

In this lecture we are going to identify the none vascular content of the superior mediastinum ; to reflect on their clinical manifestations and how these manifestations would be reflected on the **vascular content of the superior mediastinum (specifically the Superior Vena Cava)** , and we are going to talk about imaging of the superior mediastinum ; to focus on the vascular content of the superior mediastinum (arch of the aorta) also the middle mediastinum (ascending aorta) and the posterior mediastinum (descending aorta).

First we are going to talk about the vagus nerve (we are not going to talk about its details) .

None vascular contents of the superior mediastinum

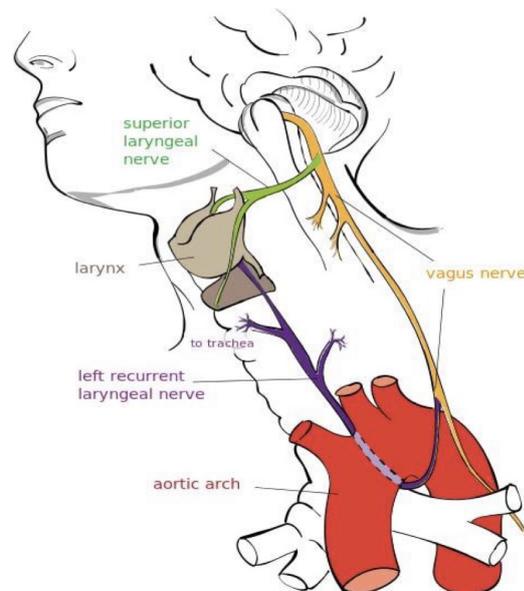
Nerves

Vagus Nerve

- 1 • **Right vagus nerve** – runs parallel to the trachea and passes posteriorly to the superior vena cava and the right primary bronchus.
- 2 • **Left vagus nerve**
 - enters the superior mediastinum between the left common carotid and the left subclavian arteries.
 - It descends anteriorly to the aortic arch

The left recurrent laryngeal nerve arises from the left vagus nerve as it passes the aortic arch.

It loops under the arch, to the left of **ligamentum arteriosum**, before continuing its journey to the larynx in the tracheal-oesophageal groove.



Where is the right recurrent laryngeal nerve? Is it in the superior mediastinum?

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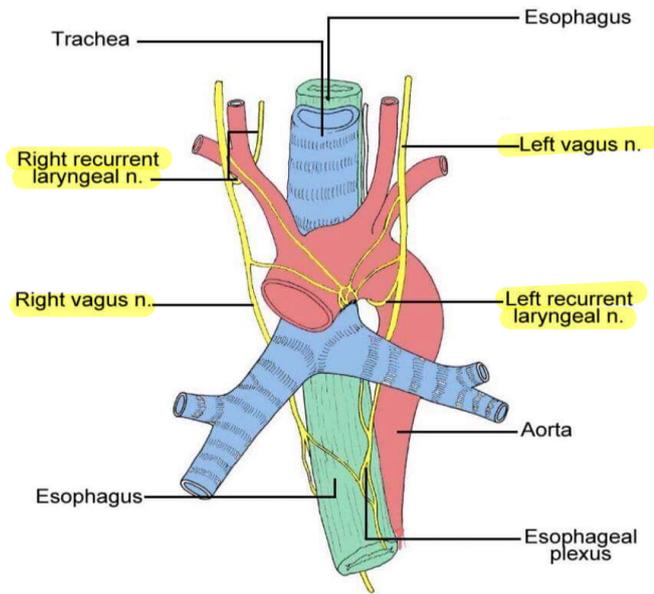
Dr. Shatarat

The right and the left vagus nerve they have almost the same course in the neck , both within the vascular compartment of the neck (the carotid sheath) , however the difference between them is when they give the recurrent laryngeal nerve :-

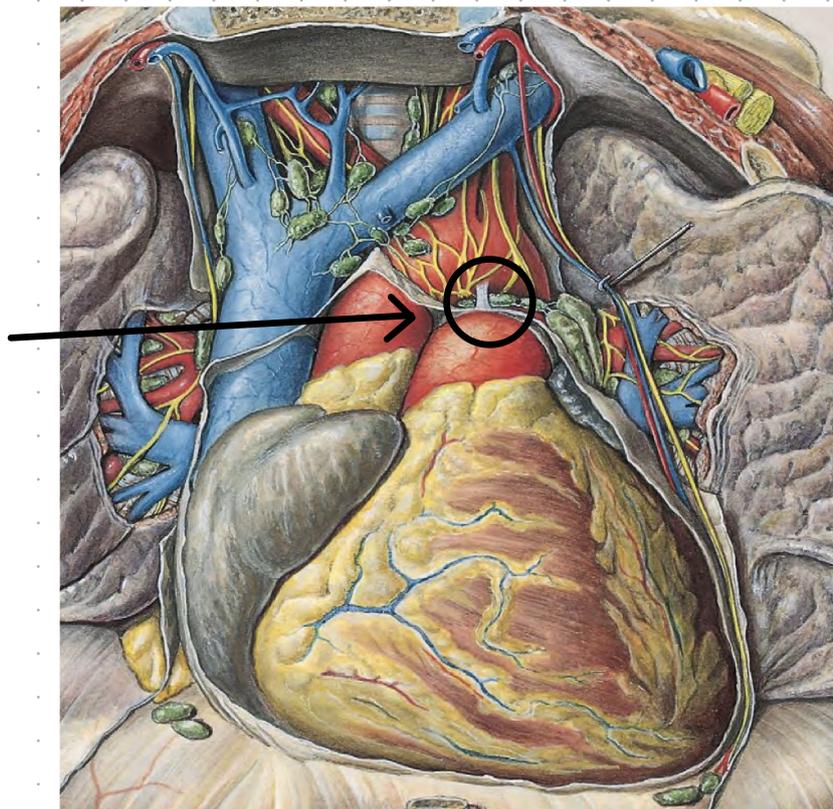
- 1- **the right one it is in the root of the neck , and it loops under the subclavian artery**
- 2- **the left one is in the superior mediastinum , and then it loops under the arch of the aorta**

*** so , in conclusion the right and left vagus nerves are both in the superior mediastinum , the left recurrent laryngeal only in the superior mediastinum**

Notice the two vagus nerves and their recurrent laryngeal nerves :



Remember this structure (ligamentum arteriosum) ; the whole course of the left recurrent laryngeal nerve lies behind this structure ; and this ligament is within the superior mediastinum specially when it joins the arch of the aorta .

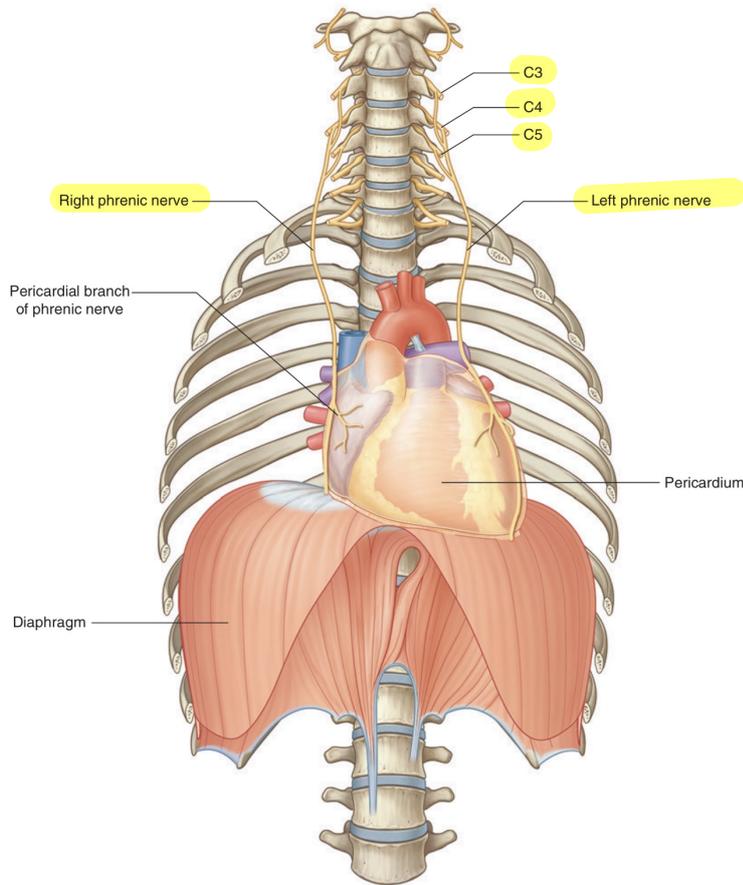
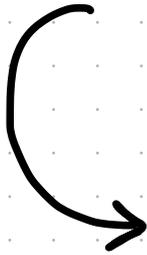


What matters in regard to the recurrent laryngeal nerves is to remember that the left recurrent laryngeal nerve lies in the middle of the superior mediastinum and it would be affected of any mass nearby this are , but the right one is not even in the superior mediastinum

Second , the Phrenic nerve (C3, C4 and C5) :-

-it is the most anterior nerve ; it lies in front of the arch of the aorta .Both the right and the left one lie anteriorly .

- they are affected by any mass in this area , and if they are affected ; they cause Paralysis of the diaphragm on the corresponding side

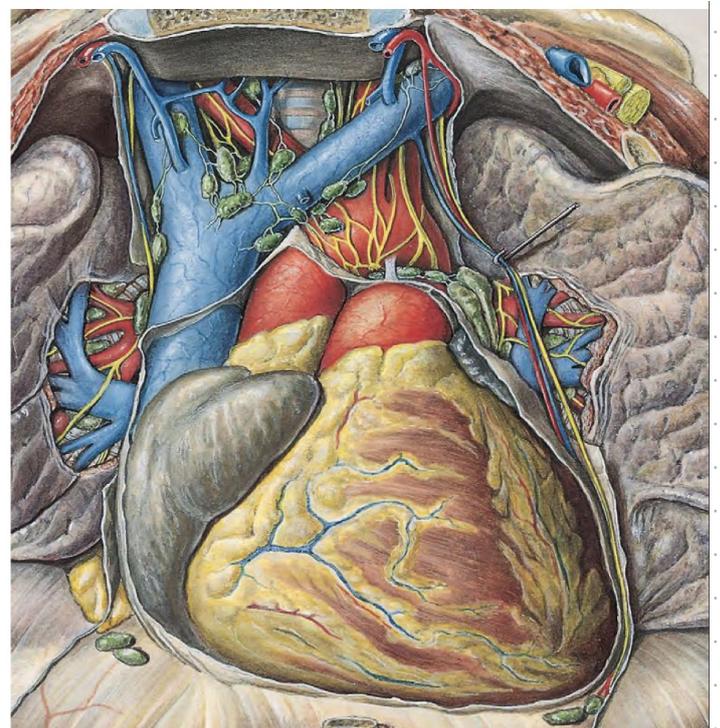


Other Nerves

- Cardiac nerves
- Sympathetic trunk

None vascular and none neurogenic structures

- Thymus
- Trachea
- Oesophagus
- Thoracic duct



Other structures are going to be discussed as we proceed .

Remember from the first lecture we said that the thoracic cavity is like a bottle and the neck of this bottle (which is narrower than the bottom) is the superior mediastinum , and anything going from the thorax to the neck and vice versa has to pass through this area ; as a result it is a very crowded area .

Unfortunately , this area is the site of metastasis -site of development of malignant tumors - these tumors in such narrow area will produce pressure ; we call it mass effect (recall from the endocrine system) this mass effect will affect the nearby vascular and nonvascular structures in the superior mediastinum , and ultimately it will produce



Superior Mediastinum Compression (SMC) Syndrome

It is caused mainly by malignant tumors in the mediastinum, the vast majority of which are either lung cancer or non-Hodgkin's lymphoma.

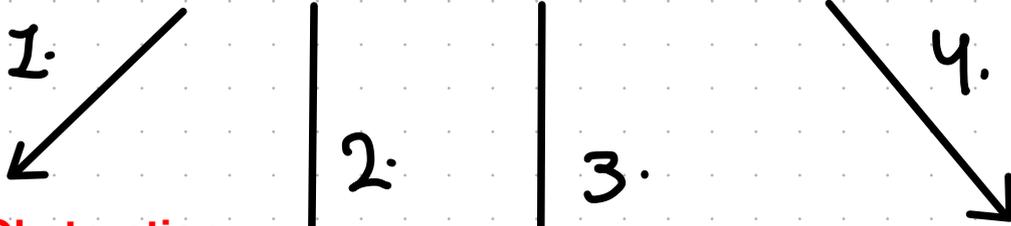
In children it is blood-related tumors

In adults it is bronchogenic lung-related tumors and others

Go through these malignant tumors , but you won't be asked to memorize them ; because what we care about here is the anatomical relations and how they manifest themselves in this area :-

- Acute lymphoblastic leukaemia (ALL)
- Non-Hodgkin lymphoma (T cell lymphoblastic lymphoma, Burkitt's lymphoma)
- Hodgkin Disease
- Malignant Germ Cell Tumours

Clinical manifestations of the syndrome



Airway Obstruction

Main bronchus and tracheal compression produces **dyspnea**

Horner's syndrome (rare) [VIP] Affecting the sympathetic trunk

The head and neck don't have their own sympathetic innervation, instead they steal this innervation with the blood vessels coming to the head, specially the common carotid artery and its branches, so the arteries take this sympathetic innervation from a ganglia that originates from the sympathetic trunk; so any mass affecting the sympathetic trunk will eventually disrupt the sympathetic innervation to the head and neck; causing :-

1- Ipsilateral ptosis (since we have partial sympathetic innervation to the muscle (levator palpebrae superioris ; which is responsible for elevating the eyelid) ; disrupting the innervation would affect the muscle ; thus causing drooping of the eyelid (Ipsilateral ptosis))

2- Miosis (since the sympathetic effect causes pupil dilation ; disrupting it would result in pupil constriction (miosis))

3- Anhidrosis (sympathetic effect increases the sweating in order to cool down the body ; disrupting it would result in absence of sweating (Anhidrosis))

Compression on the left recurrent laryngeal nerve causes **Hoarseness of voice**

(since the left recurrent laryngeal nerve is responsible for the movement of the vocal cords ; affecting the innervation would cause **Hoarseness of voice**)

5- SVC (Superior Vena Cava) obstruction

Lets focus on the superior vena cava obstruction (one of the earliest clinical presentations of SMC syndrome is SVC obstruction due to the below 3 factors)

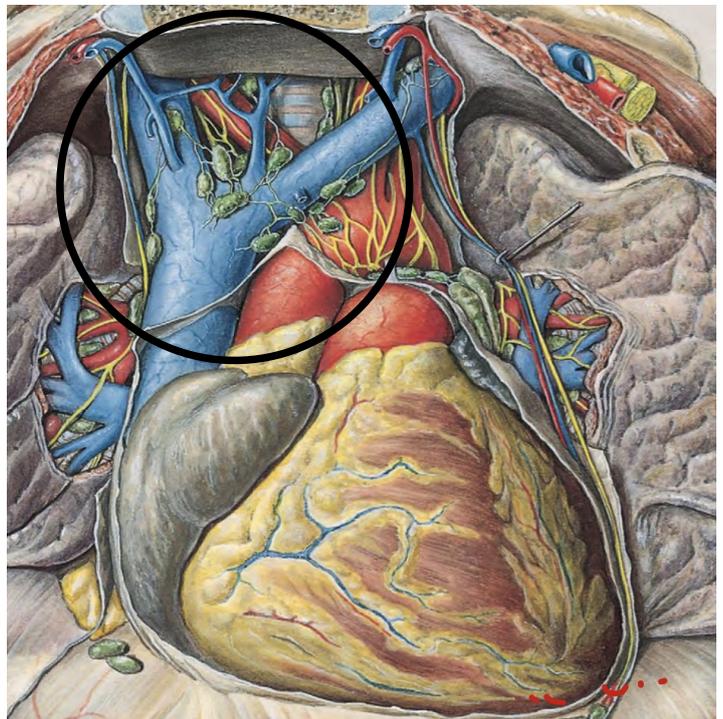
Why the SVC is to be compressed ??

it is vulnerable to extrinsic compression and obstruction because :-

1- It is thin walled (comparing it to the aorta ; which has thicker walls than the SVC)

2- Its intravascular pressure is low (comparing it the aorta ; which has high intravascular pressure)

3- the superior mediastinum has a little bit of loose connective tissue covering it ; the superior vena cava and the great veins are structures that take the venous blood , need some extra space for their movement ; so we have on the right side **DEAD SPACE** for the relaxation of the superior vena cava and great veins ; therefore, if any mass to develop in this area the expansion would take place in the right side .



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 (so non-vascular structures in the superior mediastinum may develop malignant tumors that compress the SVC) , the vast majority of which are either lung cancer or non-Hodgkin's lymphoma.

Characteristic features :-

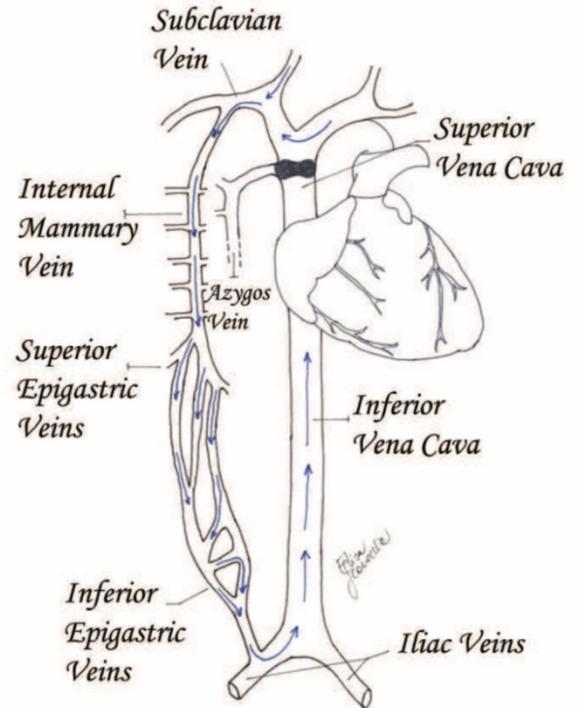
are edema (swelling due to excess fluid) of the face and arms { and that's because all the venous drainage will be crowded in these areas } and development of swollen collateral veins on the front of the chest wall



Now , when we have SVC obstruction we have one of the two scenarios :-

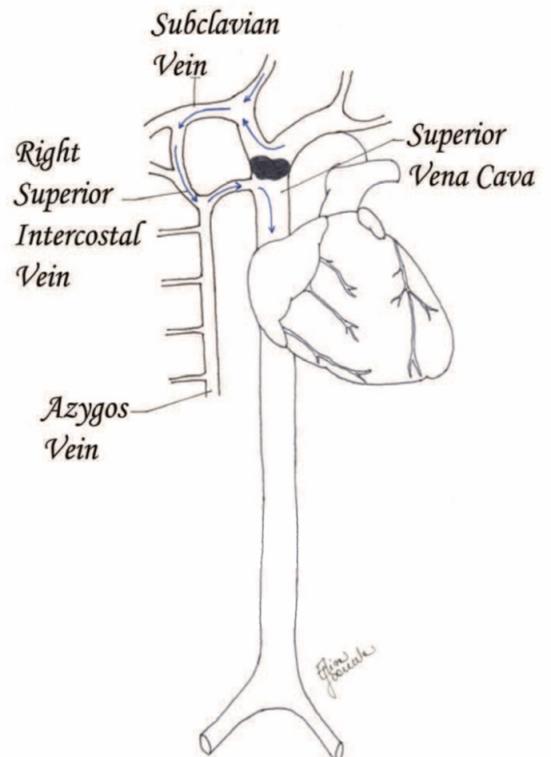
1- When obstruction of the SVC occurs inferior to the entrance of the azygos vein .

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 .



2- When the obstruction of the SVC occurs Superior to the entrance of the Azygos vein .

Blood from the upper part of the body can go back and drain through anastomoses 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



SVC obstruction assessment :-

* SVC is an emergency specially in children with blood-related tumors .

1- 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



At rest



At test

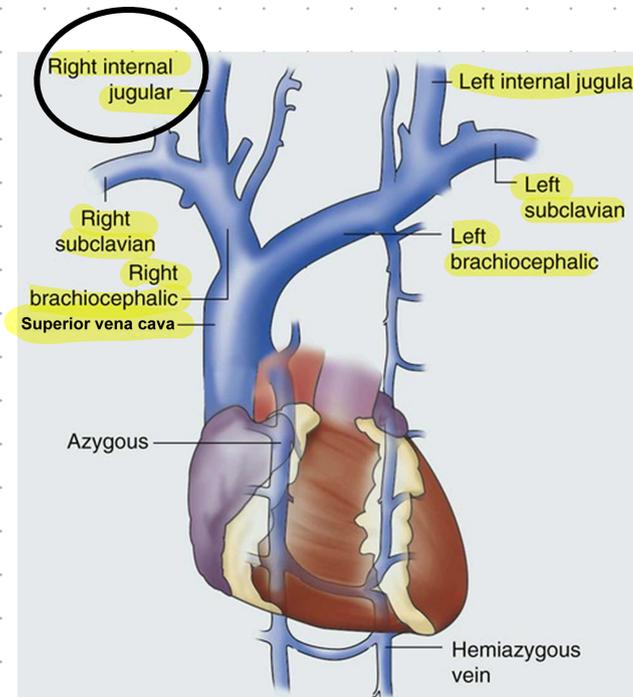
Notice the color and the size of the patient's face

2- Clinical Relevance : Jugular Venous Pressure JVP

I. The superior vena cava is a valveless structure

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

III. 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



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

