

Respiratory System

INTERCOSAL SPACES ARTERIES, AZYGOS SYSTEM & NERVES

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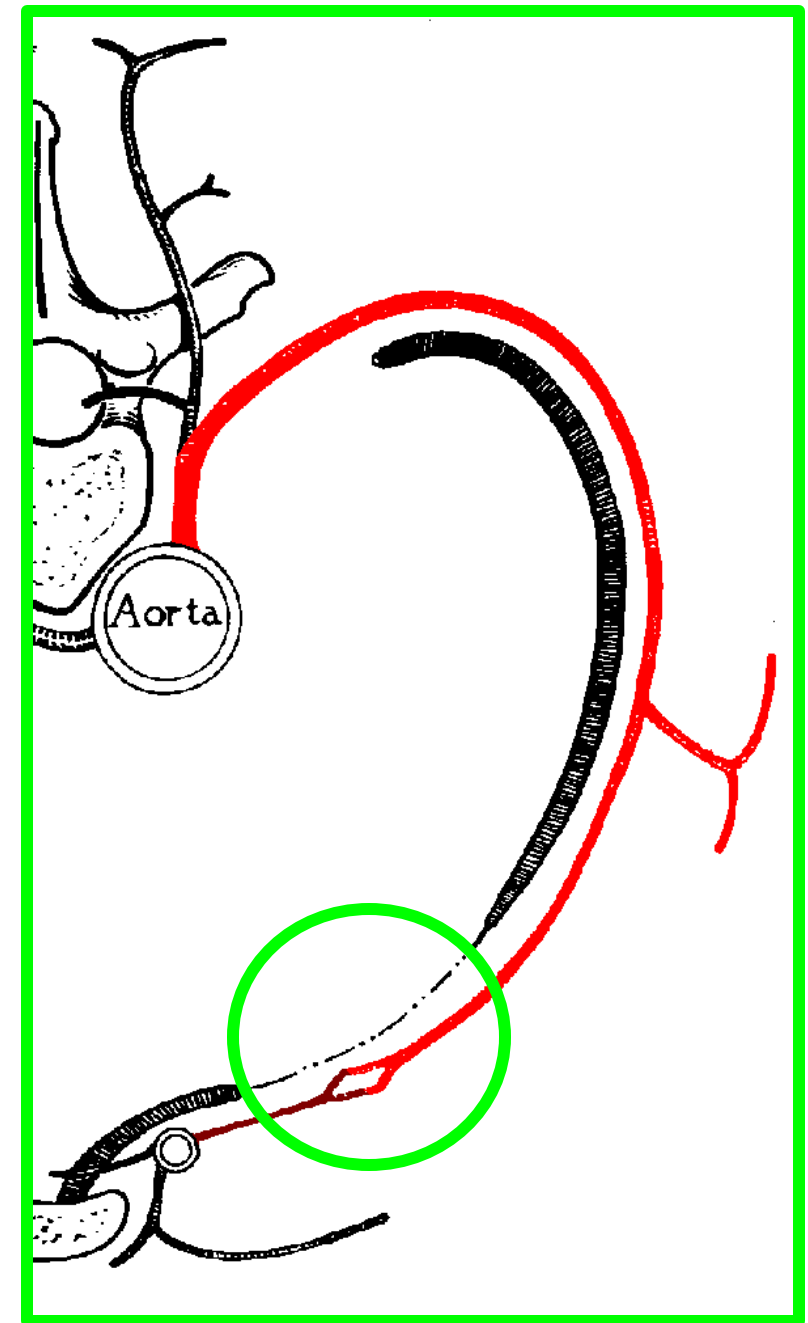
College of Medicine / University of Mutah

2024-2025

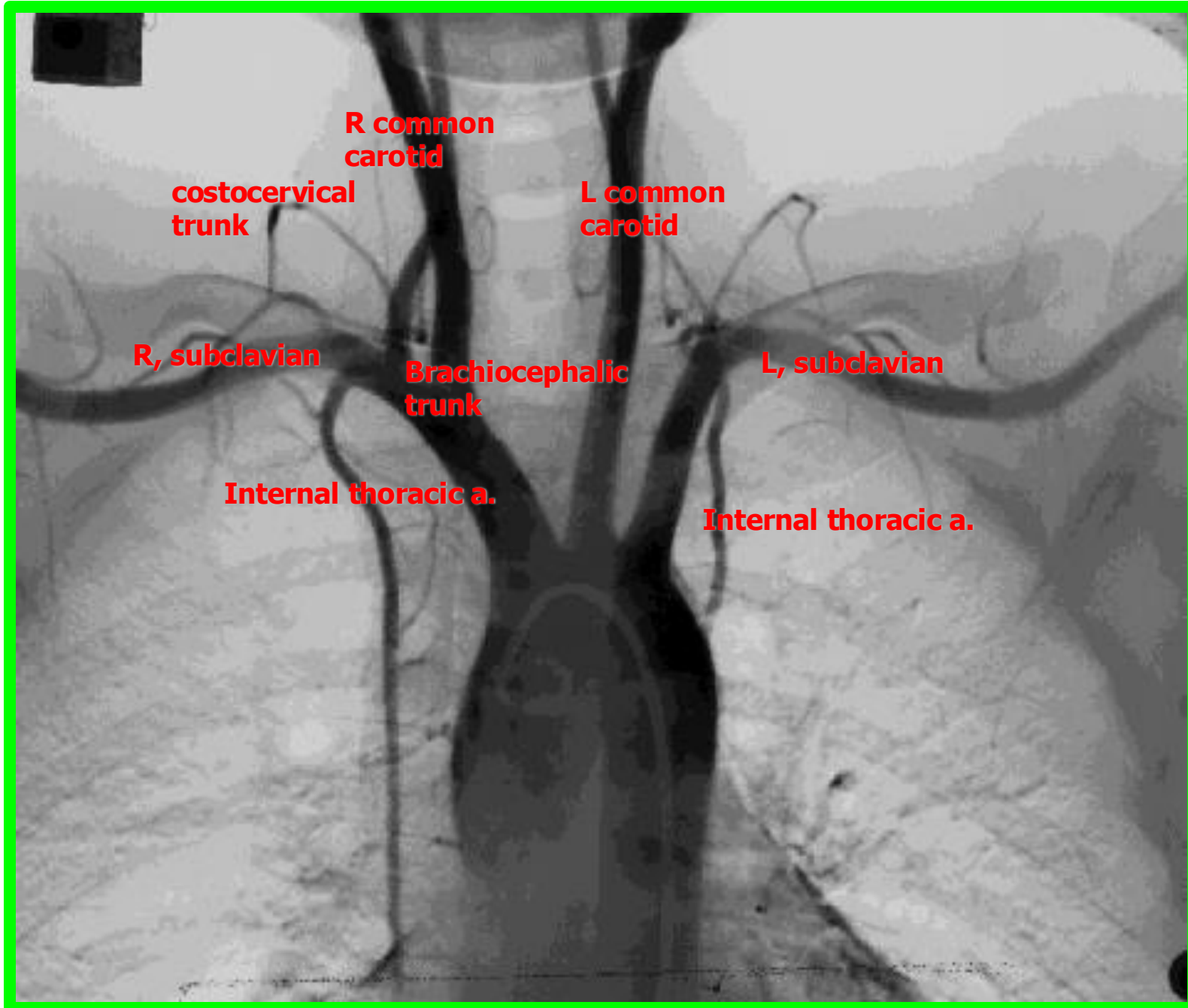
Sunday 7th October 2024

Intercostal arteries

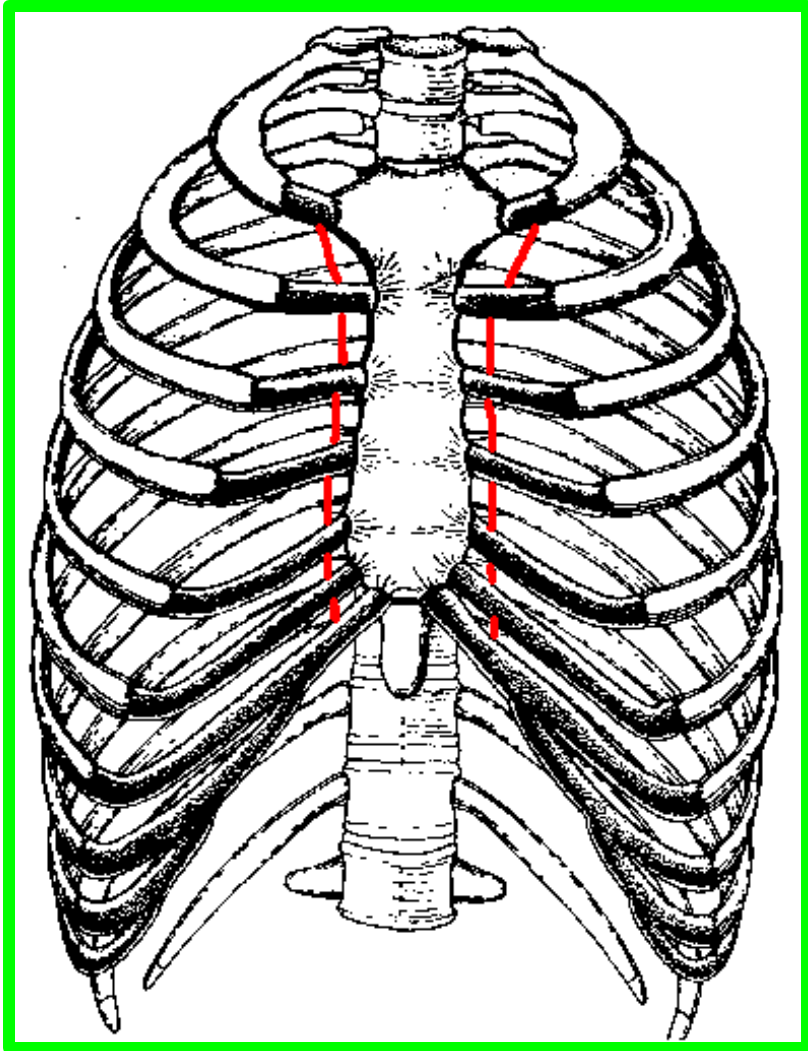
- ❖ Each intercostal space has
- ✓ a large single **posterior intercostal artery** and
- ✓ **two small anterior intercostal arteries.**
- ✓ In each space the **anterior and posterior intercostal arteries anastomose with each other**



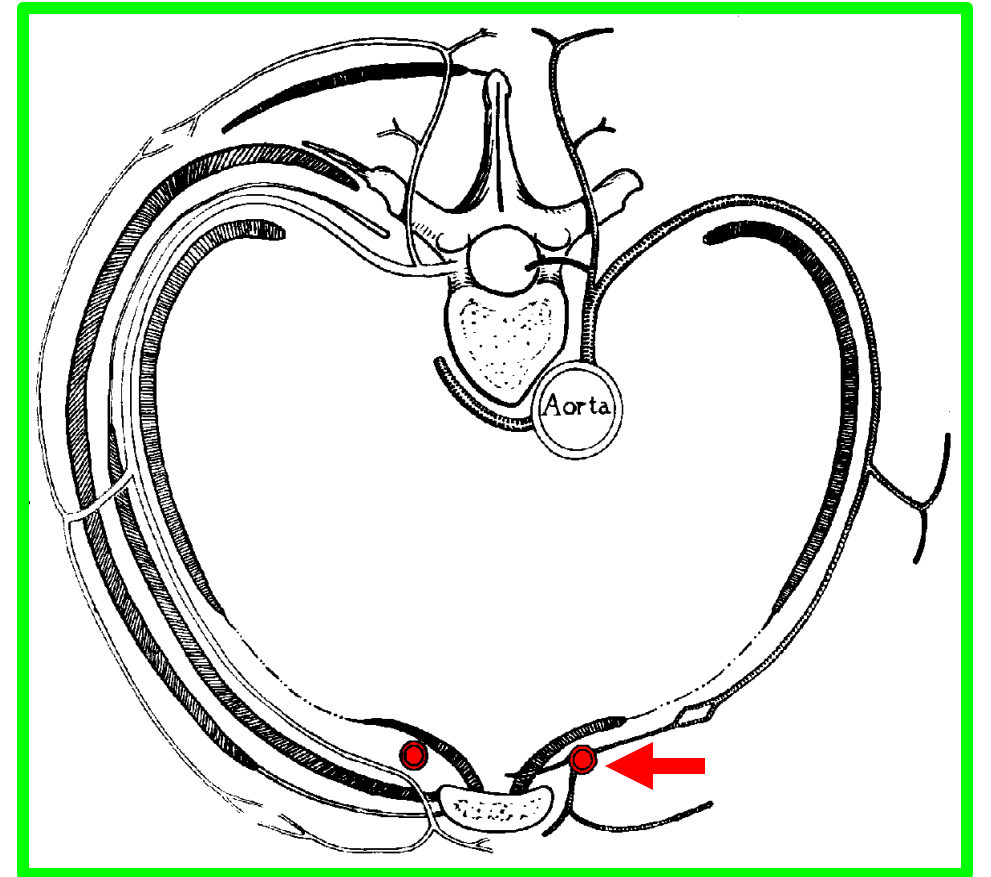
Intercostal arteries



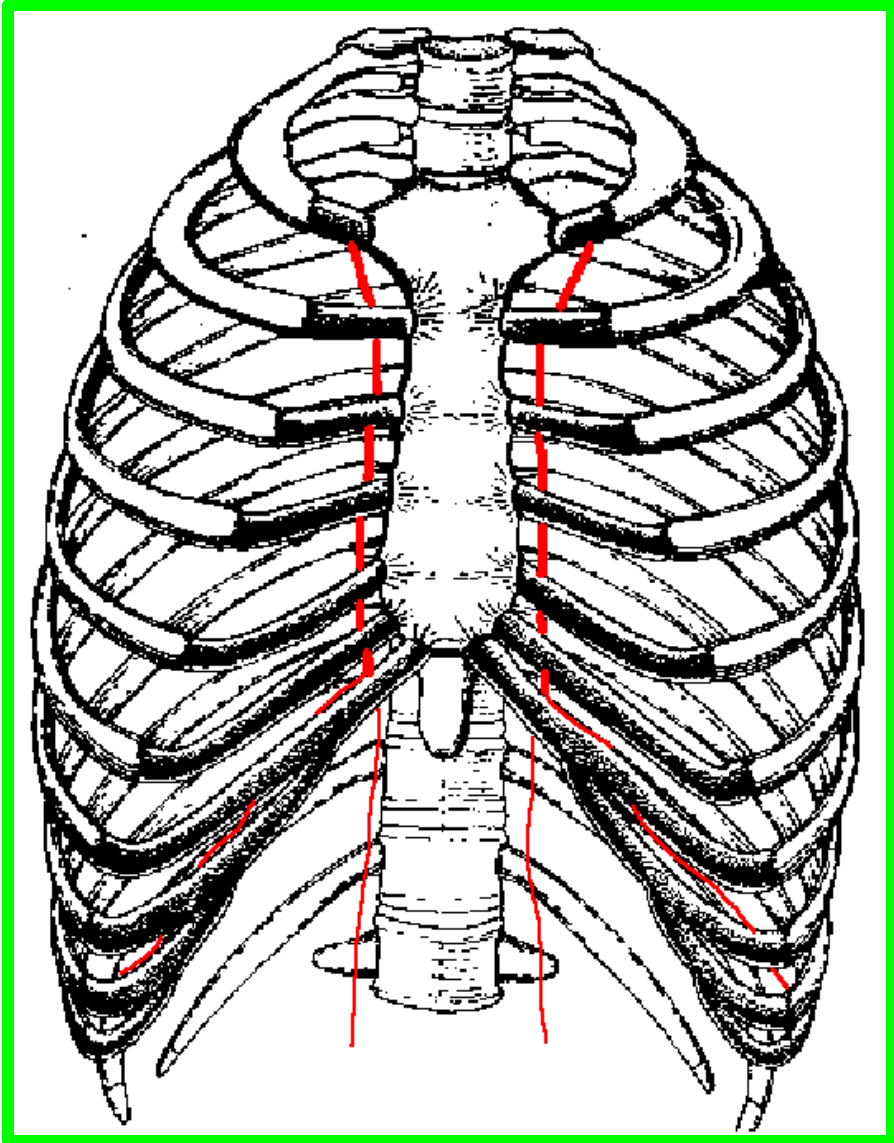
Internal thoracic artery



- ❖ Descends vertically about a finger breadth (about 1cm) lateral to the sternum



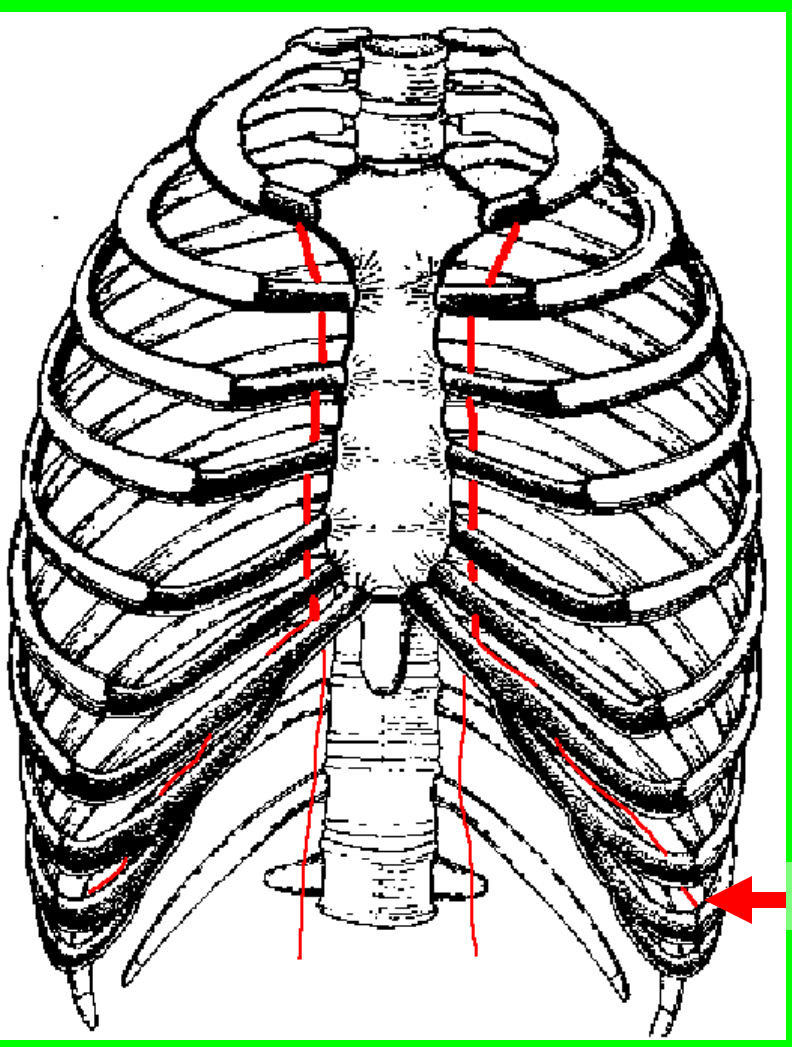
Internal thoracic artery



❖ The internal intercostal artery ends in the **6th intercostal space** by dividing into two terminal branches:

- ✓ superior epigastric
- ✓ musculophrenic arteries

Musculophrenic artery



← musculophrenic

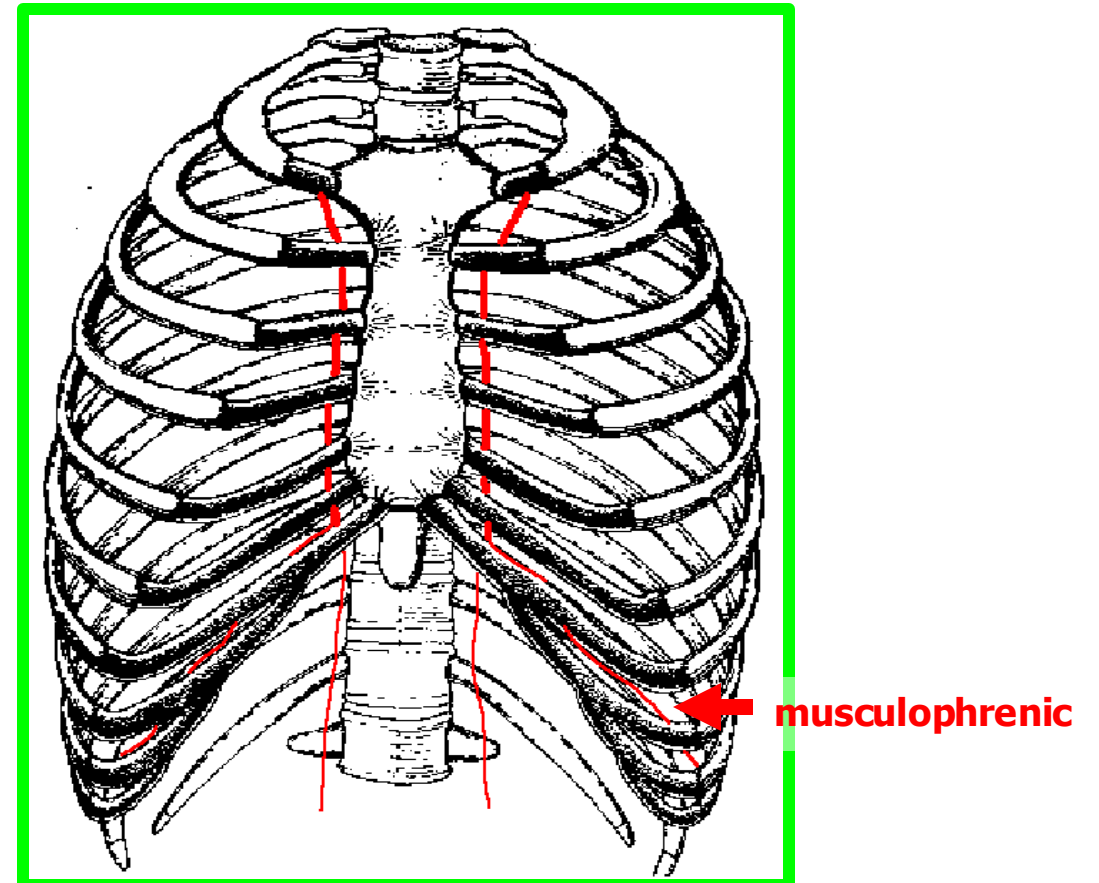
- ❖ Runs along the costal margin.
- ❖ It supplies **the diaphragm** and the lower intercostal spaces by **anterior intercostal arteries**

Anterior intercostal arteries

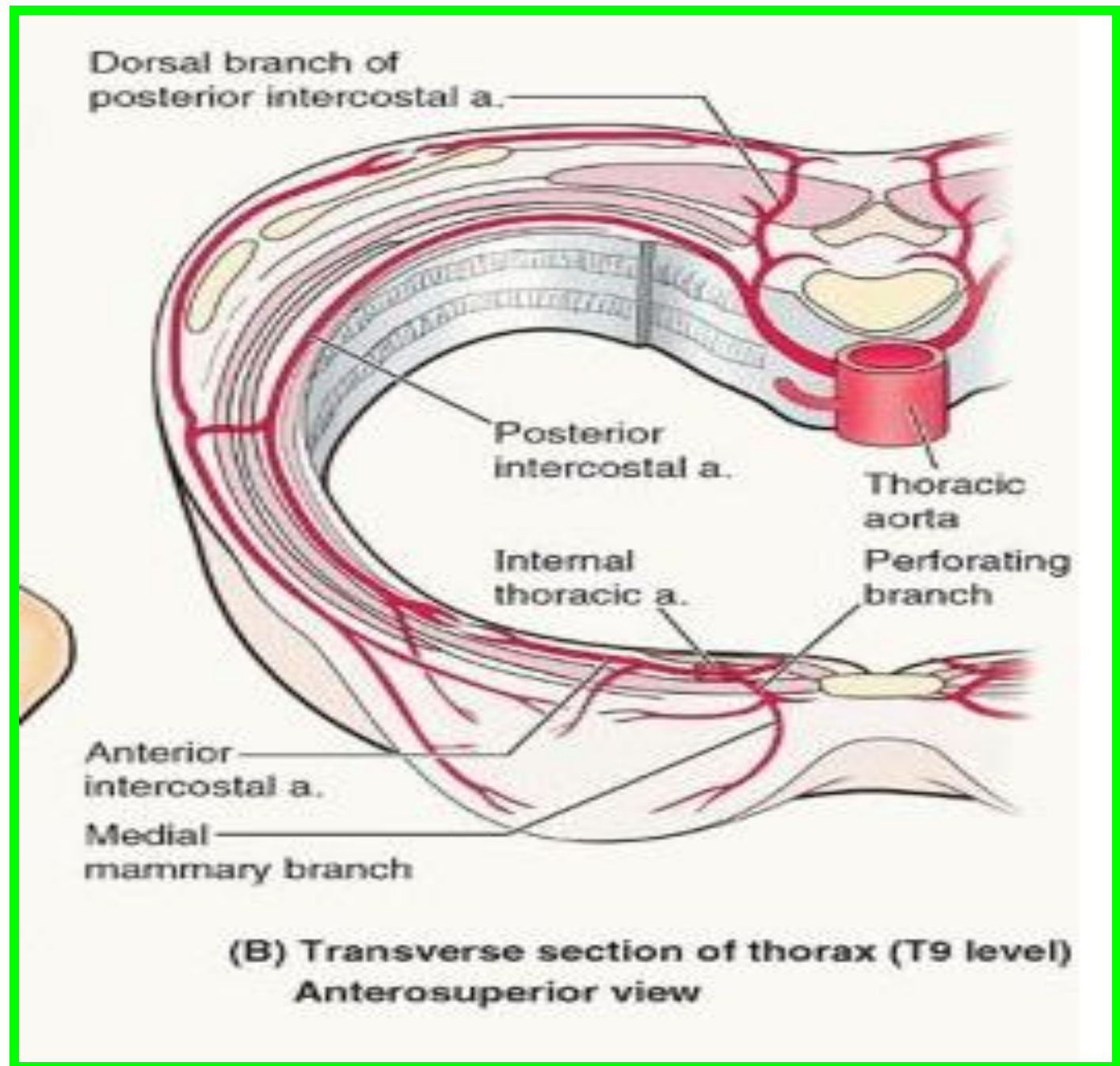
❖ The anterior intercostal arteries of the upper six spaces are branches of the **internal thoracic artery**.

❖ The anterior intercostal arteries of the lower intercostal spaces are branches of the **musculophrenic artery**

❖ The lower two spaces have posterior intercostal arteries only.



❖ Perforating branches

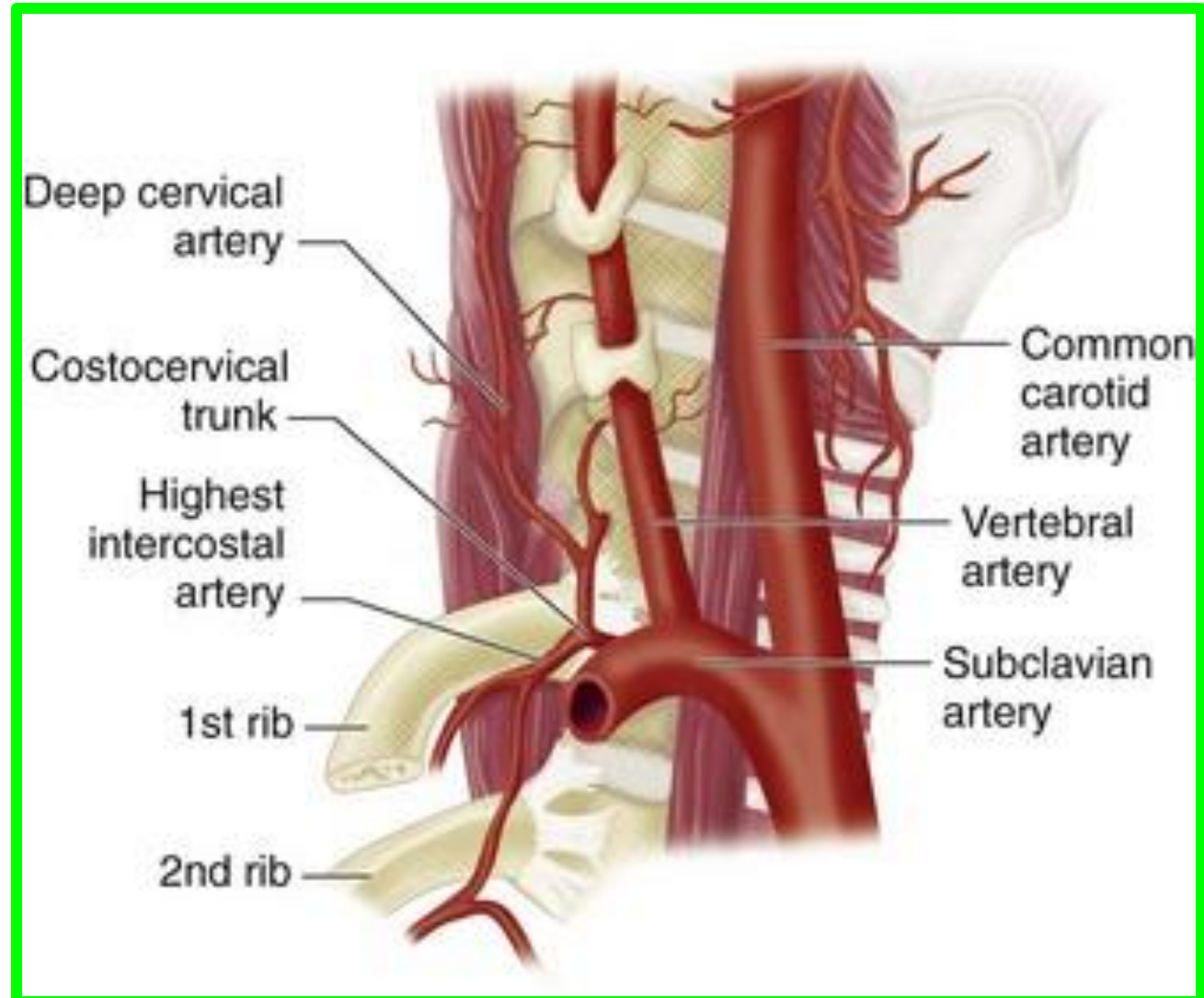


8

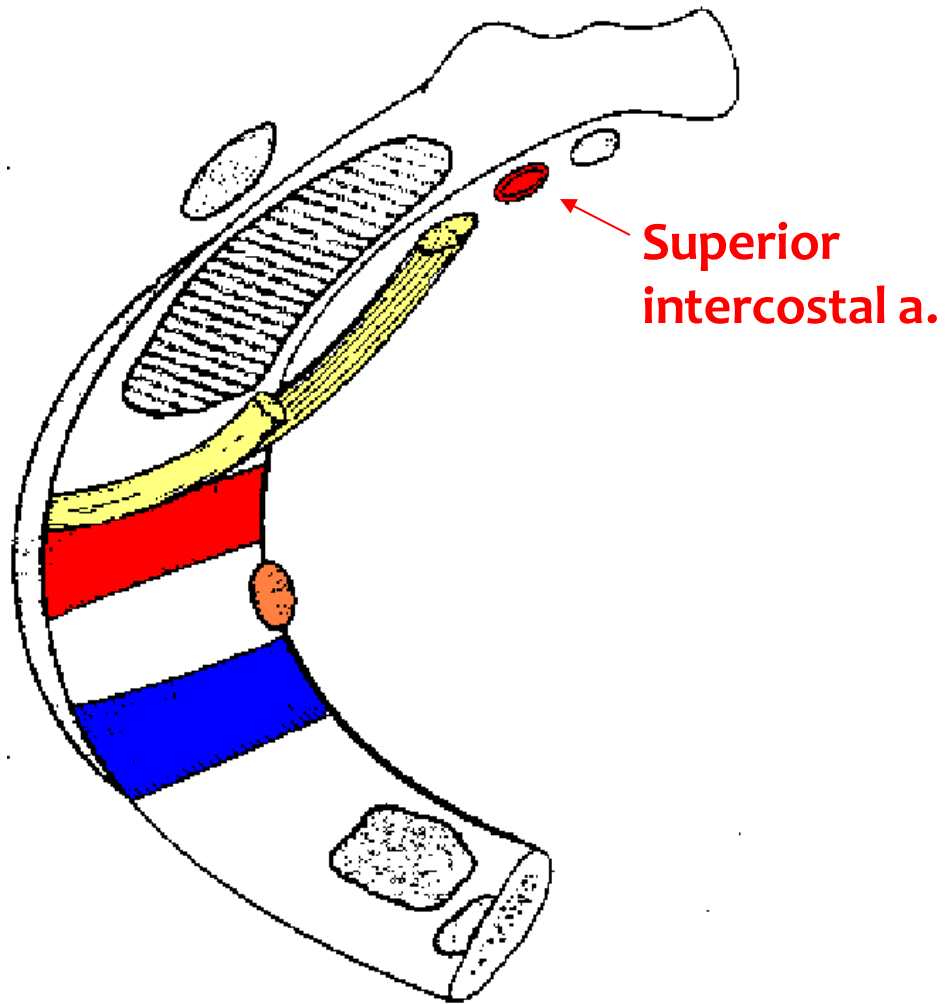
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Monday 7 October 2024

Costocervical trunk

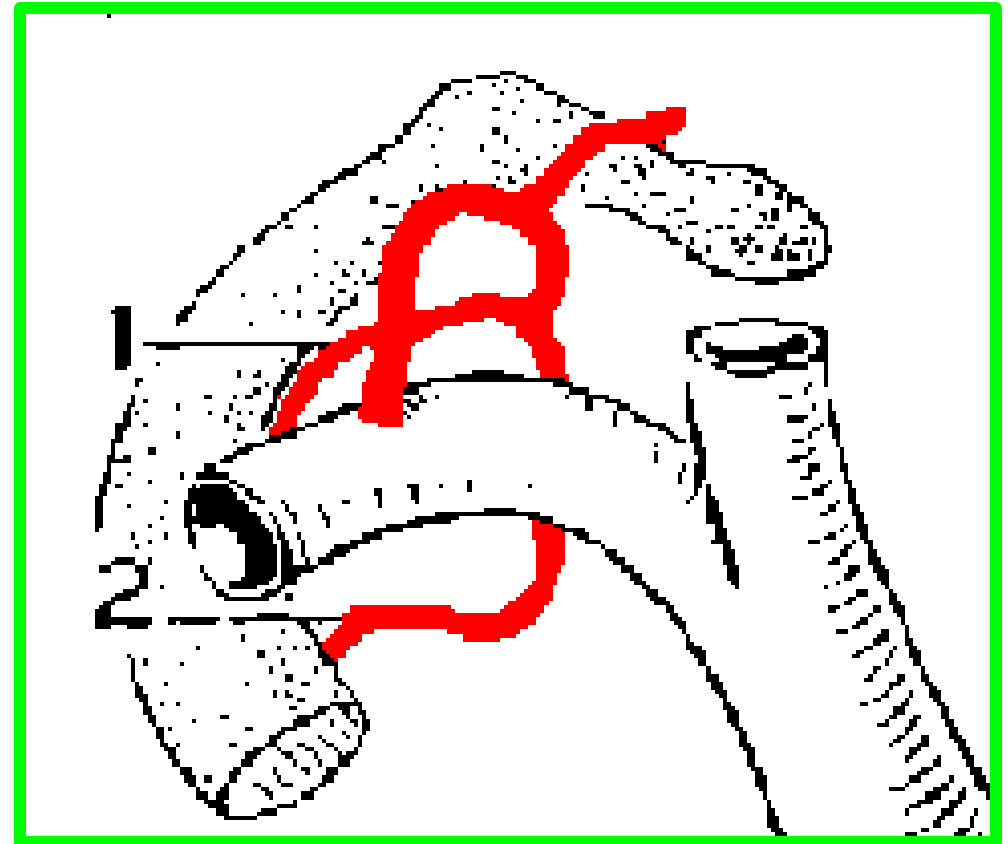
- Arises from the posterior aspect of the **subclavian artery** and divides into:
 - ✓ a branch that supplies the back of the neck (**ascending cervical**)
 - ✓ And the **superior intercostal artery** (hence the name costocervical).



Superior intercostal artery



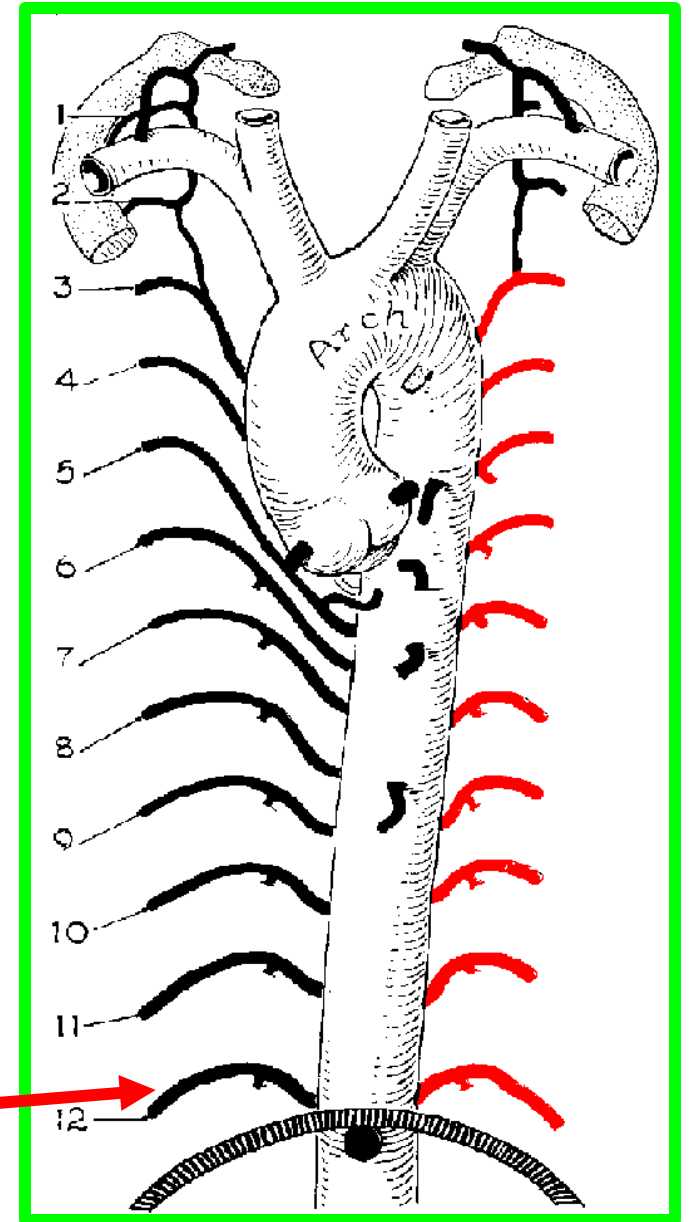
- crosses the neck of the first rib to supply the upper 2-3 posterior intercostal spaces



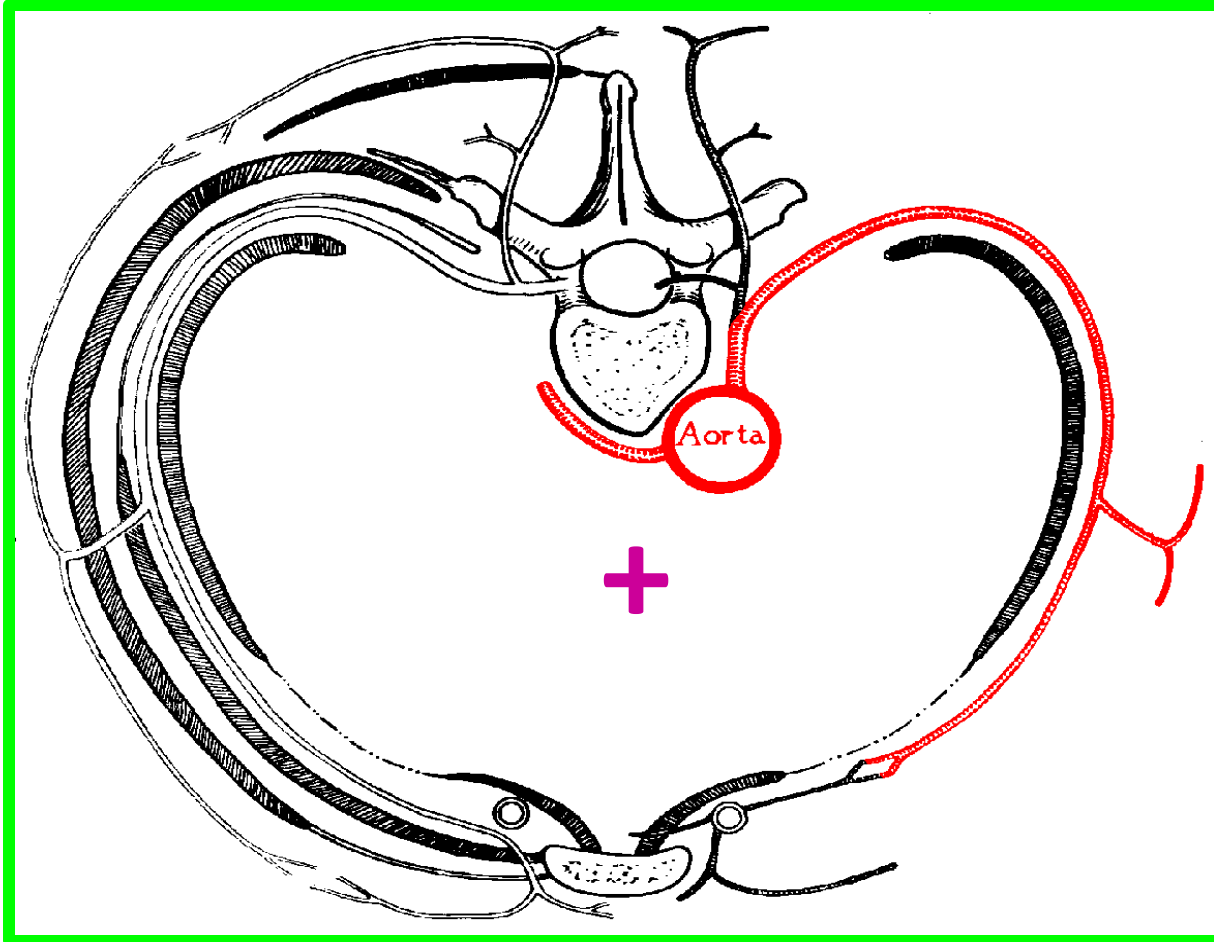
Posterior intercostal arteries

- ❖ The posterior intercostal arteries of the lower nine spaces are branches of the **descending thoracic aorta**, so as the **subcostal artery**

Subcostal artery



Posterior intercostal arteries

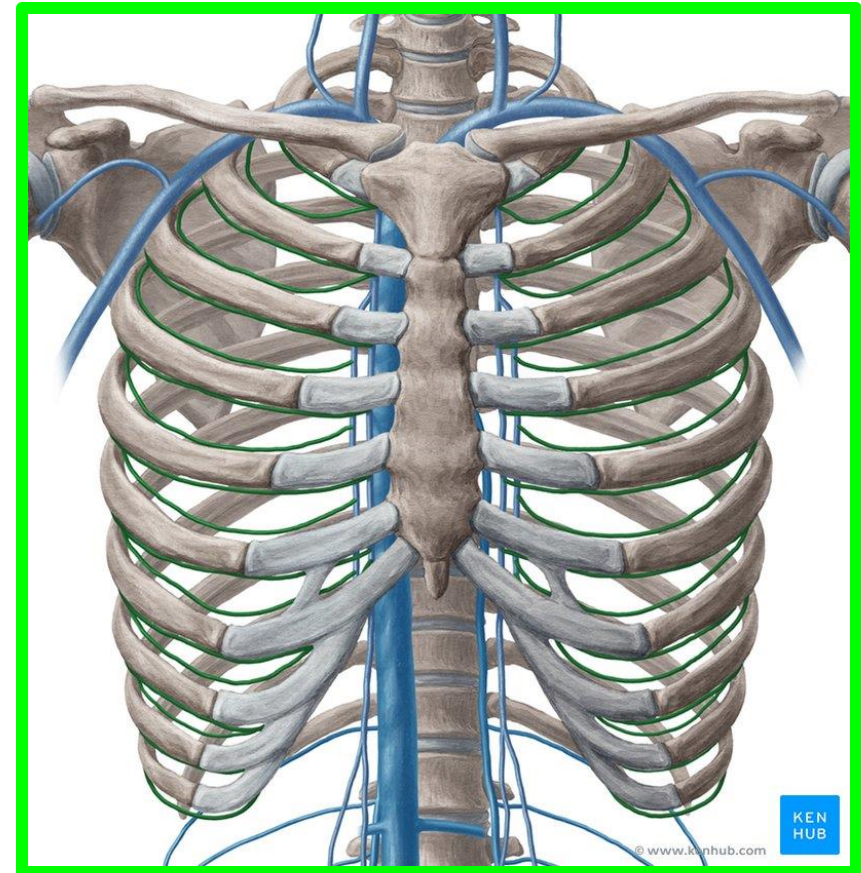


- ❖ Because the **aorta** lies on the **left side** of the posterior thoracic wall:
- ✓ the **lower nine** intercostal arteries of **Rt. side** are longer than their counter parts on **the left**

Venous drainage of the thoracic wall

** The Anterior Intercostal Veins:-

- ✓ **The upper 6 pairs** end in the **internal thoracic (mammary) vein** which ends into brachiocephalic vein.
- ✓ **The 7, 8, 9th pairs** end in the **musculo-phrenic vein**.



13

Dr. Aiman Qais Afar

Monday 7 October 2024

The Posterior Intercostal Veins

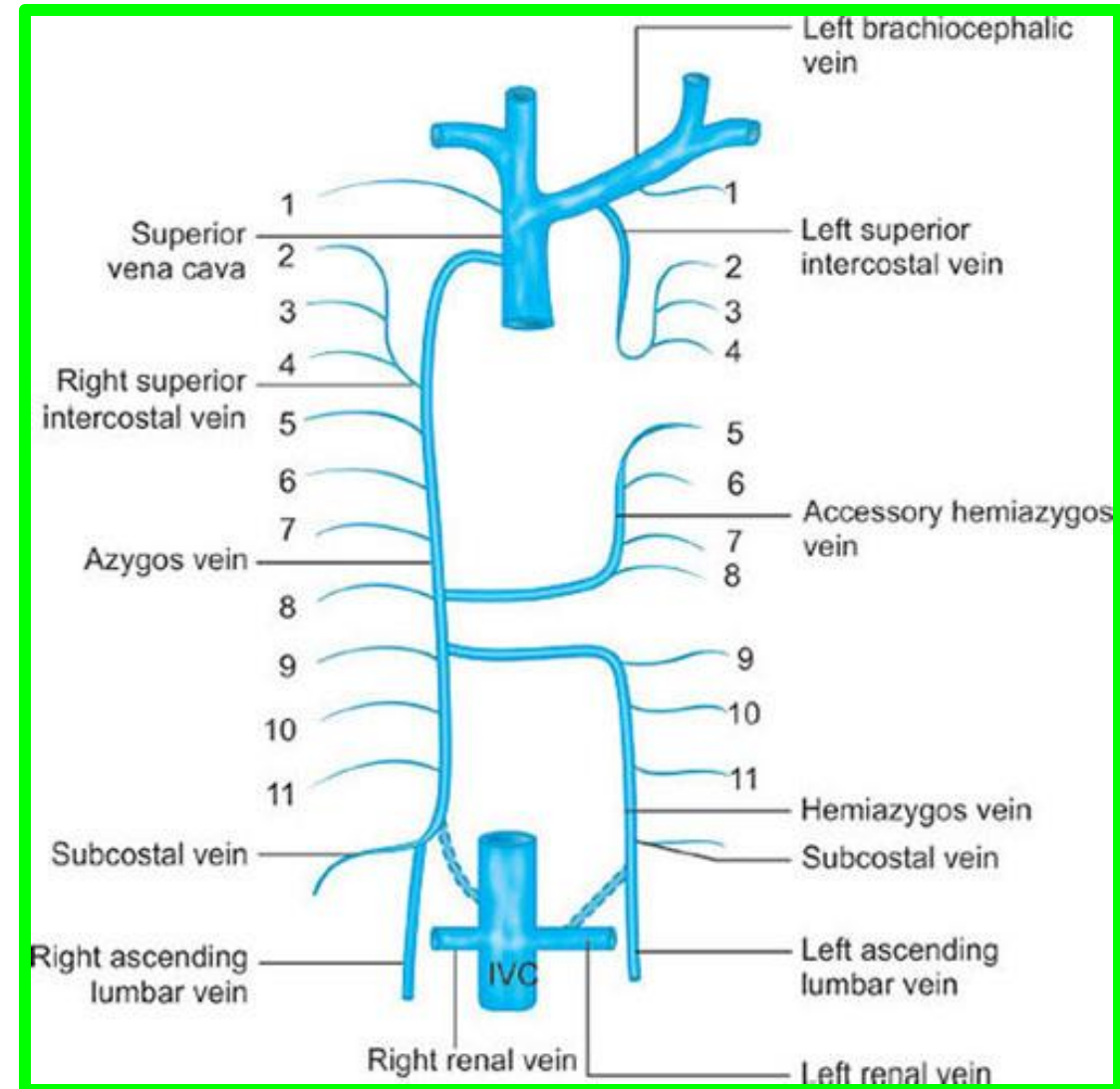
* 11 veins on each side and subcostal vein.

A) On the right side:

1- **The first vein** drains into the **right brachio-cephalic vein**.

2- **The 2nd and 3rd veins:** form the **right superior intercostal vein** which ends in the **arch of azygos vein**.

3- **From 4th till 11th** and **subcostal vein:** end into the **azygos vein**.

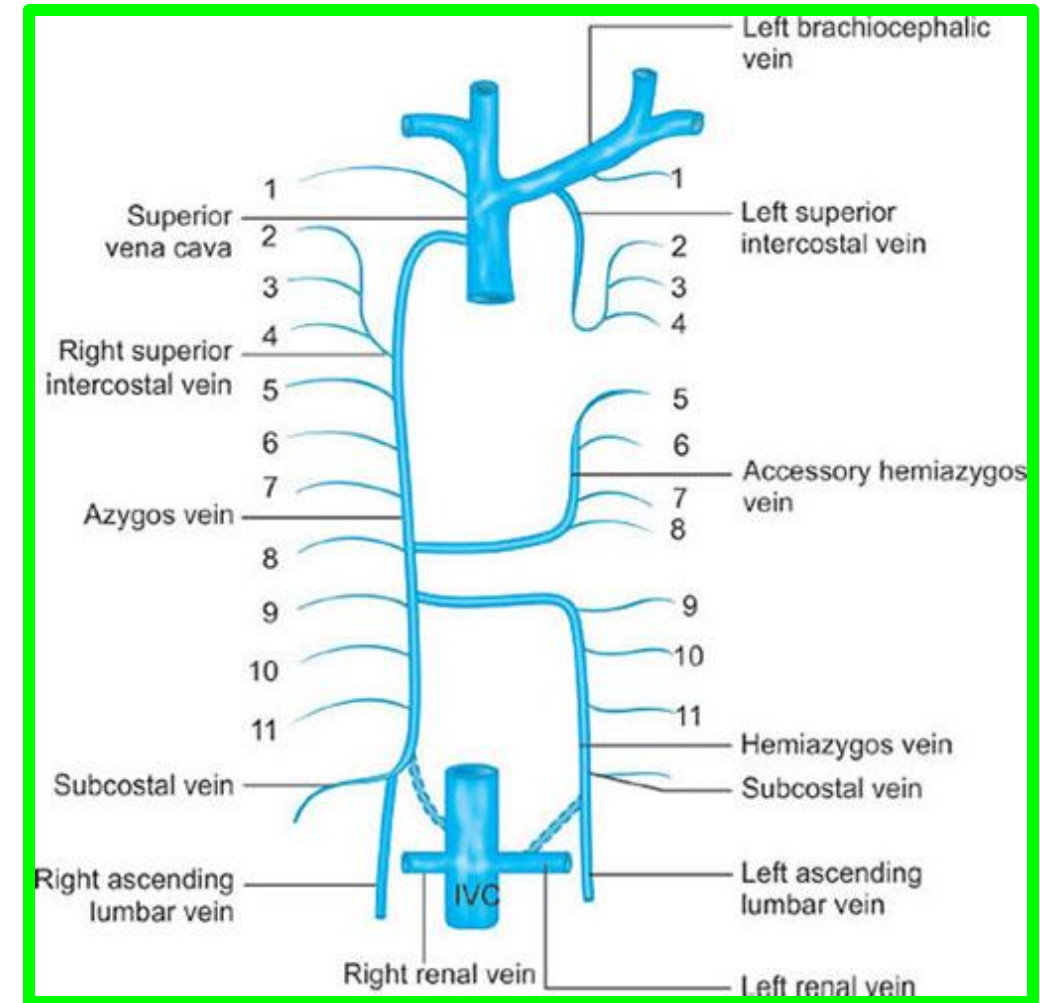


The Posterior Intercostal Veins

B) On the left side:

1-The first vein ends into the left brachio-cephalic vein.

2-The 2nd and 3rd veins: form the left superior intercostal vein which ends into the left brachio-cephalic vein.



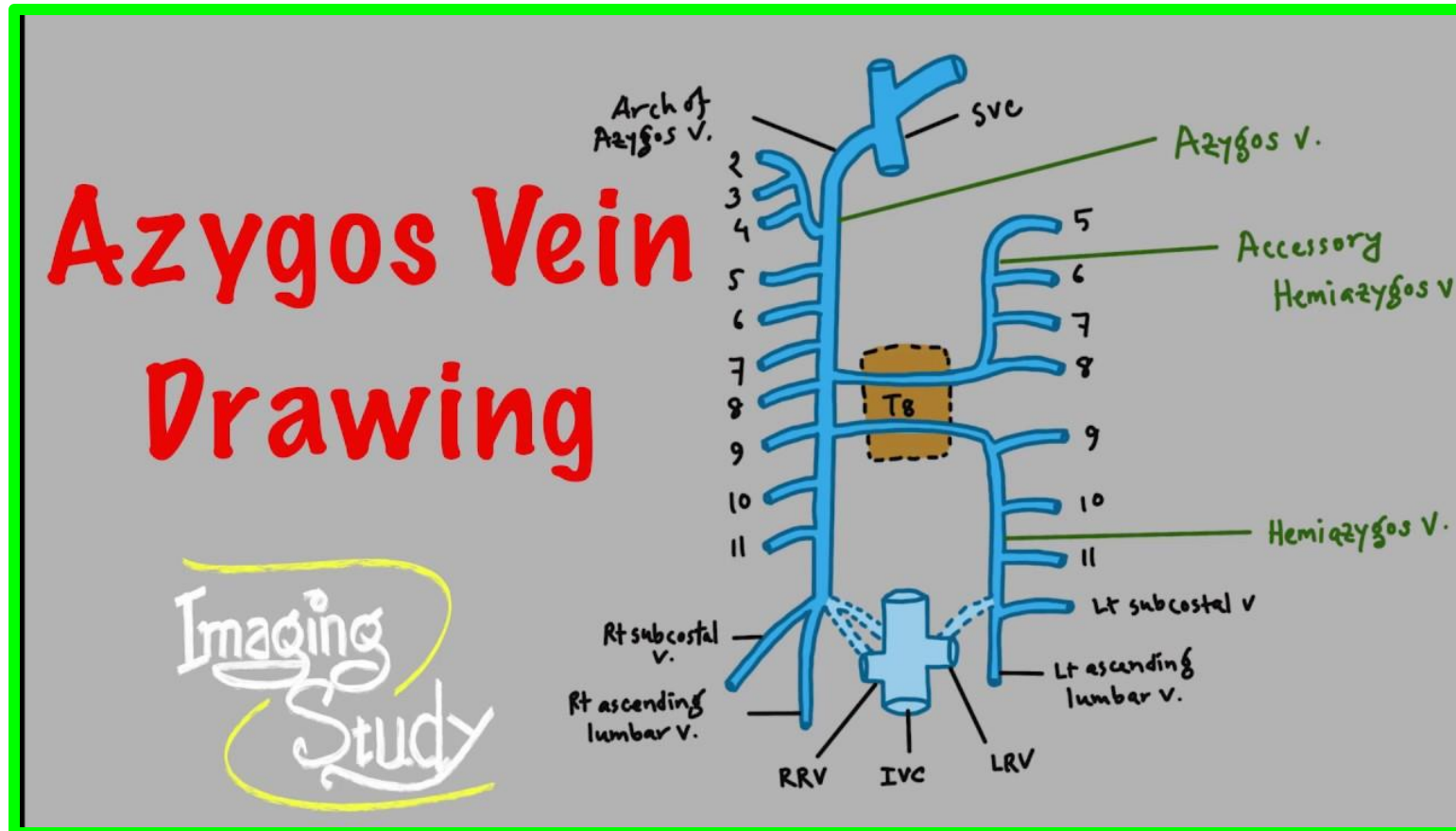
3-The left 4th to 8th: end in the accessory (superior) hemiazygos vein.

4- From the 9th to 11th and subcostal vein: end in the hemiazygos vein.

Azygos Vein:

** Beginning: \neg in the abdomen and arises as follows:

- 1- From the back of the inferior vena cava.
- 2- From the union of the right subcostal and right ascending lumbar veins.

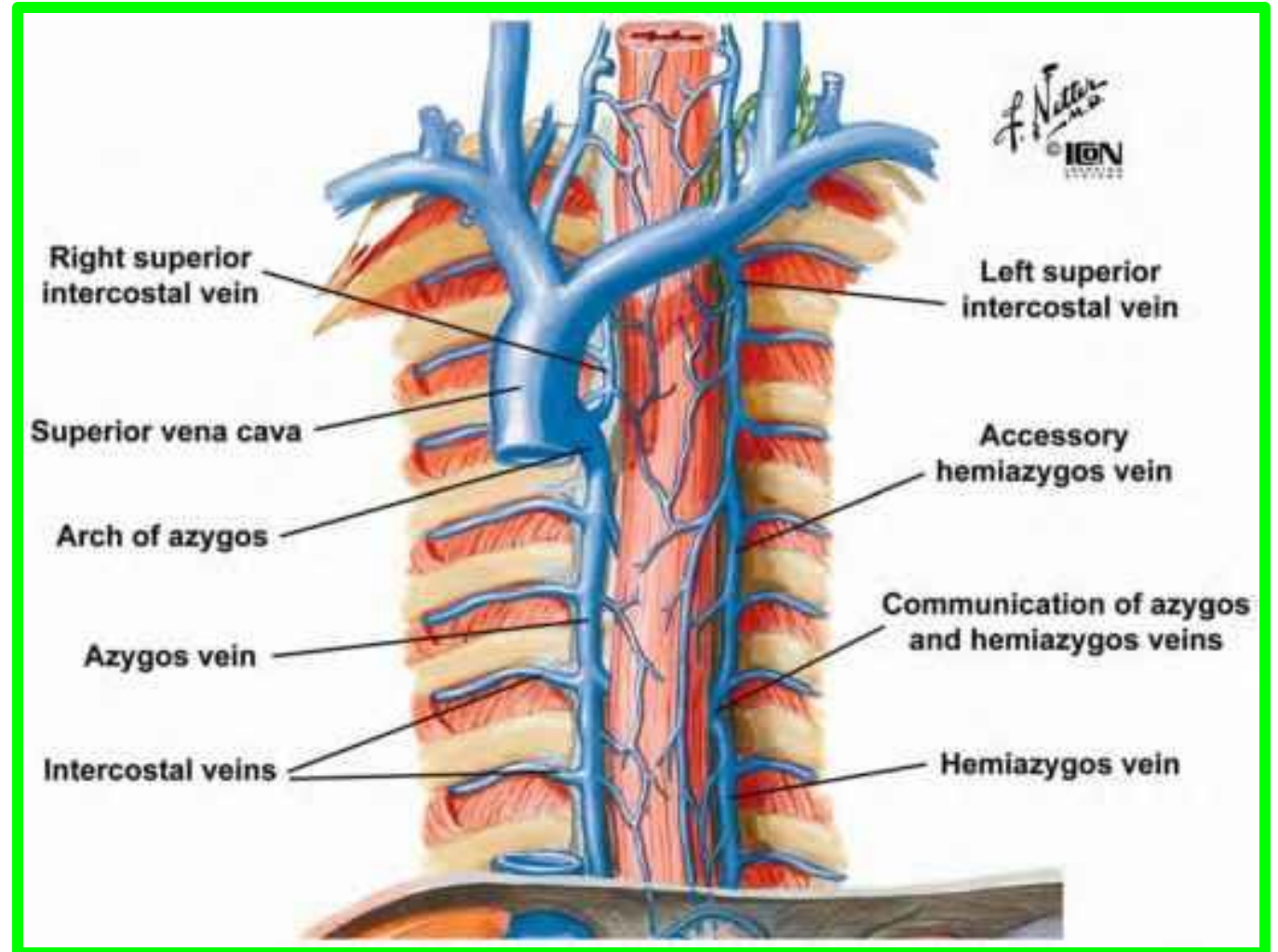


The azygos system of veins

✓ on each side of the vertebral column, drains **the back** and **thoracoabdominal walls** and **mediastinal viscera**.

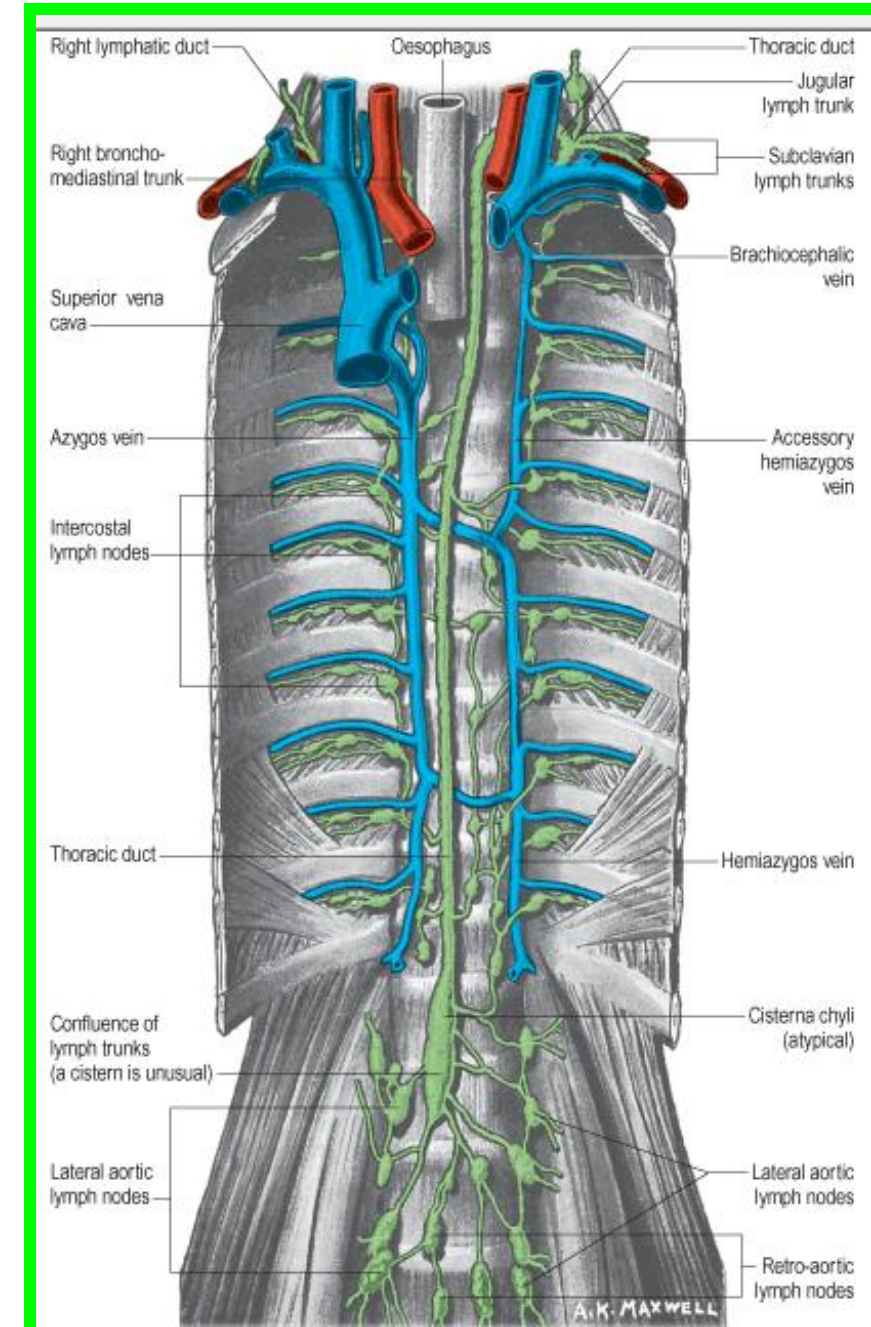
✓ The **azygos vein** forms a collateral pathway between **the SVC** and **IVC**

✓ It ascends in **the posterior mediastinum**, passing close to the right sides of the bodies of the **inferior 8 thoracic vertebrae**.



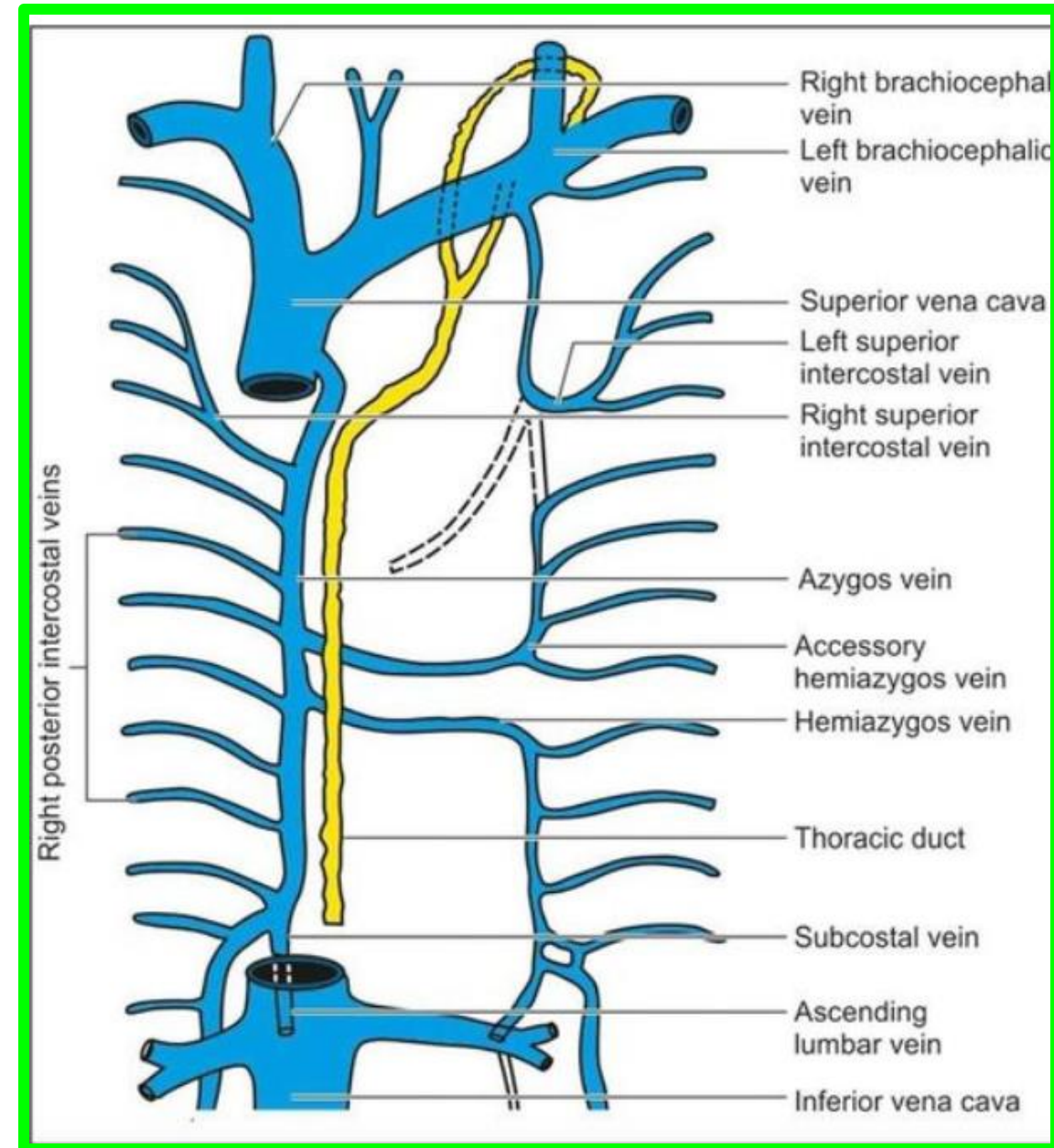
The azygos system of veins

- ✓ It arches over the superior aspect of the root of the right lung to join **the SVC**
- ❖ The azygos vein communicates with:
 - ✓ The posterior intercostal veins,
 - ✓ The vertebral venous plexuses that drain the back, vertebrae, and structures in the vertebral canal.
 - ✓ The mediastinal,
 - ✓ Esophageal, and
 - ✓ Bronchial veins



The hemiazygos vein

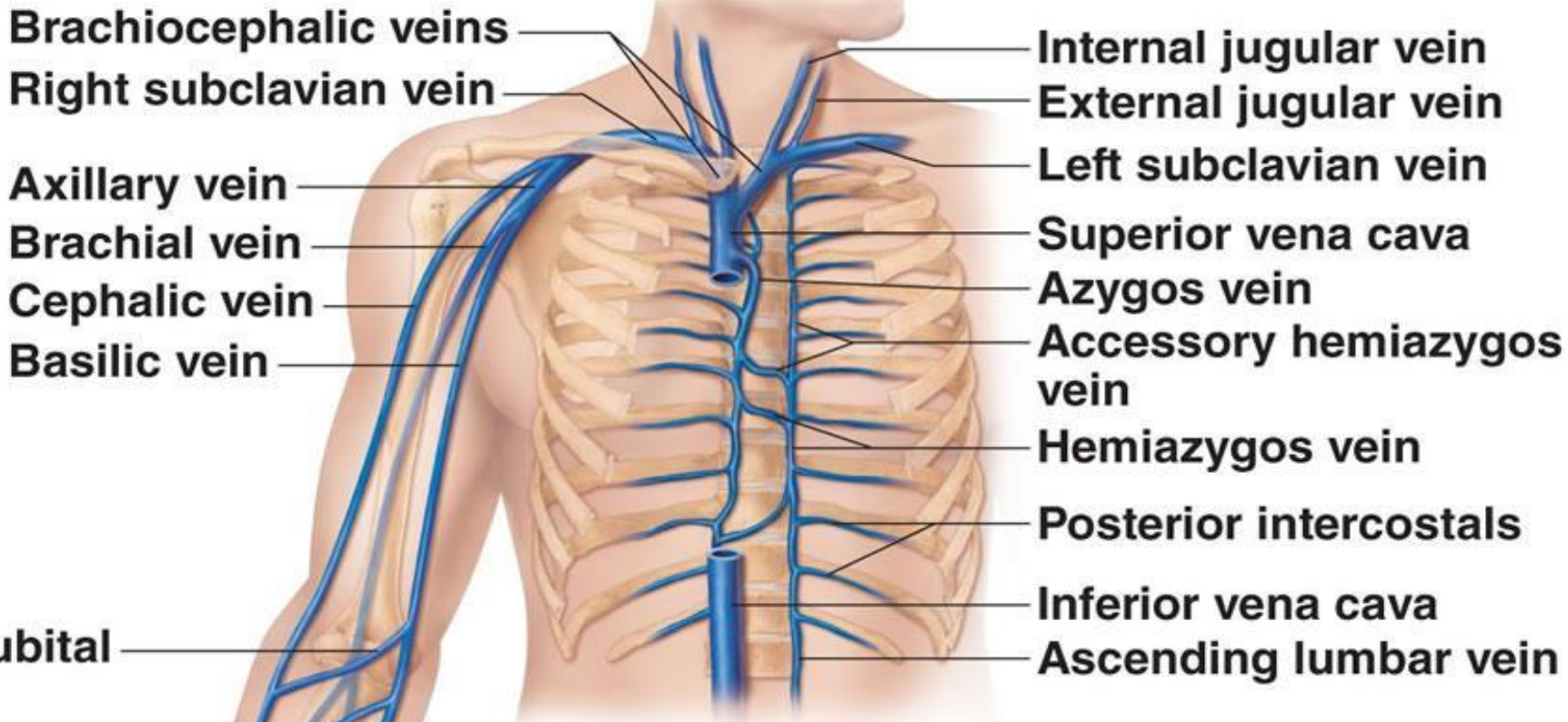
- ✓ Arises on the left side by the junction of the **left subcostal** and **ascending lumbar veins**.
- ✓ It ascends on the left side as far as the **T9 vertebra**.
- ✓ Here it crosses to the right, and joins **the azygos vein**.



The hemiazygos vein

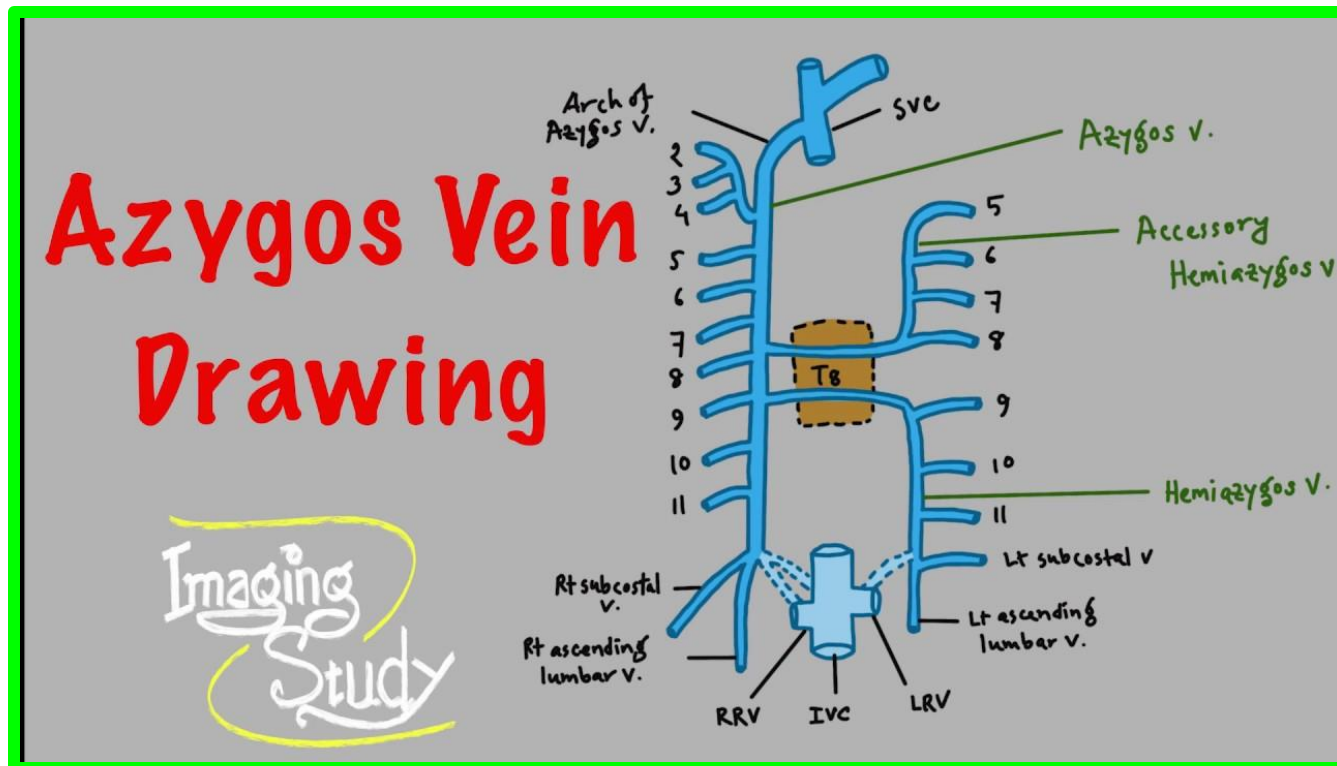
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Monday 7 October 2024

- ✓ The hemiazygos vein receives:
 - The inferior three posterior intercostal veins,
 - The inferior esophageal veins, and
 - Several small mediastinal veins.



The accessory hemiazygos vein

- ✓ Begins at the medial end of the 4th or 5th intercostal space and descends on the left side of vertebral column from T5 through T8.
- ✓ It receives tributaries from veins in the 4th-8th intercostal spaces and sometimes from the left bronchial veins.
- ✓ It crosses over the T7 or T8 vertebra to joins the azygos vein.

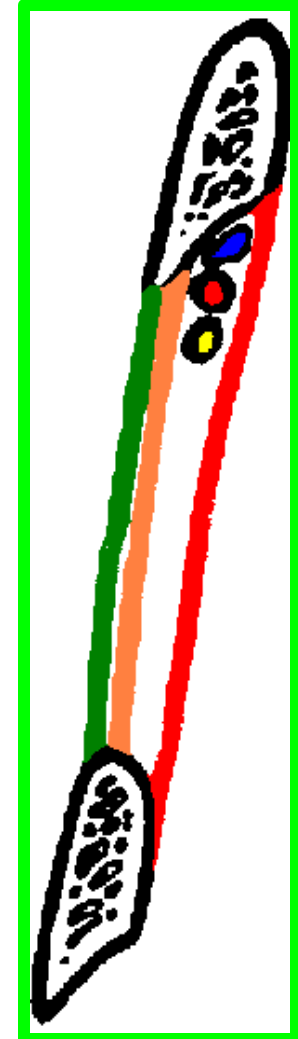
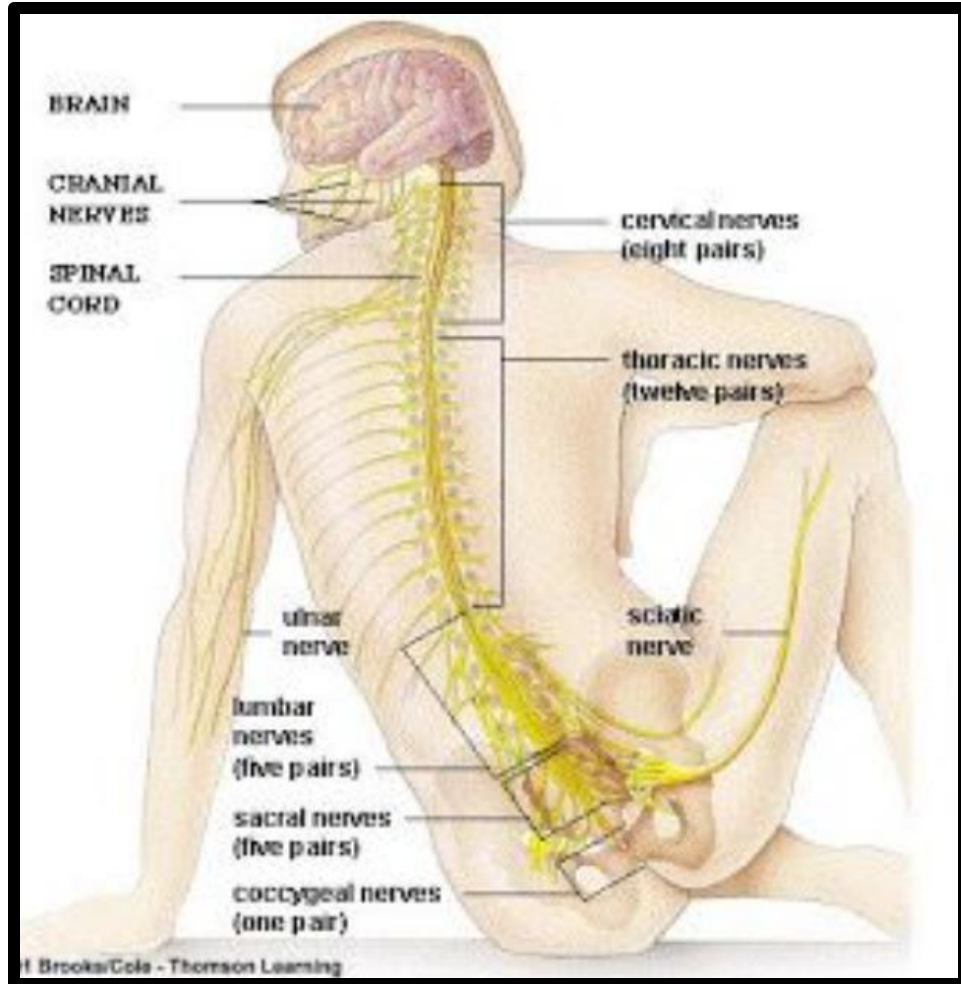


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Monday 7 October 2024

Intercostal Nerves

Neurovascular bundle

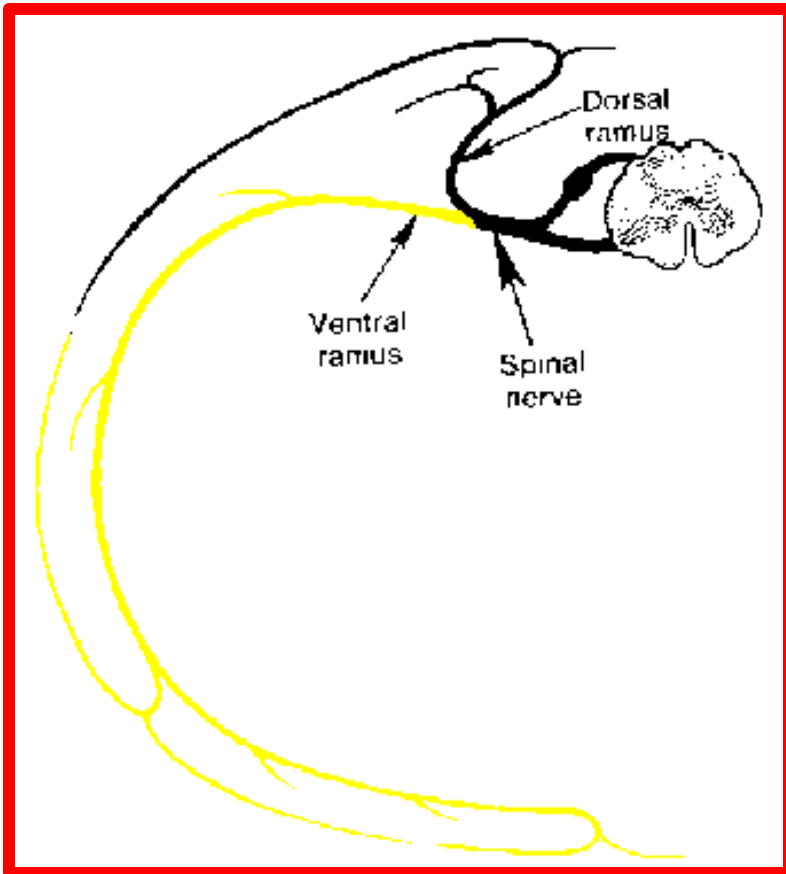
❖ In the thorax, the neurovascular bundle is located near the lower border of the corresponding rib sheltered by the costal groove.



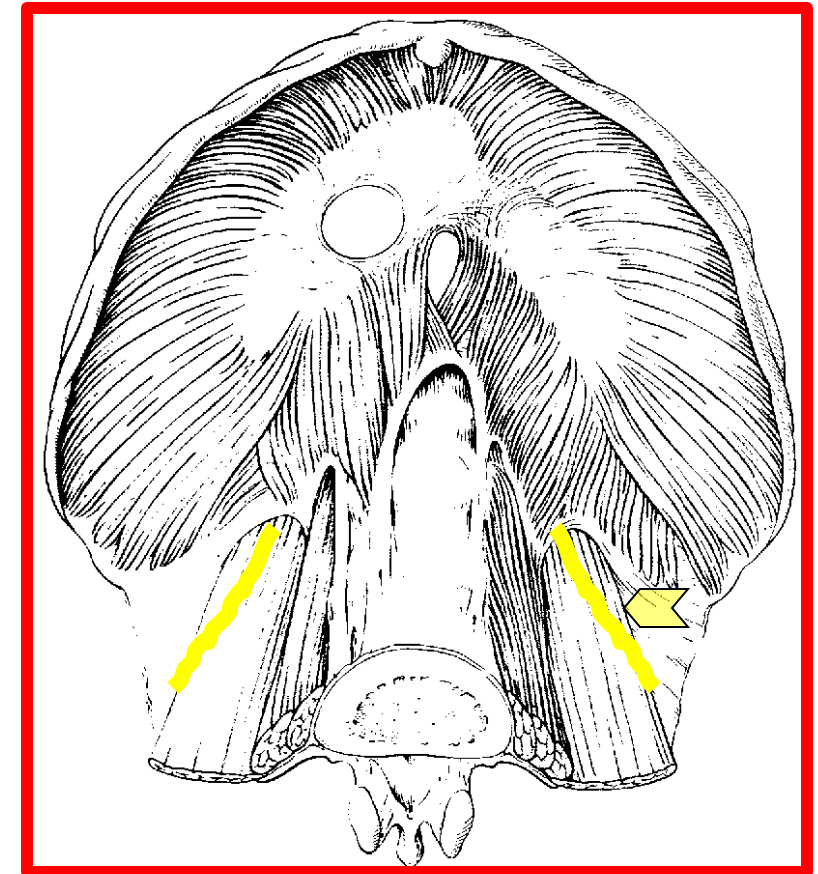
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Intercostal Nerves

❖ These are the **anterior primary rami** (ramus = branch L.) of **the first 11 thoracic spinal nerves**.

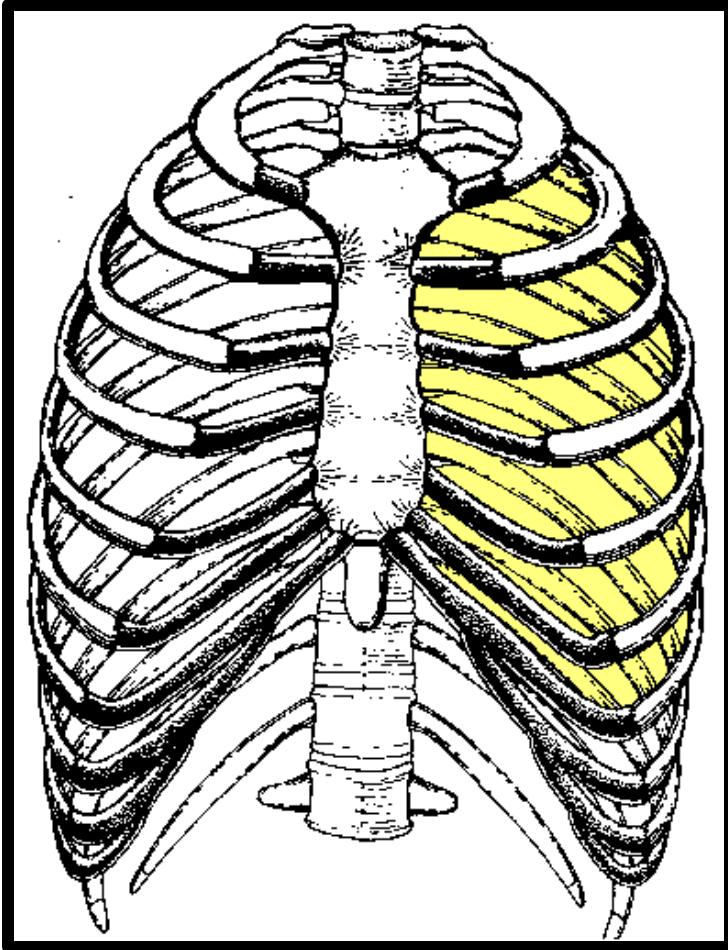


- ❖ The anterior ramus of the **12th thoracic spinal nerve**:
 - ✓ runs at the lower border of the twelfth rib

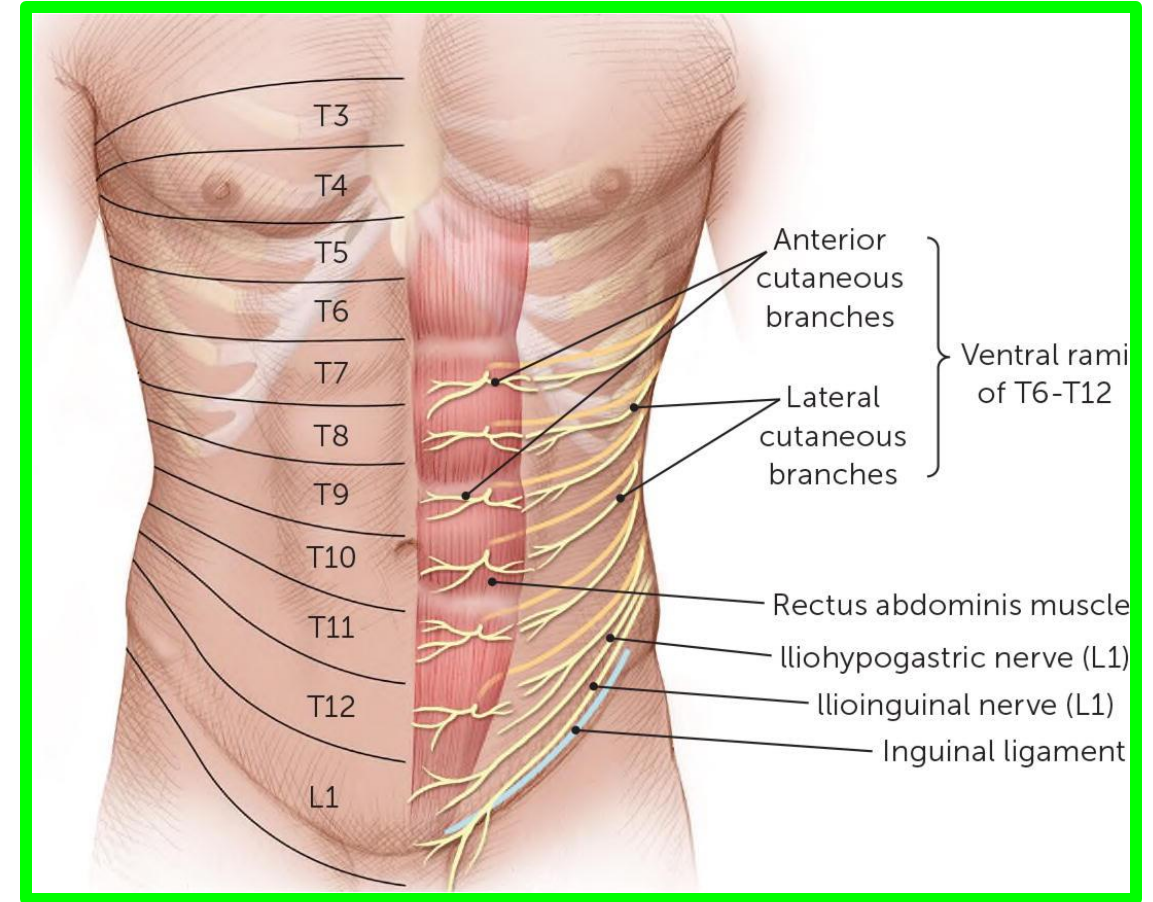


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Monday 7 October 2024

❖ The **first six intercostal nerves** are distributed within their intercostal spaces

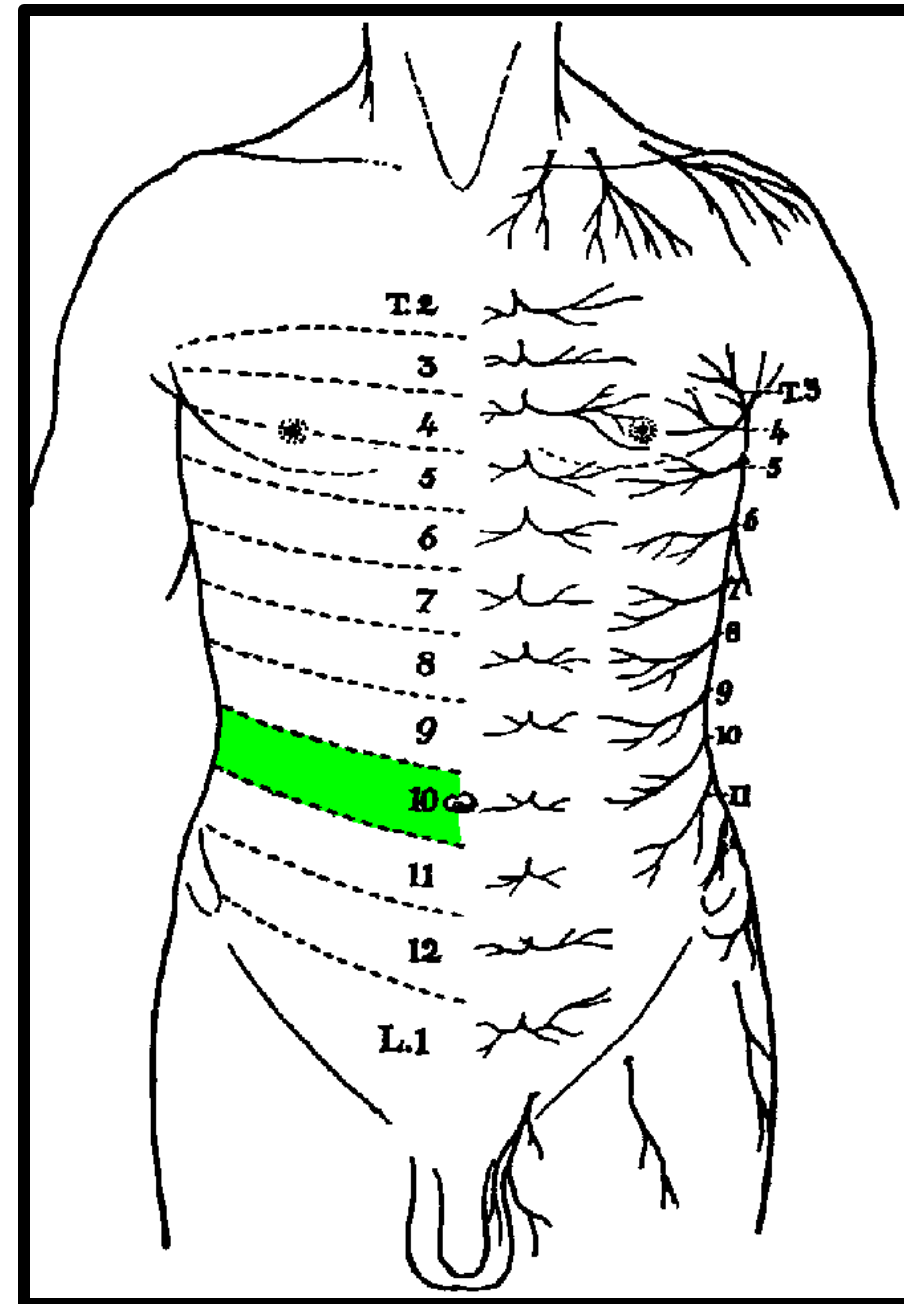


❖ The **7th to 11th intercostal nerves** and the **subcostal nerve** leave the anterior end of the intercostal space to enter **the anterior abdominal wall**, which they also supply.



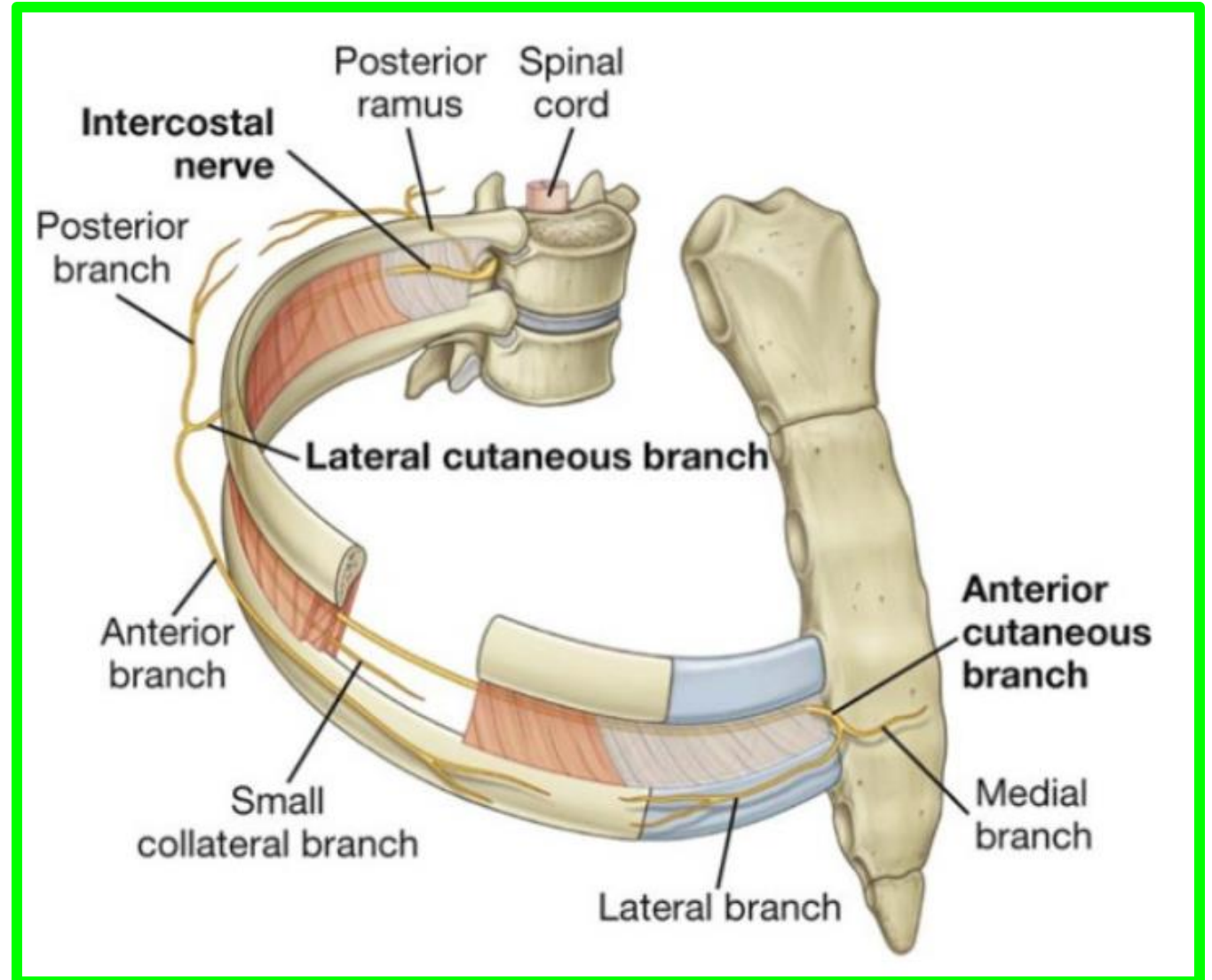
Intercostal Nerves

❖ e.g., the 10th intercostal nerve reaches the level of the umbilicus

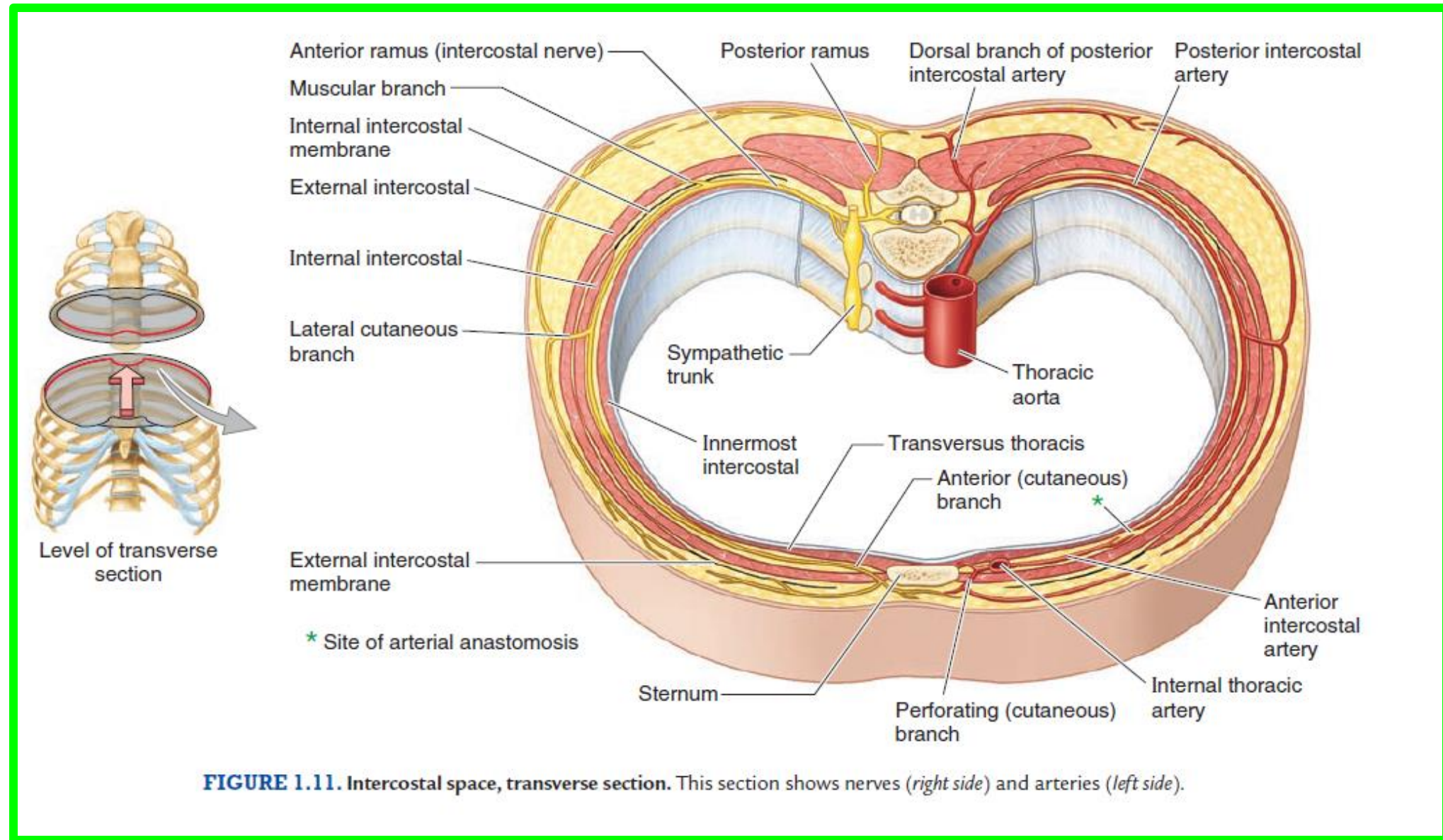


Branches of intercostal nerves

- ❖ Lateral cutaneous branch
- ❖ Anterior cutaneous branch
- ❖ Collateral branch
- ❖ Muscular (motor) branches
- ❖ Sensory branches
- ❖ Rami communicants

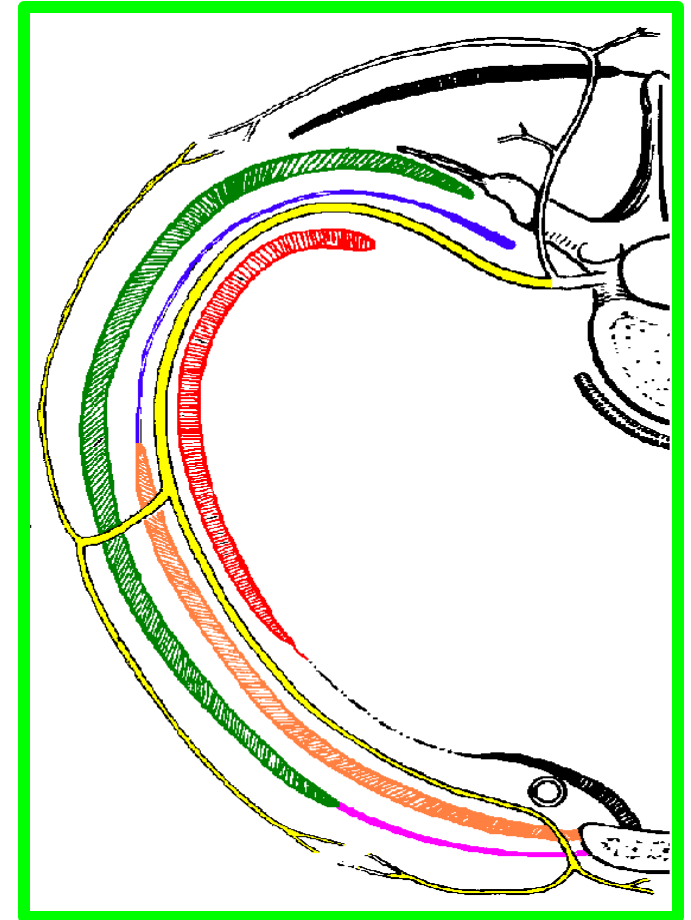
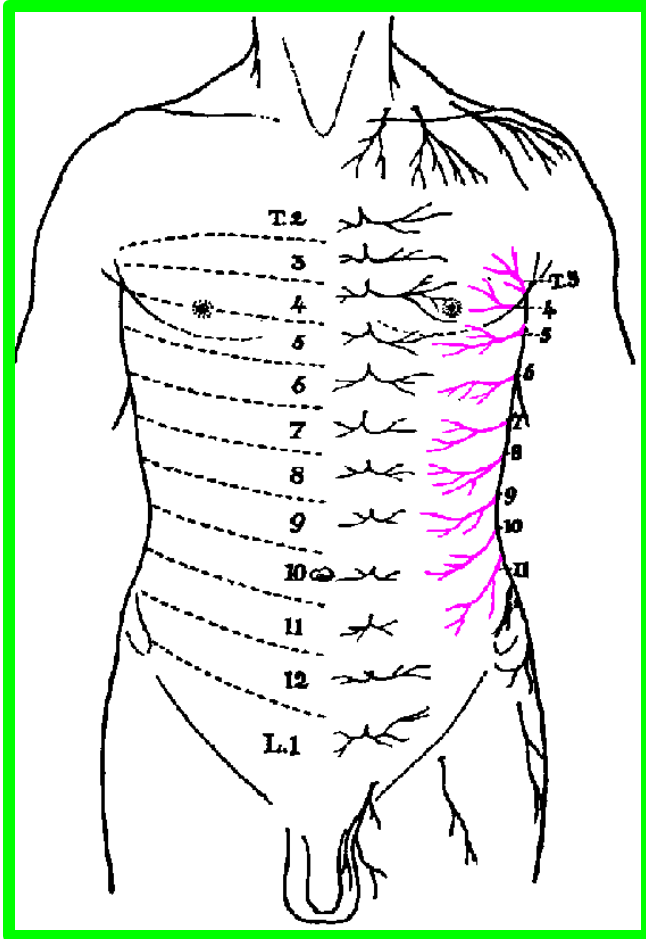


Branches of intercostal nerves



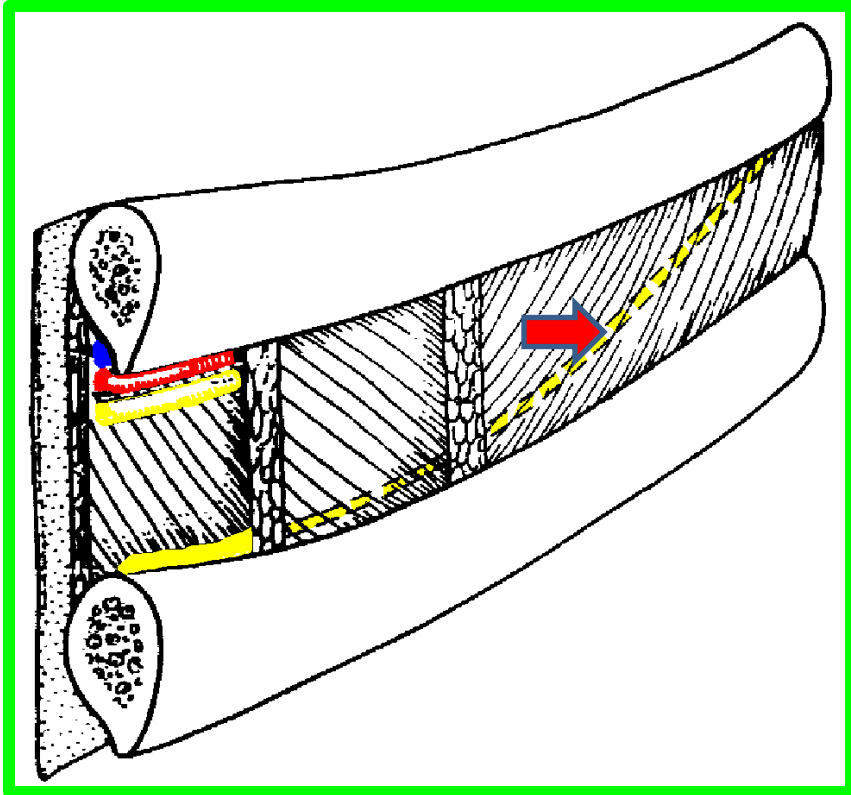
❖ Lateral cutaneous branch

Reaches the skin near **the mid-axillary line** and divides into **anterior** and **posterior branches**



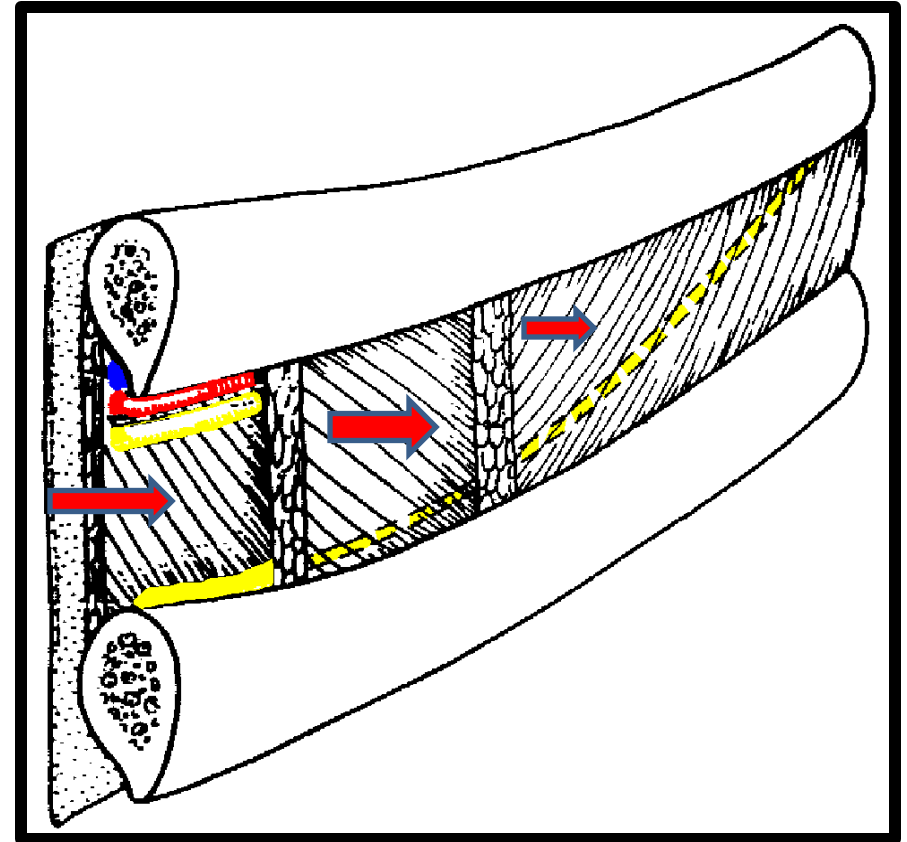
❖ Collateral branch

- ❖ runs inferior to the main nerve near the upper border of the rib below



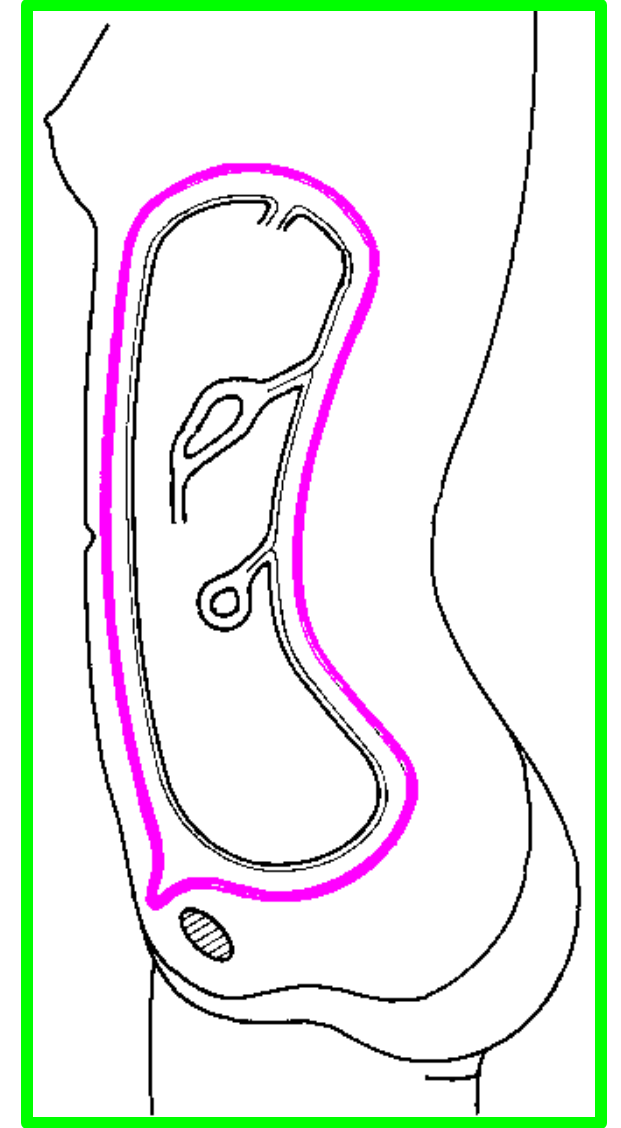
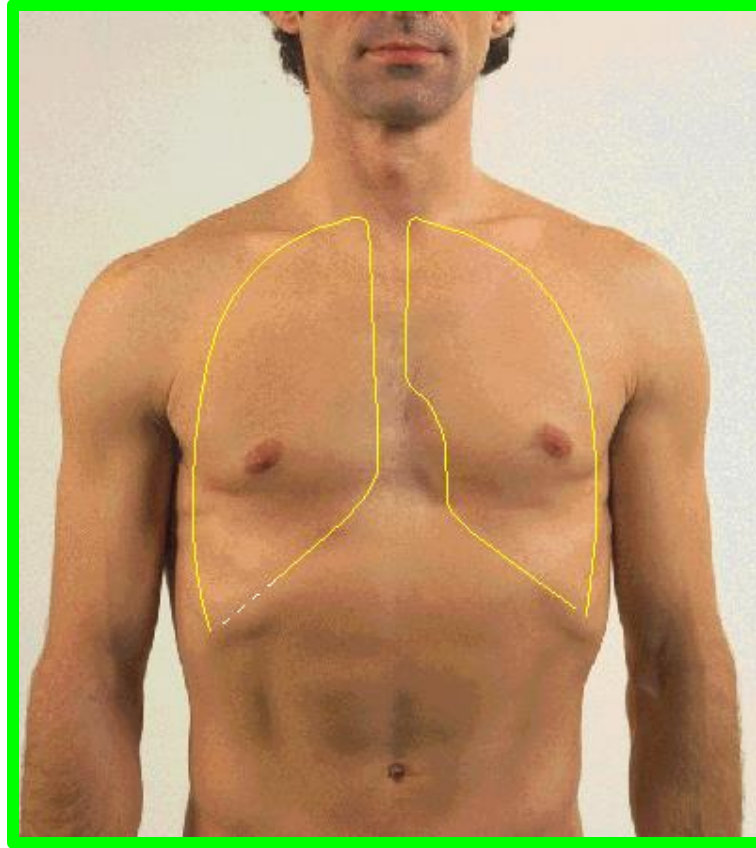
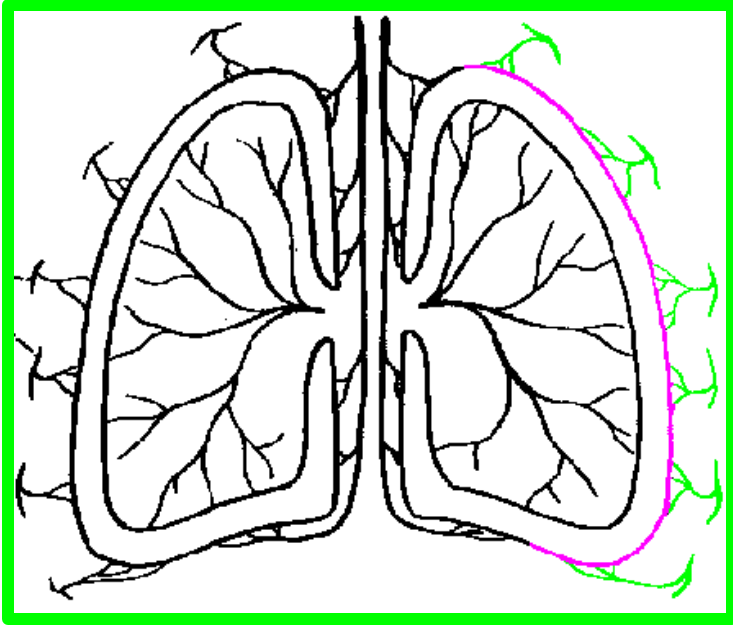
❖ Muscular (motor) branches

- ❖ given off by the main nerve and its collateral to **the intercostal muscles**



❖ Sensory branches

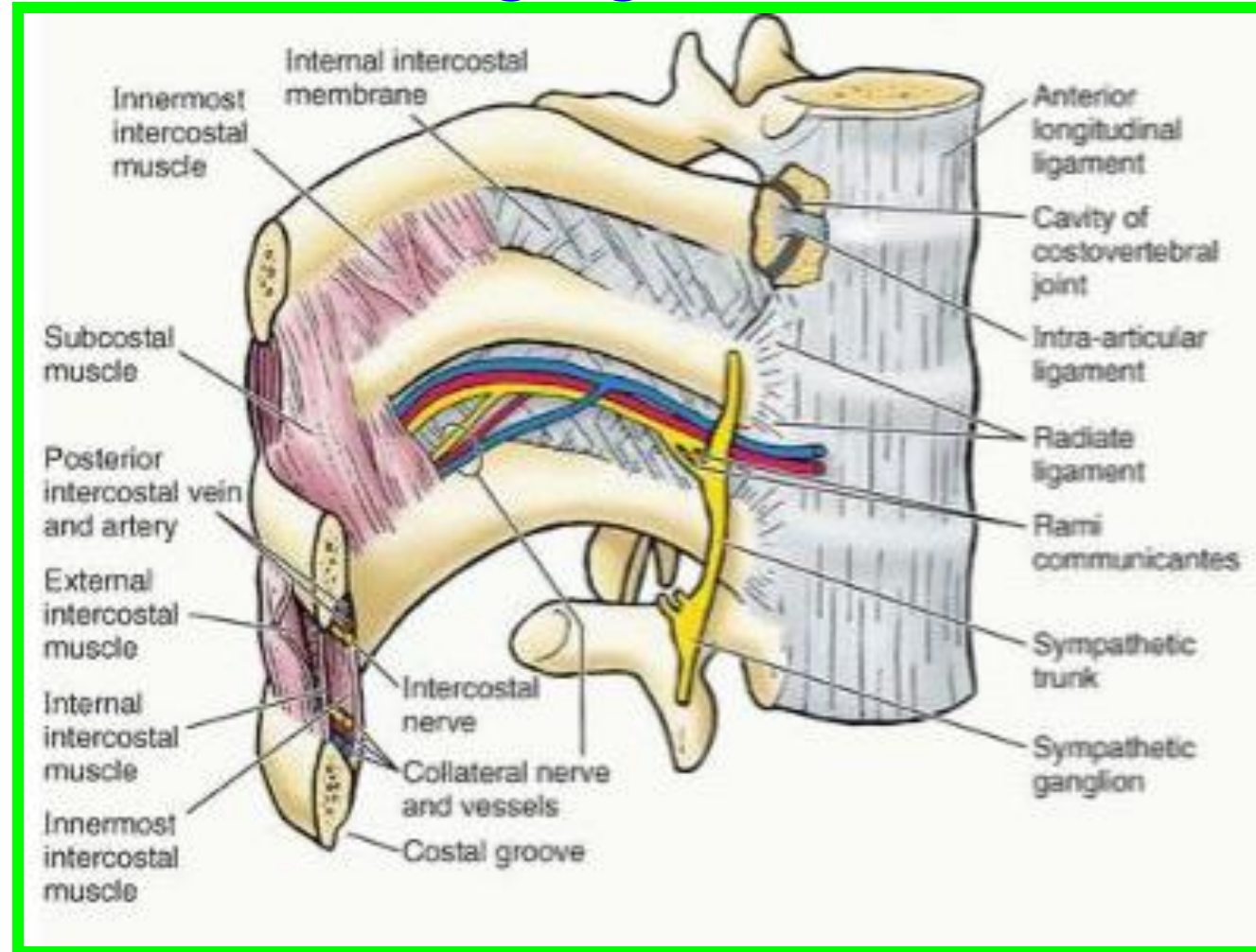
❖ To the pleura



❖ To the **peritoneum** in the case of **the 7th-11th intercostal nerves**

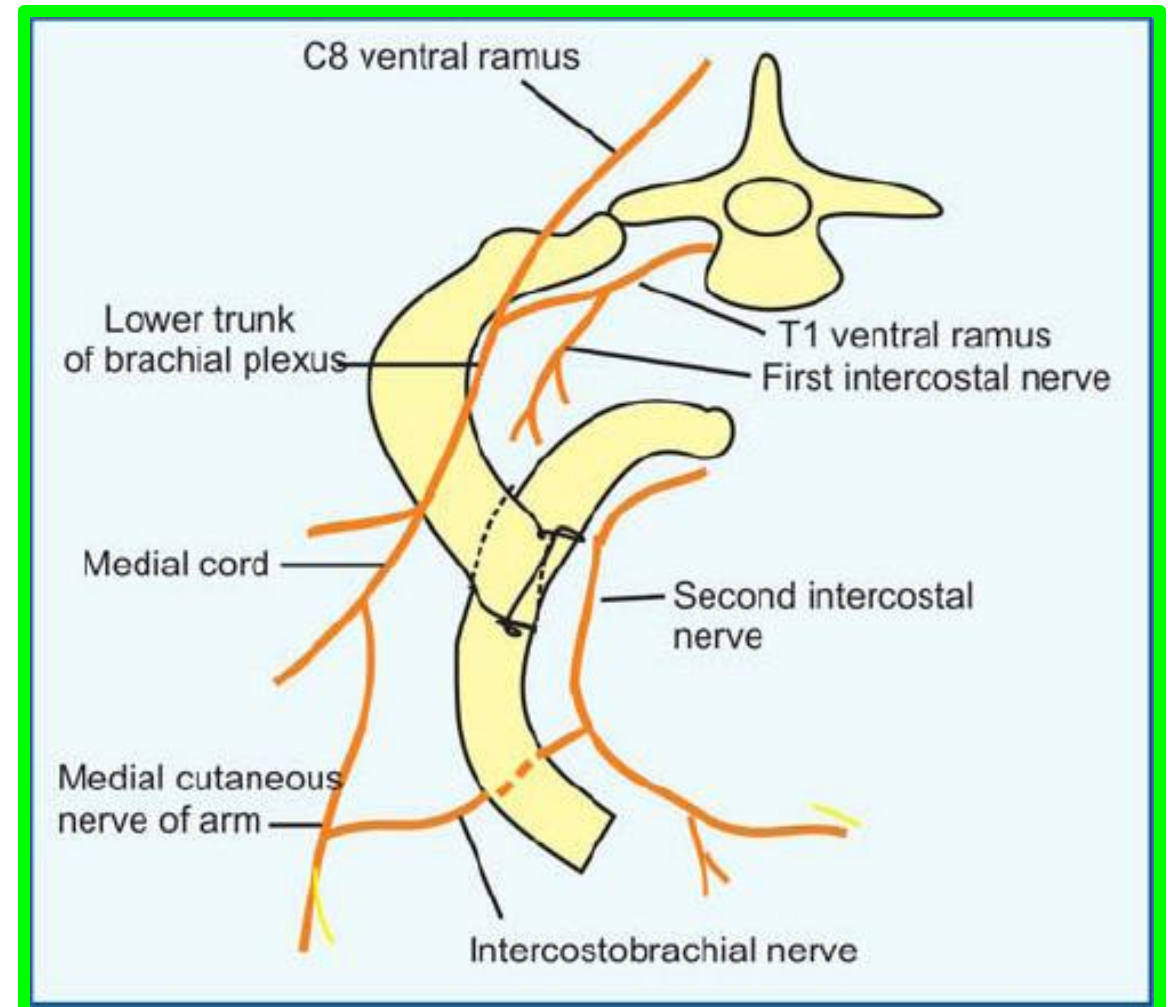
❖ Rami communicantes

❖ connect the intercostal nerve to a ganglion of the sympathetic trunk



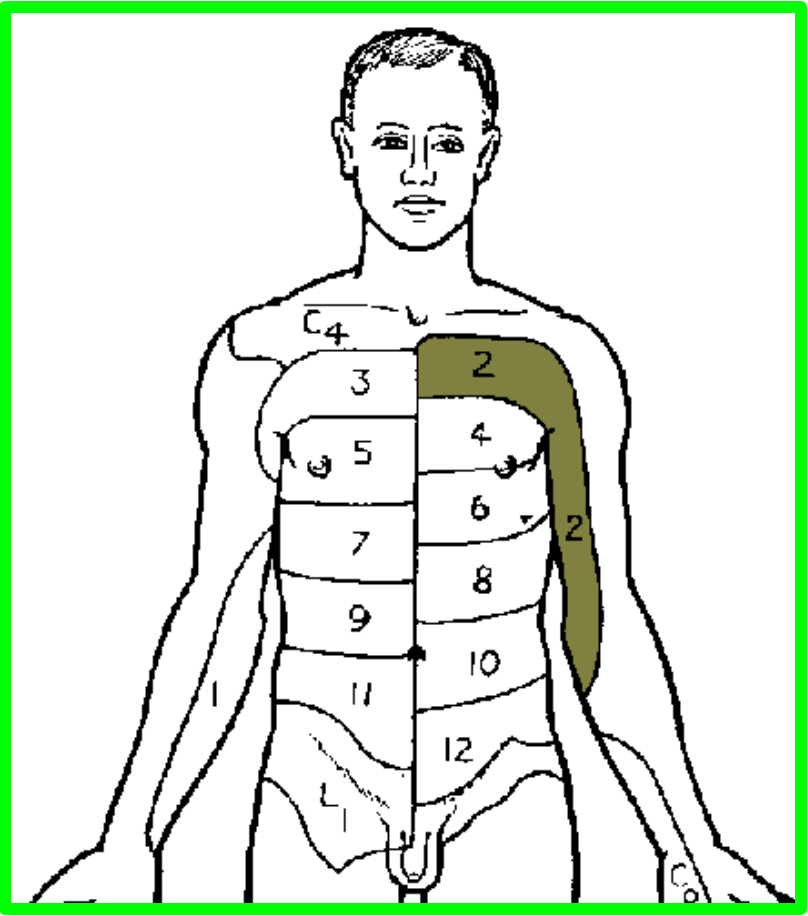
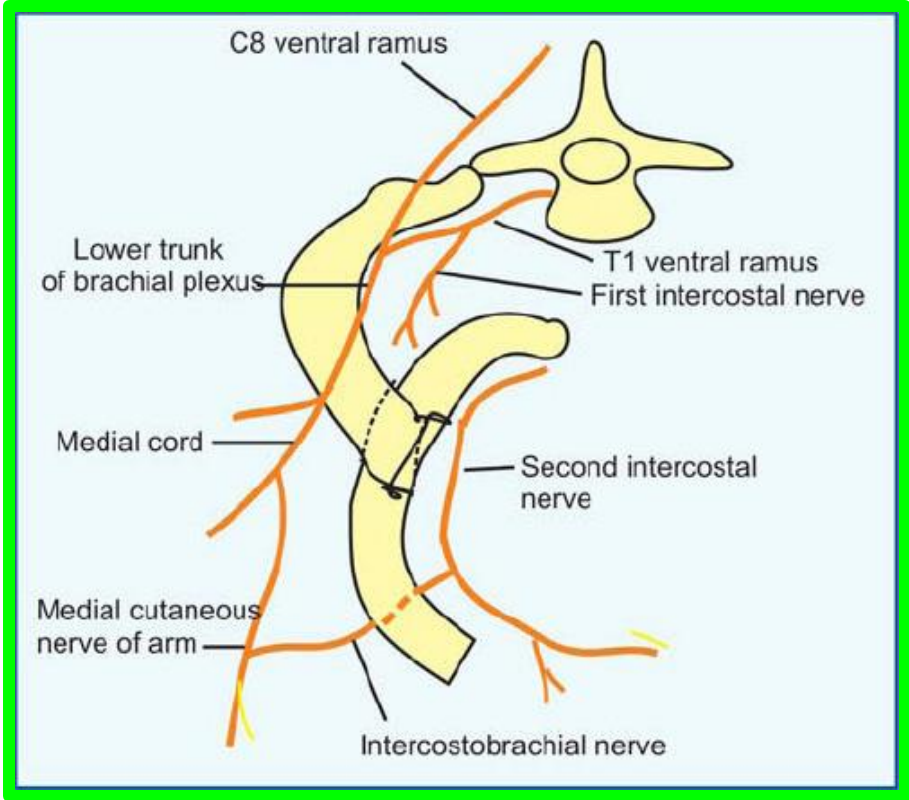
The 1st intercostal nerve

- ❖ Divides into a **large superior** and a **small inferior** part
- ❖ The **superior part** joins the **brachial plexus** (the nerve plexus that supplies the upper limb)
- ❖ The **inferior part** is thus left small and has neither **anterior** nor **lateral cutaneous** branches; in other words, it **does not reach the skin of the thorax**



The 2nd intercostal nerve

- ❖ The **lateral cutaneous branch** of the 2nd intercostal nerve joins **the brachial plexus** and supplies the skin of the axilla and the upper medial side of the arm (brachium)
- ❖ It is called the **intercostobrachial nerve**

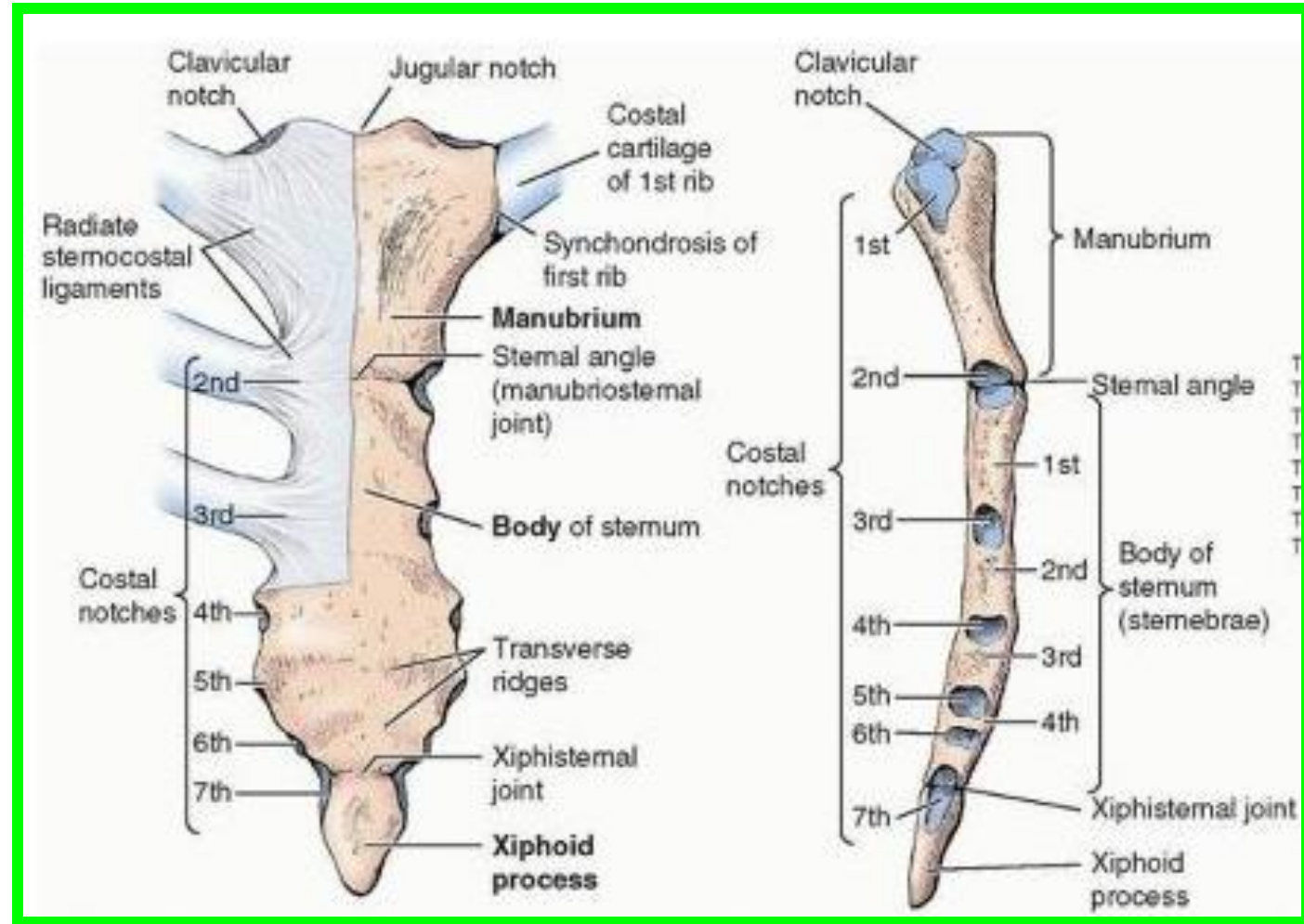


Joints of the Chest Wall

Joints of the Sternum

The manubriosternal joint is a **cartilaginous joint** between the manubrium and the body of the sternum.

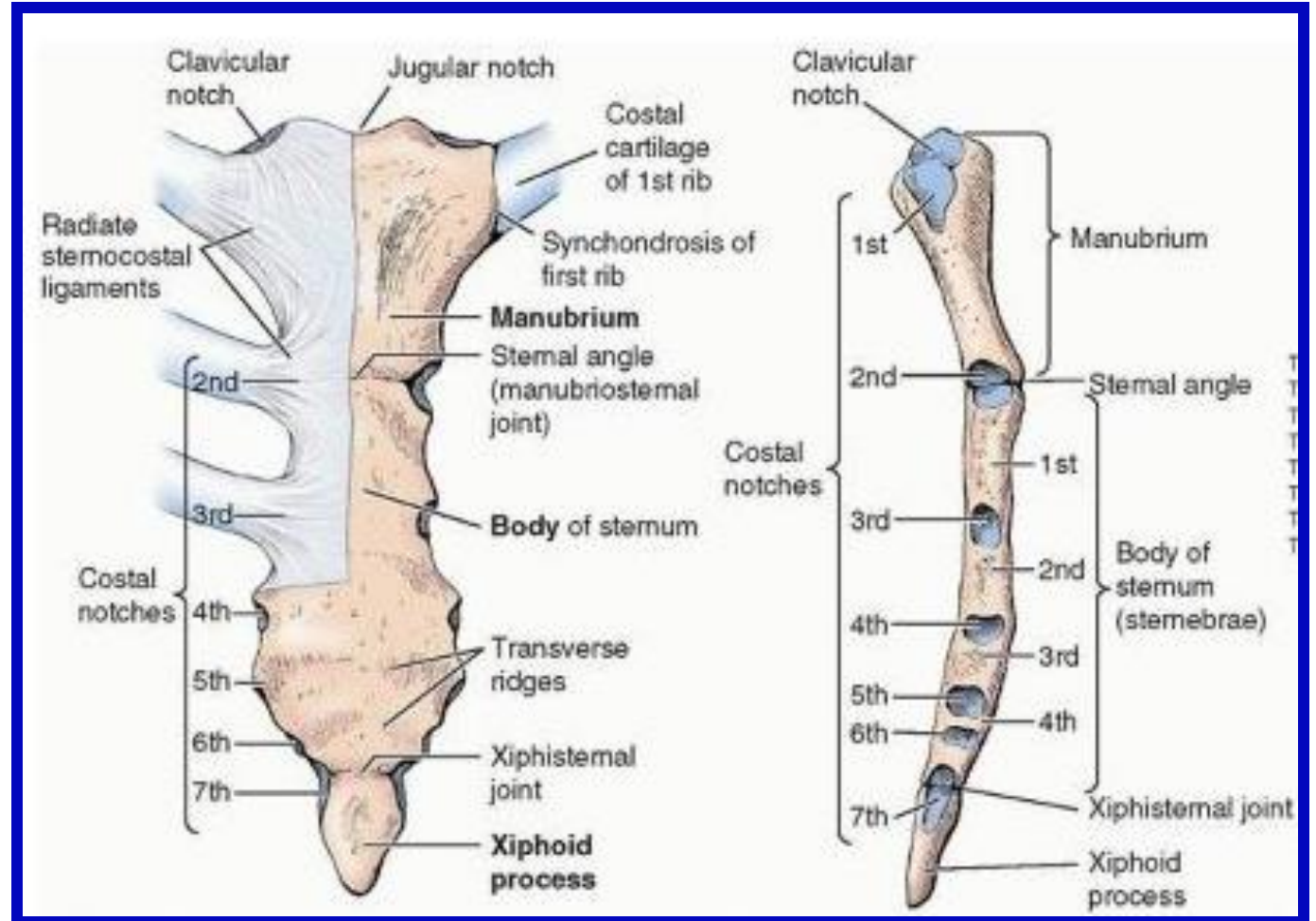
A small amount of angular movement is possible during respiration.



Joints of the Sternum

The xiphisternal joint is a cartilaginous joint between the xiphoid process (cartilage) and the body of the sternum.

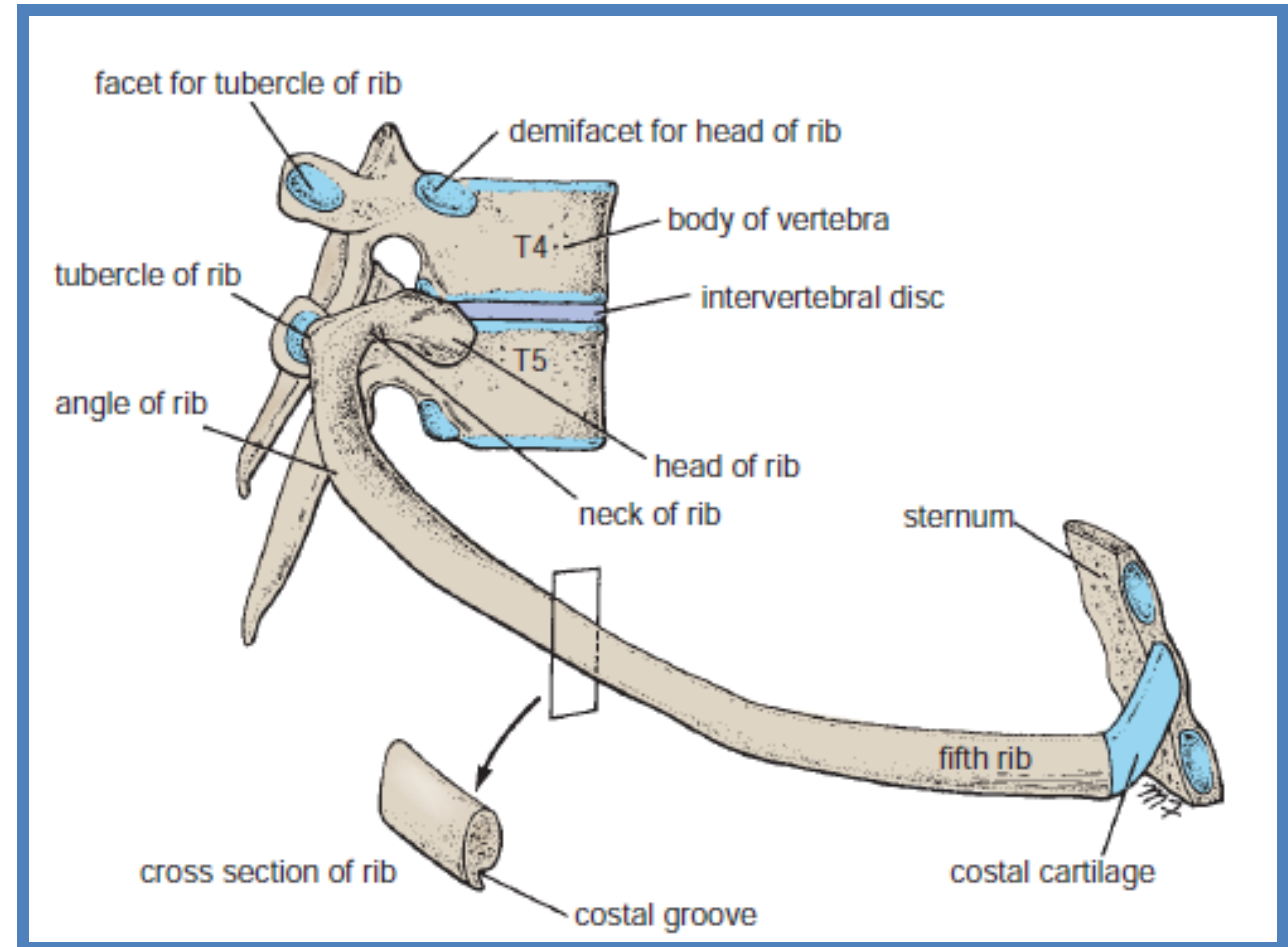
The xiphoid process usually fuses with the body of the sternum during middle age.



Joins of the Heads of the Ribs

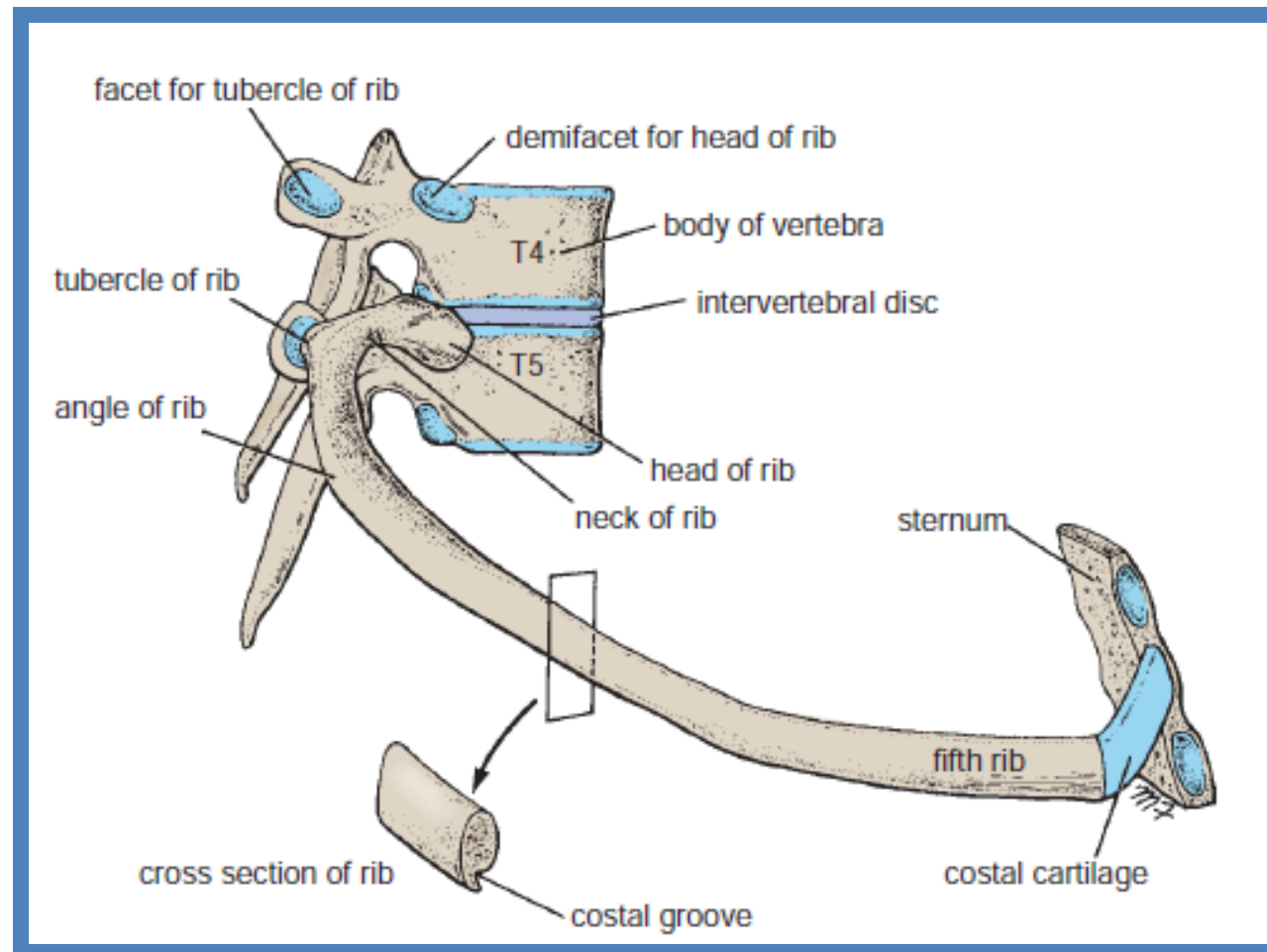
The 1st rib and the three lowest ribs have a **single synovial joint** with their corresponding vertebral body.

For the 2nd to 9th ribs, the head articulates by means of a **synovial joint** with the corresponding vertebral body and that of the vertebra above it



Joints of the Tubercles of the Ribs

The tubercle of a rib articulates by means of a **synovial joint** with the transverse process of the corresponding vertebra
(This joint is absent on the 11th and 12th ribs.)



37

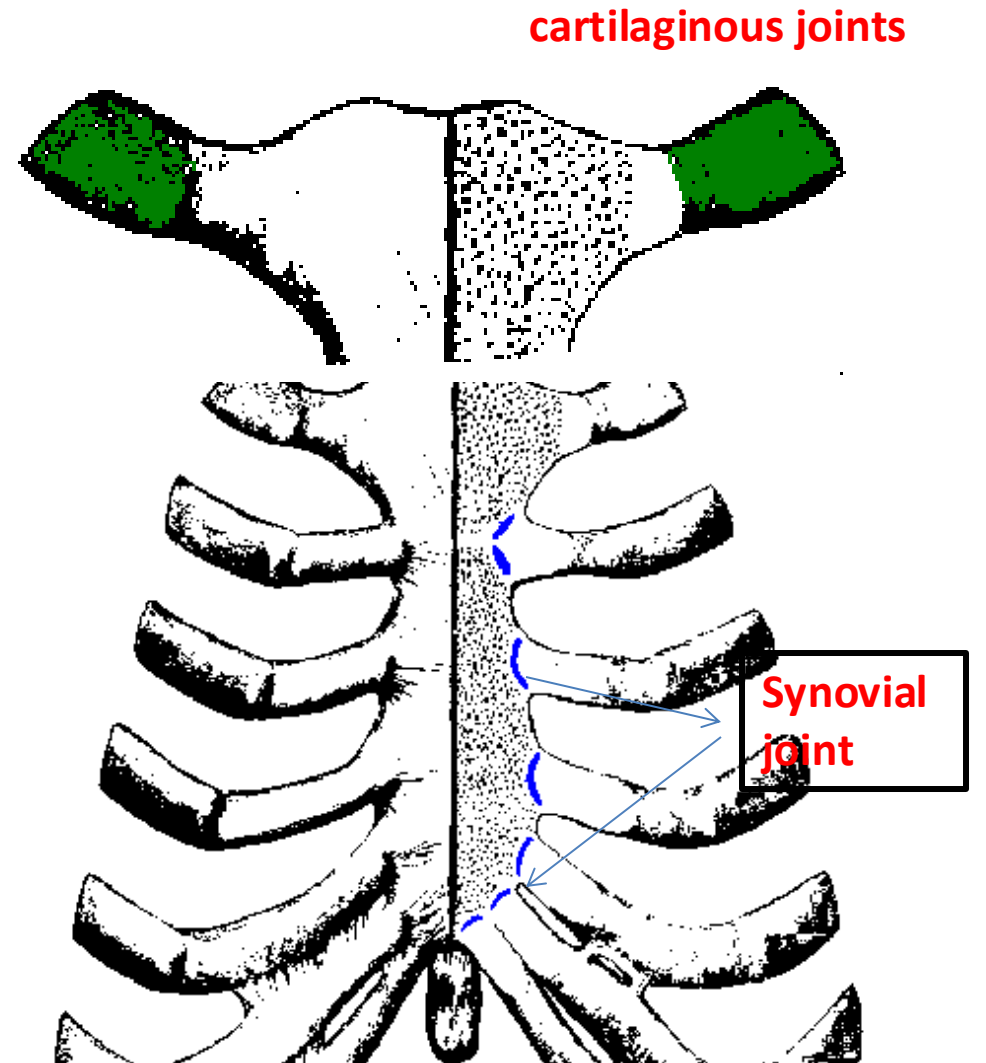
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Monday 7 October 2024

Joints of the Costal Cartilages with the Sternum

The **1st costal cartilages** articulate with the manubrium, by **cartilaginous joints** that permit no movement.

The **2nd to 7th costal cartilages** articulate with the lateral border of the sternum by **synovial joints**.

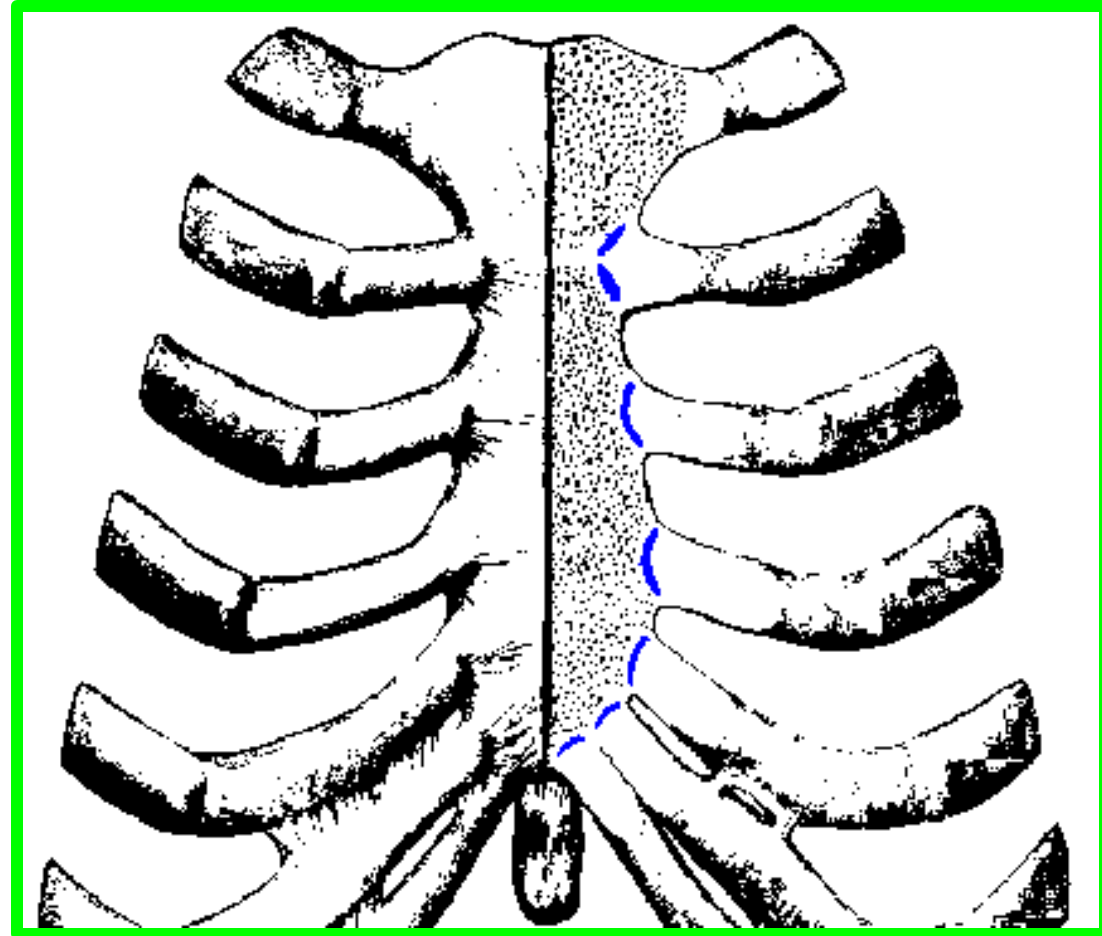


Joints of the Costal Cartilages with the Sternum

The:

6th, 7th, 8th, 9th, and 10th costal cartilages articulate with one another along their borders by **small synovial joints**.

The cartilages of the **11th and 12th ribs** are embedded in the abdominal musculature





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7th October 24