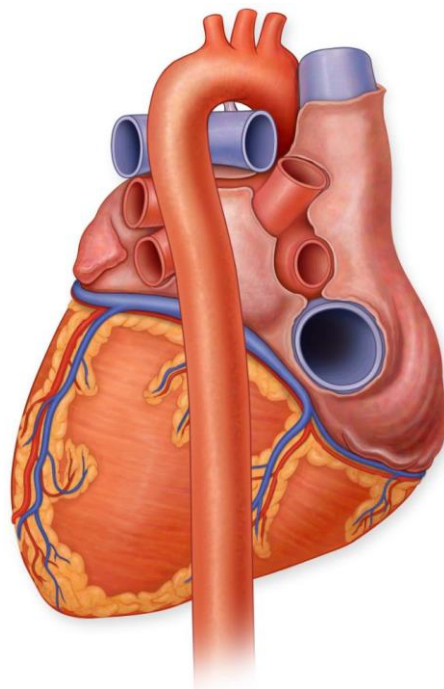
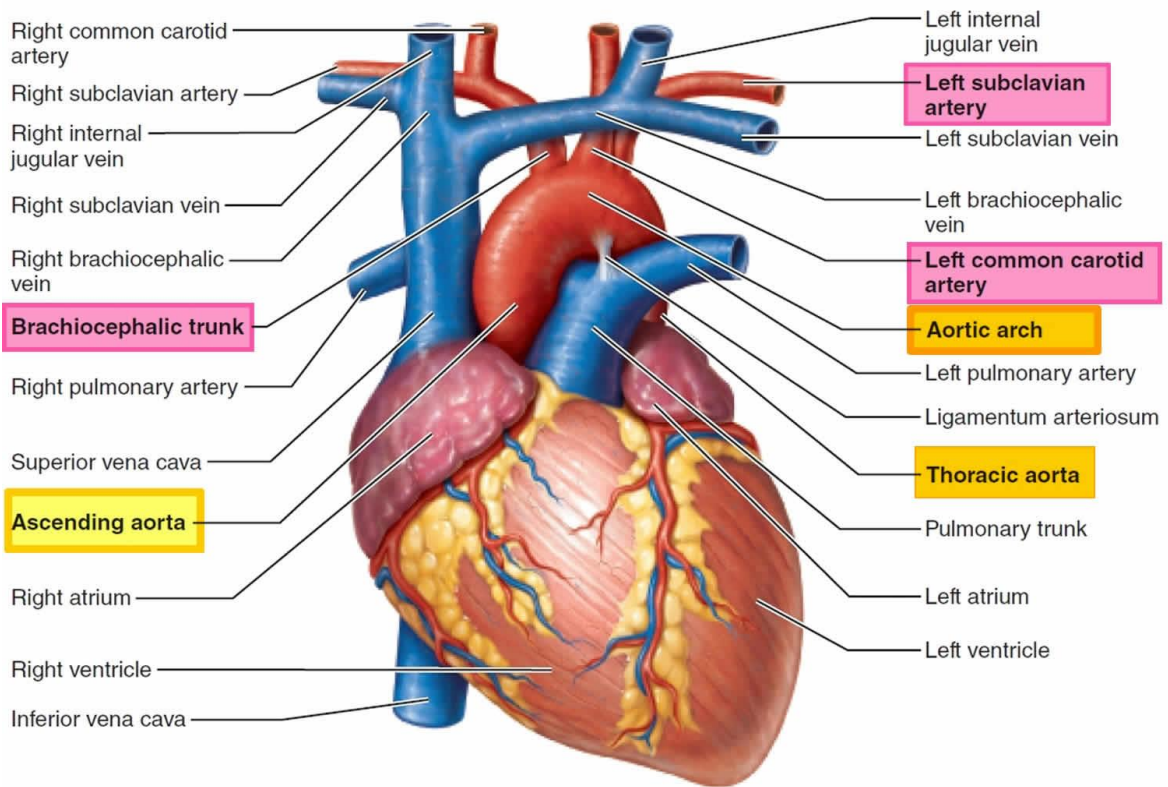


Large Arteries of the Thorax



I) Thoracic Aorta

- ★ The aorta is the largest artery in the body.
- ★ It carries oxygenated blood from the heart to the whole body.
- ★ It runs first in the thorax then in the abdomen.
- ★ Its **thoracic part** is divided into ascending aorta, arch of aorta and descending aorta.

A) Ascending Aorta

- ★ A **short wide** artery.
- ★ It is **5 cm** long with its whole length lies **inside the fibrous pericardium**.
- ★ It **begins** at the **aortic orifice** of the left ventricle behind the left border of the sternum opposite the **3rd left intercostal space**.
- ★ It **runs** obliquely upwards, forwards and to the right to **end** behind the **2nd right sternocostal junction** by becoming arch of aorta.

★ Relations:

1-Anteriorly:

- **Below:** it is overlapped by the infundibulum of the right ventricle, root of the pulmonary trunk and right auricle.
- **Above:** The pericardium separating it from the right pleura and lung.

2-Posteriorly:

- **Below,** the transverse sinus of pericardium separates it from the 2 atria (mainly the left).
- **Above,** the right pulmonary artery separates it from the right principal bronchus.

3-On its right side:

- **Below:** Right atrium and its auricle .

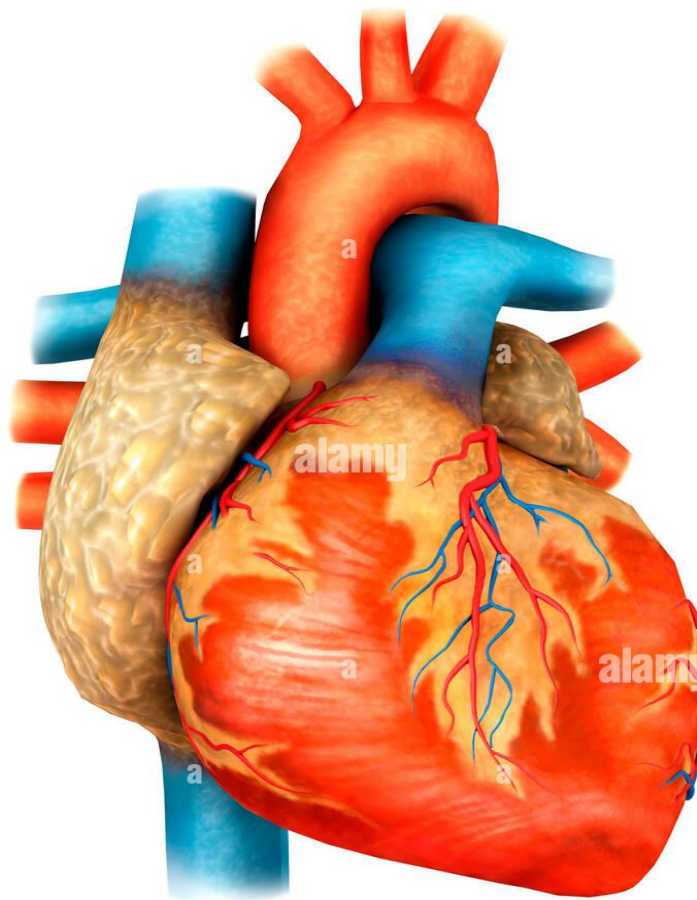
- **Above: S.V.C.**

4-On its left side:

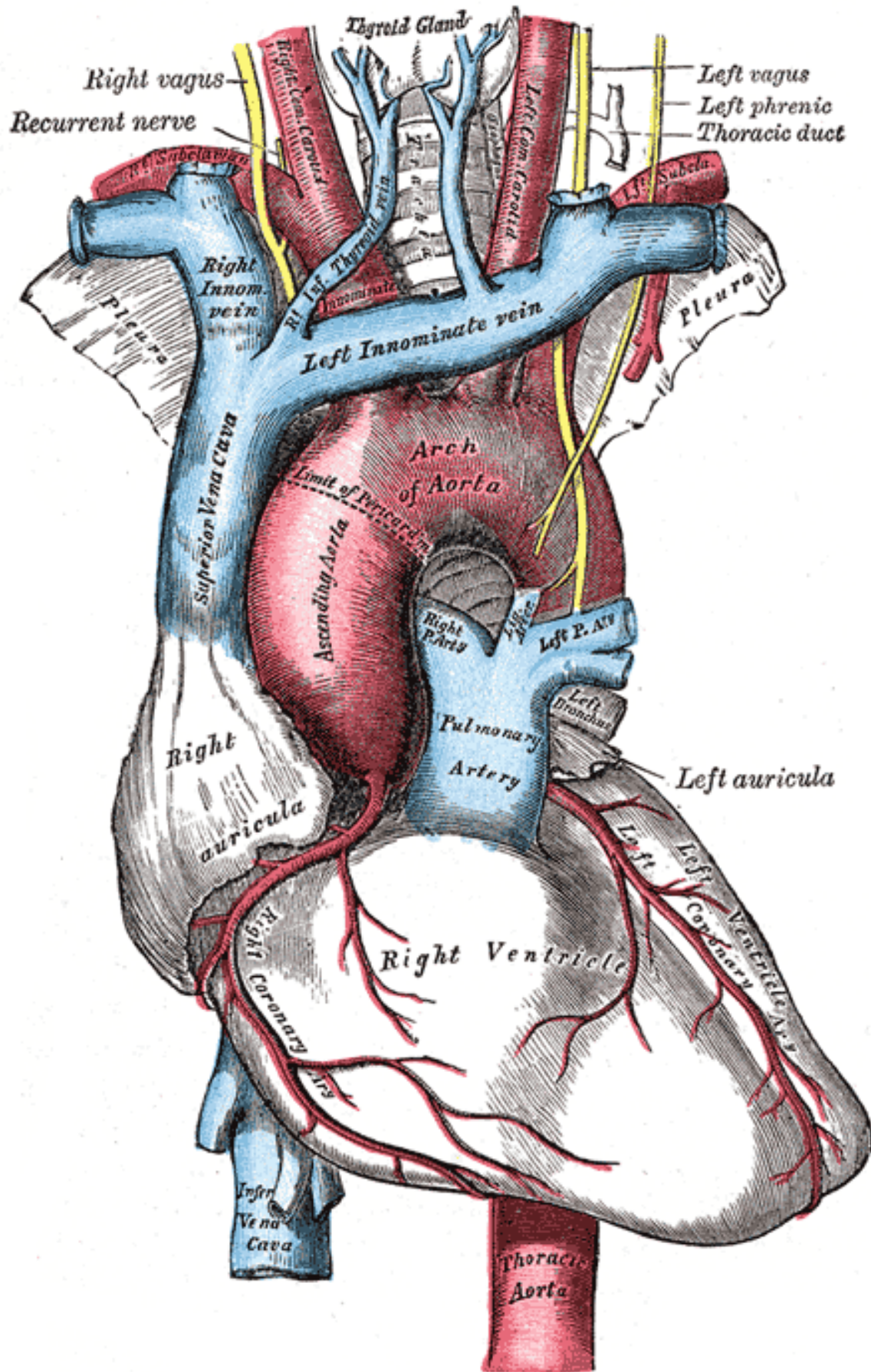
- **Below:** left atrium and its auricle.
- **Above:** the pulmonary trunk.

★ Branches of ascending aorta:

- At its **beginning**, the ascending aorta has **3 dilatations** opposite the cusps of the aortic valve called the **aortic sinuses** (one anterior and two posterior) which give 2 branches:
 - 1. Right coronary** artery: arises from the anterior aortic sinus.
 - 2. Left coronary** artery: arises from the left posterior aortic sinus.



Large Vessels of the Thorax 2022



B) Arch of Aorta

- ★ **It begins** at the 2nd right sternocostal junction as a continuation of ascending aorta.
- ★ It **passes first upwards, backwards** and to **left** in front of the trachea & behind the lower ½ of the manubrium sterni, **then backwards and downwards** on the left side of the trachea.
- ★ It **ends** on the left side of **disc** between **T4 and T5** vertebrae by becoming the descending thoracic aorta.

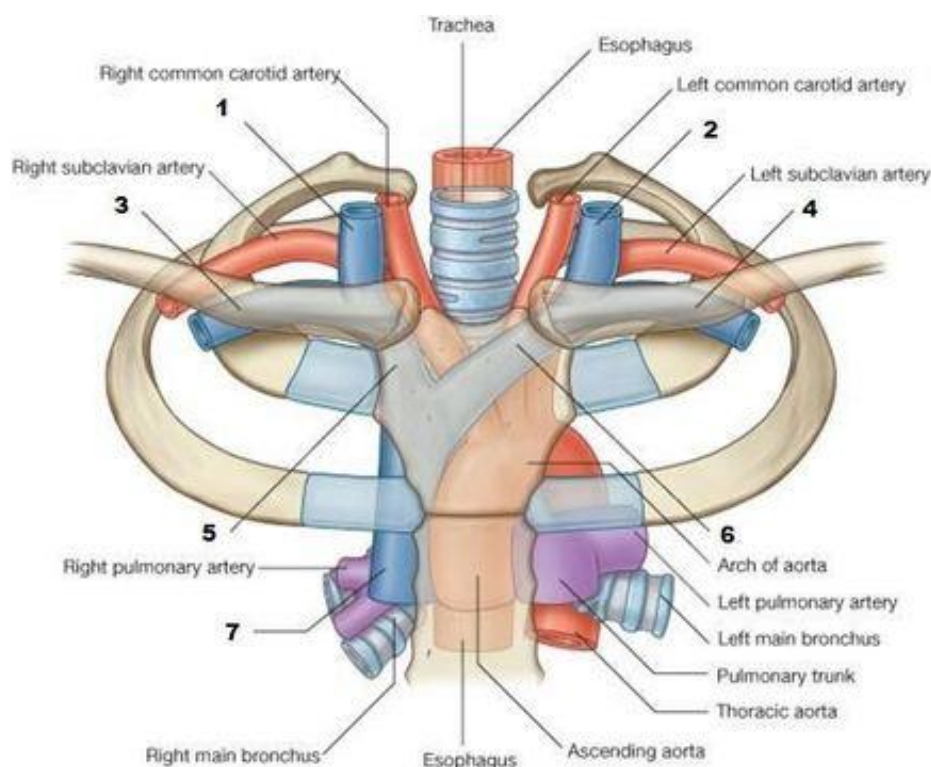
★ **Relations:**

a- The upper convex aspect is related to:

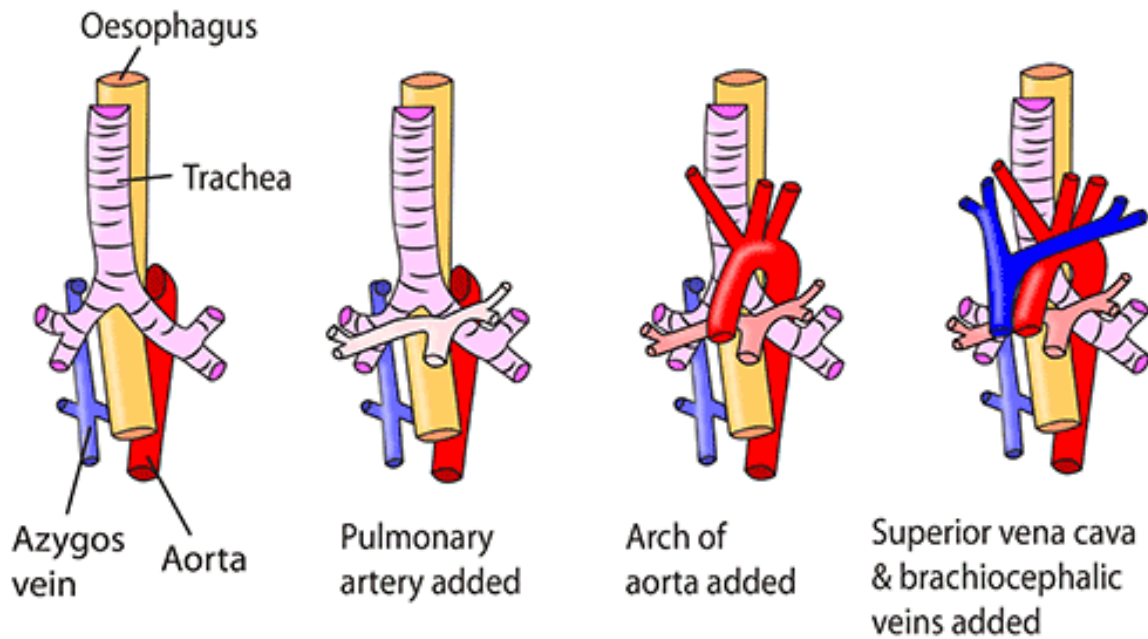
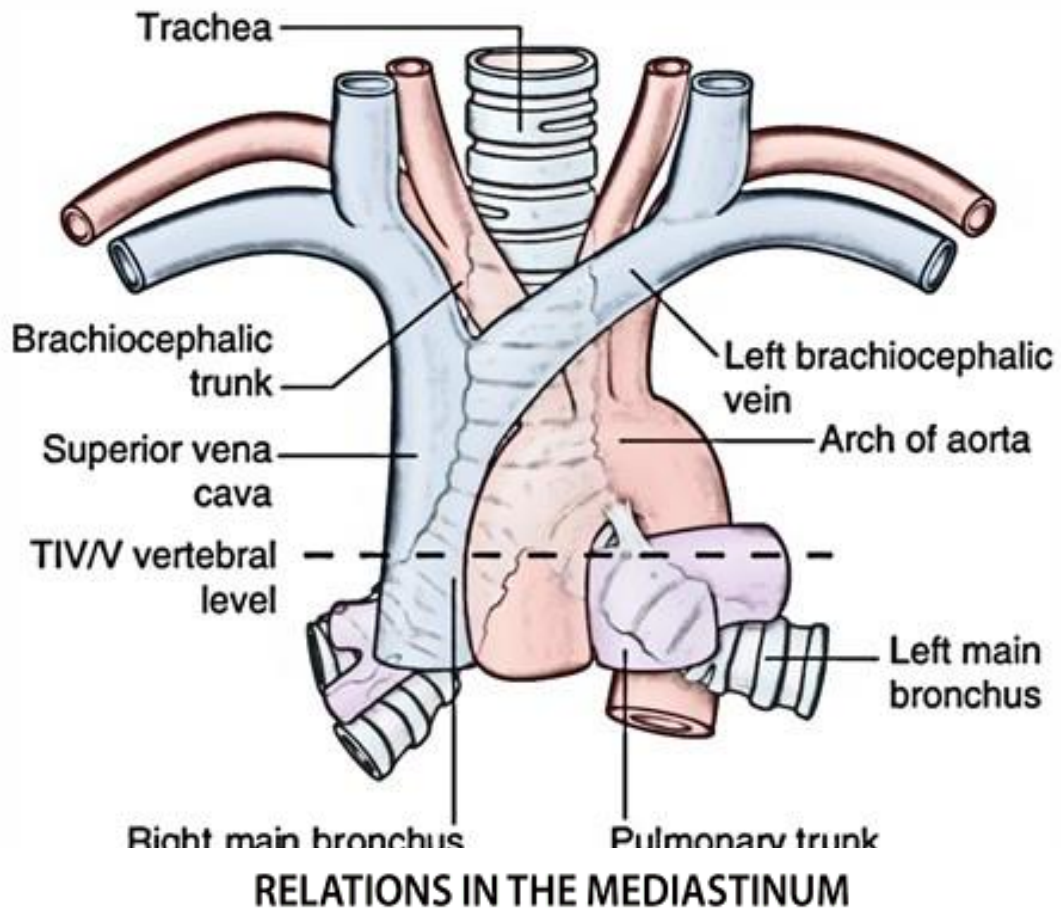
1. Origins of its **3 large branches:**

- **Brachiocephalic** artery arises behind center of manubrium.
- **Left common carotid** artery to the left of brachiocephalic artery
- **Left subclavian** artery behind the left common carotid artery.

2. **Left brachiocephalic vein:** runs obliquely along **upper border** of the arch of the aorta **in front** of the origin of its main branches.

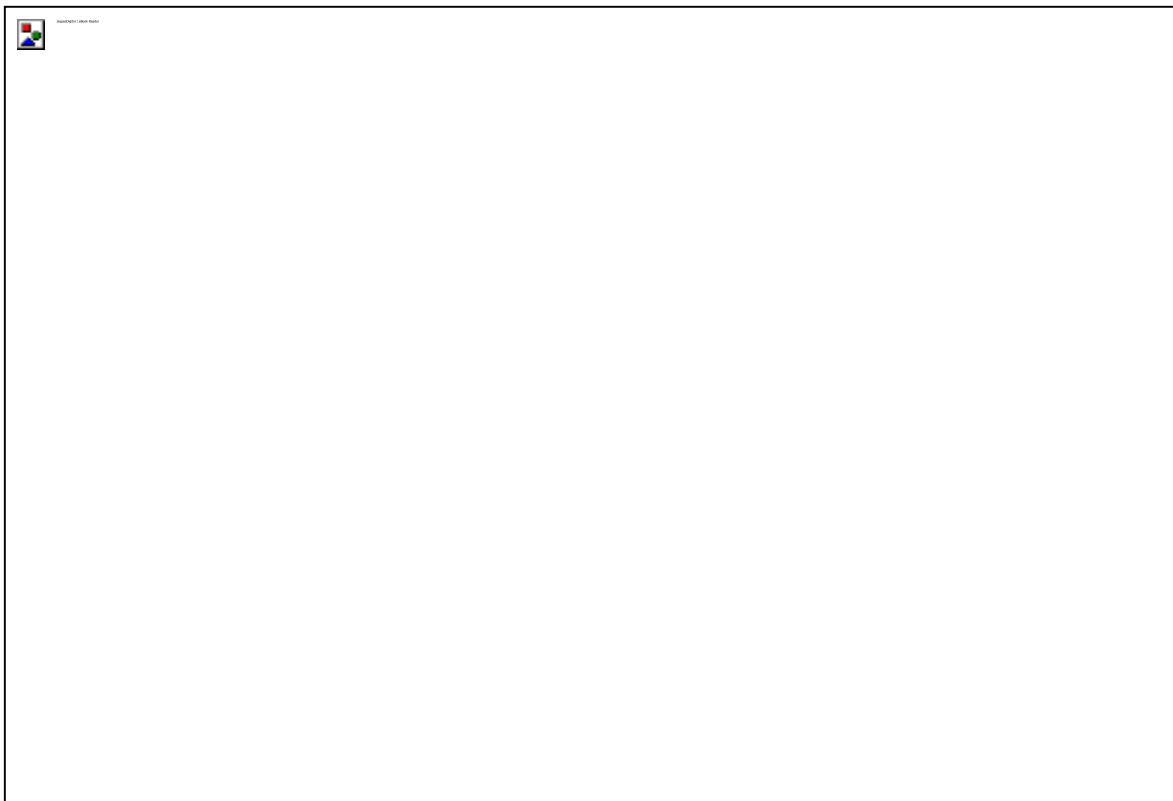


Large Vessels of the Thorax 2022



b- The lower concave aspect is related to:

1. **Bifurcation** of pulmonary trunk into right and left pulmonary arteries.
2. **Ligamentum arteriosum** (fibrosed ductus arteriosus of the fetus) extends between the left pulmonary artery and lower surface of arch of aorta.
3. Superficial **cardiac plexus** in front of ligamentum arteriosum.
4. Left **recurrent laryngeal** nerve.
5. **Left principal bronchus**.

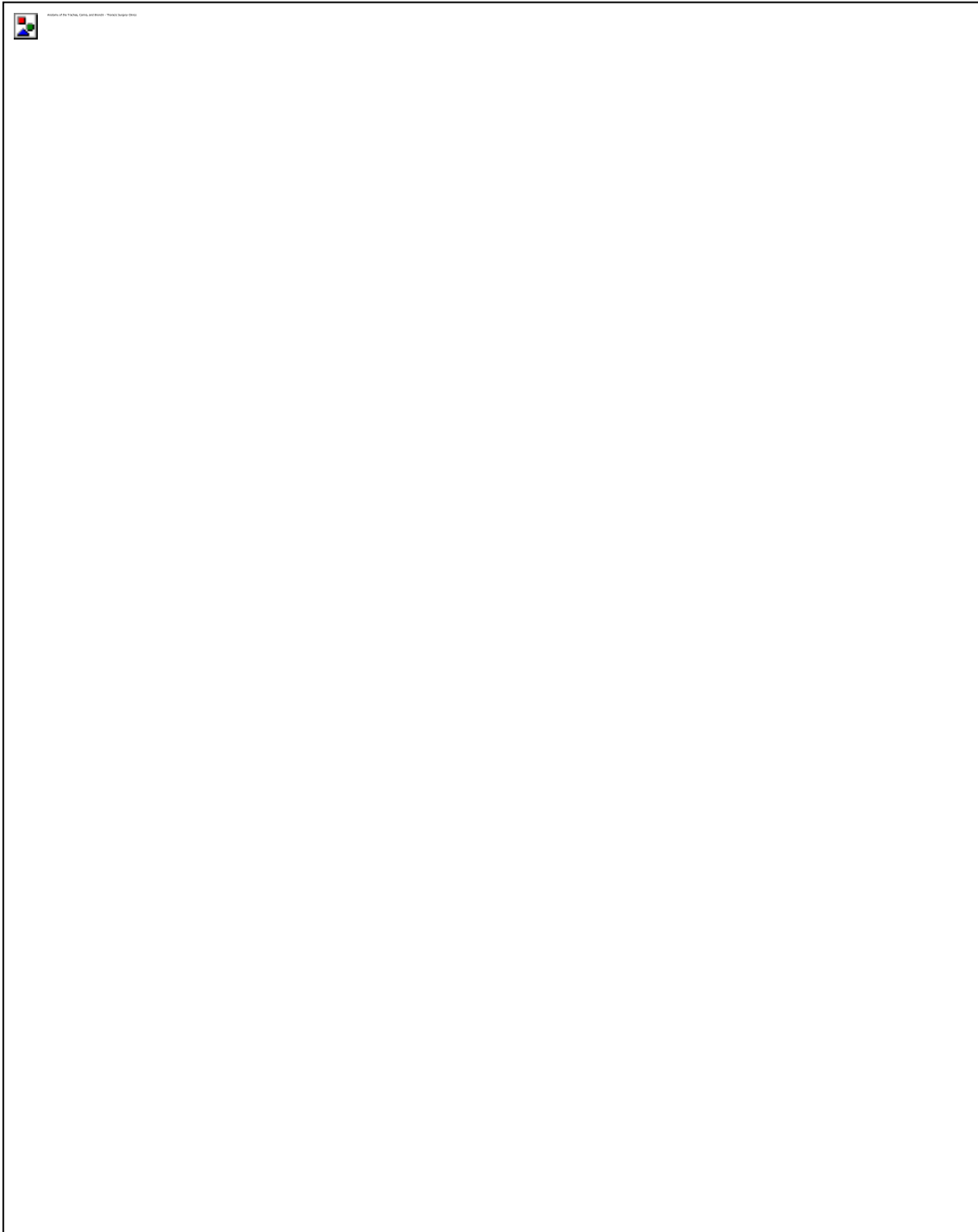


c- The left anterior aspect is related to:

1. The mediastinal surfaces of the left pleura and lung.
2. The structures crossing the arch:
 - Left phrenic nerve and pericardiophrenic vessels.

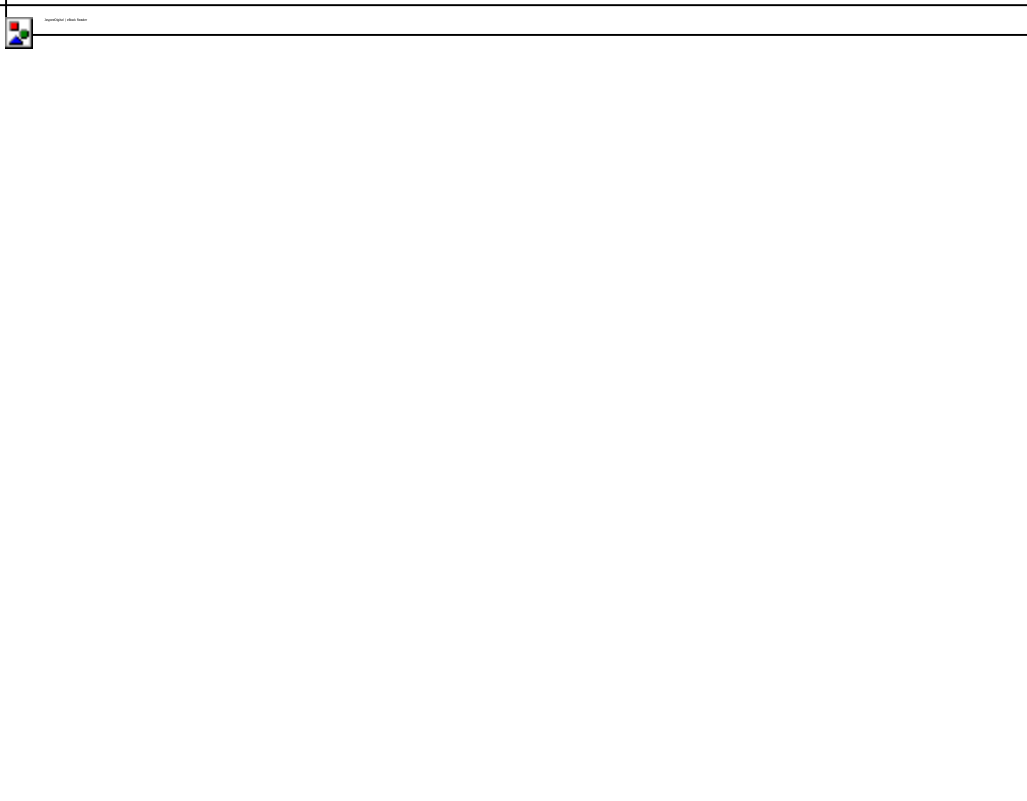
Large Vessels of the Thorax 2022

- Left vagus nerve, crossed superficially from posterior to anterior by the left phrenic nerve.
- Superior cervical cardiac branch of left sympathetic chain.
- Inferior cervical cardiac branch of left vagus nerve.
- Left superior intercostal vein.



Arch of aorta (relations and branches)

Large Vessels of the Thorax 2022



d- The right posterior aspect is related to:

1. **Trachea** .
2. Deep cardiac plexus & tracheobronchial lymph nodes: **on the bifurcation** of the trachea.
3. **Oesophagus**: behind the trachea.
4. **Left recurrent laryngeal** nerve: **posterior to ligamentum arteriosum** then in the **groove** between trachea and oesophagus.
5. **Thoracic duct**: behind left border of the oesophagus.

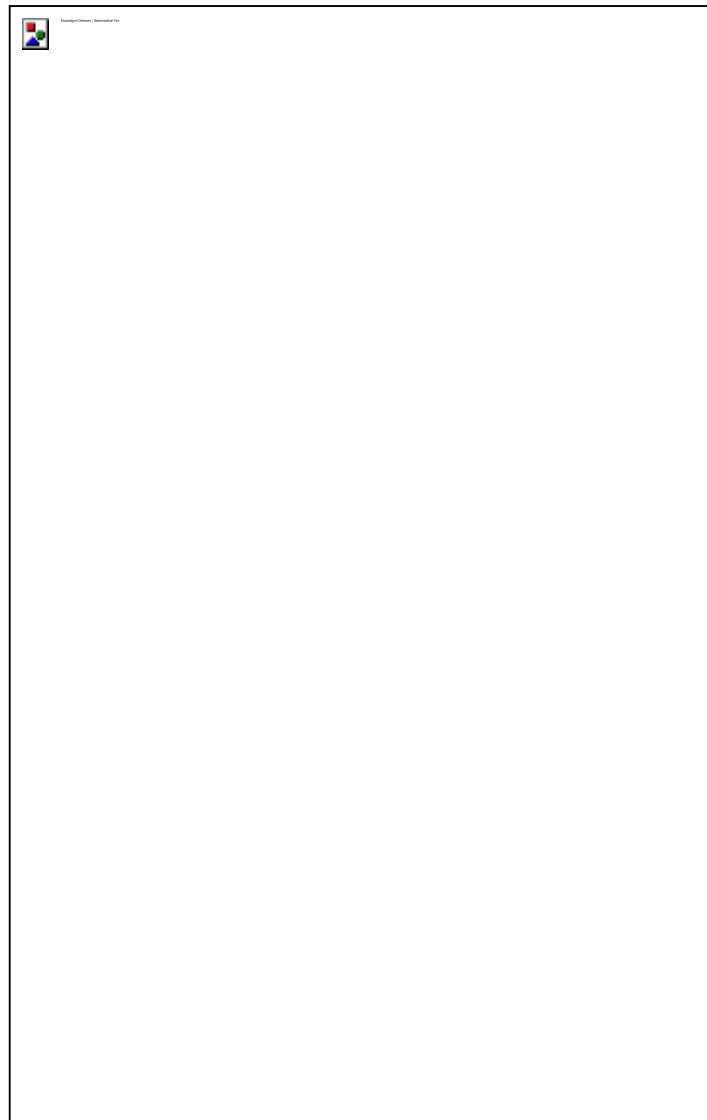
★ **Branches**: The aortic arch gives off 3 large branches from its upper convex aspect: **brachiocephalic, left common carotid** and **left subclavian arteries**.



Right posterior relations of the arch of aorta

C) Descending Thoracic Aorta

- ★ The **longest** part of the aorta in the thorax; it is about **8** inches (20 cm) long.
- ★ It **begins** on the left side of the **disc between T4 and T5** as the continuation of the arch of the aorta.
- ★ It **descends obliquely** downwards and to the right **first on the left** side of the bodies of **3** thoracic vertebrae (**T5-T7**) **then in front** of the lower **5** thoracic vertebrae (**T8-T12**).
- ★ It **ends** in the middle line at the level of lower border of **T12**, by passing through the **aortic opening of the diaphragm** to continue as the **abdominal aorta**.



★ **Relations:**

a- Anteriorly: from above downwards, it is related to the followings:

- The **left principal bronchus**.
- **Fibrous pericardium & Oblique sinus** of serous pericardium separating it from the left atrium.
- **Oesophagus cross** from right to left in front of aorta at **T₇** vertebra.
- **Diaphragm**.

b- Posteriorly: from above downwards it is related to the followings:

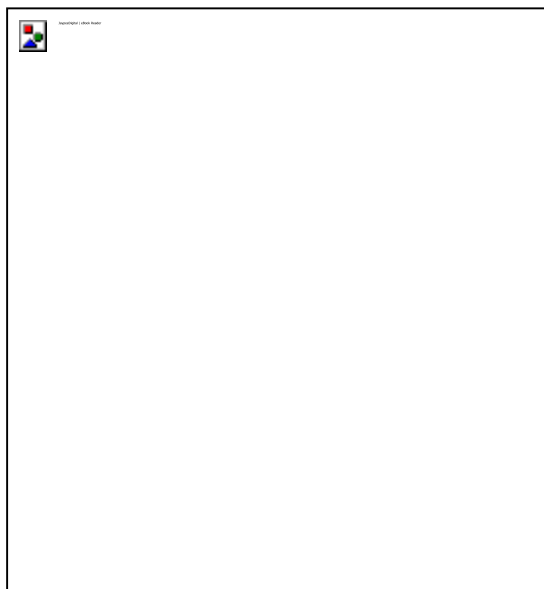
- Lower **5** thoracic vertebrae (**T₈-T₁₂**).
- The superior and inferior **hemiazygos** veins (cross from left to right behind the aorta at T₈ and T₉ vertebrae respectively).

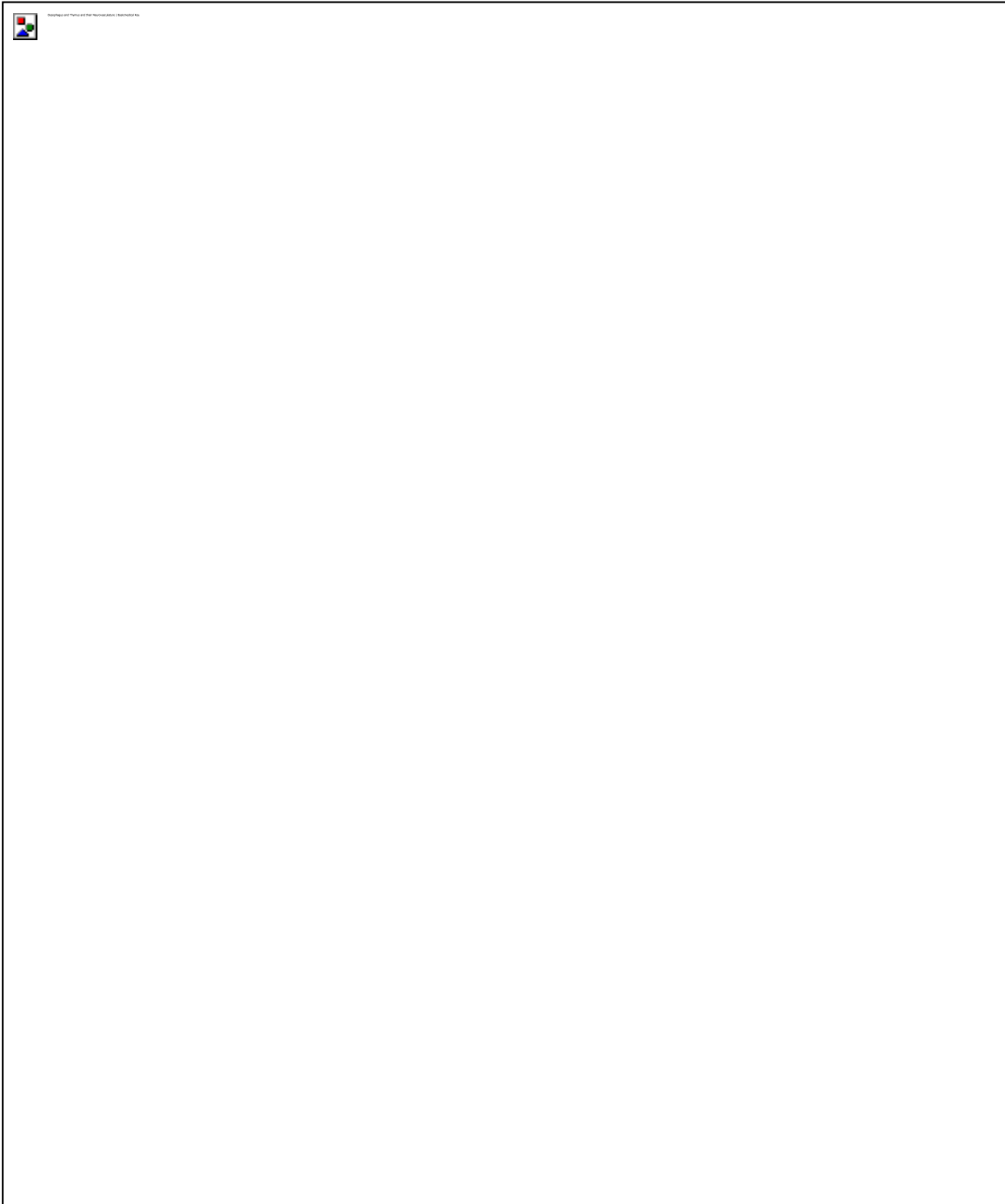
c- On its right side: from above downwards, it is related to the followings:

- **Oesophagus** (before crossing in front of aorta at T₇ vertebra).
- **Azygos vein** on right side of lower part of aorta.
- The **thoracic duct** between azygos vein and lower part of aorta.

d- On its left side: from above downwards, it is related to the followings:

- Its **upper part** is related to the left pleura and lung
- Its **lower end** is related to the oesophagus.





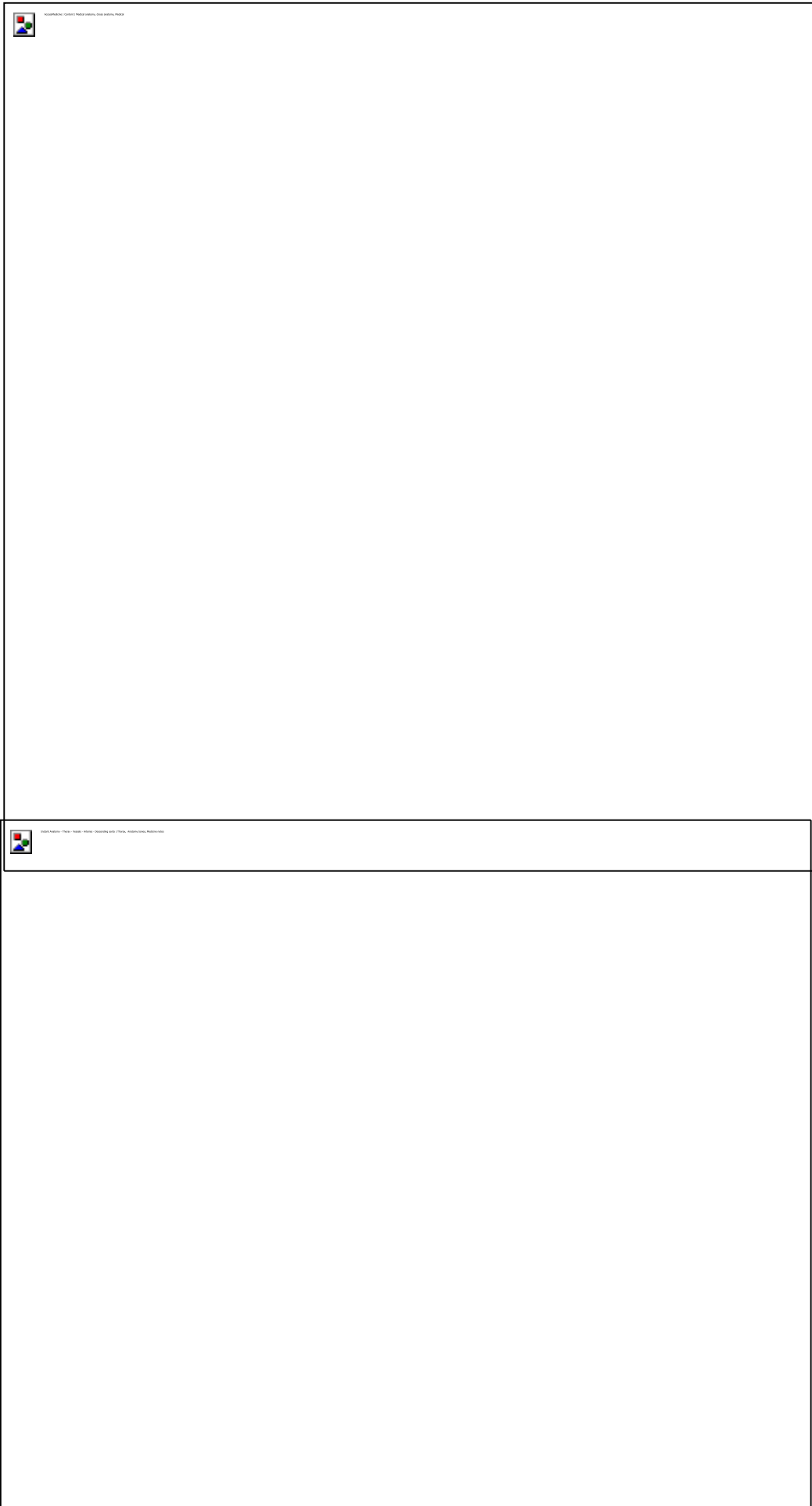
Anterior relations of descending aorta

Large Vessels of the Thorax 2022





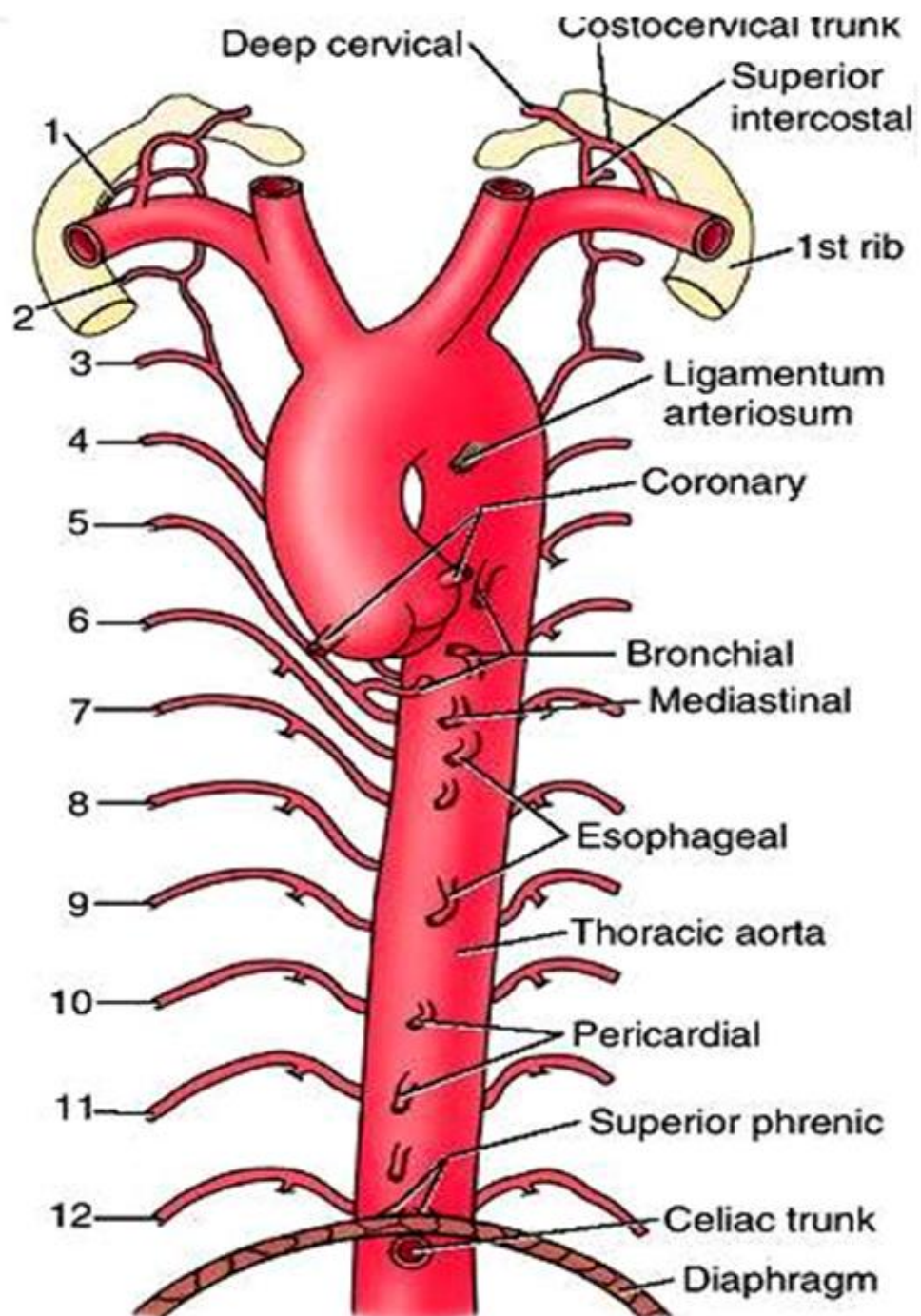
Large Vessels of the Thorax 2022



★ **Branches:**

- 1- Nine pairs of **posterior intercostal** arteries (from 3rd to 11th).
- 2- One pair of **subcostal** arteries.
- 3- **Two left bronchial** arteries.
- 4- Four or **five oesophageal** branches.
- 5- Few small twigs to the **pericardium, mediastinum** and **diaphragm**.

**Branches of
Thoracic
Aorta**



II) Pulmonary Trunk

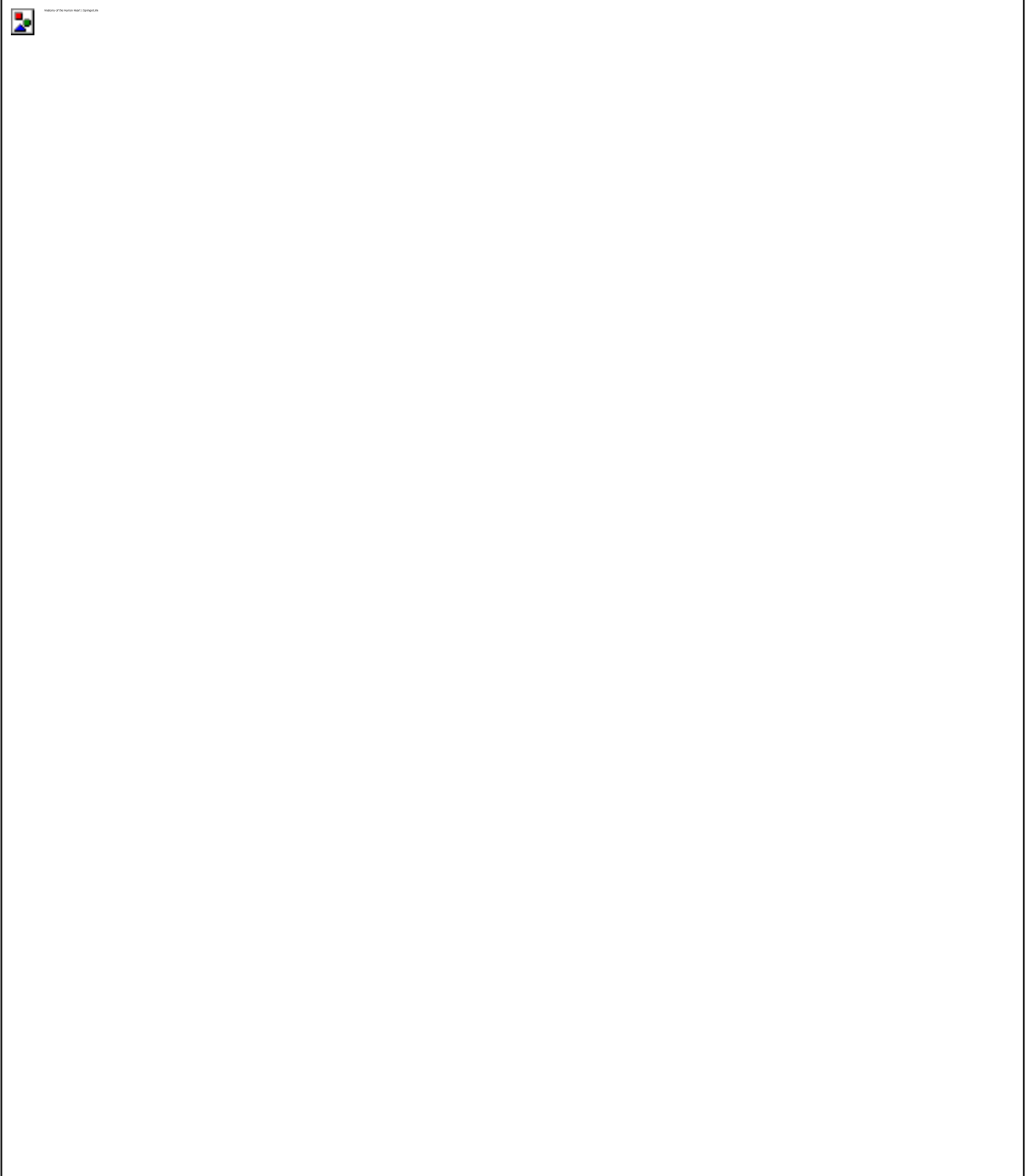
- ★ An arterial trunk which conveys deoxygenated blood from the right ventricle to the lungs.
- ★ It is **5 cm** long with its whole length of the pulmonary trunk lies within the **fibrous pericardium**.
- ★ It **begins** from the pulmonary orifice of the right ventricle, behind the 3rd left sternocostal junction.
- ★ It lies first in **front of ascending aorta**, enclosed together within a single **sheath of the serous pericardium** (both vessels develop from the **truncus arteriosus** of the fetus).
- ★ It is then **runs** upwards, backwards and to the left, to become on the left side of the ascending aorta.
- ★ It **ends below the arch** of aorta, at the level of the **sternal angle** (disc between T4 and T5) by **dividing** into right and left pulmonary arteries.
- ★ **Relations:**
 - **Anterior:** left pleura and lung.
 - **Posterior:**
 - **Below:** ascending aorta and origin of left coronary.
 - **Above:** transverse sinus of pericardium separating it from the left atrium.
 - **On each side:** Corresponding coronary artery separating it from the corresponding auricle .
- ★ **Branches of the pulmonary trunk:**
 - These are the **right and left pulmonary arteries** which enter the hilum of the corresponding lung.

Large Vessels of the Thorax 2022

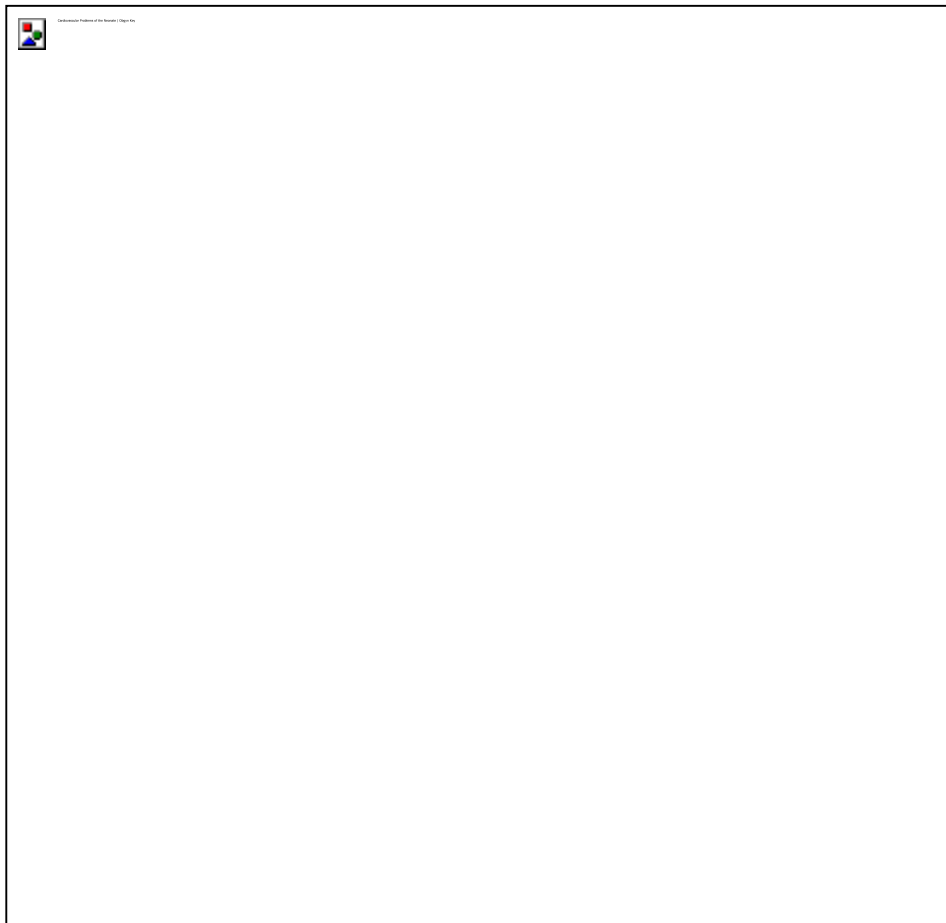
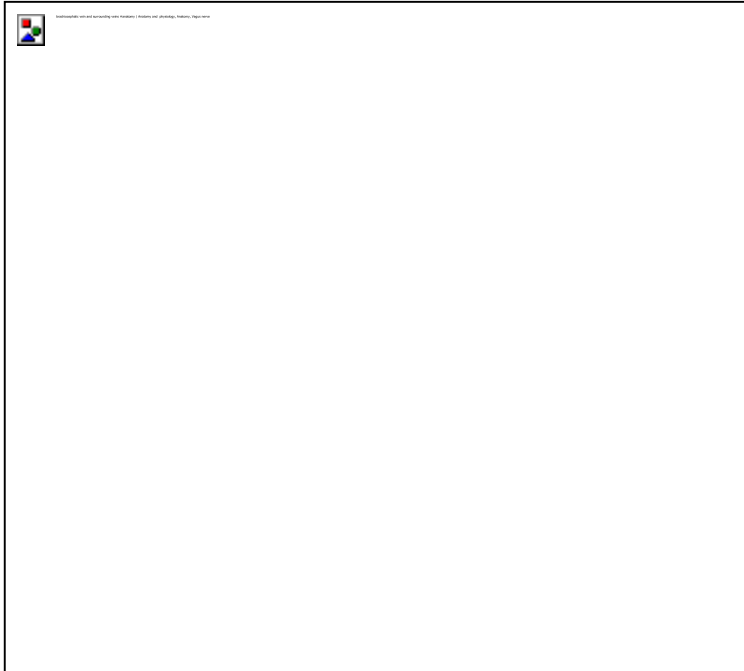
- The two **pulmonary arteries** run horizontally along the upper border of the **upper border of the heart**, above the superior pulmonary veins.
 - 1) The **right pulmonary artery** is longer and wider than the left.
 - It forms the roof of the transverse sinus of the pericardium.
 - It is related anterior to the ascending aorta & S.V.C.
 - It is related posterior to the right bronchus and oesophagus.
 - 2) The **left pulmonary artery**:
 - It is connected to the lower surface of arch of aorta by **ligamentum arteriosum**.
 - It runs **in front of** the left principle bronchus and descending aorta.



Large Vessels of the Thorax 2022



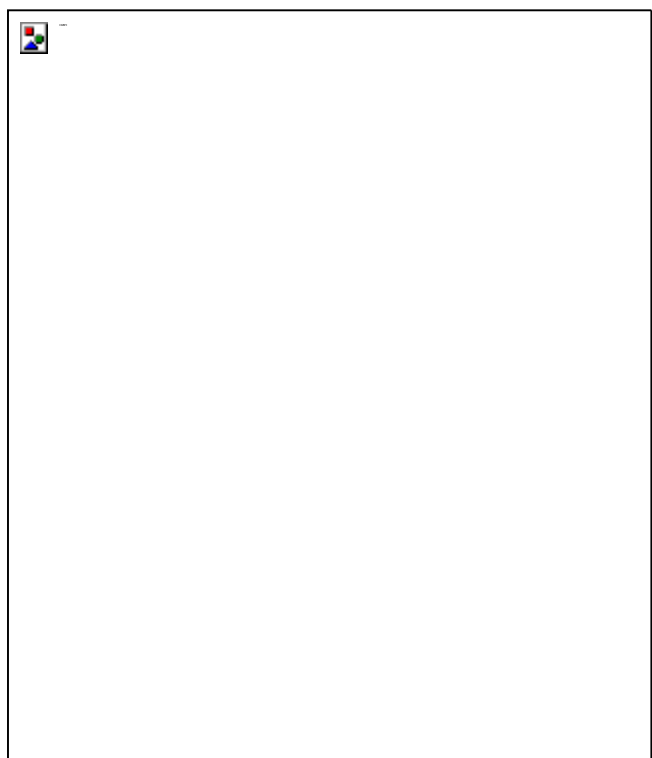
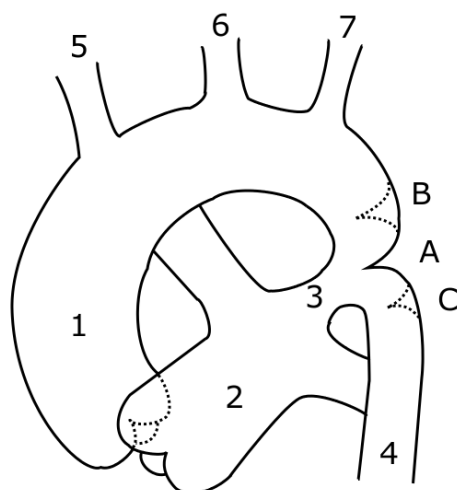
Large Vessels of the Thorax 2022



★ **Applied anatomy:**

1-Coartication (narrowing) **of the aorta:**

- Aortic coartication is a congenital anomaly which is classified according to the site of narrowing into:
 - 1- **Pre-ductal type:** (rare) affecting the segment proximal to the ductus arteriosus which remains patent with severe early symptoms.
 - 2- **Ductal type:** affecting the aorta at the site of attachment of ligamentum arteriosus.
 - 3- **Post-ductal type:**(commonest) affecting the segment distal to the ductus arteriosus and origin of subclavian vessels.
 - The circulation to the lower limb is maintained via collaterals between branches of the subclavian arteries and those of the descending aorta.



2-Thoracic aorta is the commonest site for severe **atherosclerosis** leading to weakness of the wall of the artery with roughness of its endothelial lining.

3-Aortic aneurysm: this is a localized dilatation of aorta which may compress the contents of mediastinum causing mediastinal syndrome. Rupture of aortic aneurysm causes severe haemorrhage which is often fatal if surgical intervention is delayed.



3- Embolus is any foreign body circulating in the blood.

4- Embolism may be arterial or venous.

5- Arterial embolism leads to distal arterial obstruction and acute ischaemia.

6- Massive venous embolism leads to **pulmonary embolism** with obstruction of pulmonary trunk and sudden death.

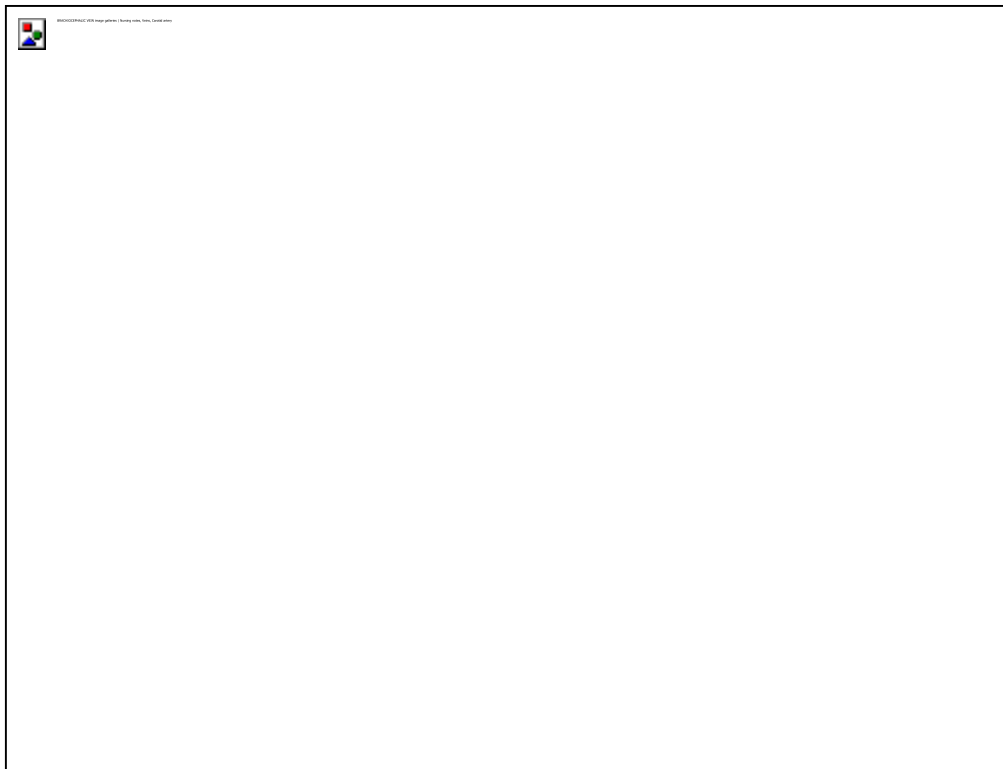
Large Veins of the Thorax

1) Brachiocephalic Veins

- ★ The 2 brachiocephalic veins (right and left) **drain** the upper limbs (brachium) as well as the head and neck (cephalic).
- ★ They **also drain** the anterior wall of the thorax, the upper part of the posterior wall of the thorax as well as **lymph** from the whole body.
- ★ The 2 veins **end** behind the lower border of the lower border of the 1st right costal cartilage close to sternum.
- ★ by **uniting** together to form the **S.V.C.**

a) Right brachiocephalic vein:

- It begins by union of right subclavian vein and right IJV behind the medial end of the right clavicle.
- It descends **vertically** in the superior mediastinum, to end at the lower border of the 1st right costal cartilage close to sternum.



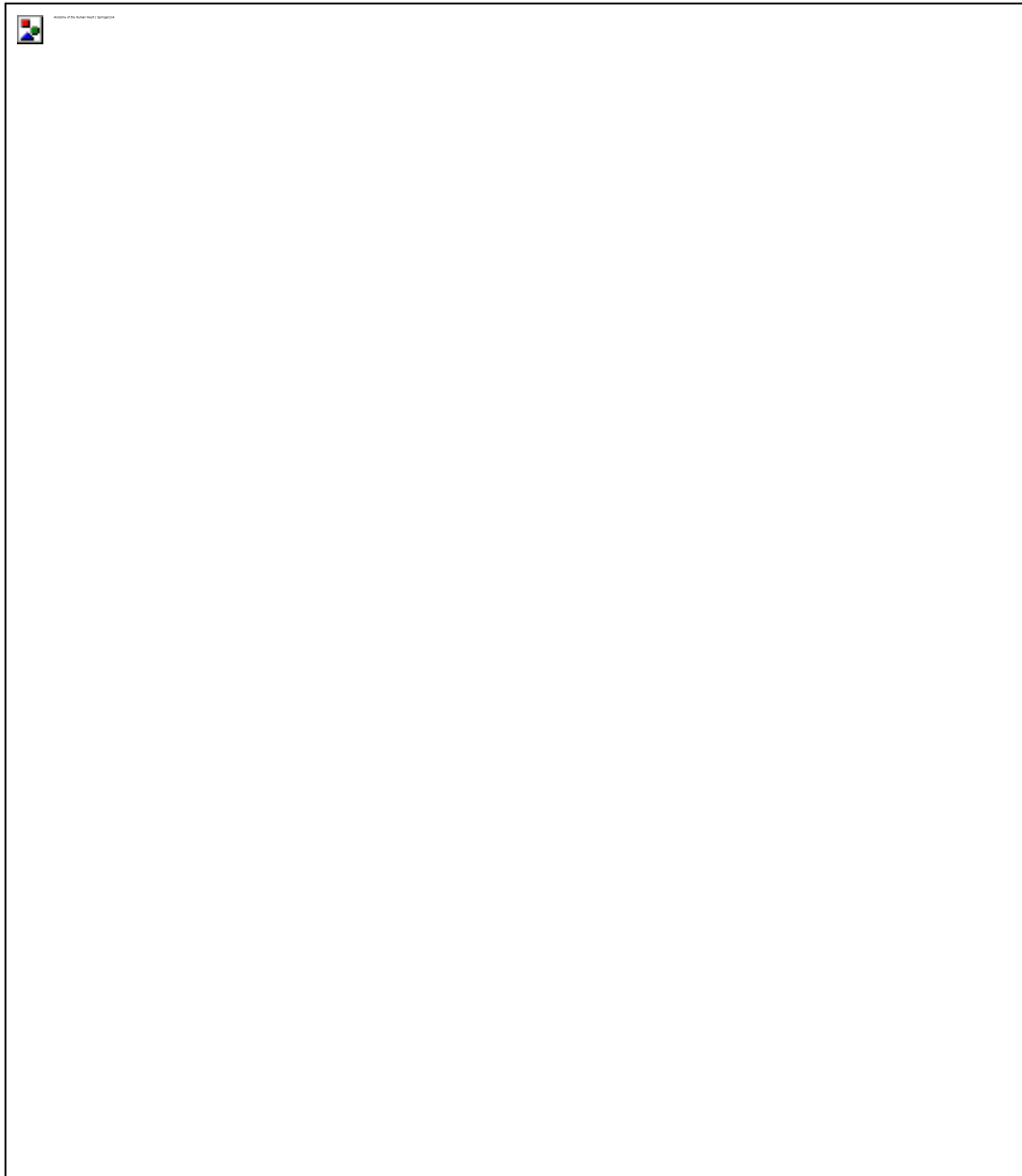
- **Relations:**

a- Anteriorly: right sternoclavicular joint and 1st right costal cartilage.

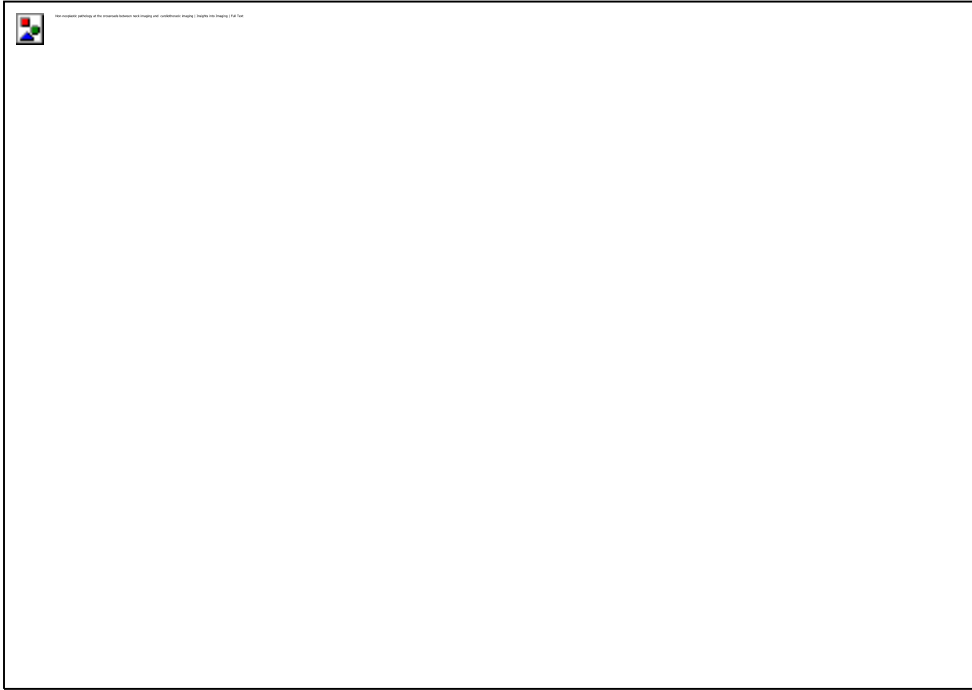
b- Posteriorly: right phrenic nerve and internal thoracic artery.

c- On its right side: separated from the right pleura and lung by the right phrenic nerve and internal thoracic artery.

d- On its left side: separated from the brachiocephalic artery by the right vagus nerve.

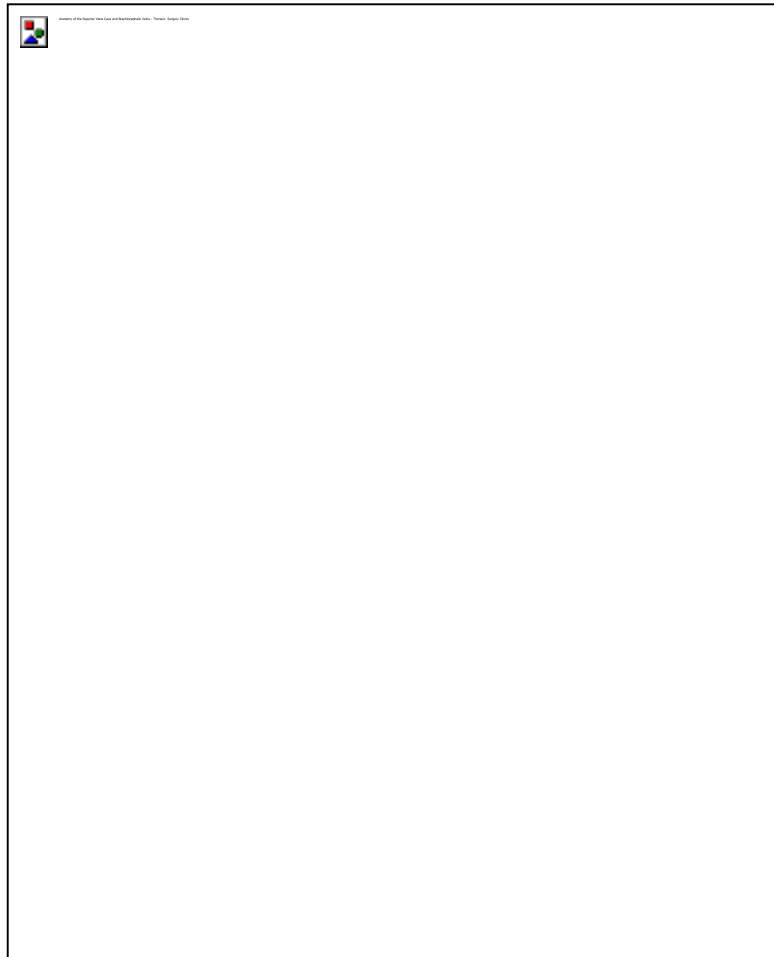


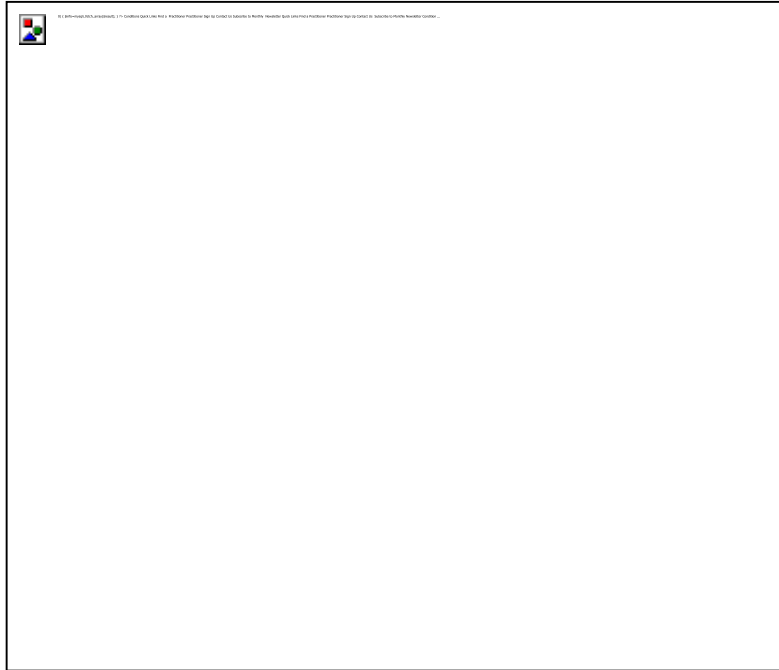
Large Vessels of the Thorax 2022



• Tributaries

- 1-** Right inferior thyroid vein and right vertebral vein.
- 2-** Right internal thoracic vein and right 1st posterior intercostal vein.
- 3-** Right lymphatic duct.





b) Left brachiocephalic vein:

- It **begins** by union of left subclavian vein and left IJV behind the medial end of the left clavicle.
- It **descends obliquely** downwards and to the right **behind the upper 1/2 of the manubrium sterni**, in the **superior mediastinum**, along the upper aspect of the **arch of the aorta**, crossing **in front** of the origins of its **3 large branches**.
- It **ends** behind the lower border of the 1st right costal cartilage, close to the sternum.
- **Relations:**
 - a- Anteriorly:** left sternoclavicular joint and the manubrium sterni.
 - b- Posteriorly:**
 - At its beginning, it is related to left phrenic and left vagus nerves.

Large Vessels of the Thorax 2022

- The origins of the 3 branches of the aortic arch separate it from the trachea.

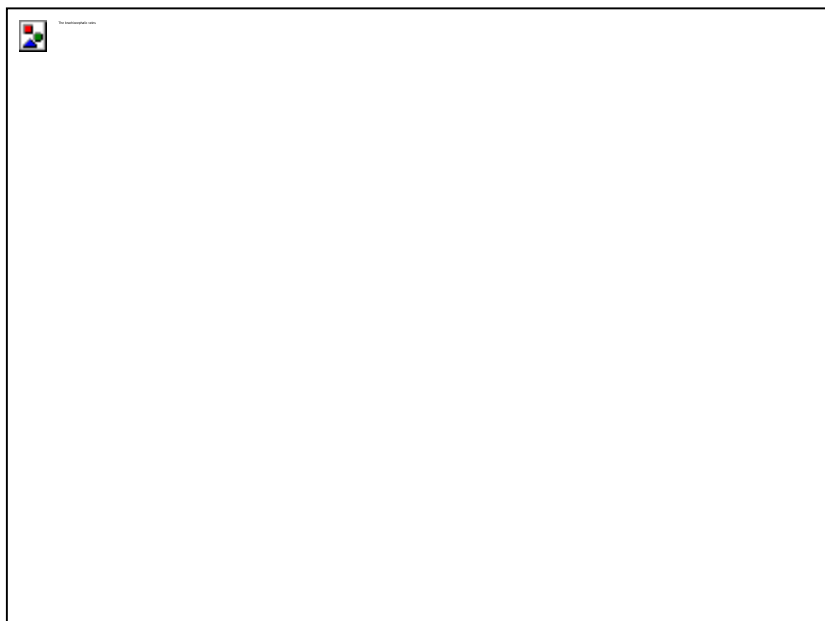
c- Below: the arch of the aorta.

★ Tributaries:

- 1-** Left vertebral vein and left inferior thyroid vein.
- 2-** Left internal thoracic vein, left 1st posterior intercostal vein and left superior intercostal vein.
- 3-** Thoracic duct.

2) Superior Vena Cava (S.V.C.)

- ★ A large vein which drains venous blood from upper 1/2 of the body.
- ★ It measures about 2 inches long.
- ★ Its upper 1/2 lies in the superior mediastinum while its lower 1/2, lies inside the fibrous pericardium, in the middle mediastinum.
- ★ It is **formed** by the union of the 2 brachiocephalic veins behind the lower border of the 1st right costal cartilage close to sternum.
- ★ It **descends** vertically to **pierce** the pericardium at the level of the 2nd right costal cartilage.
- ★ It **ends** by opening into the right atrium behind the 3rd right costal cartilage, close to the sternum.



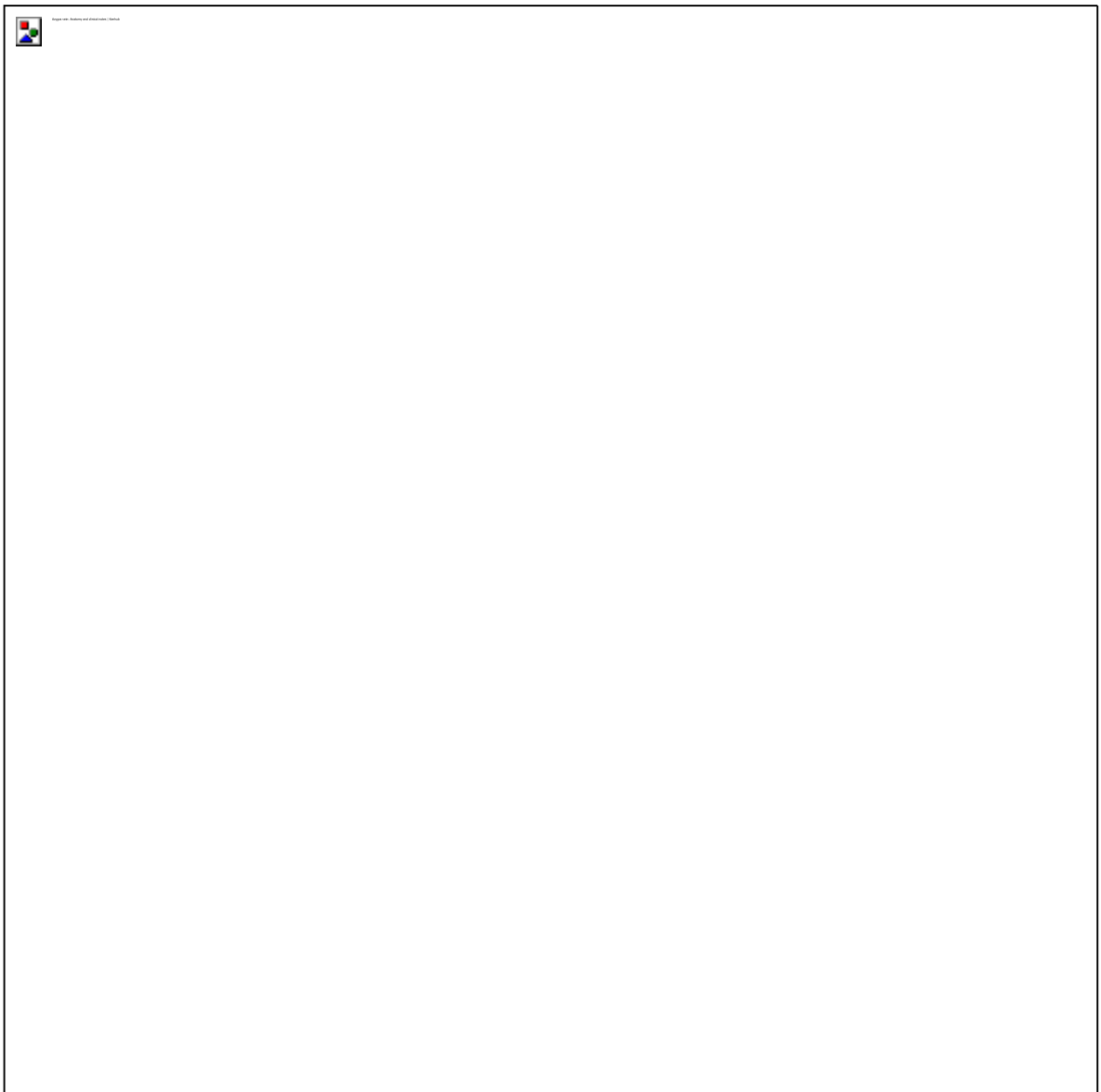
★ **Relations:**

a- Anteriorly: the anterior borders of right leura and lung separate it from internal thoracic artery and the 2nd and 3rd right costal cartilages.

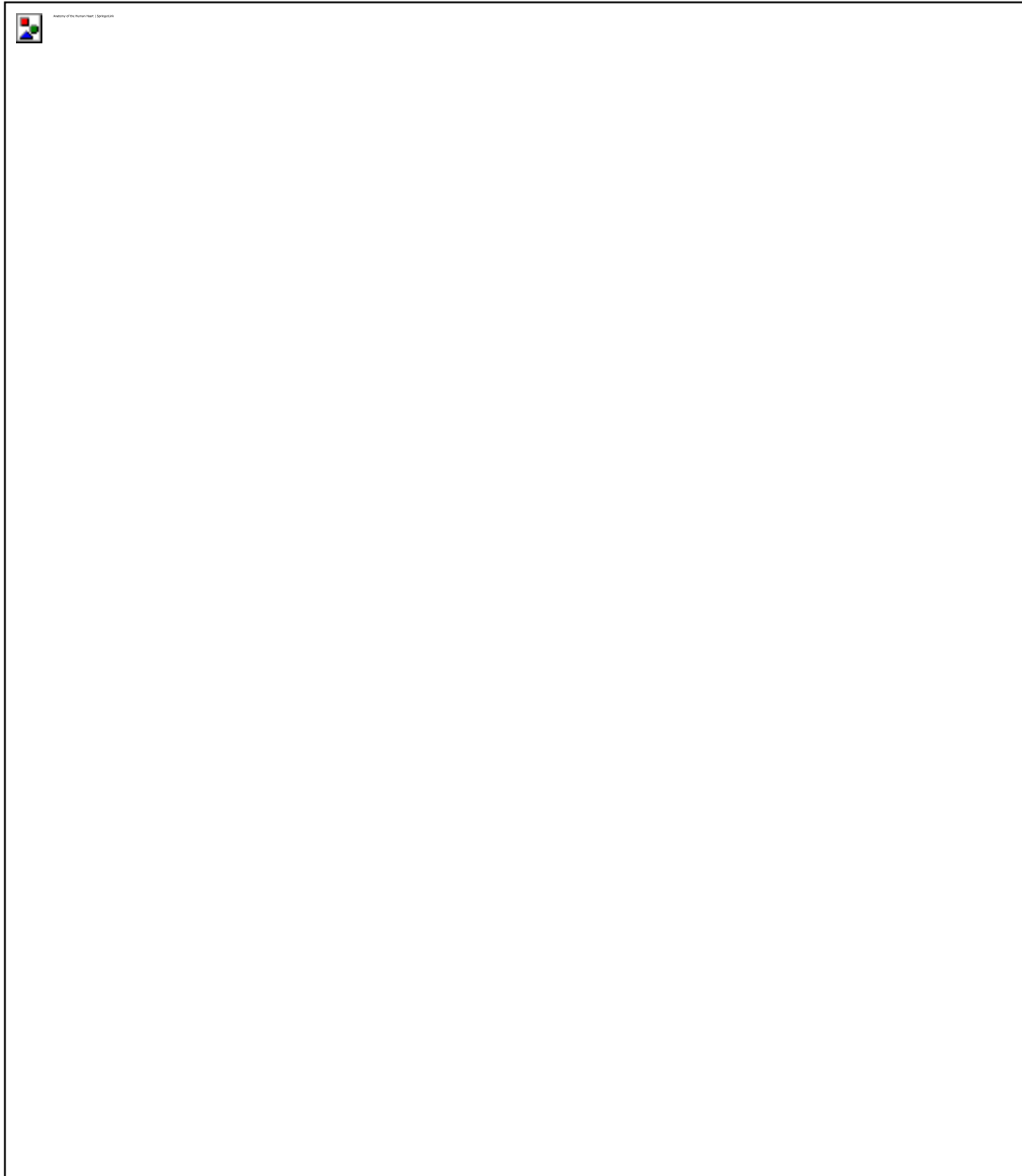
b- Posteriorly: it is related to right vagus on the right side of trachea above and root of left lung below.

c- On its right side: it is related to right pleura and lung separated from them by right phrenic nerve & right pericardiophrenic vessels.

d- On its left side: it is related to beginning of brachiocephalic artery (above the pericardium) and to ascending aorta (inside pericardium).



Large Vessels of the Thorax 2022



★ **Tributaries:**

The S.V.C. has only **one** tributary, the **azygos vein**, which enters it from behind, at the level of the 2nd right costal cartilage just before it pierces the pericardium.

★ **surface anatomy** is represented by a vertical line drawn from the lower border of the 1st right to the 3rd right costal cartilage, close to the right margin of the sternum.