# Department of Anatomy and Histology

## School of Medicine

## The University of Jordan

## Cardiovascular system


by Dr. Amjad Shatarat

2019

# Objectives

**Recognize and understand the main parts of** mediastina and its boundaries

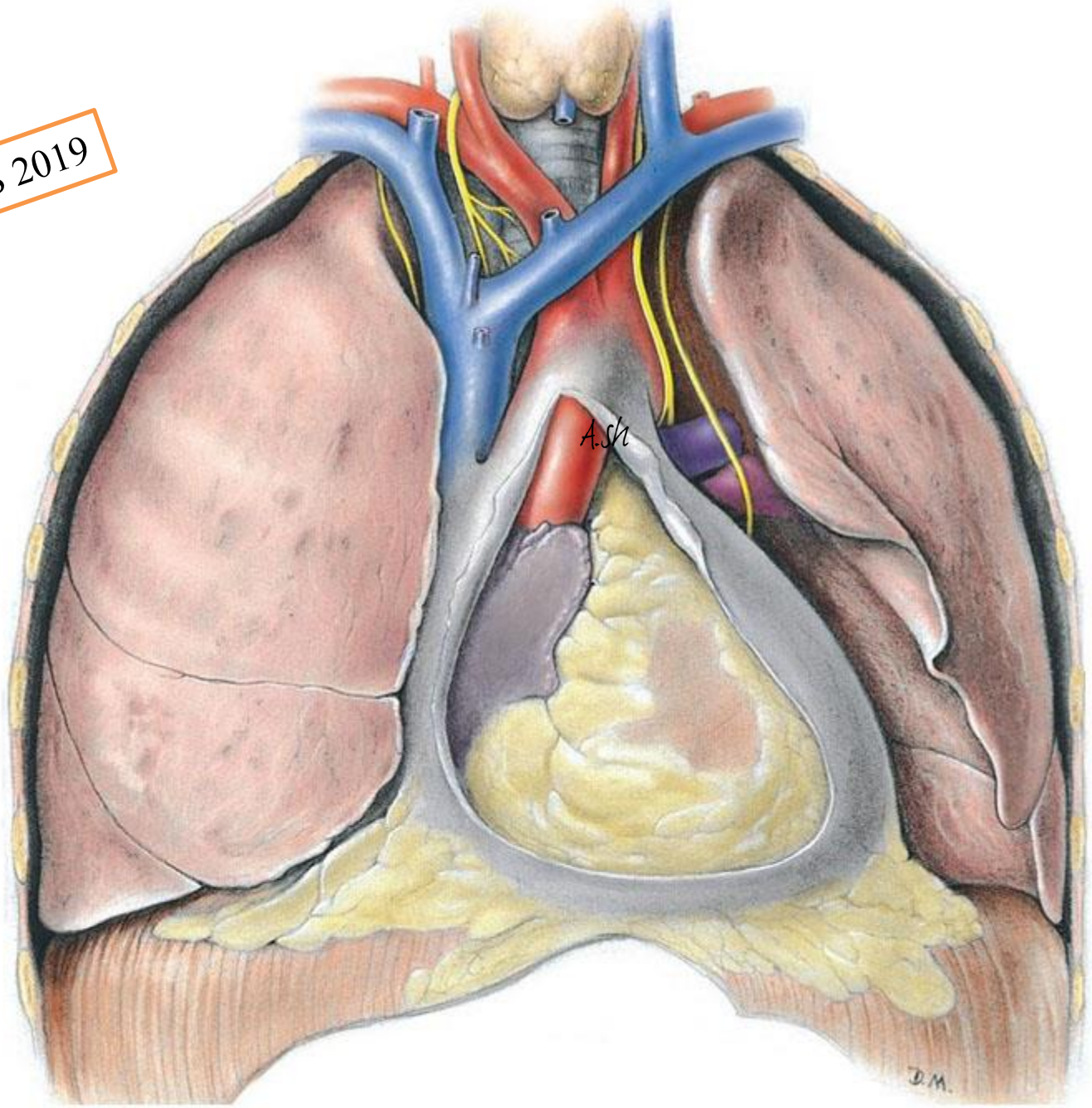
To discuss and explain the contents of the superior mediastinum

To get familiar with other none vascular structures in the superior mediastinum

To have a good grasp of knowledge about the great veins of the superior mediastinumand and their clinical correlations

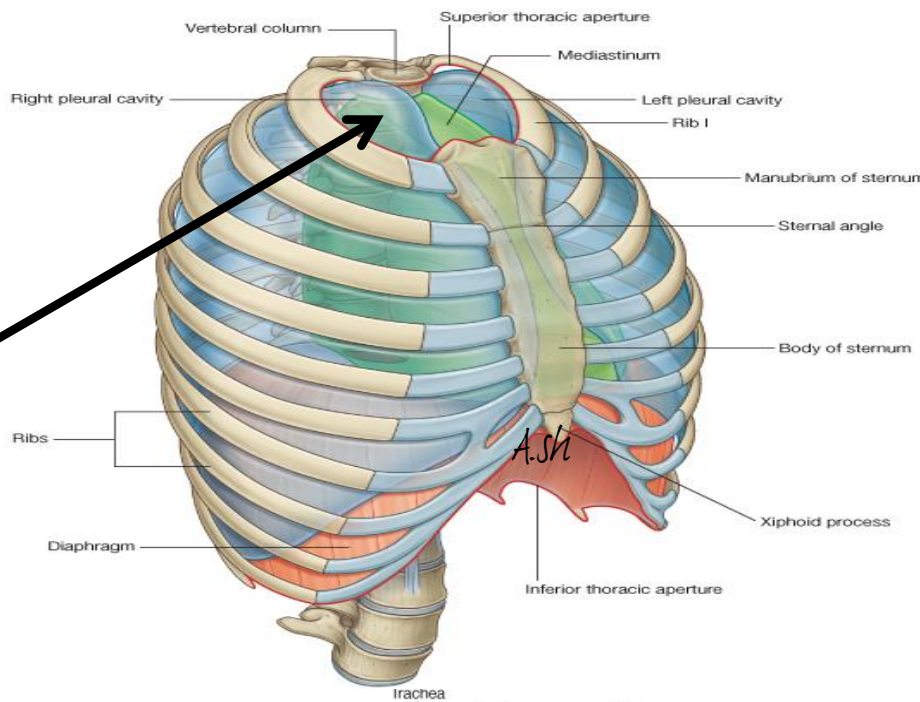
To **Comprehend the** anatomy of  the Arch of the aorta, its branches relations and clinical correlations

CVS 2019



# CHEST CAVITY

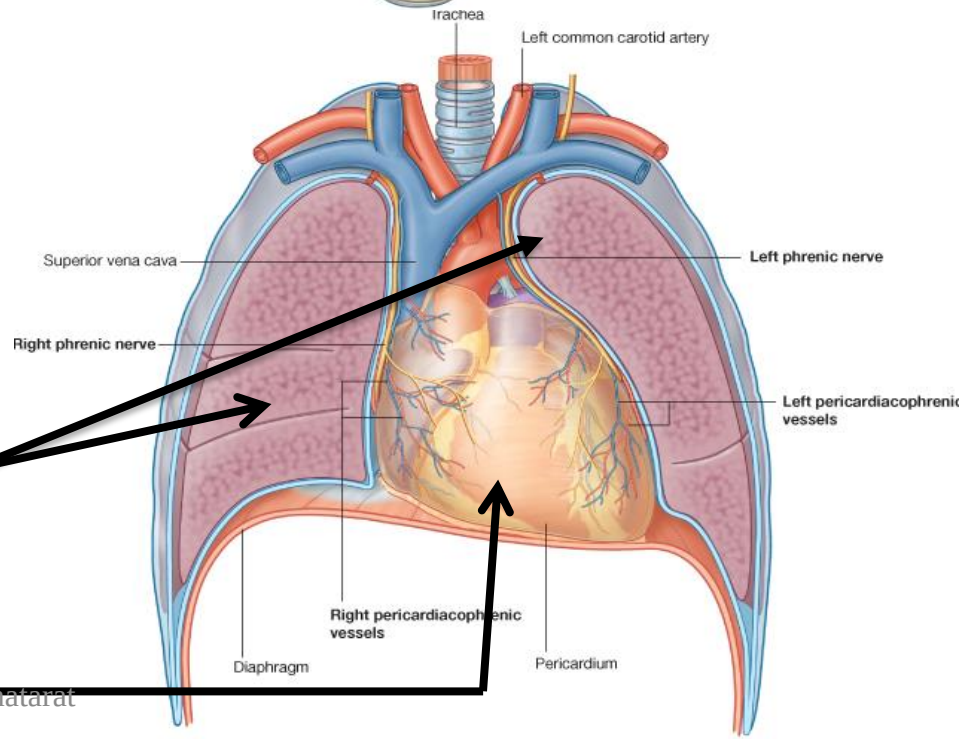
**The chest cavity is bounded by the chest wall and below by the diaphragm**
**It extends upward into the root of the neck about one fingerbreadth**
***above the clavicle on each side***
**The diaphragm, separates the chest from the abdominal viscera**




**The chest cavity can be divided into**

**MEDIAN PARTITION CALLED THE MEDIASTINUM**

**LATERALLY PLACED PLEURAE AND LUNGS**

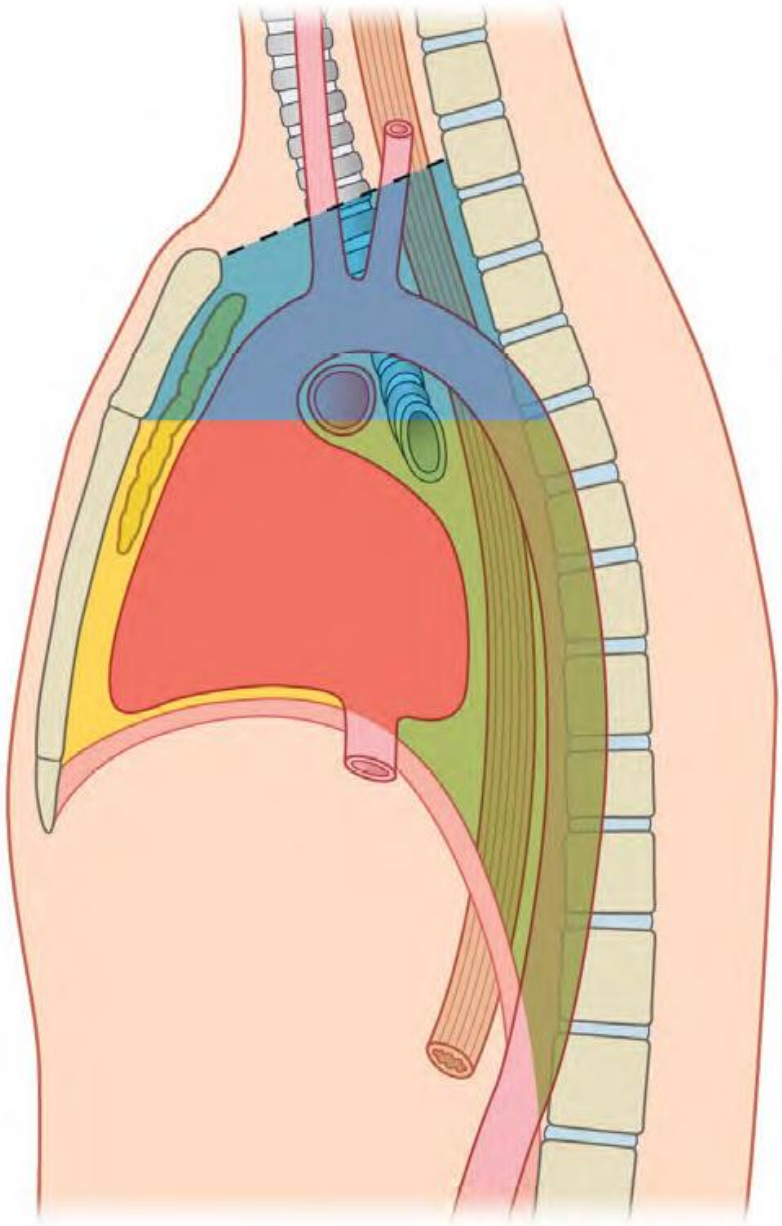



© Elsevier. Drake et al: Gray's Anatomy for Students - www.studentconsult.com

# MEDIASTINUM

- The term mediastinum is commonly applied to the region between the two pleural sacs bounded anteriorly by the sternum and posteriorly by the thoracic vertebral column and extending vertically from the thoracic inlet to the diaphragm.
- For descriptive purposes, this region is arbitrarily divided into superior and inferior mediastina, and the latter is subdivided into anterior, middle and posterior parts.
- The plane of division into superior and inferior mediastina crosses the manubriosternal joint and the lower surface of the fourth thoracic vertebra

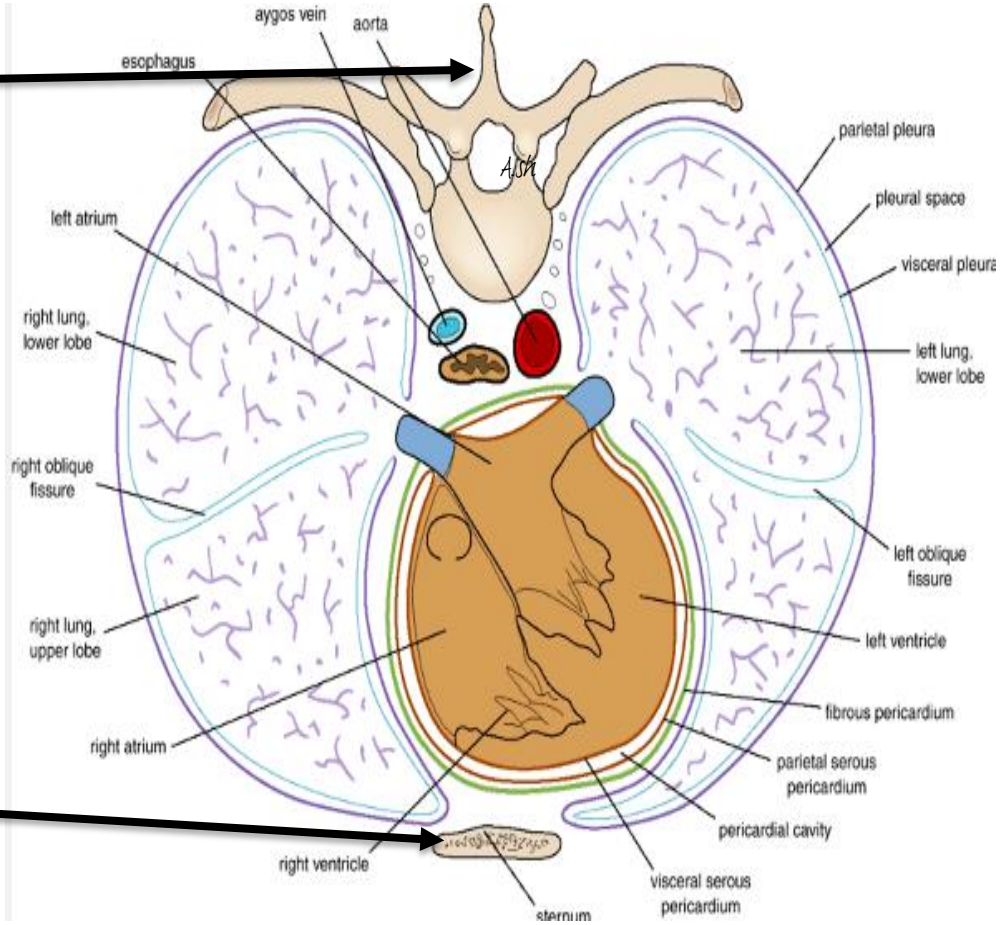
Gary's Anatomy



**The Mediastinum extends**

Posterior

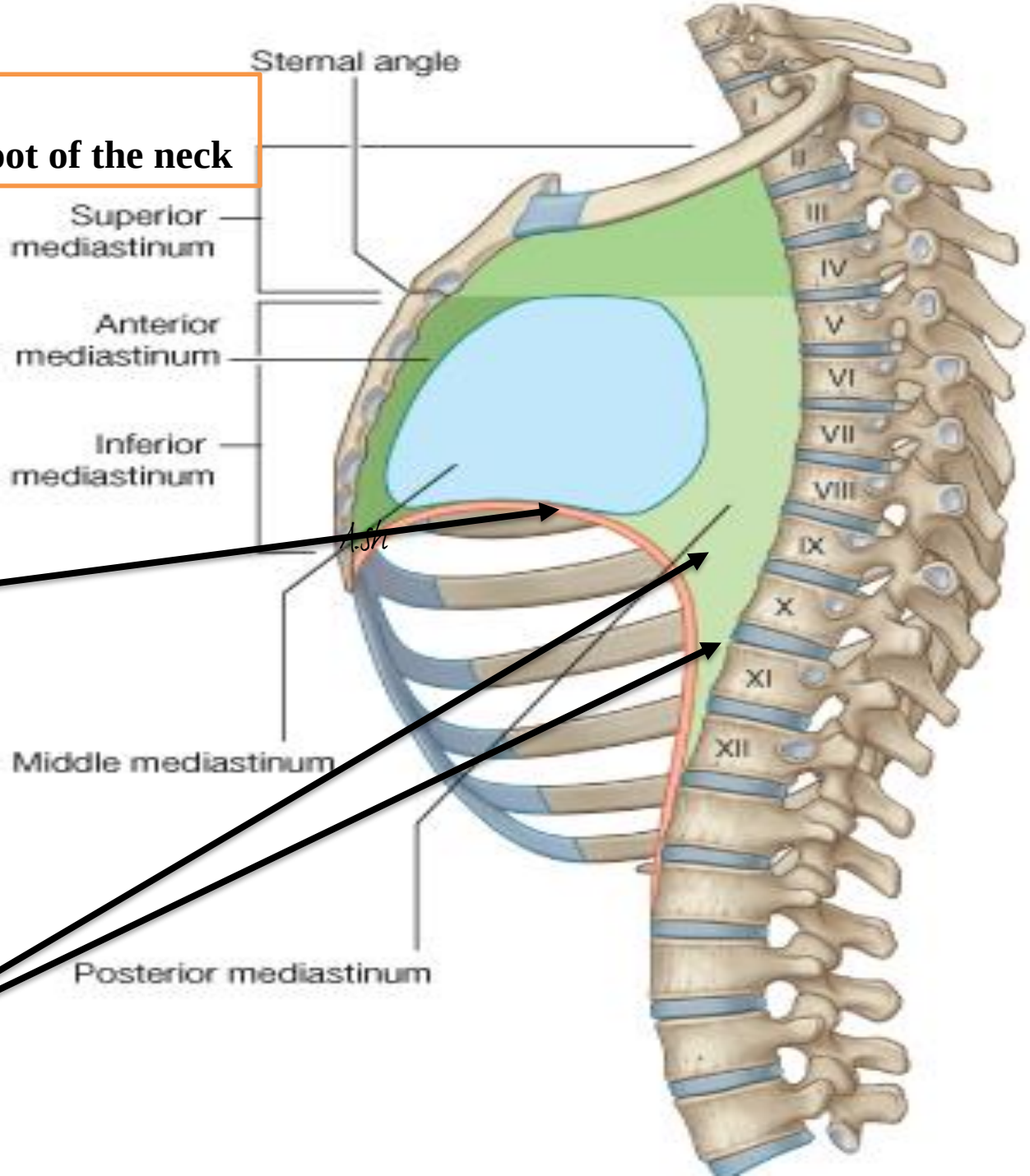
***Posteriorly:*** **to the vertebral column**




***Anteriorly:*** **to the sternum**

Anterior

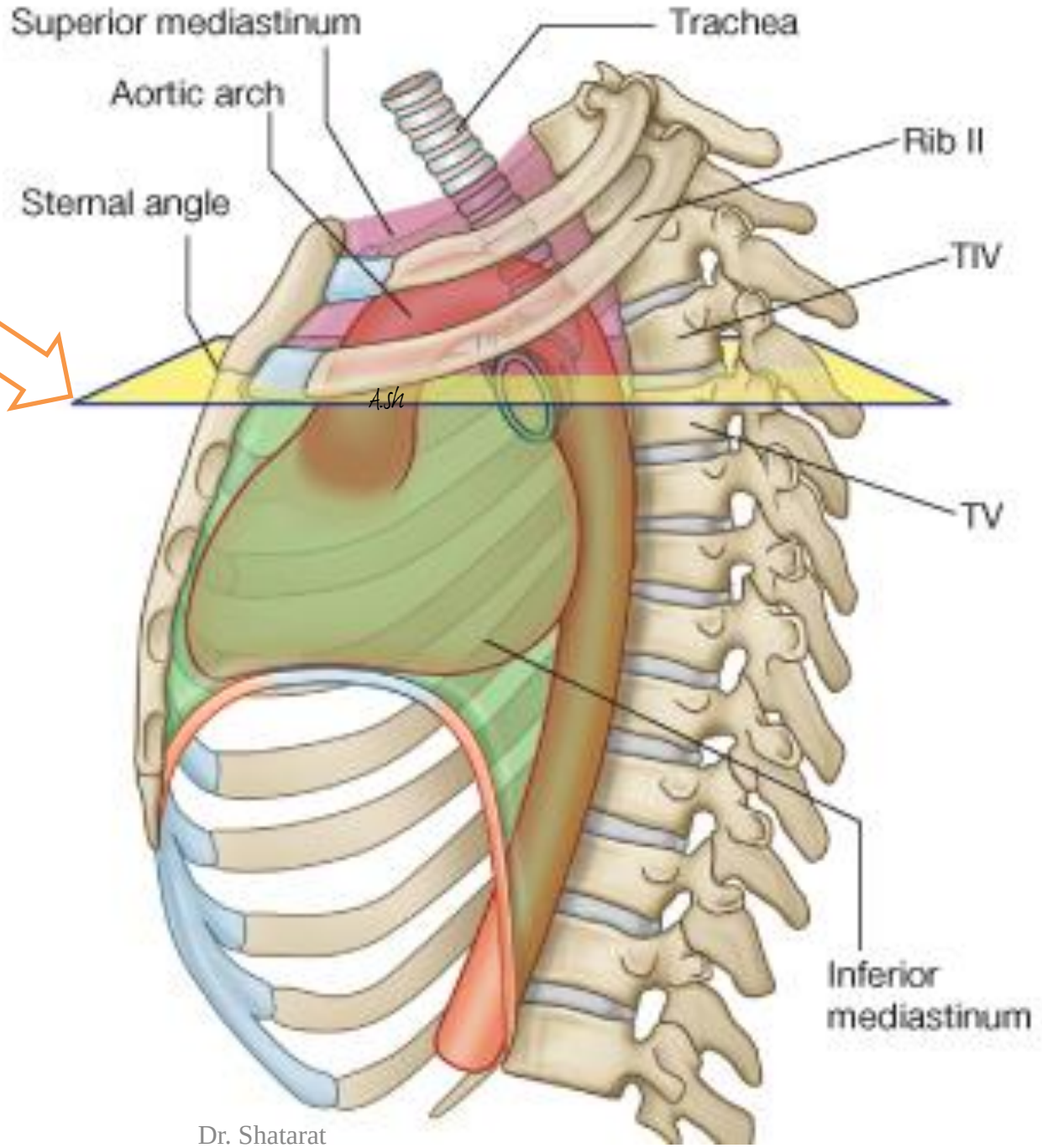
***Superiorly:***
**to the thoracic outlet and the root of the neck**

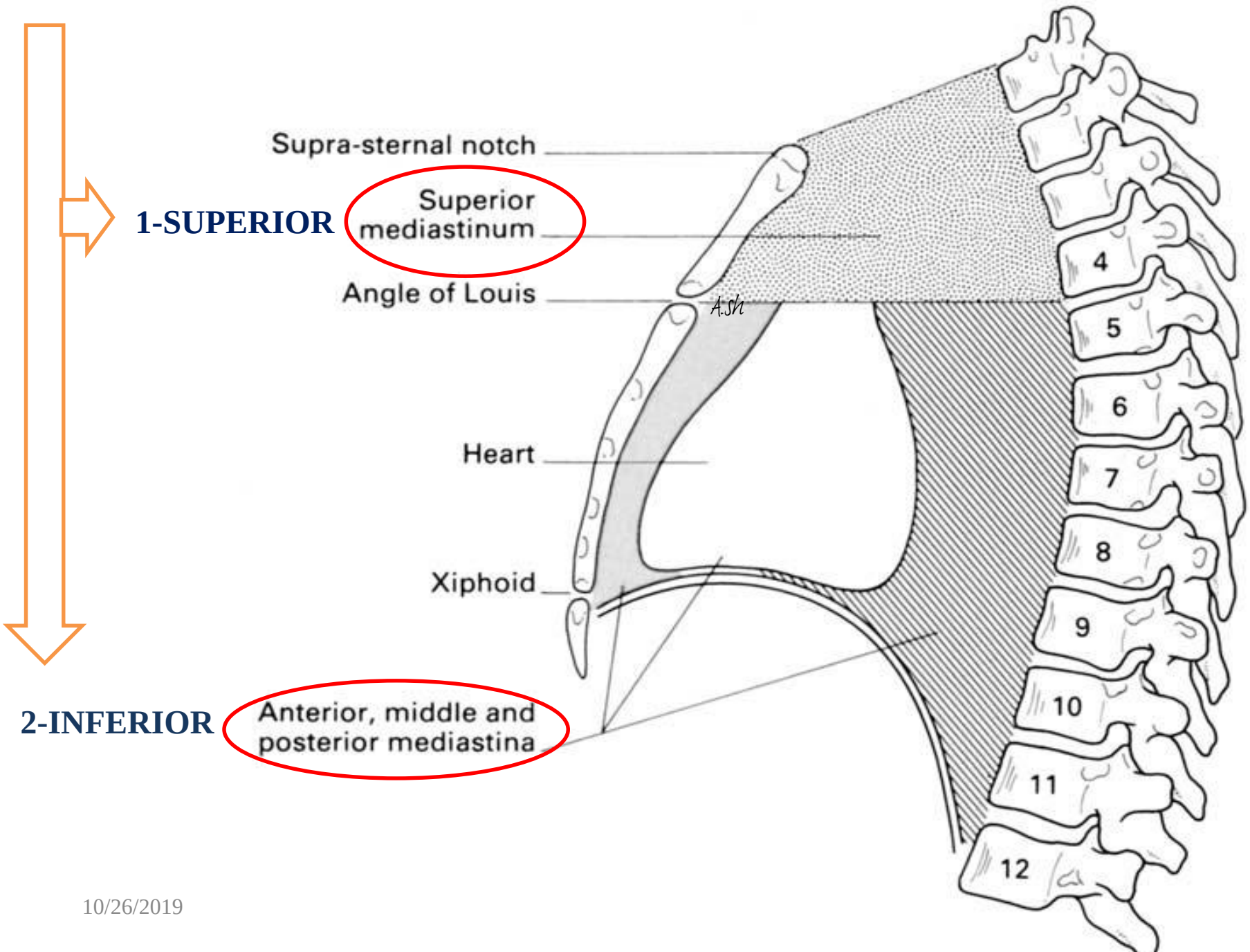



***Inferiorly:*** **to the diaphragm**

Note:
The diaphragm is a dome shaped structure which means that the floor of the mediastinum is somehow not at the same level at all sites. It is getting deeper posteriorly

**An imaginary plane passing from the sternal angle anteriorly (angle of Louis) to the lower border of the body of the fourth thoracic vertebra posteriorly divides the mediastinum into:**




1-SUPERIOR
2-INFERIOR
Supra-sternal notch
Superior mediastinum
Angle of Louis
A.SH
Heart
Xiphoid
Anterior, middle and posterior mediastina
4
5
6
7
8
9
10
11
12

# THE INFERIOR MEDIASTINUM is further subdivided into:

**1-THE MIDDLE MEDIASTINUM**

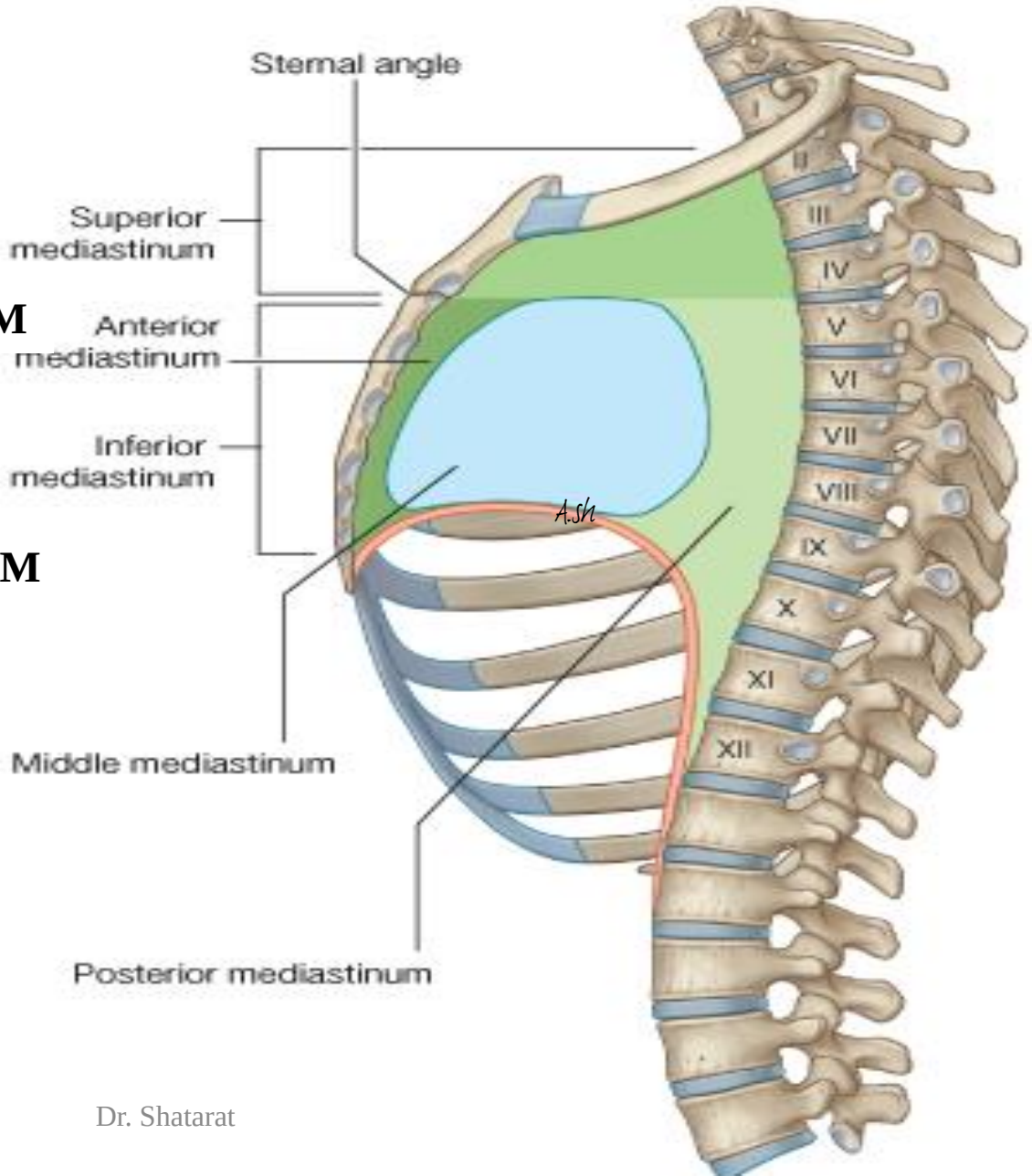
**consists of**
**<u>the pericardium and heart</u>**

**2-THE ANTERIOR MEDIASTINUM**

**is a space between the**
**<u>pericardium and the sternum</u>**

**3-THE POSTERIOR MEDIASTINUM**

**lies between**
**<u>THE PERICARDIUM</u>**
**And**
**<u>THE VERTEBRAL COLUMN</u>**



Quick reminder

***What is the sternal angle?***

# The sternal angle (angle of Louis)

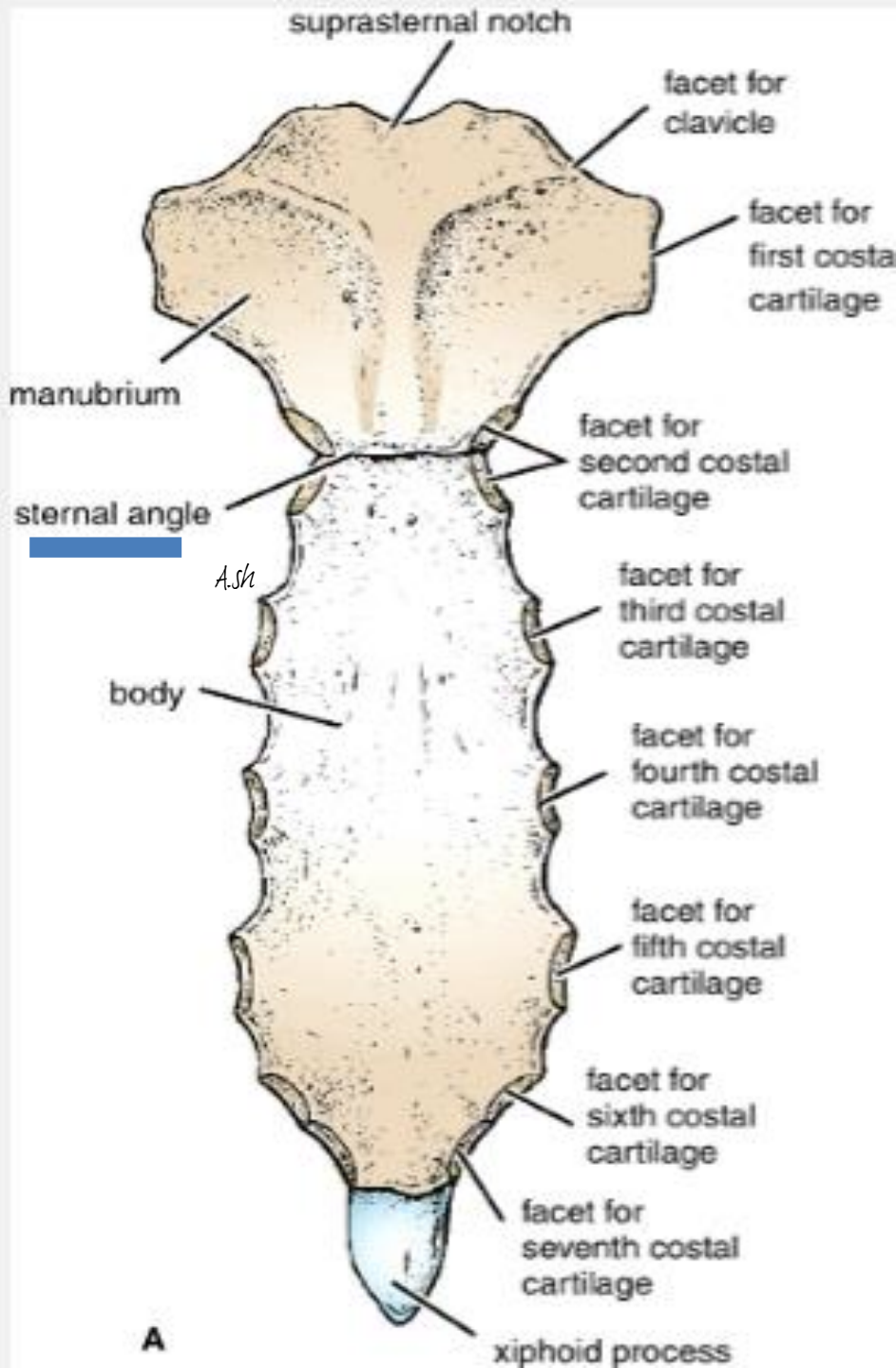
**formed by the articulation of the manubrium with the body of the sternum**

Can be recognized by the presence of a **transverse ridge** on the anterior aspect of the sternum

The transverse ridge lies at the level of the

## second costal cartilage

The point from which all costal cartilages and ribs are counted



Do you know how to count ribs?

A- Find the **suprasternal notch**

B- From the suprasternal notch, go down slowly until you reach **a transverse ridge** on the anterior aspect of the sternum

C- Once you have found the transverse ridge move your finger laterally and you will find the **second costal cartilage**

D- Form the second costal cartilage start to count ribs ***downwards and posterio-laterally***

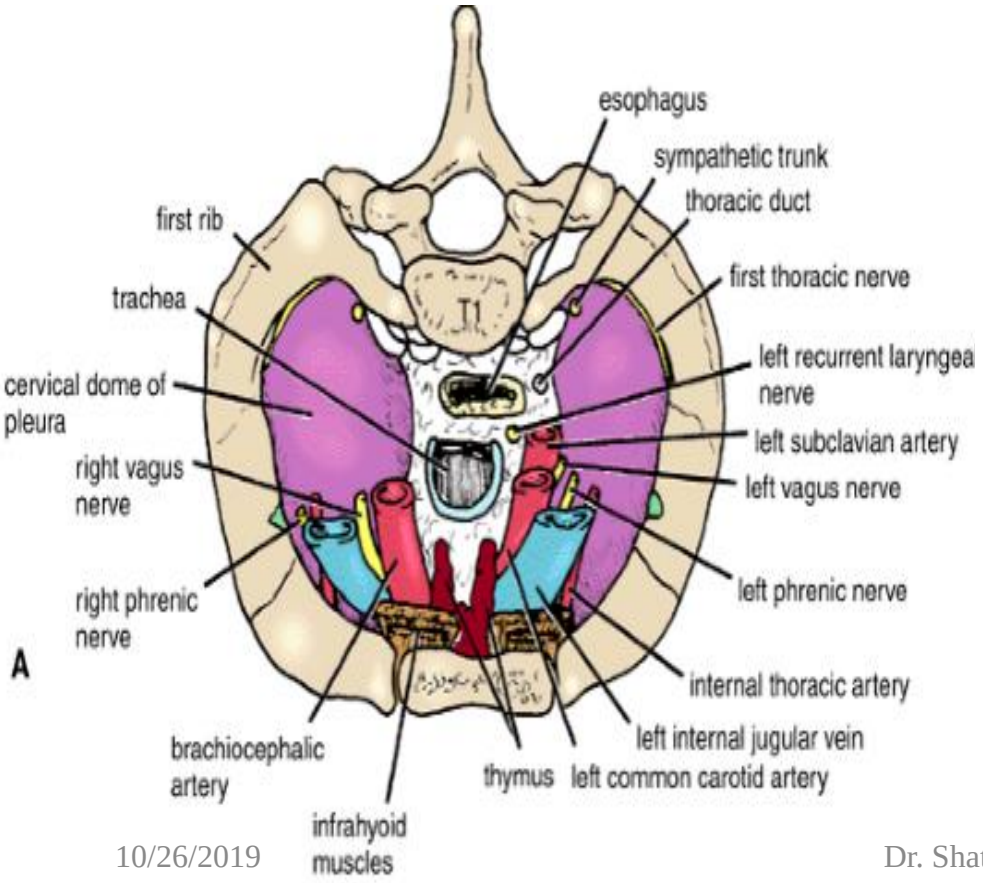
Note;
If you would count downwards only, you will ended up counting
The true ribs only.

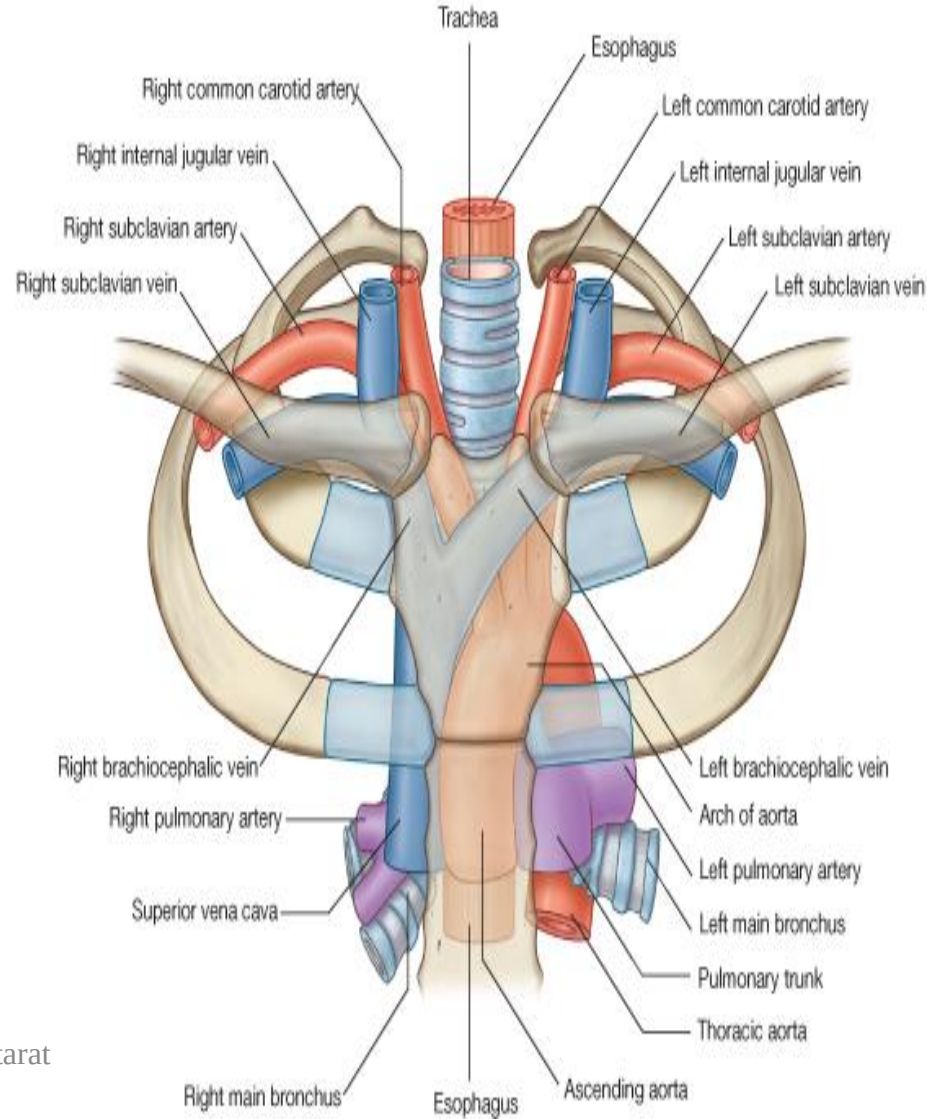
# THE SUPERIOR MEDIASTINUM

(a) THYMUS
(b) LARGE VEINS
(c) LARGE ARTERIES
(d) TRACHEA
(e) ESOPHAGUS
(f) THORACIC DUCT
(g) SYMPATHETIC TRUNKS

# THE SUPERIOR MEDIASTINUM

**is bounded in front by the manubrium sterni and behind by the first four thoracic vertebrae**



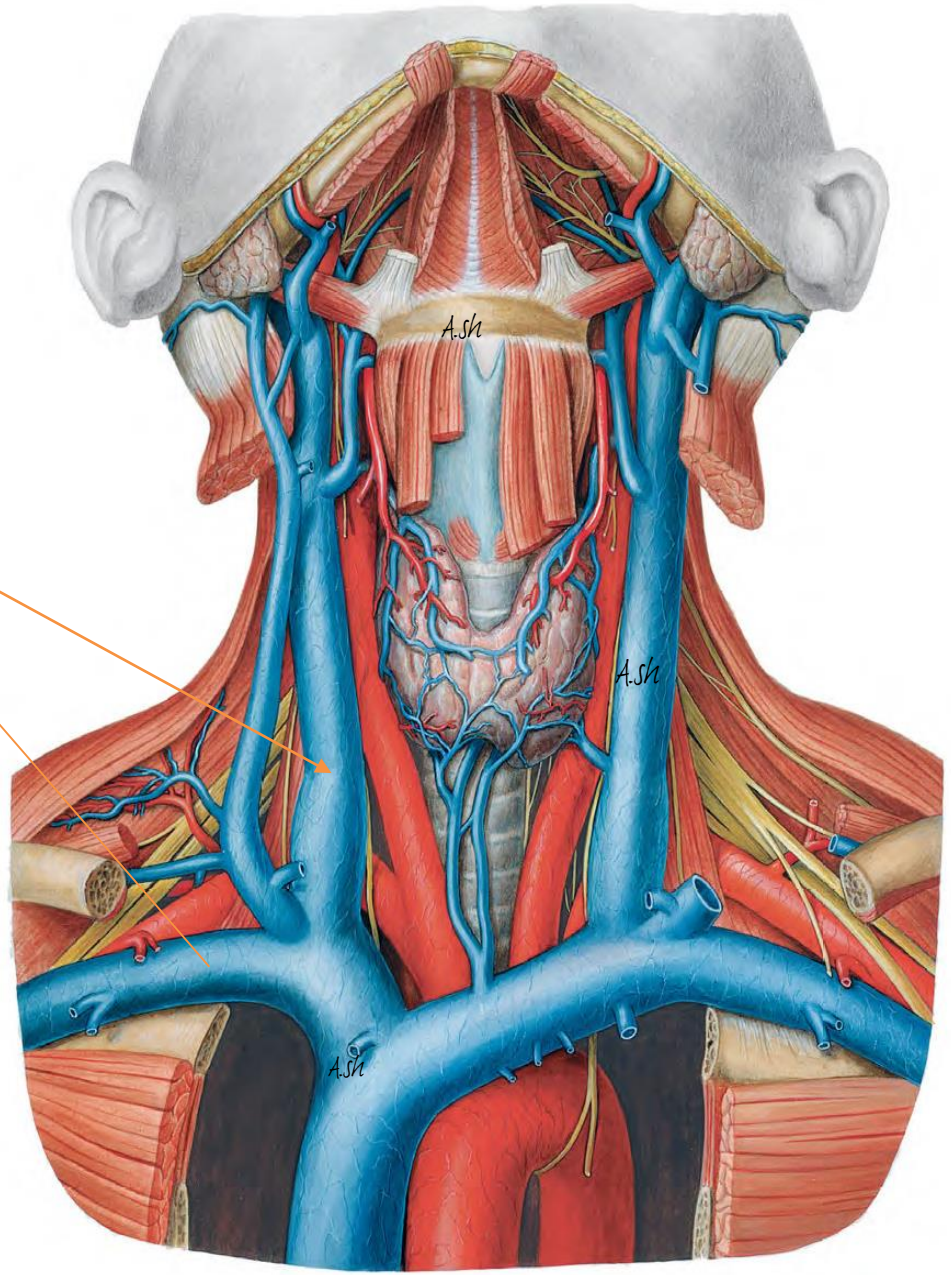
# Great Veins of the Superior Mediastinum

# A-The right brachiocephalic vein:

- formed by the union of ***the right subclavian*** and ***the right internal jugular veins***

**the right venous angle**

- Begins posterior **to the medial end (sternal end) of the right clavicle**
- ***it is shorter than the left one and more vertical) do you know why?***




**Venous tributaries**

Include

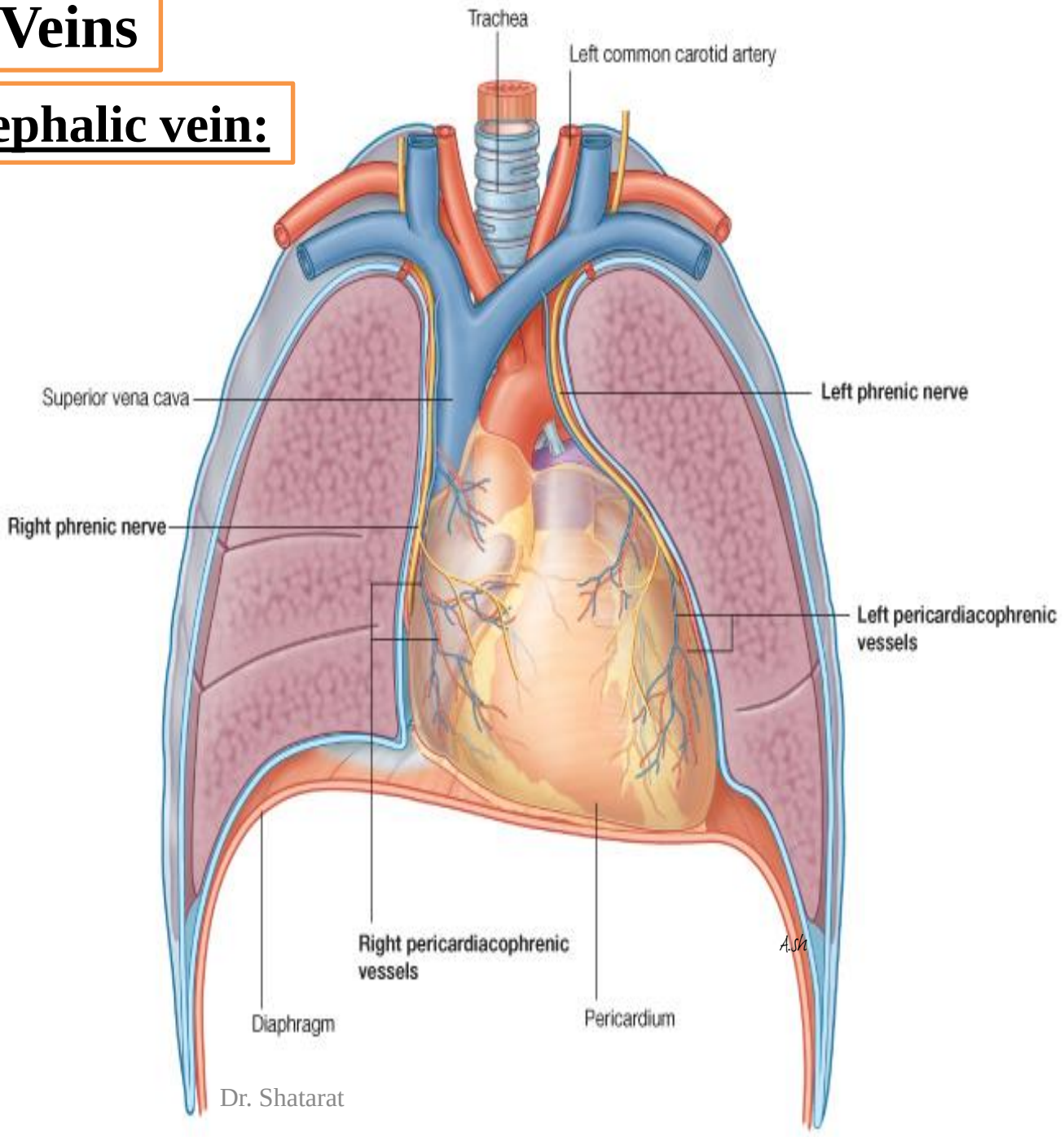
- ***The right vertebral vein***
- ***First posterior intercostal***
- ***Internal thoracic veins***
- **The inferior thyroid and thymic veins m**

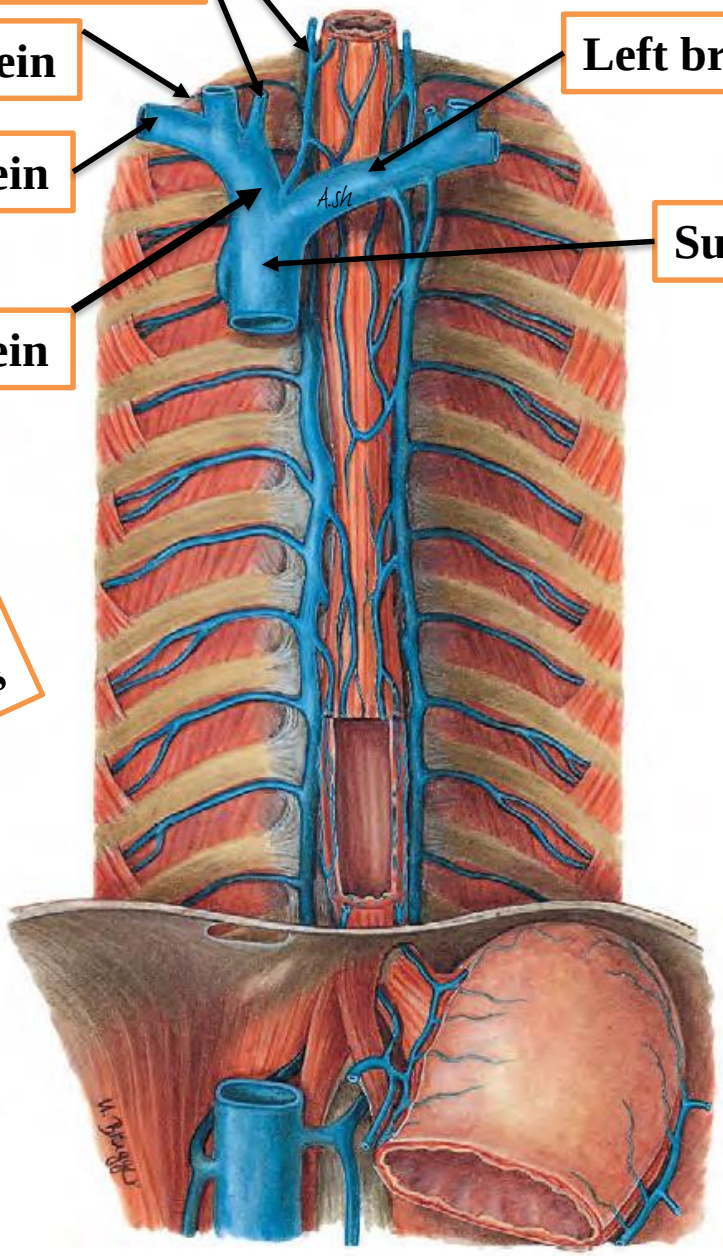
**also** drain into it

# 1-Brachiocephalic Veins

## A-The right brachiocephalic vein:

- formed by the union of ***the right subclavian*** and ***the right internal jugular veins***
- Begins posterior **to the medial end of the right clavicle**
- ***it is shorter than the left one and more vertical)***



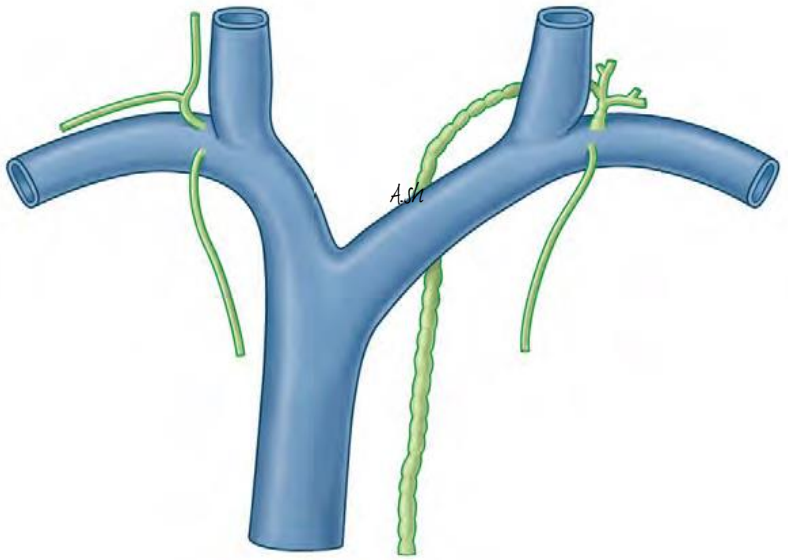



## Venous tributaries

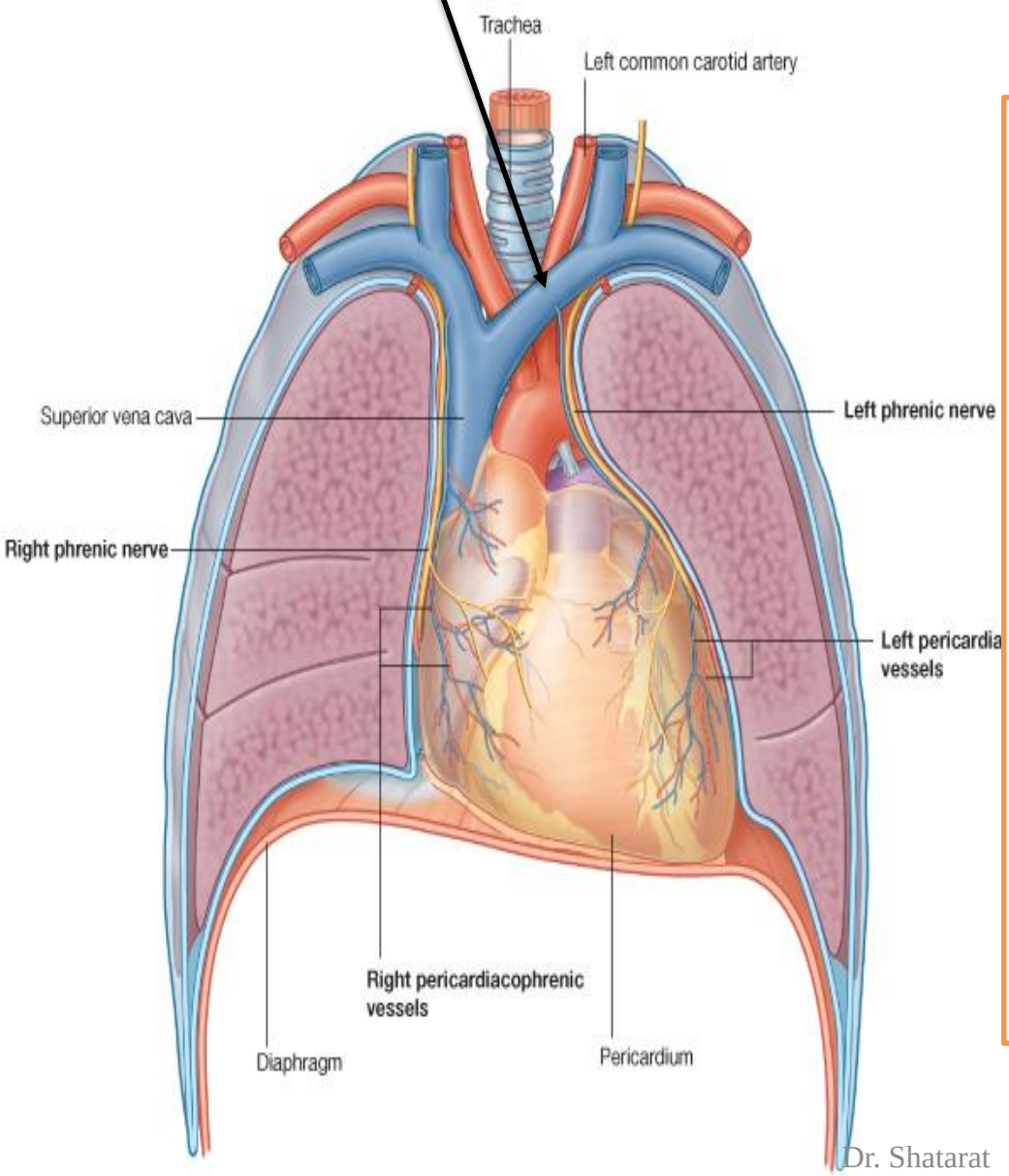
Include
***the vertebral veins***
***first posterior intercostal***
***internal thoracic veins.***
The inferior thyroid and thymic veins may also drain into it

The right venous angle
receives the right lymphatic duct

The left venous angle
receives lymph from the thoracic duct



# B-The left brachiocephalic vein:




Is formed by the union of ***the LEFT subclavian*** and ***the LEFT internal jugular veins***

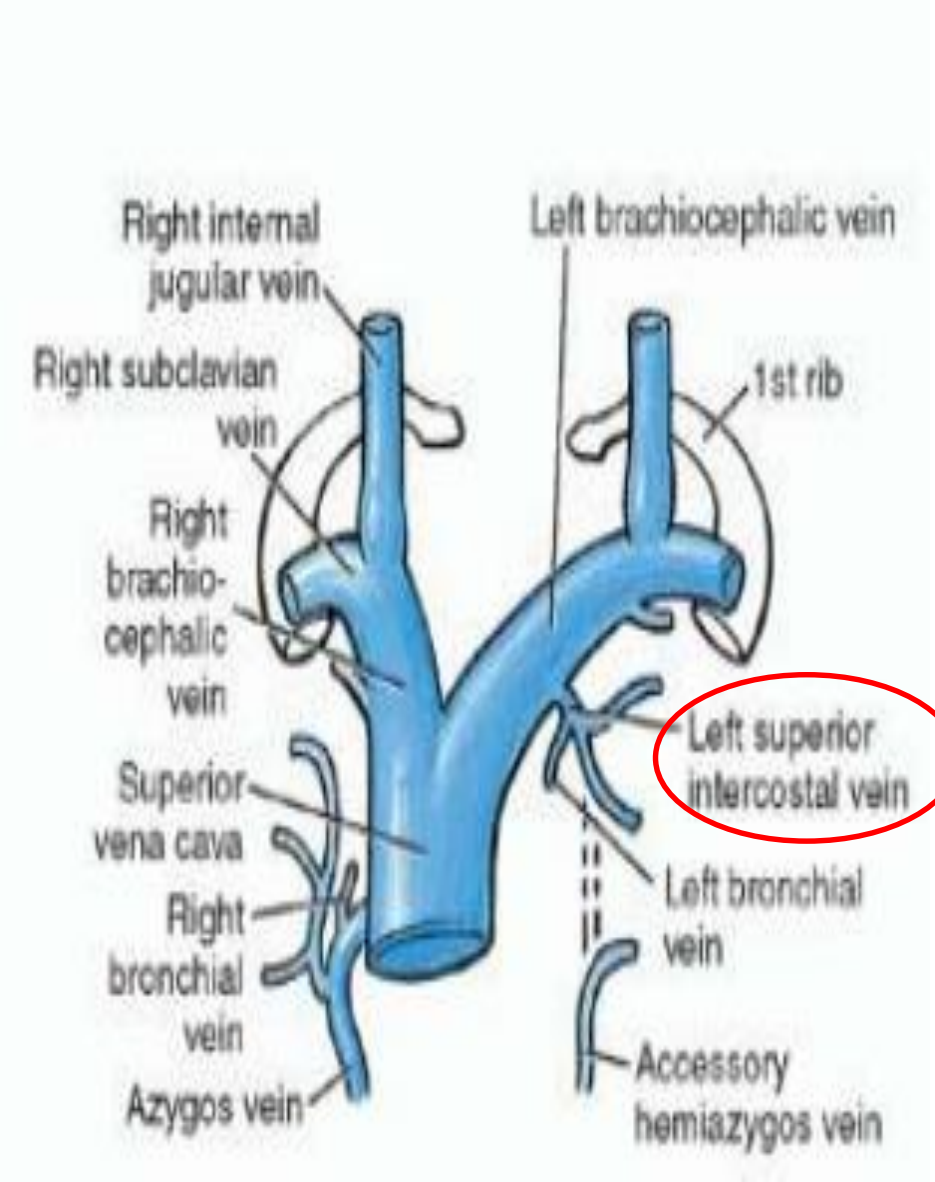
the left "venous angle"

**receives lymph from the thoracic duct**

- **Begins posterior to the medial end of the left clavicle**

- **It passes obliquely and it is longer than the right one) why?**
- It joins the right brachiocephalic vein to form

**THE SUPERIOR VENA CAVA**




# Venous tributaries

Include

***Left vertebral vein***

***First posterior intercostal vein***

***Left superior intercostal vein***

***Inferior thyroid vein***

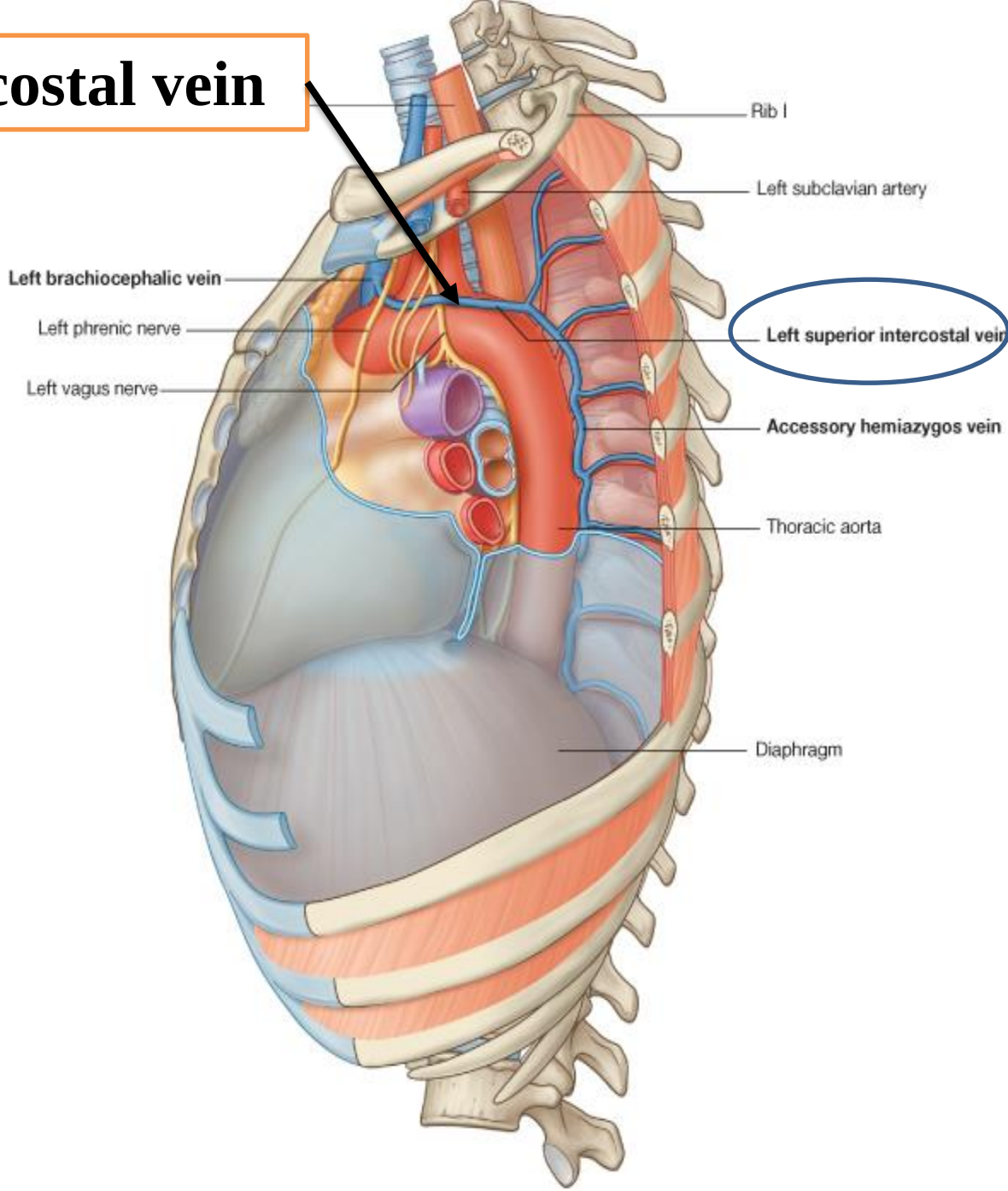
***Internal thoracic veins***

It may also receive thymic and pericardial veins

# The left **superior intercostal vein**

**It drains**

- **The second, third and sometimes the fourth posterior intercostal veins**
- **Usually, it drains the left bronchial veins**
- **Sometimes the left pericardiacophrenic vein**



# Superior Vena Cava SVC

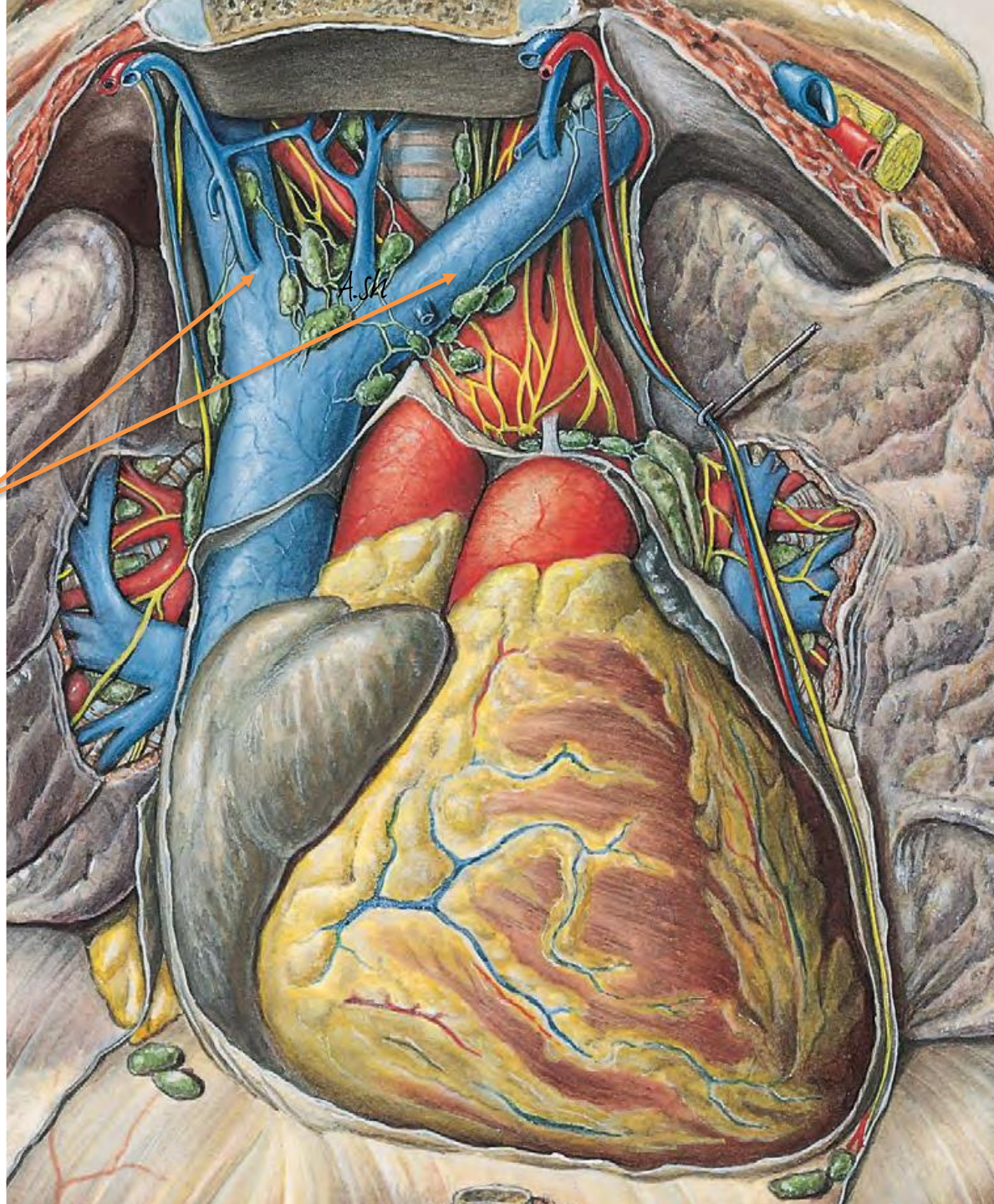
- Generally, it receives venous return from the upper half of the body, above the diaphragm, except the **lungs and heart**

- **It is valveless**
- It is a large-diameter (2.4 cm), but short (7 cm)
- It is formed by the union of *the two brachiocephalic veins* posterior to the lower edge

**of the right first (1) costal cartilage**

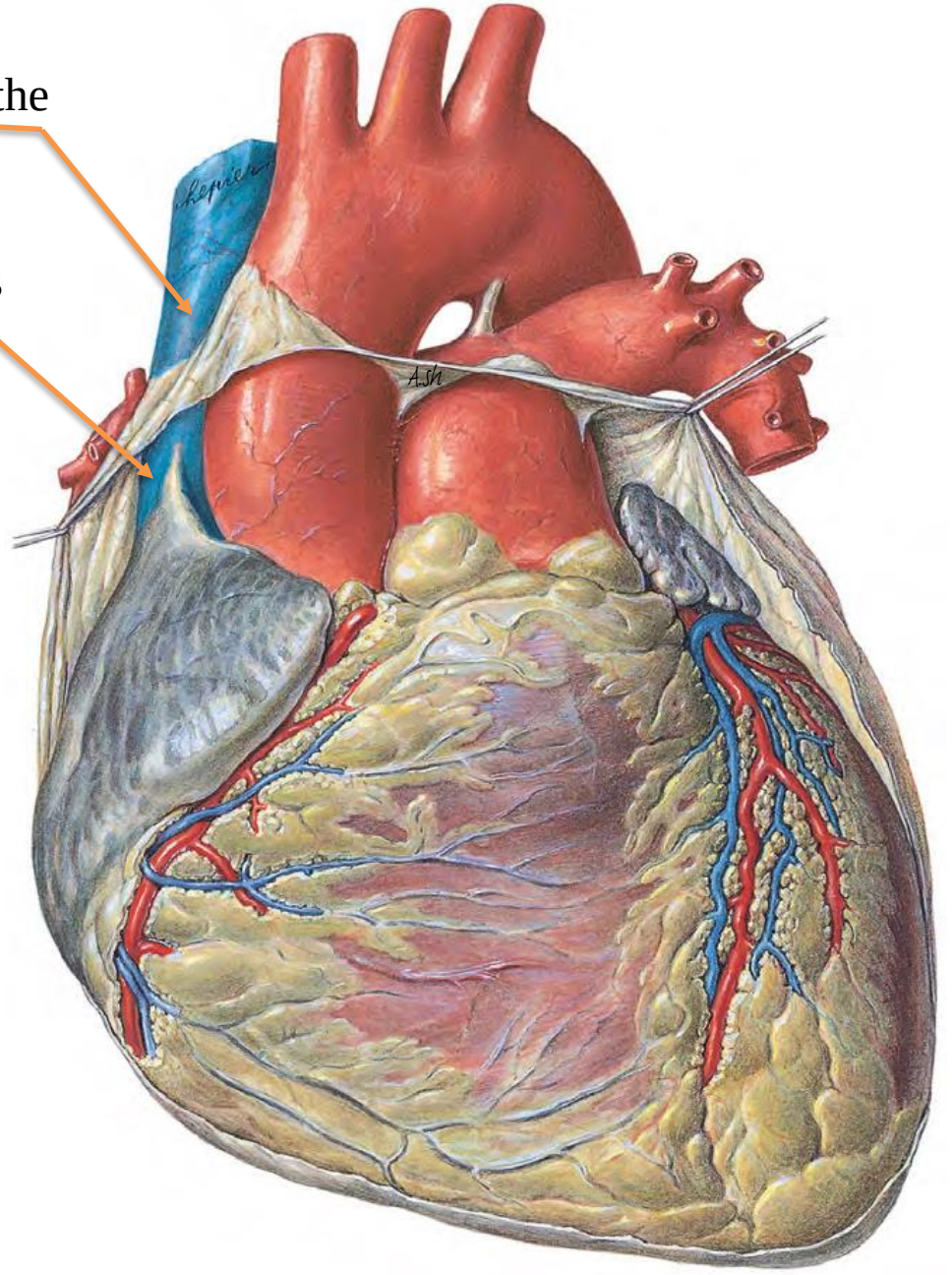
- ***pierces the pericardium at the level of the second (2) costal cartilage***
- Terminates at the lower edge of the right third **(3)** costal cartilage, where it joins the right atrium

SVC, Remember 1, 2 and 3

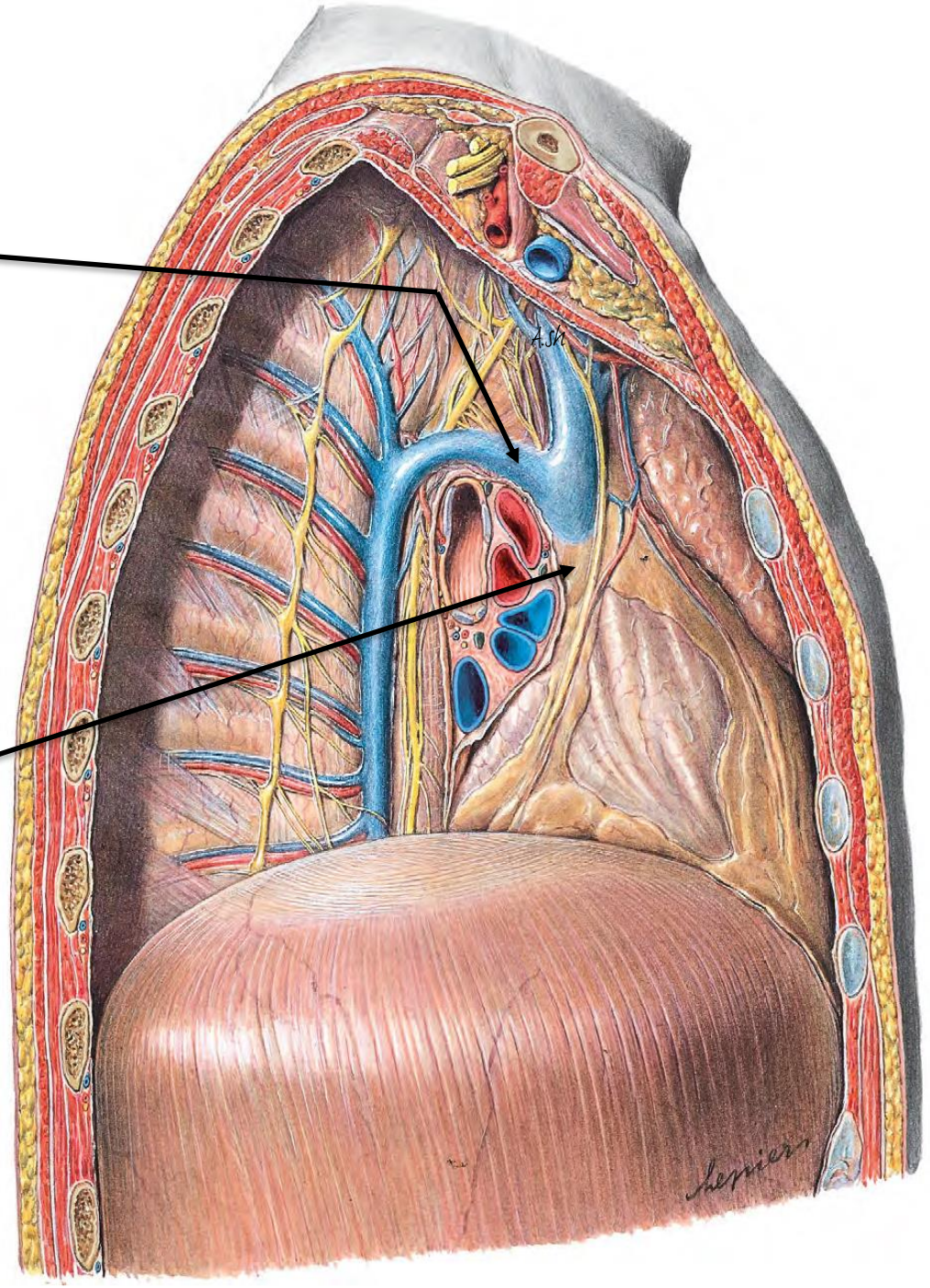


- THE upper half is located within the superior mediastinum

- The lower half of the superior vena cava is within the pericardial sac and is therefore contained in the middle mediastinum



- The **vena azygos** joins the posterior aspect of the superior vena cava just before it enters the pericardial sac and may also receive pericardial and mediastinal veins

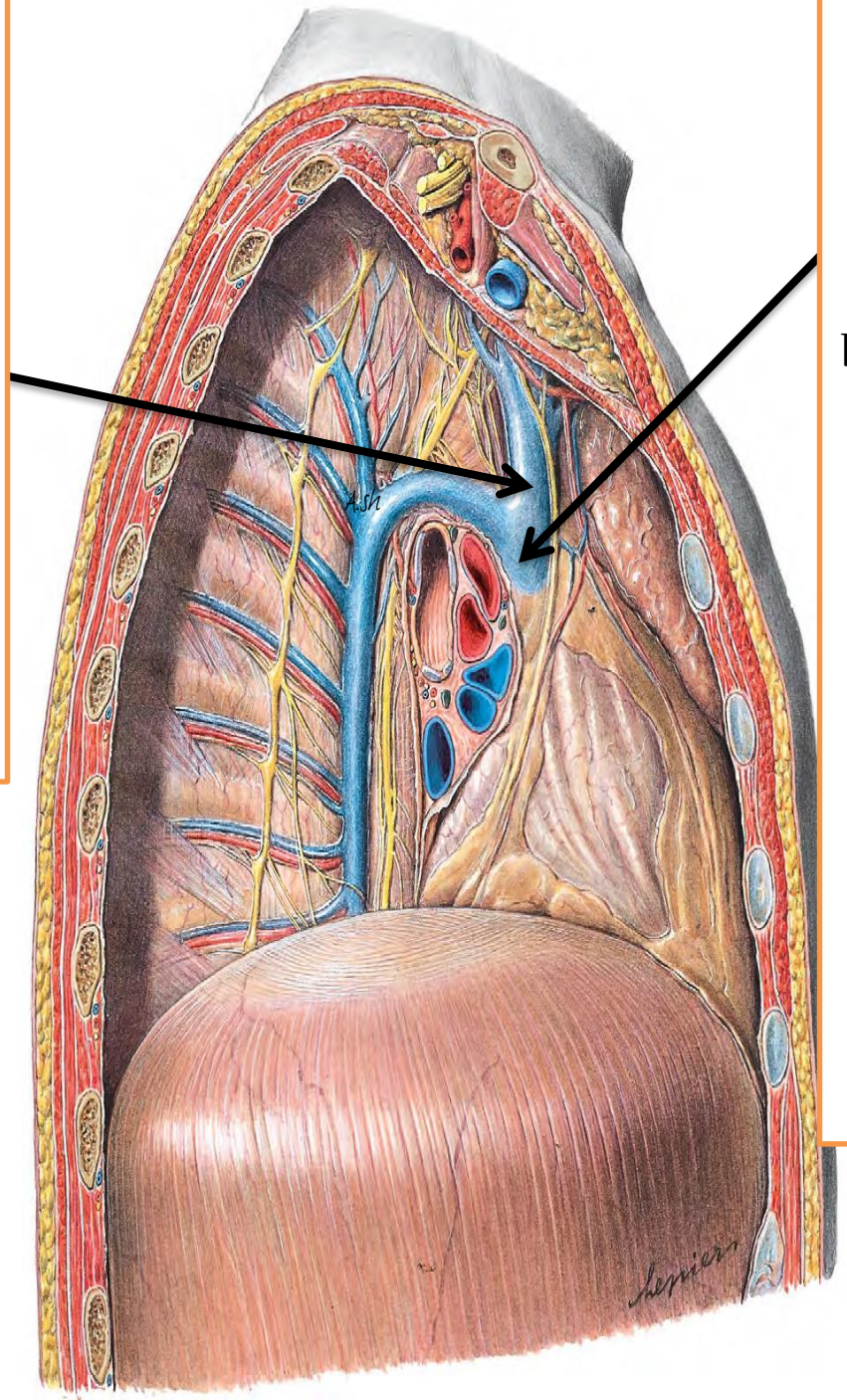


**Superior vena cava syndrome (SVCS)**

- caused by obstruction of the superior vena cava
- More than 80% of cases of SVCS are caused by compression of the vessel wall by malignant tumors in the mediastinum, the vast majority of which are either lung cancer or non-Hodgkin's lymphoma.

Characteristic features are edema (swelling due to excess fluid) of the face and arms and development of swollen collateral **veins on the front of the chest wall**

When obstruction of the SVC occurs **inferior to the entrance of the azygos vein** blood from the upper part of the body can drain **the azygos vein** which communicate with the inferior vena cava which return the blood to the right atrium



When obstruction of the SVC occurs **superior to the entrance of the azygos vein**, blood from the upper part of the body can drain through anastomose between, for example, **the internal thoracic vein of the subclavian vein** and **the intercostal veins** which drain back **to the azygos vein** and finally to the SVC and return to the right atrium through the IVC and azygos system of veins


At rest


At test

Look at the face!!!

**Pemberton's test**

SVC obstruction can be assessed clinically by performing **Pemberton's test**. The patient is asked to raise both arms above their head – a positive test is indicated if facial edema or cyanosis occurs after approximately 1 minute

https://www.youtube.com/watch?v=uAD3stfTmwk

## Clinical Relevance: Jugular Venous Pressure JVP

- The superior vena cava is a **valveless** structure

⇩

This allows the pressure in the right atrium to be conducted upwards into the right internal jugular vein

⇩

Visualisation of the right internal jugular vein is an indicator of the **jugular venous pressure** – which in turn represents **the pressure in the right atrium**

The JVP can be identified as a pulsation between the two heads of the sternocleidomastoid muscle

Causes of a raised JVP include
**right-sided heart failure**
pulmonary hypertension
SVC obstruction.

Just watch this video ⇨ https://www.youtube.com/watch?v=LxqK5MgVBmc