorly to L1, below the liver, at Cisterna Chyli in the Abdomen.
- ✓ It passes within diaphragm through Aortic Opening to posterior mediastinum between aorta and azygos vein.
- ✓ At level of T5, it crosses obliquely from right to left behind aorta and esophagus to reach the Superior Mediastinum.
- ✓ It arches Anteriorly to the left pleural and lung, then downward to end at the angle between left internal jugular vein and subclavian vein.
- ✓ It's drained by left subclavian vein and left internal jugular vein.
- ✓ It's beaded and has numerous valves.
- ✓ It's The largest lymphatic trunk in the body.
- ✓ It Drains $\frac{3}{4}$ of the body : the Lower Limbs, Pelvis, Abdomen, Left Thorax, Left Half of Head and Neck, Left Upper Limb.



☆☆ **Lymph** is the waste products which are secreted by cells into the intercellular space and drained by small lymphatic vessels.

☆☆ **Liver** is the largest lymphatic organ, which secretes about half of lymph in the body.

☆☆ **The Right Lymphatic Trunk drains** : Right Upper Limb, Right Part of the Thorax, and Right Half of Head and Neck.

4) Azygos System :

- a. Drains the wall of the abdomen through lumbar veins (4 or 5).
- b. Drains the wall of the thorax through intercostal veins.
- c. Lumbar veins form an union with ascending lumbar vein which passes through the diaphragm, then it is united with subcostal vein.
- d. **In the right side of the body** :
 - ✓ The Right Subcostal Vein forms an union with the other intercostal veins (except 1st intercostal vein) to form Azygos Vein.

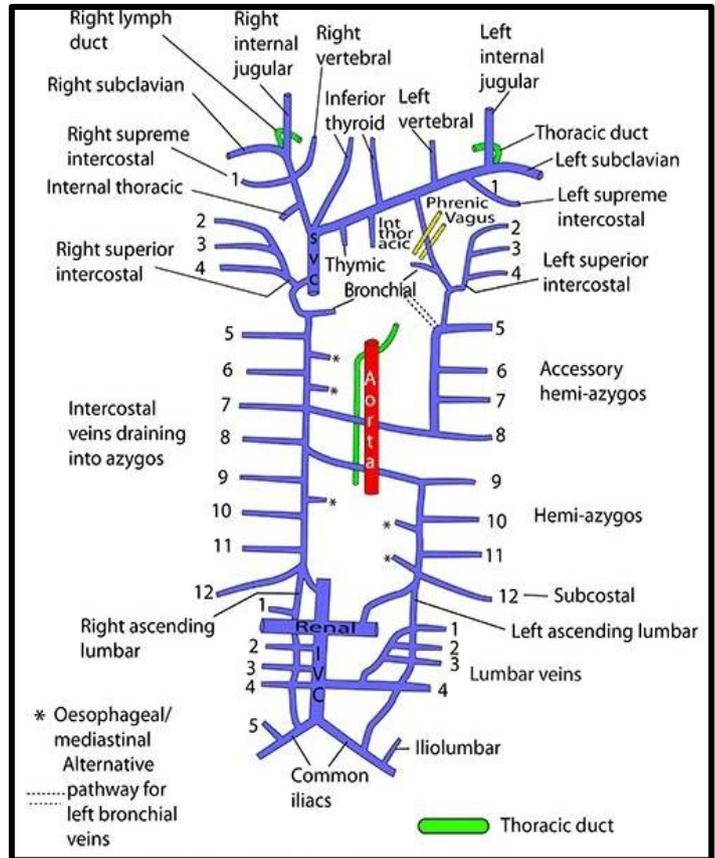
e. In the left side of the body :

- ✓ The Left Subcostal Vein forms an union with 9th, 10th, 11th intercostal veins to form Inferior Hemiazygos Vein.
- ✓ 2nd, 3rd, 4th are united to form The Left Superior Intercostal vein, which is drained by The Left Brachiocephalic Vein.
- ✓ The Superior Hemiazygos vein drains 5th, 6th, 7th, 8th intercostal veins.
- ✓ Superior & Inferior Hemiazygos Veins drain into the Azygos Vein.

f. Azygos vein drains into Superior Vena Cava.

☆ **Azygos means deep, Chyli means lymph.**

☆ Four structures pass from Thorax to Abdomen through diaphragm by only three openings, **as the structures are : Inferior Vena Cava, Esophagus, Aorta, and Thoracic Duct.**



☆☆☆ Here is (below) a cross section of the superior mediastinum ☆☆☆

