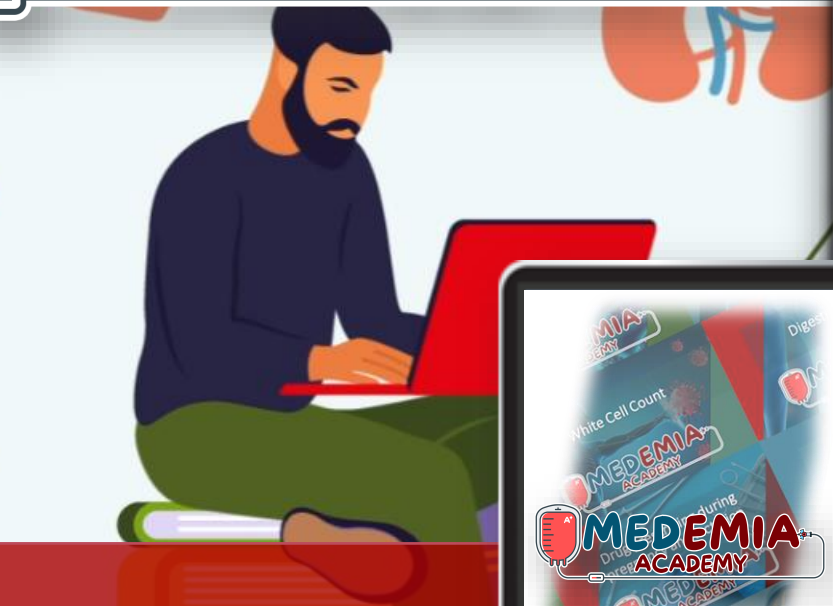


Intercostal space (VAN) and Azygos system

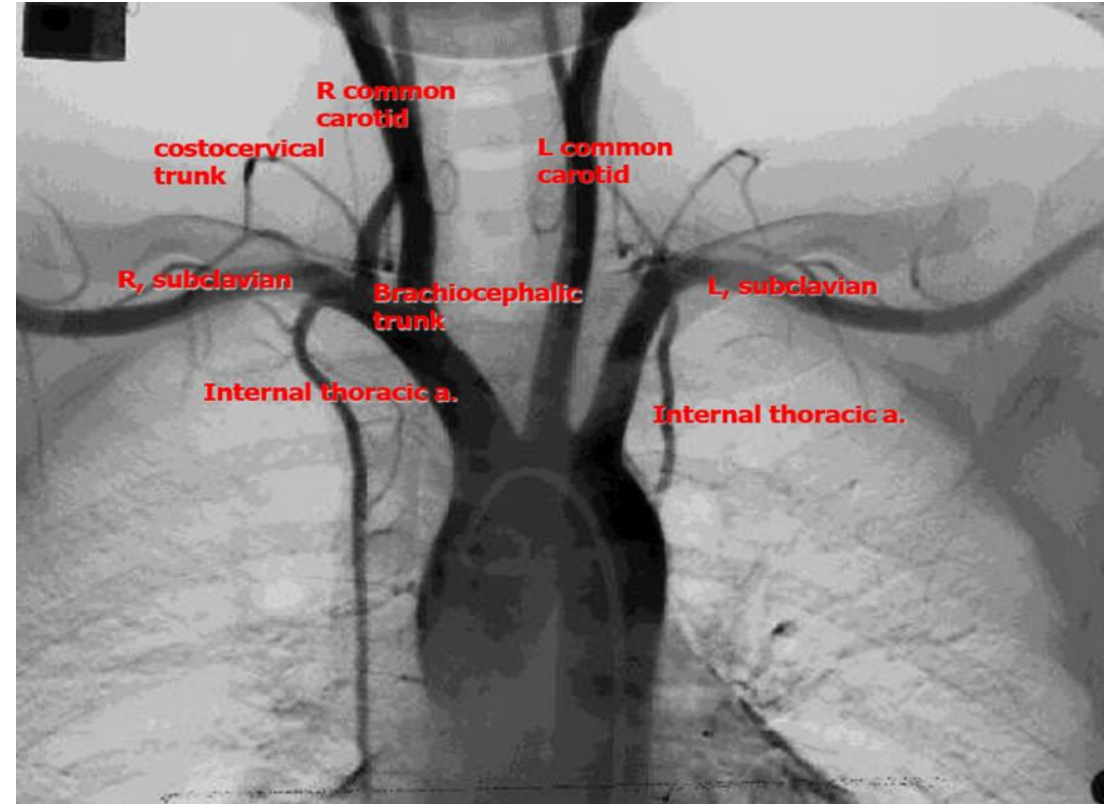


MEDEMIA ACADEMY



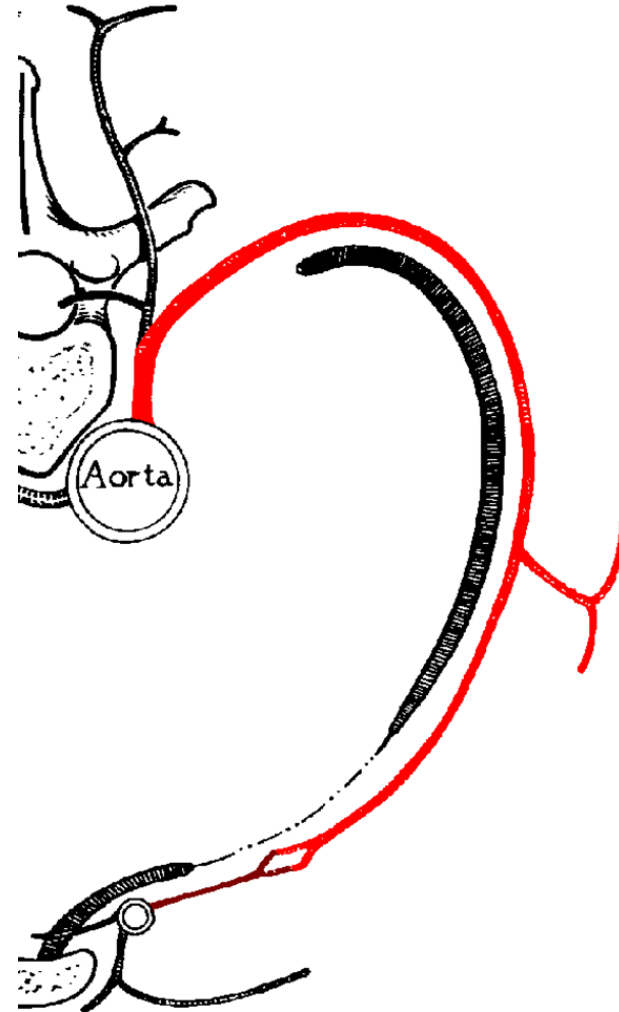
Arch of the Aorta

- ❖ Continuation of Ascending aorta
- ❖ The aortic branches supply the Head and the upper extremities.
- ❖ Give 3 main branches :
 - Brachiocephalic trunk
 - Left common carotid artery
 - Left subclavian artery



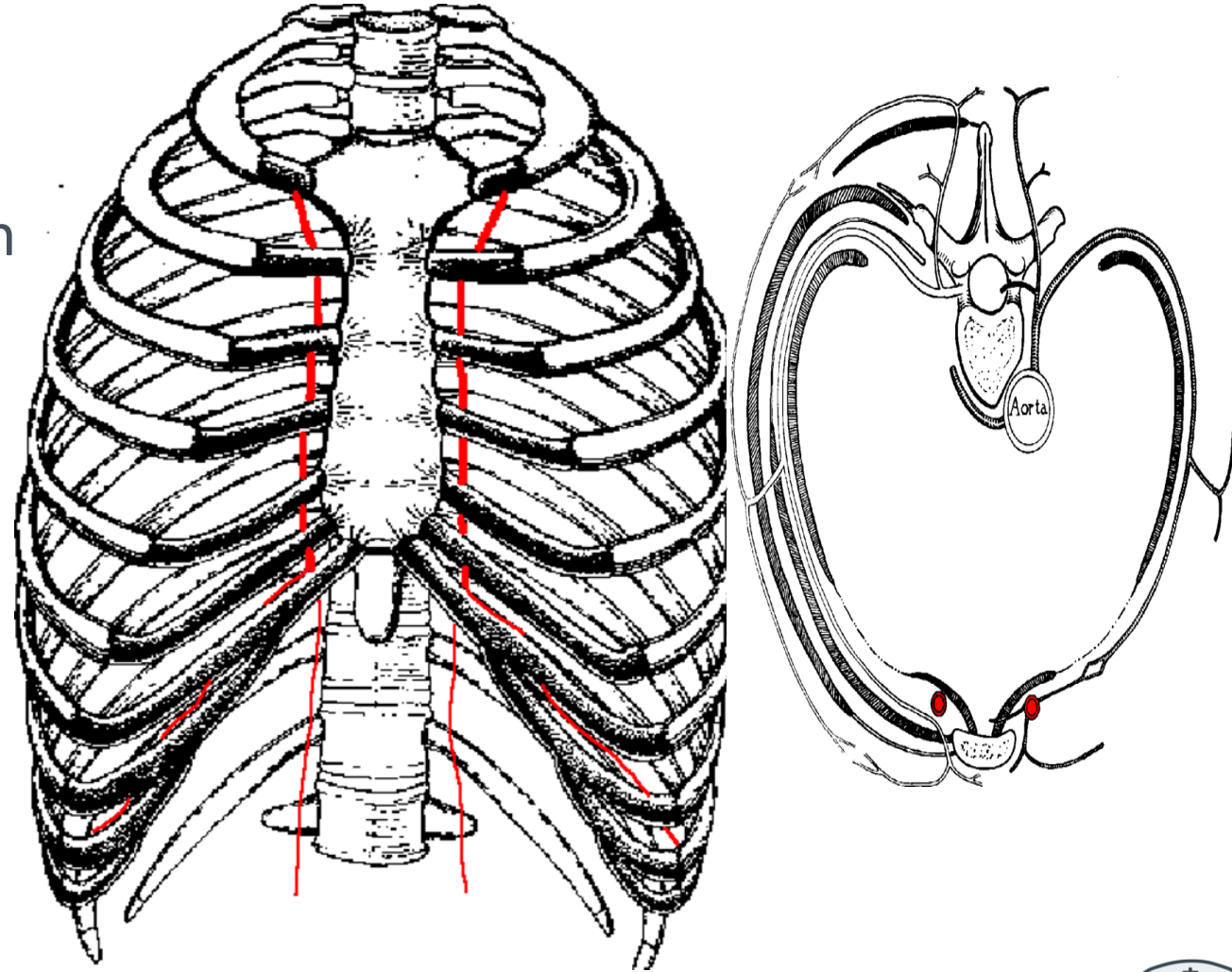
Intercostal arteries

- ❖ 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



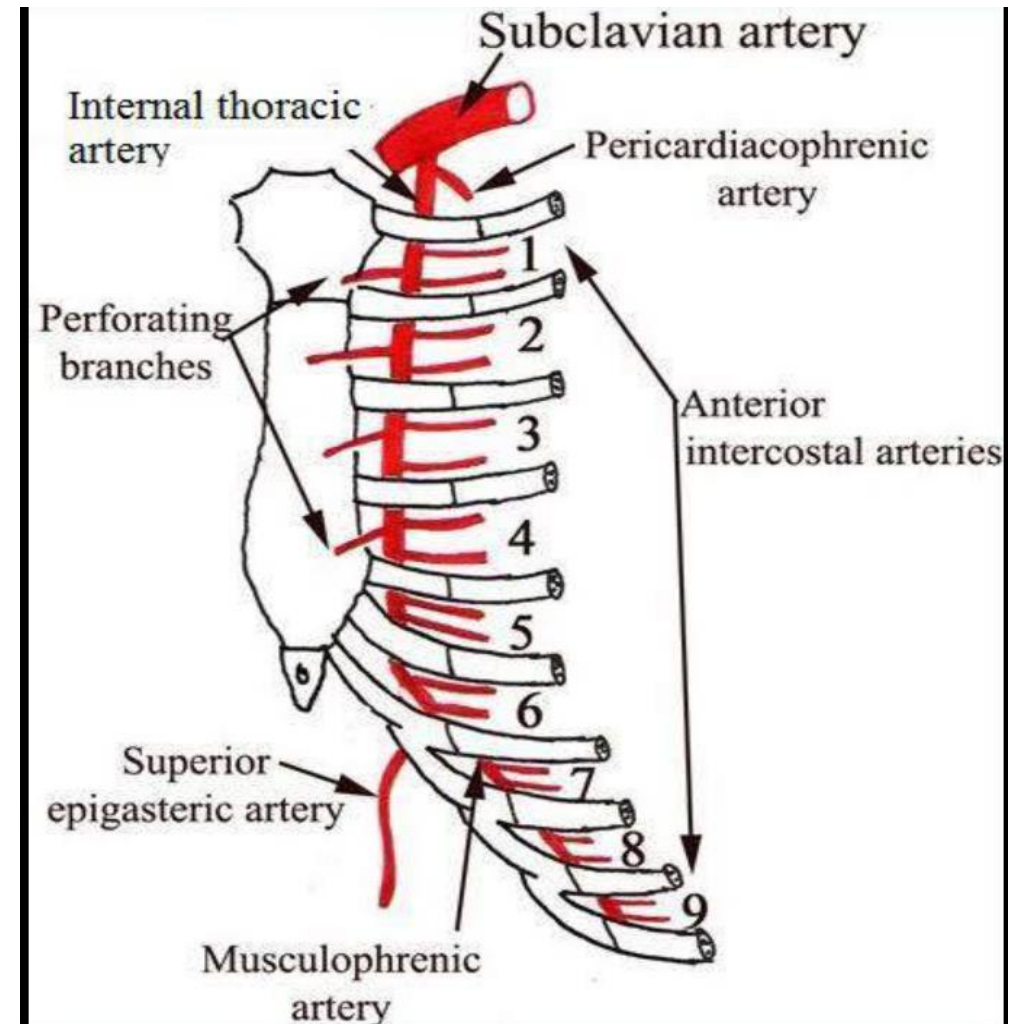
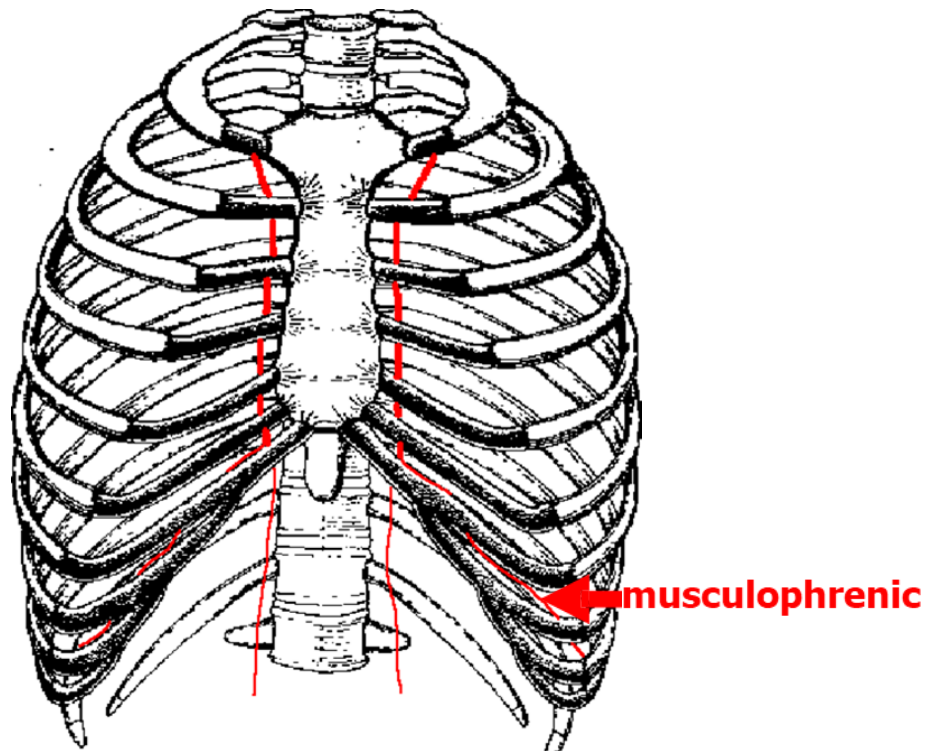
Internal Thoracic artery

- ❖ It's a branch from subclavian artery
- ❖ The internal thoracic artery ends in the 6th intercostal space by dividing into two terminal branches:
 - superior epigastric
 - musculophrenic arteries
- ❖ Descends vertically about a finger breadth (about 1cm) lateral to the sternum



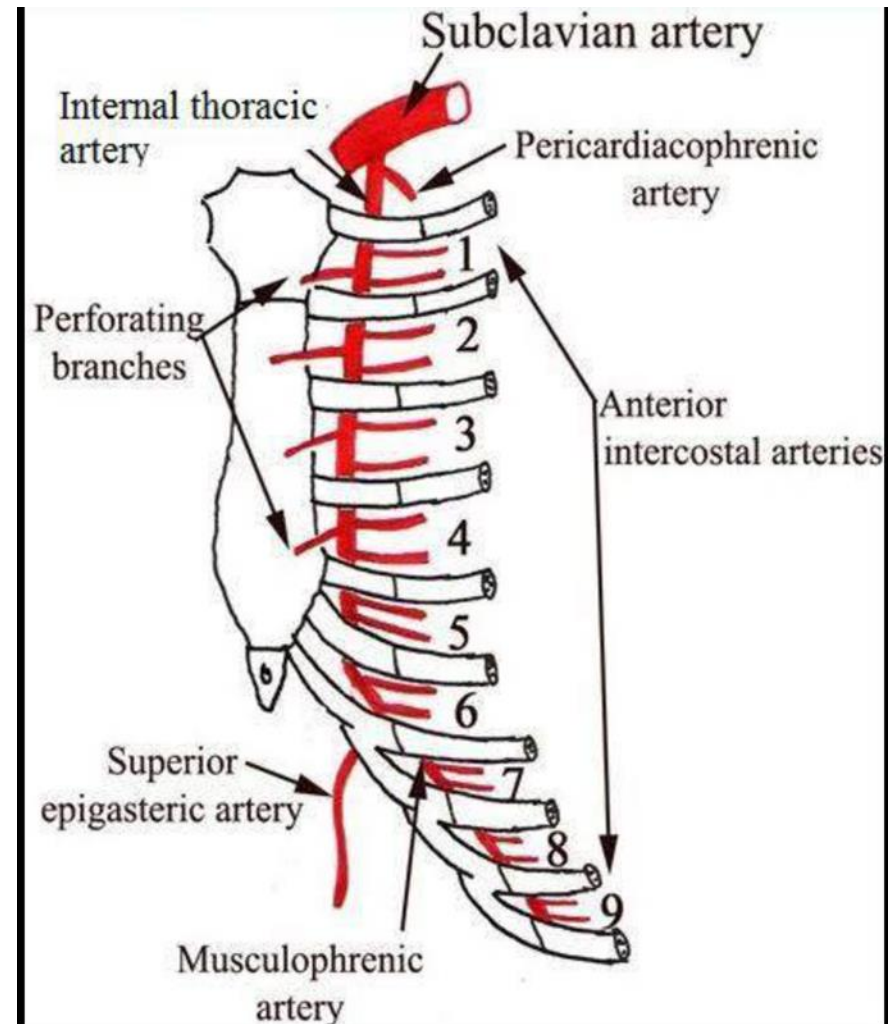
Musculophrenic artery

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



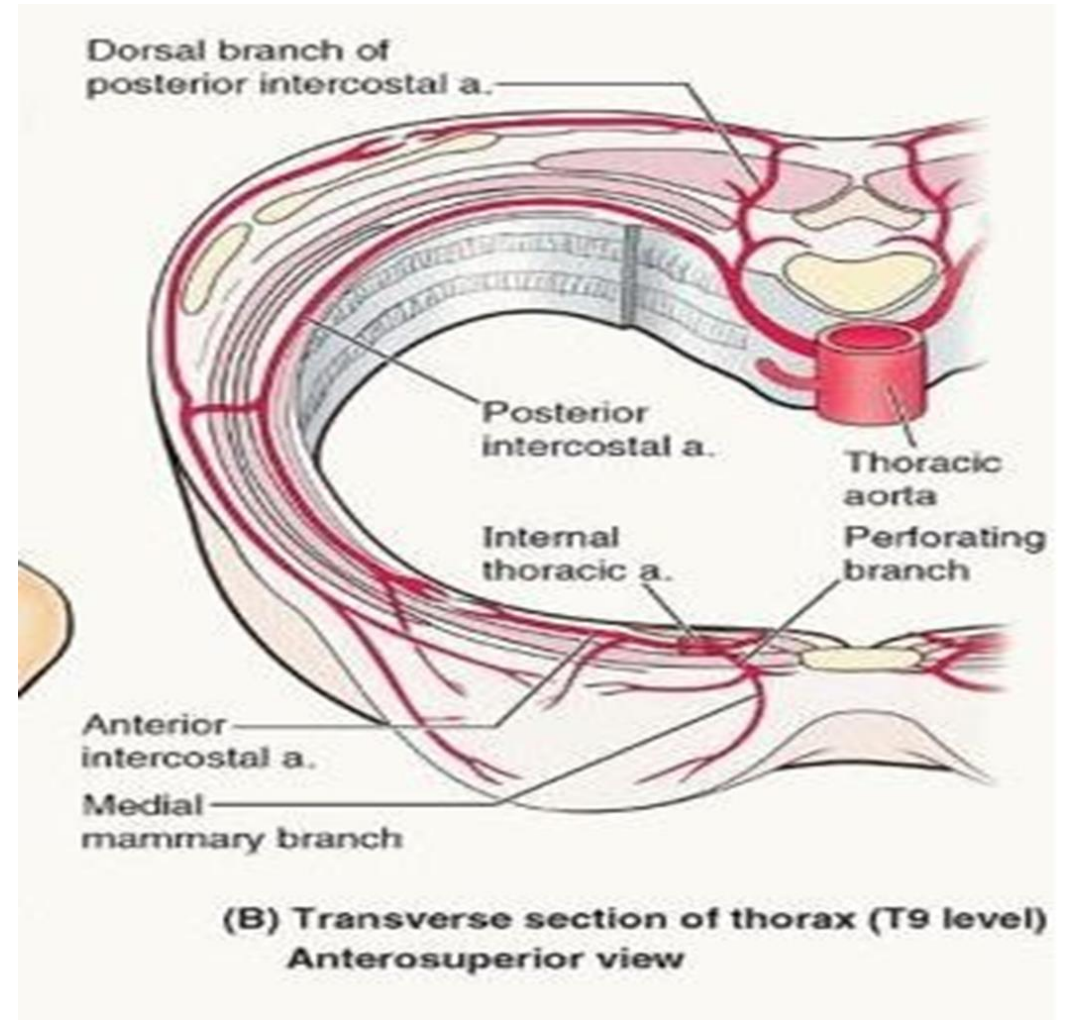
Anterior intercostal arteries

- ❖ 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(10,11) have posterior intercostal arteries only.



Perforating branches

- ❖ The anterior intercostal artery and the posterior intercostal artery anastomose together and form perforating branch (medial mammary branch) to supply the breast in females.

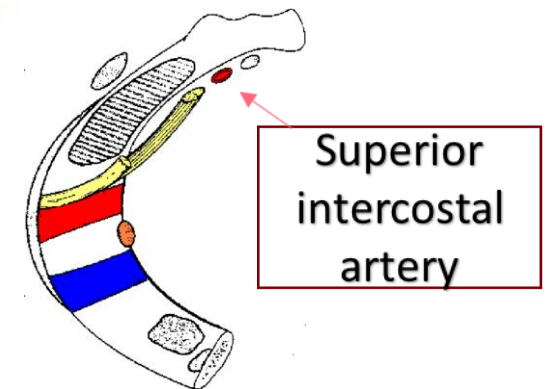
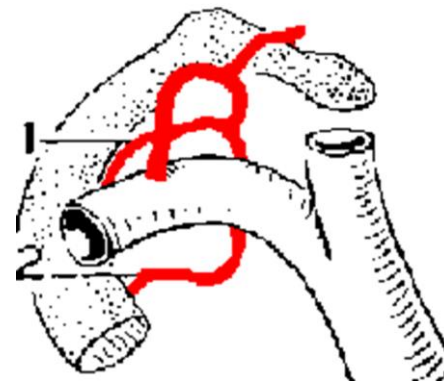
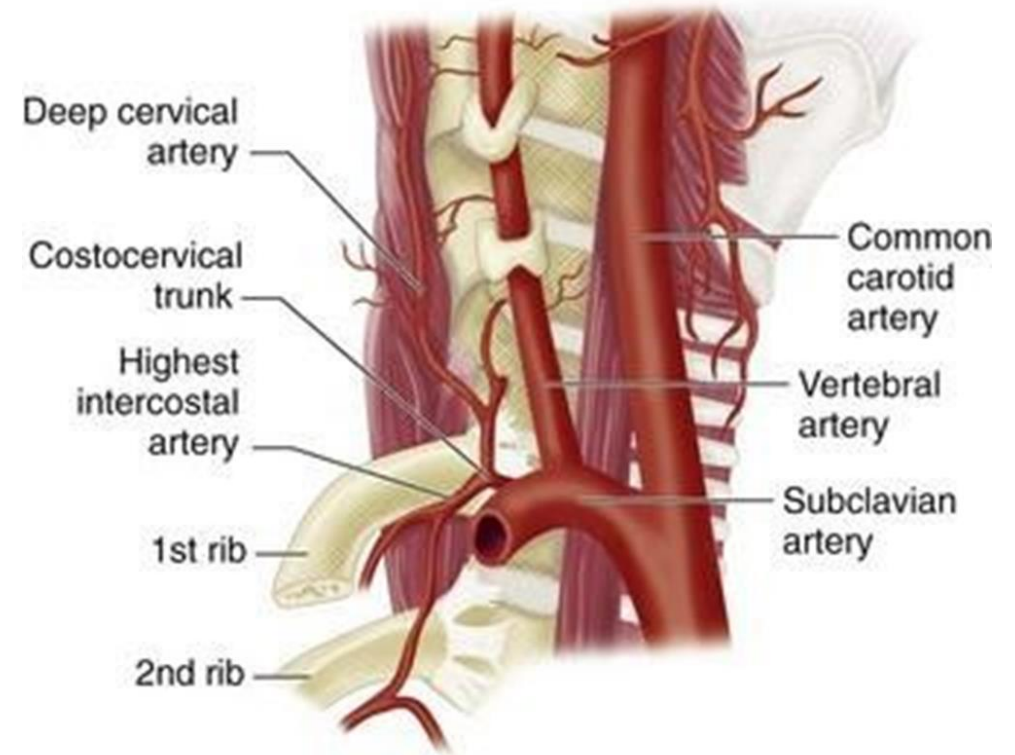


Costocervical trunk

❖ Arises from the posterior aspect of the subclavian artery and divides into:

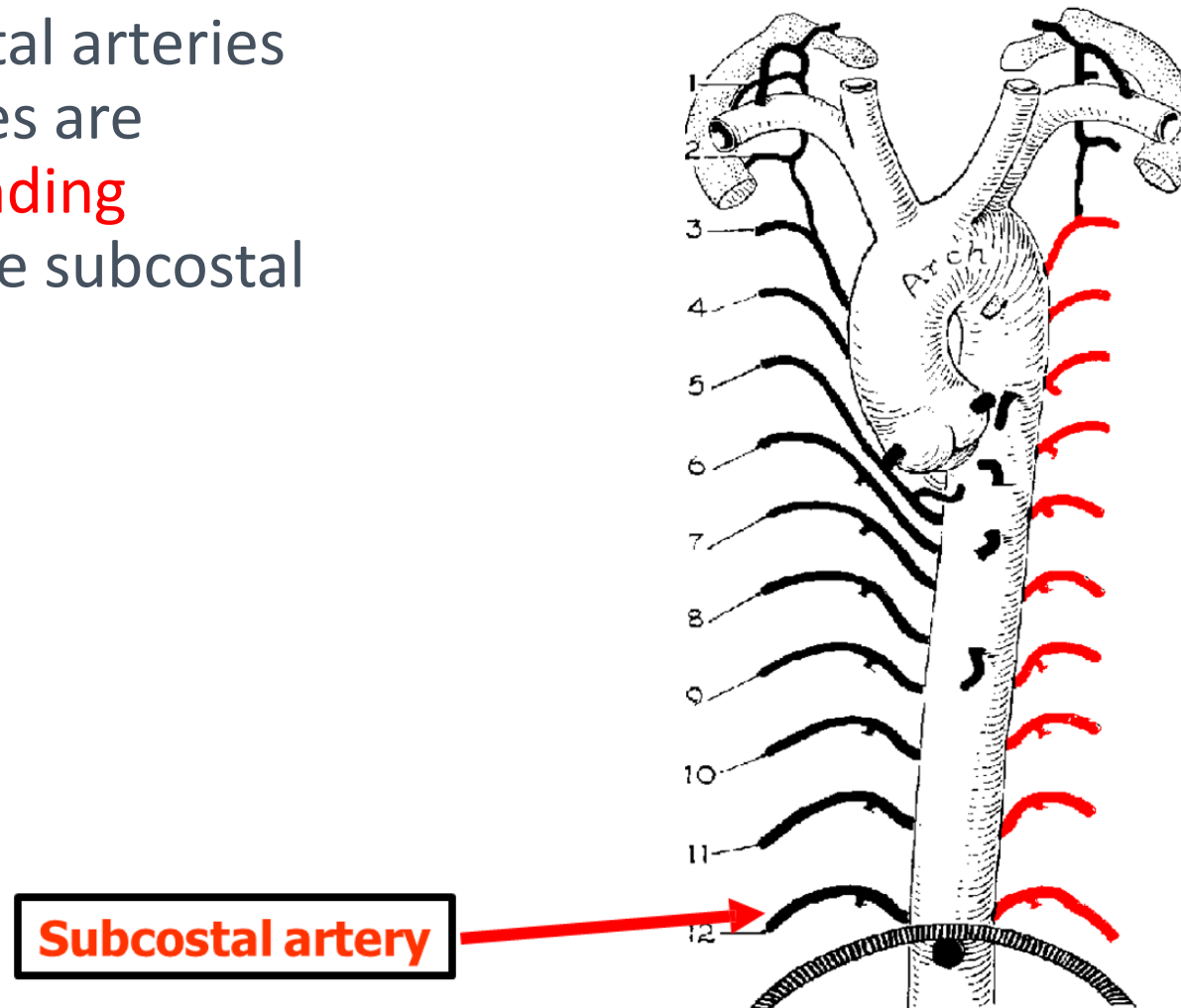
- **Ascending/deep cervical artery:** branch that supplies the back of the neck.
- **Superior intercostal artery** (hence the name costocervical): it supplies the first 2-3 intercostal spaces .

❖ The superior intercostal artery crosses **the neck of the first rib** to supply the upper 2-3 posterior intercostal spaces



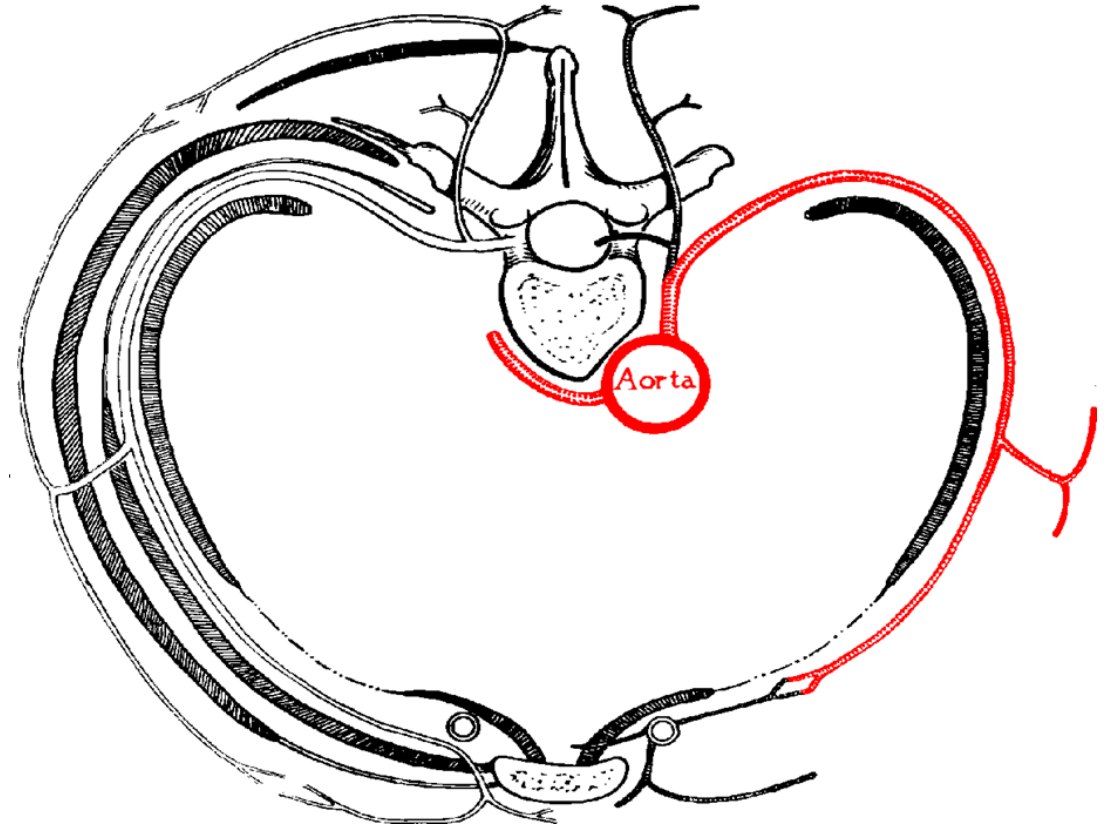
Posterior intercostal artery

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



Posterior intercostal arteries

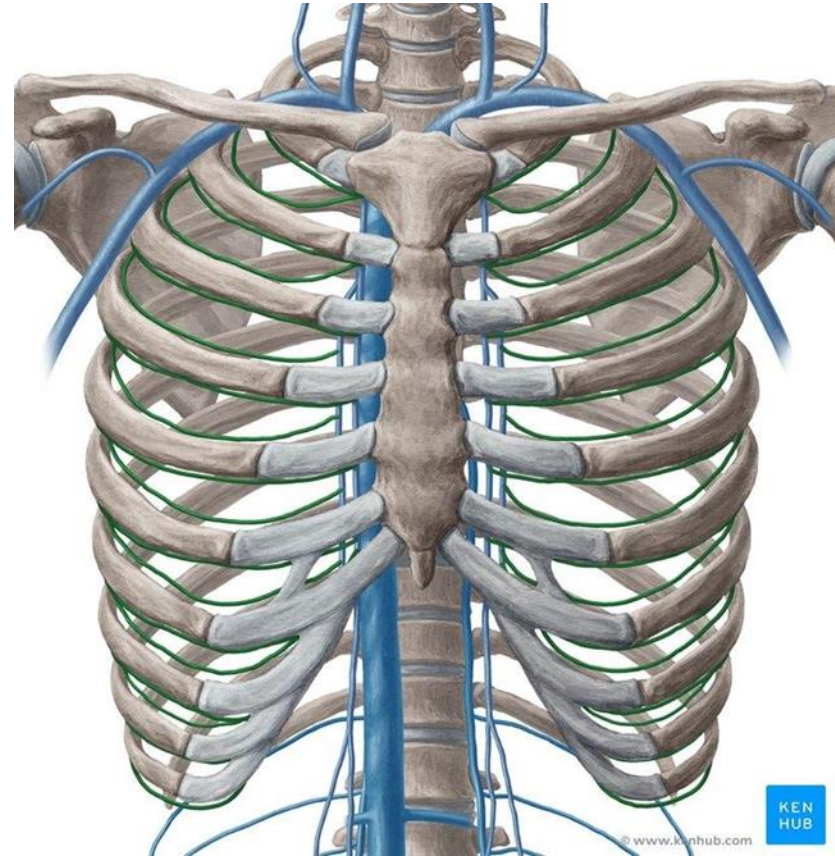
- ❖ The lower nine intercostal arteries of Rt. side are **longer** than their counter parts on the left:
- Because the aorta lies on the left side of the posterior thoracic wall



Venous drainage of the thoracic wall

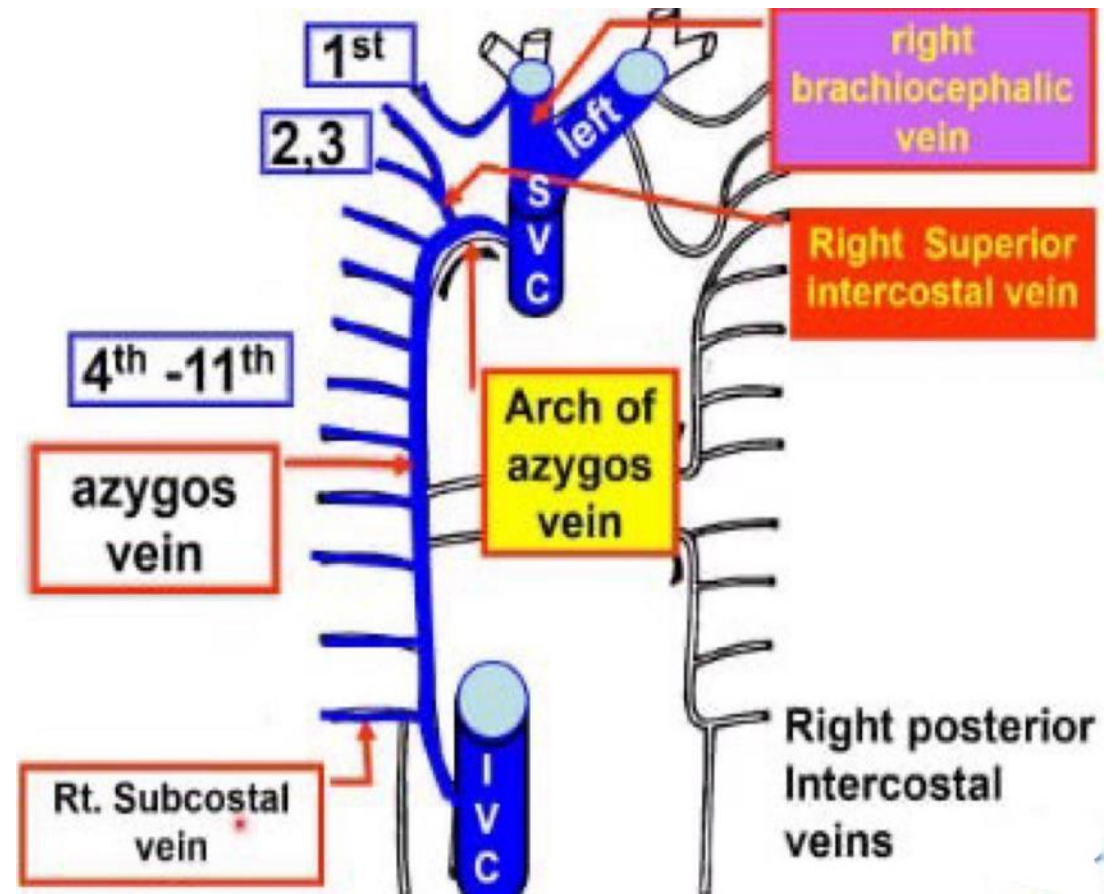
❖ The Anterior Intercostal Veins:-

- 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**.



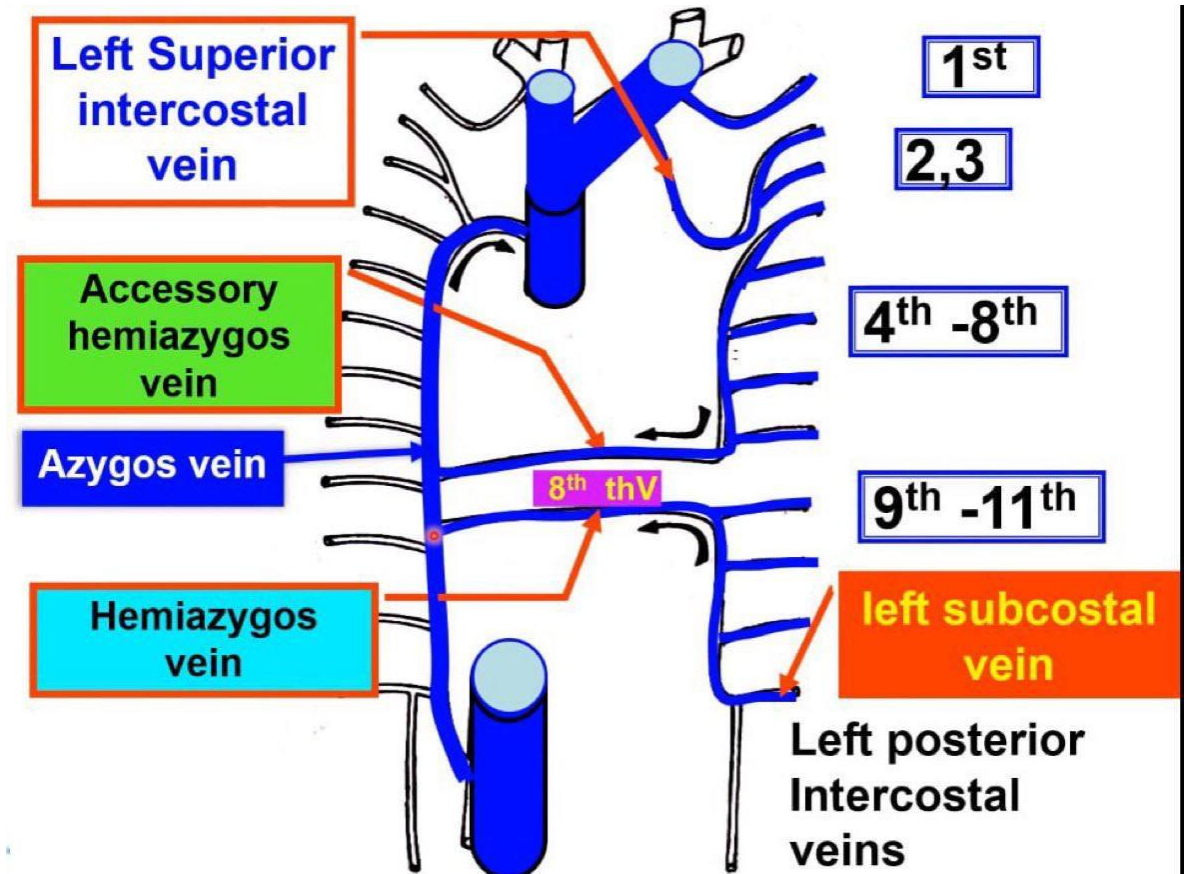
The Posterior Intercostal Veins

- ❖ 11 veins on each side and subcostal vein.
- On the right side:
 - The first vein drains into the **right brachio-cephalic vein**.
 - The 2nd and 3rd veins: form the **right superior intercostal vein** which ends in the **arch of azygos vein**.
 - From 4th till 11th and subcostal vein: end into the **azygos vein**.



The Posterior Intercostal Veins

- On the left side:
 - The first vein ends into the **left brachio-cephalic vein**.
 - The 2nd and 3rd veins: form the left superior intercostal vein which ends into the **left brachio-cephalic vein**.
 - The left 4th to 8th: end in the **accessory (superior) hemiazygos vein**.
 - From the 9th to 11th and subcostal vein: **end in the hemiazygos vein**.



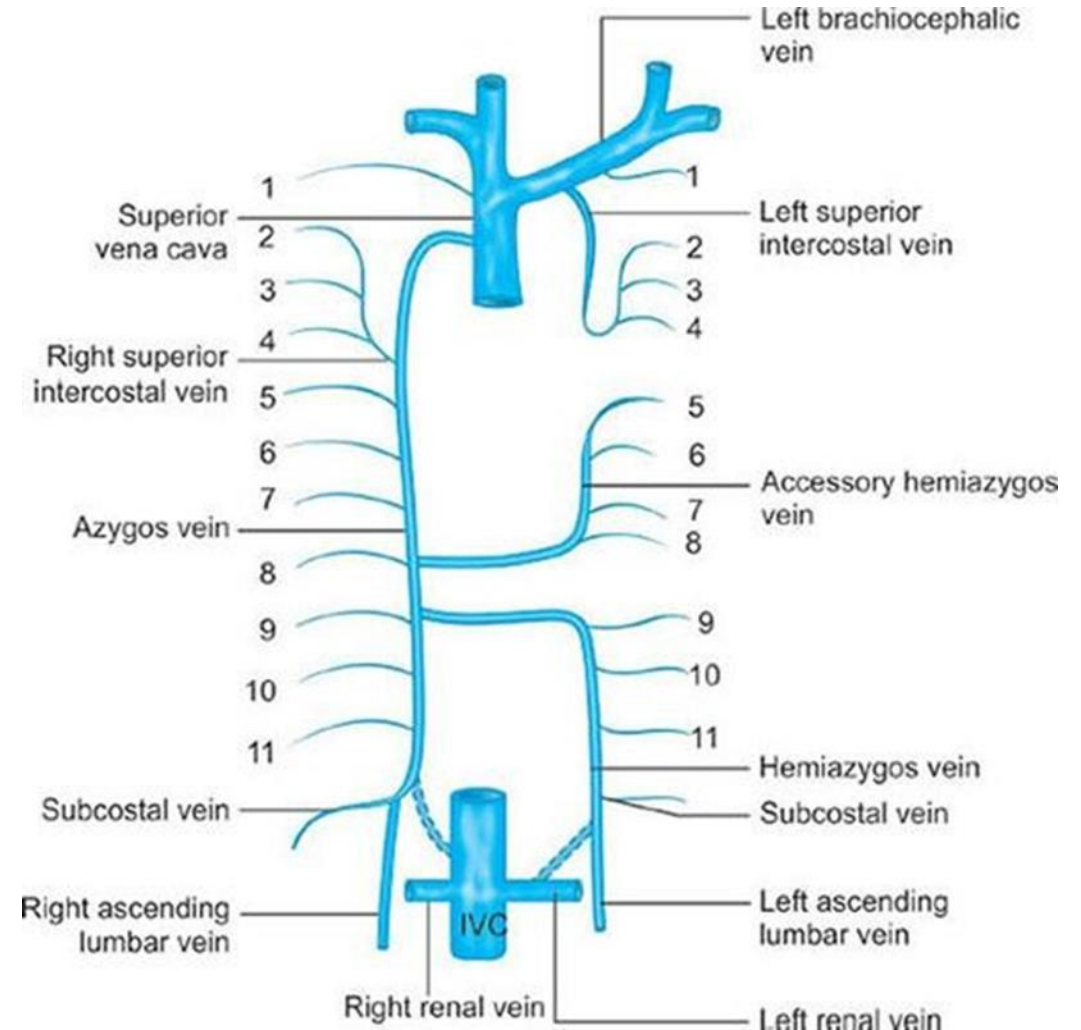
Posterior intercostal veins

Right side	Left side
<ul style="list-style-type: none">• Right 1st vein: ends into the right brachio-cephalic vein	<ul style="list-style-type: none">• Left 1st vein : ends into the left brachio-cephalic vein
<ul style="list-style-type: none">• Right 2nd and 3rd : together they form right superior intercostal vein which ends in arch of azygos vein	<ul style="list-style-type: none">• Left 2nd and 3rd veins : they form together the left superior intercostal vein which ends into the left brachio- cephalic vein
<ul style="list-style-type: none">• Right 4th to 11th and subcostal veins :end into the azygos vein	<ul style="list-style-type: none">• Left 4th till 8th veins: end in accessory hemiazygos vein
	<ul style="list-style-type: none">• Left 9th to 11th and subcostal veins : end in hemiazygos vein



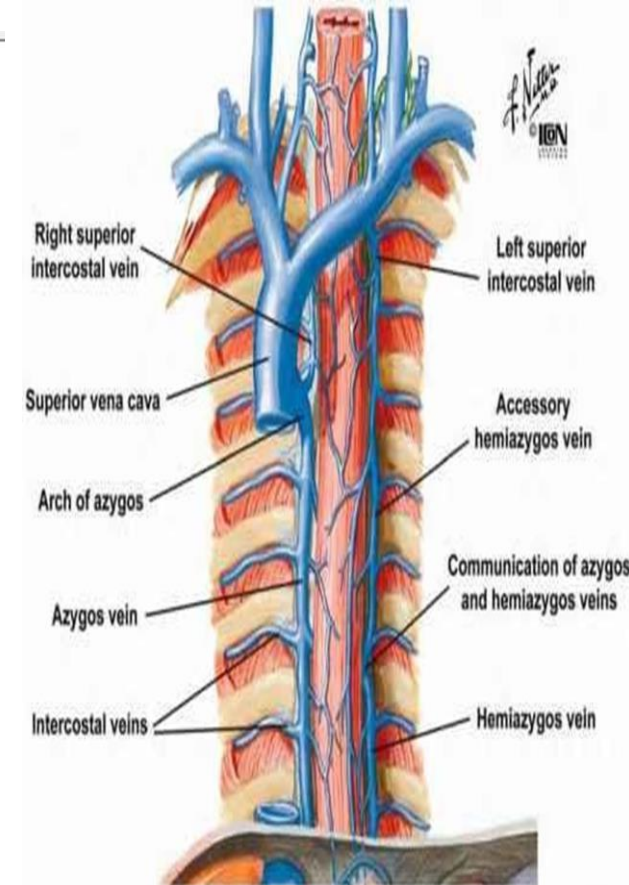
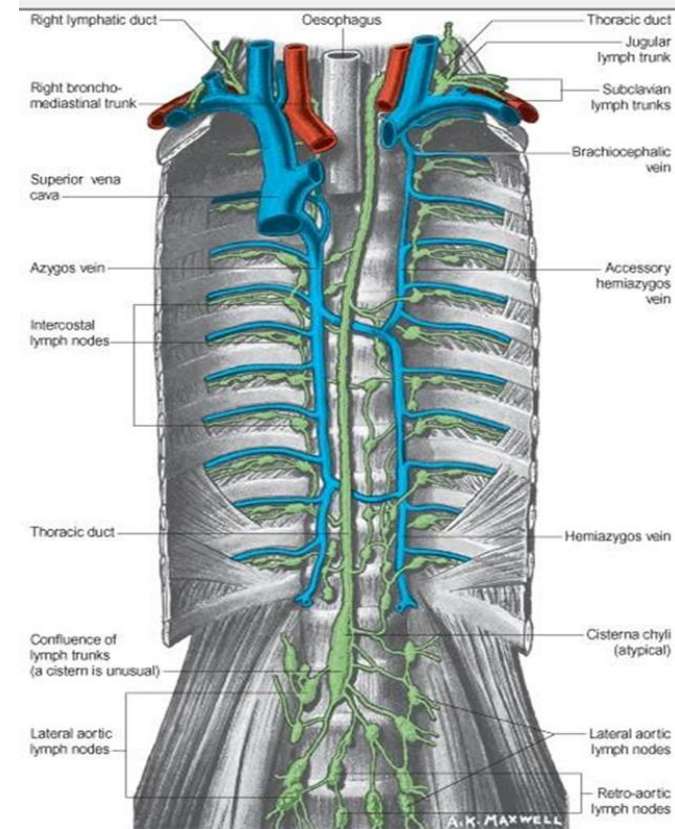
Azygous vein

- ❖ The azygos vein forms a **collateral pathway** between the SVC and IVC.
- ❖ Begins in Abdomen and arises as follows :
 - From the back of the inferior vena cava.
 - From the union of the right subcostal and right ascending lumbar veins.
- ❖ It enters thoracic cavity through aortic opening of the diaphragm with aorta and thoracic duct at T12.
- ❖ Then it ascends in the posterior mediastinum, passing close to the right sides of the bodies of the **inferior 8 thoracic vertebrae**.
- ❖ Finally, It arches over the superior aspect of the root of the **right lung** to join the SVC



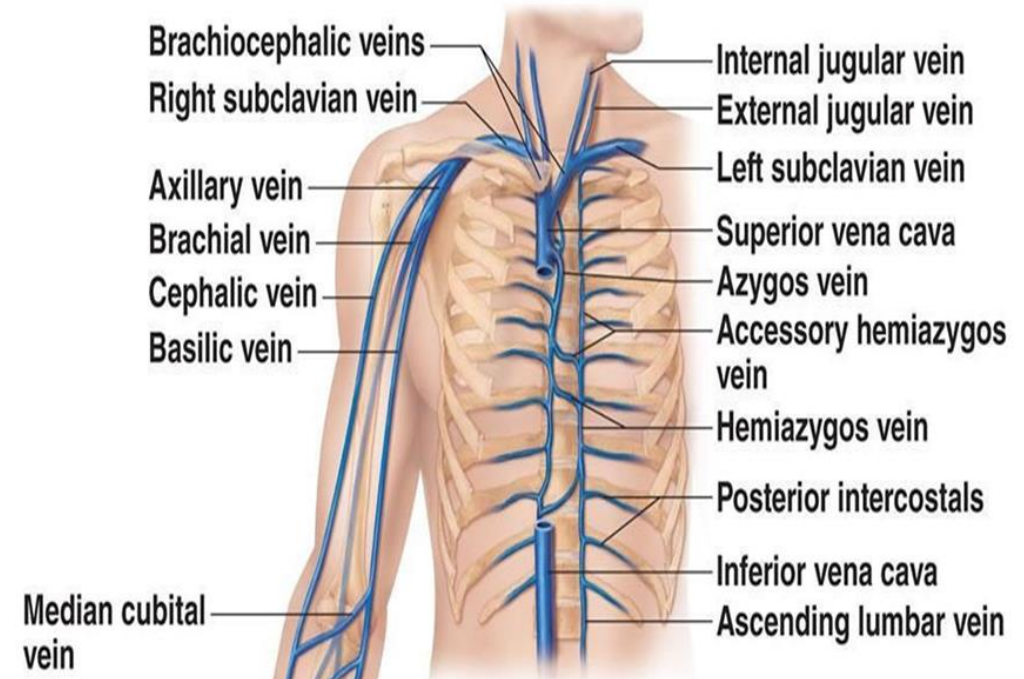
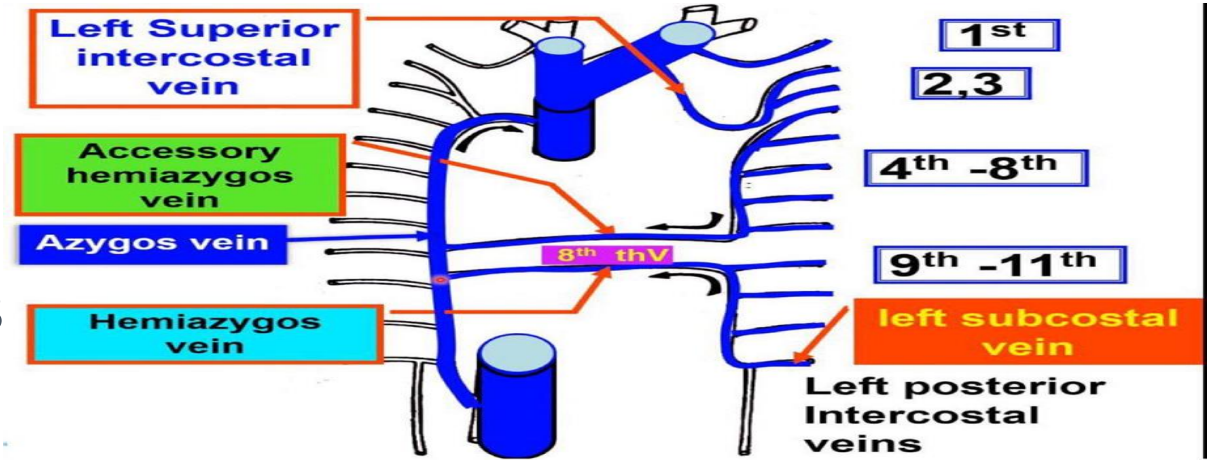
The azygos system of veins

- ❖ On each side of the vertebral column, drains the back and thoracoabdominal walls and mediastinal viscera.
- ❖ 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 veins
 - Esophageal veins
 - Bronchial veins



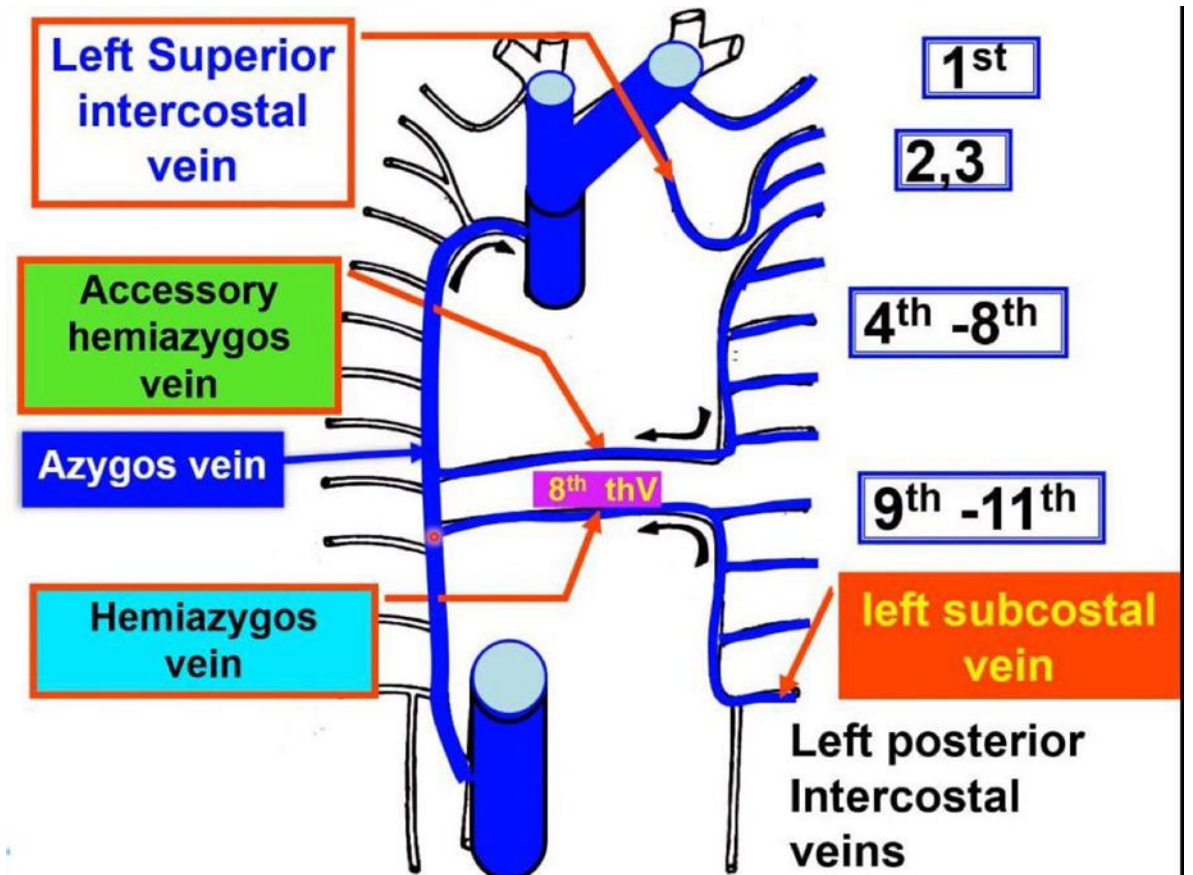
Hemiazygos vein

- ❖ 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** and crosses to the right to join the azygos vein.
- ❖ The hemiazygos vein receives:
 - **The inferior three posterior intercostal veins.**
 - **The inferior esophageal veins.**
 - **Several small mediastinal veins.**



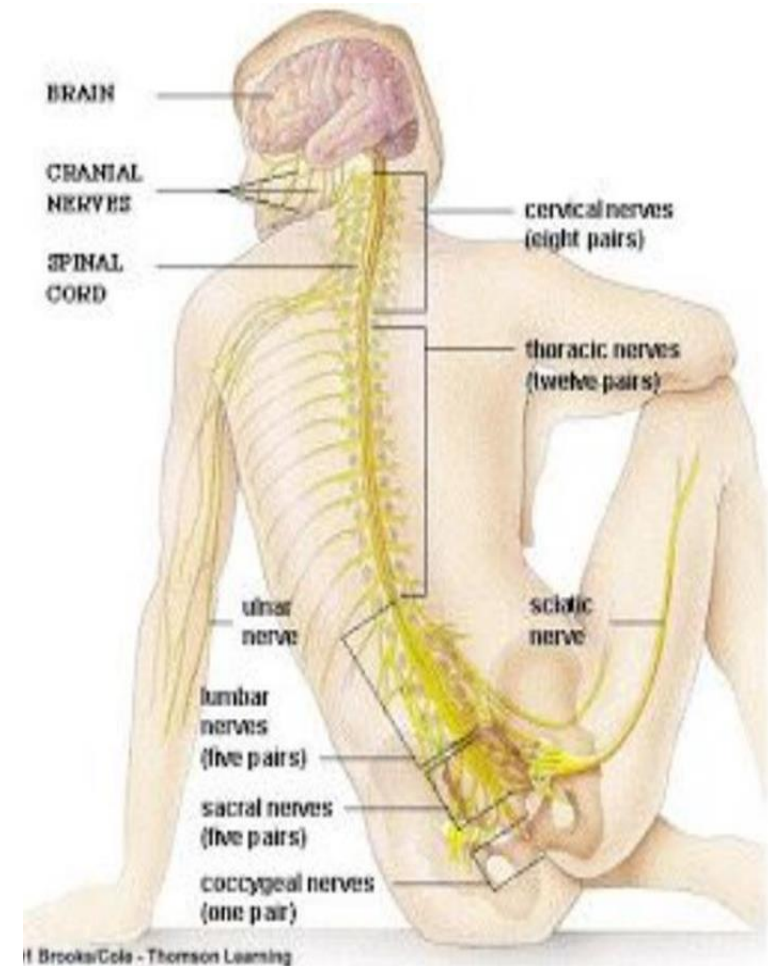
The Accessory hemiazygos vein

- ❖ 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.

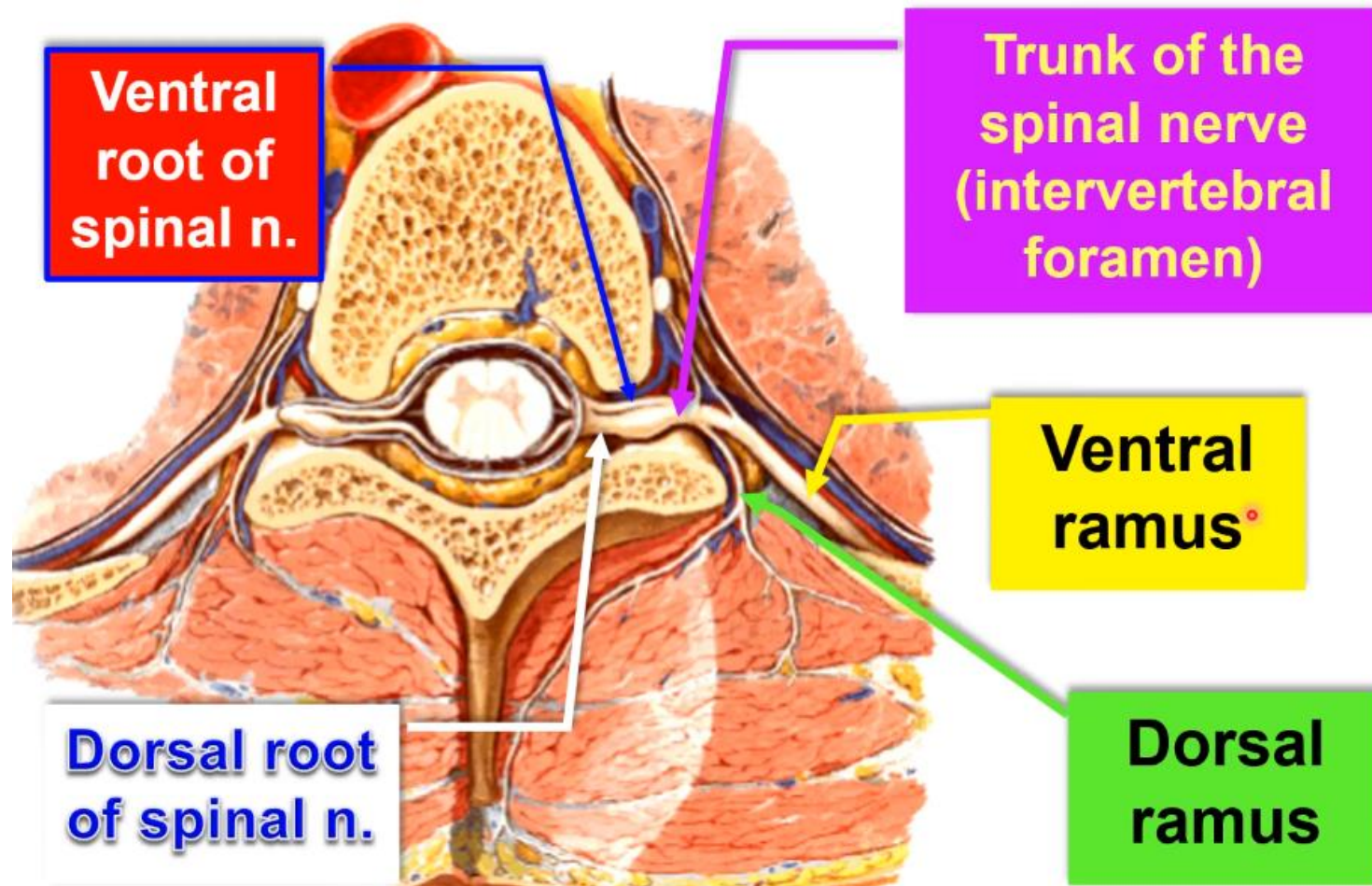


Neurovascular bundle

- ❖ The neurovascular bundle is located near the lower border of the corresponding rib sheltered by the costal groove.

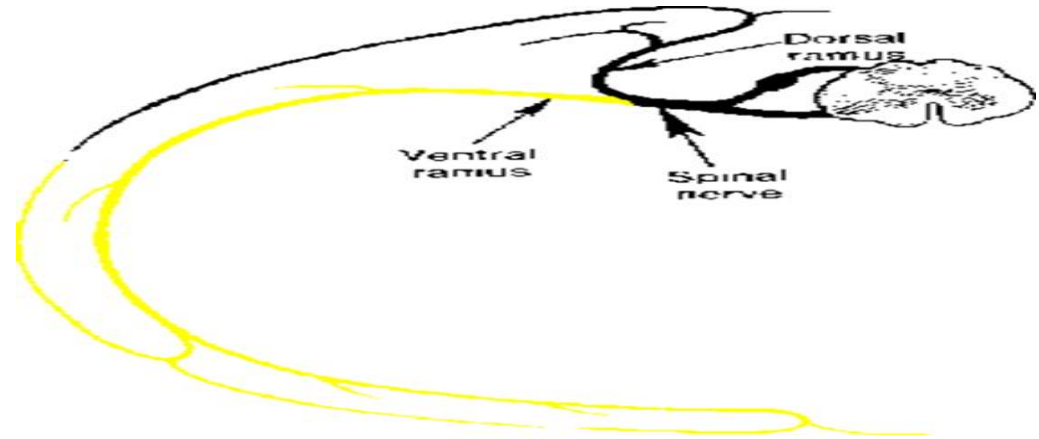


Thoracic spinal nerves

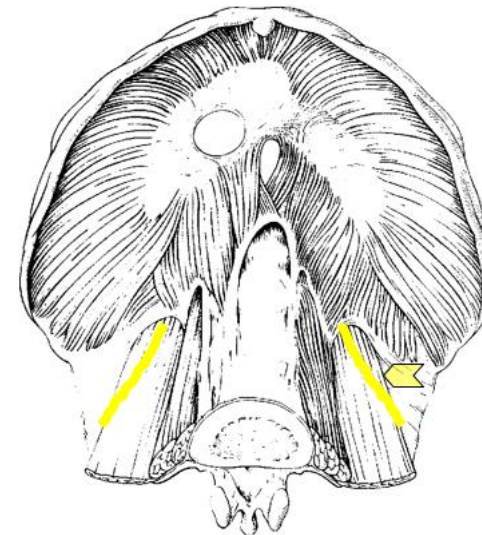


Intercostal nerves

❖ These are the anterior primary rami (Ventral rami) of the first 11 thoracic spinal nerves.

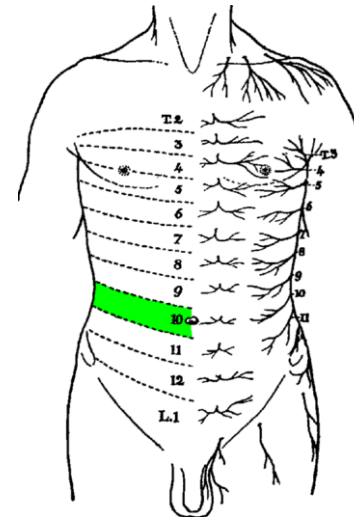
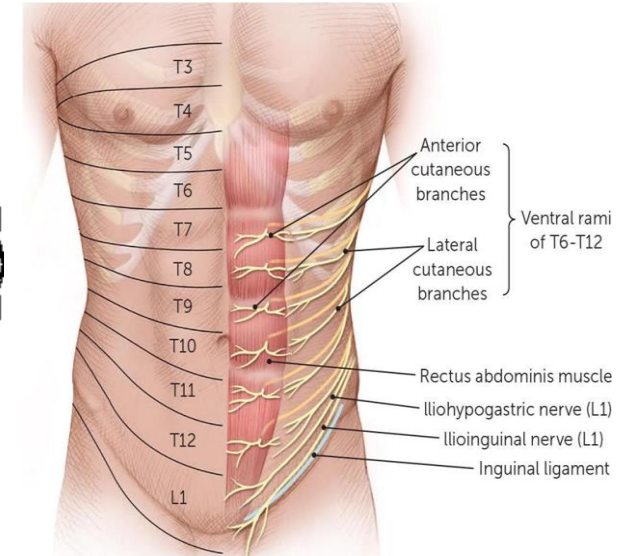
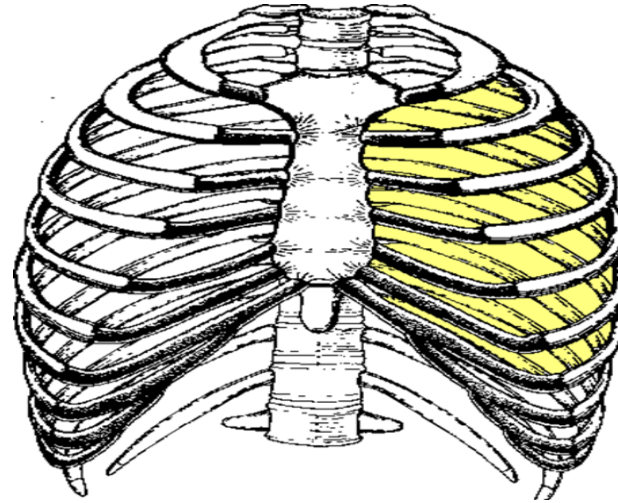


❖ The anterior ramus of the 12th thoracic spinal nerve runs at the lower border of the twelfth rib



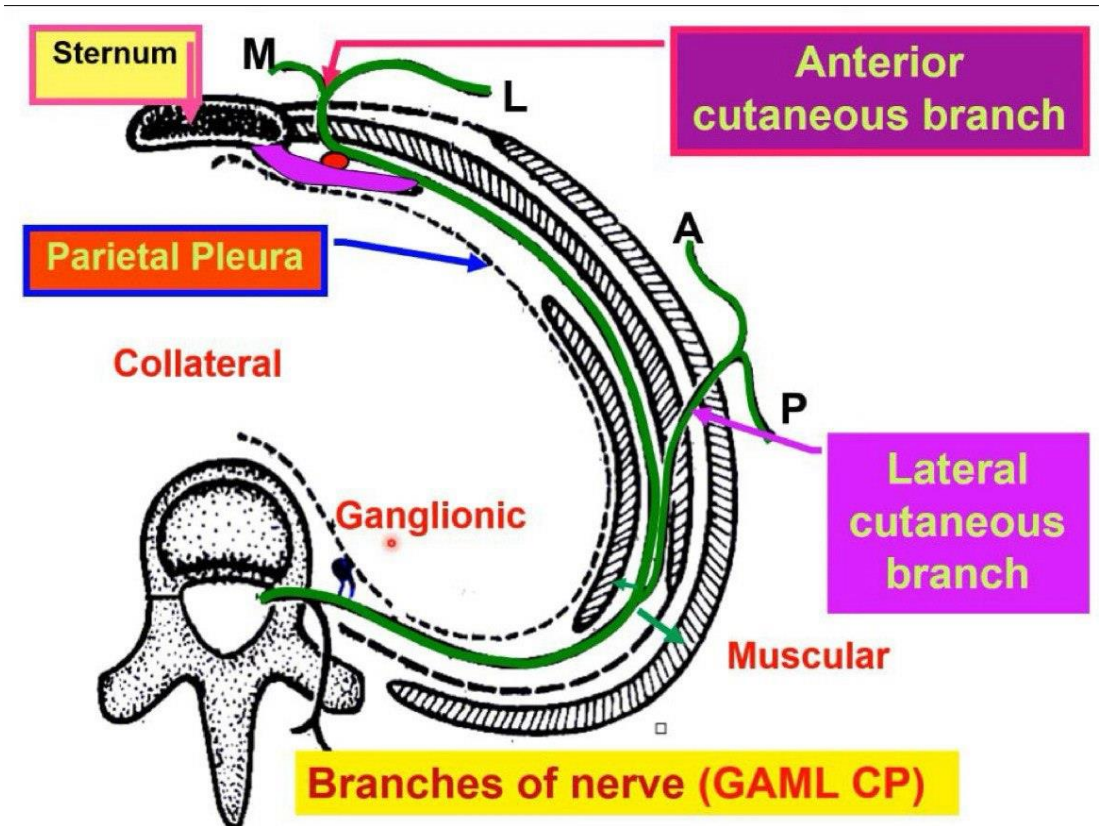
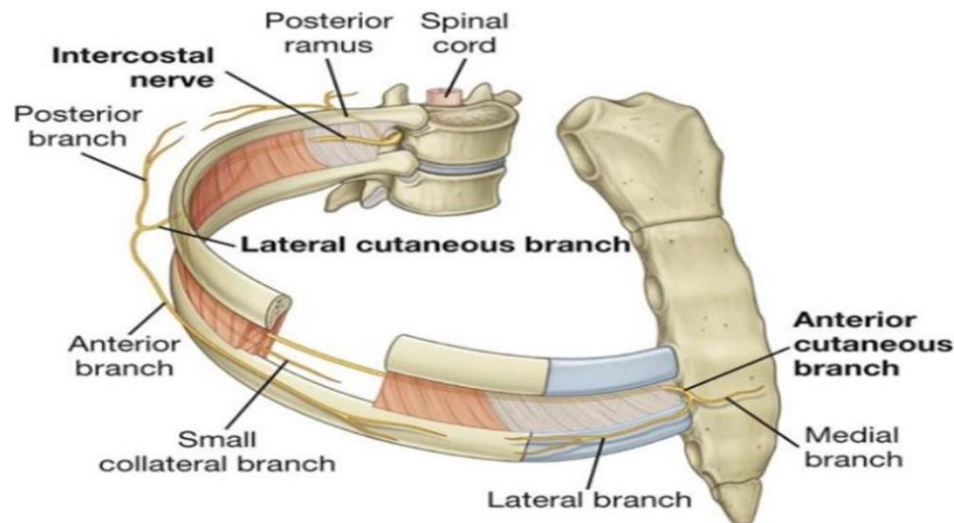
Intercostal nerves

- ❖ 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.
- ❖ For example, the 10th intercostal nerve reaches the level of the umbilicus



Branches of intercostal nerves

1. Lateral cutaneous branch
2. Anterior cutaneous branch
3. Collateral branch
4. Muscular (motor) branches
5. Sensory branches
6. Rami communicants



Branches of intercostal nerves

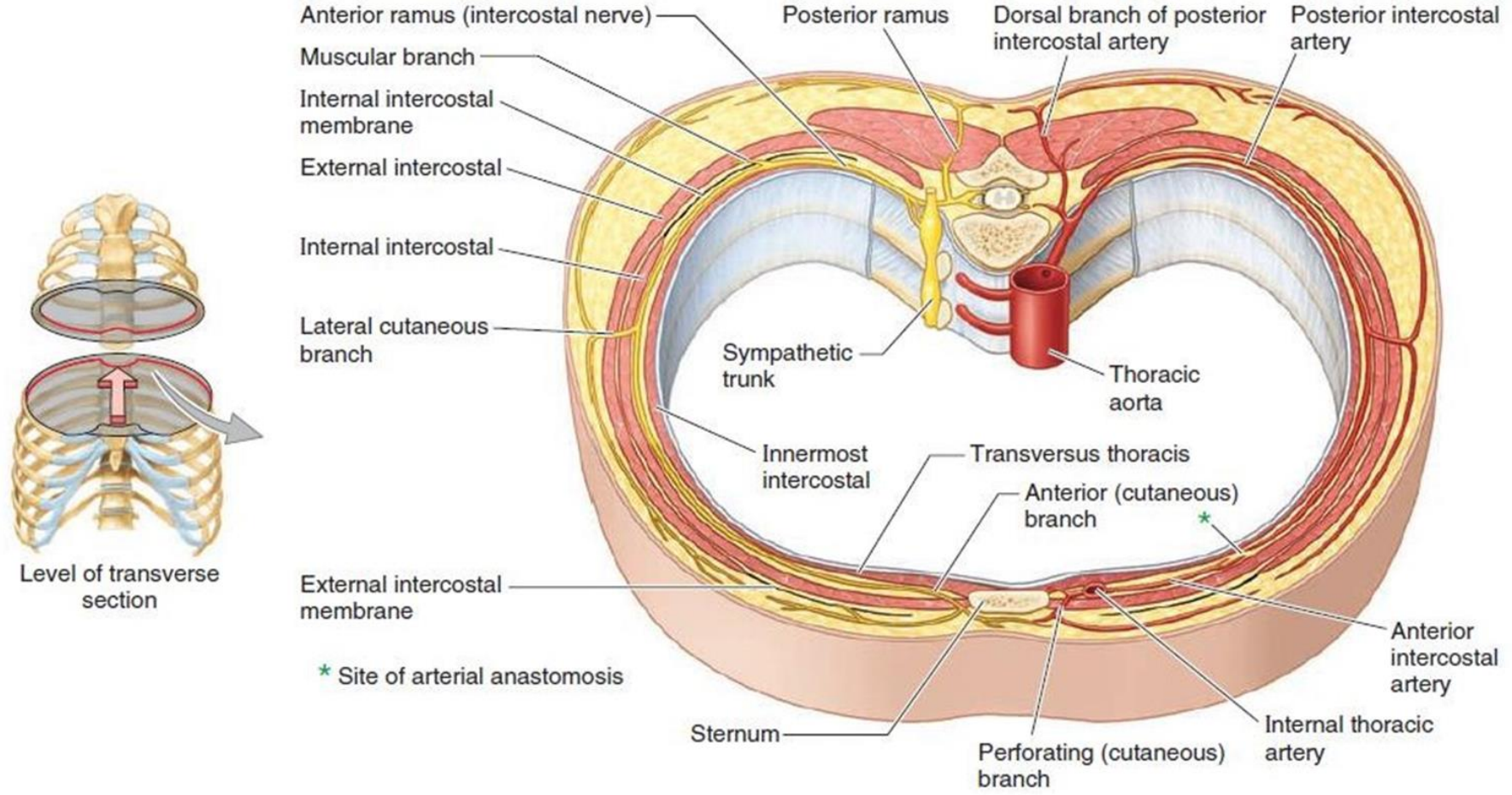
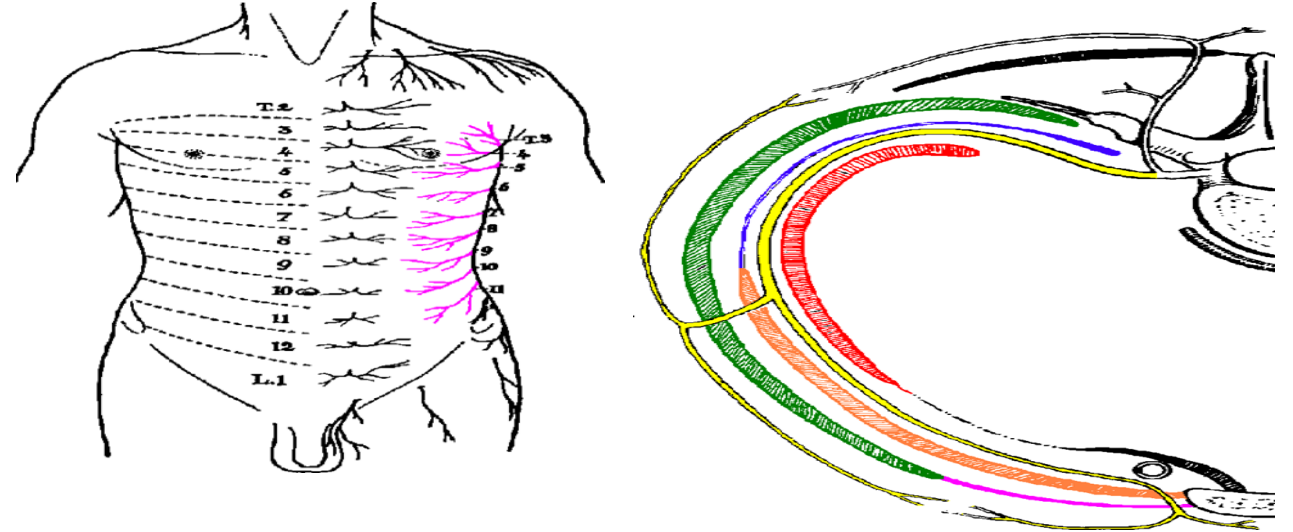


FIGURE 1.11. Intercostal space, transverse section. This section shows nerves (*right side*) and arteries (*left side*).

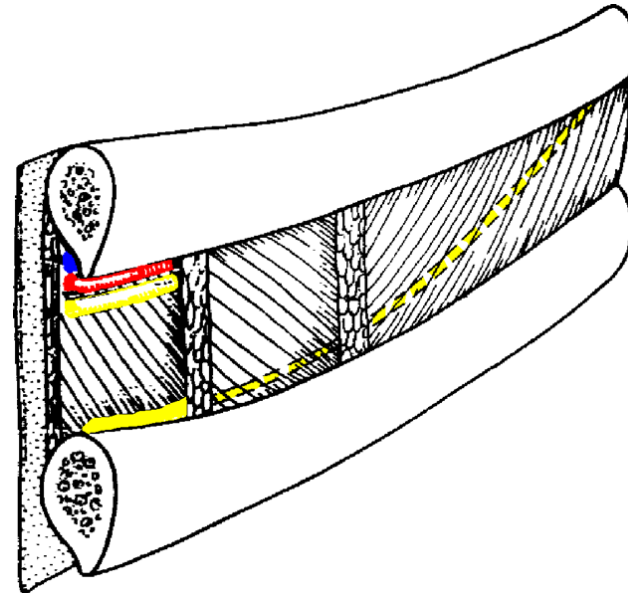


Branches of intercostal nerves

- ❖ Lateral cutaneous branch : reaches the skin near the mid-axillary line and divides into anterior and posterior branches

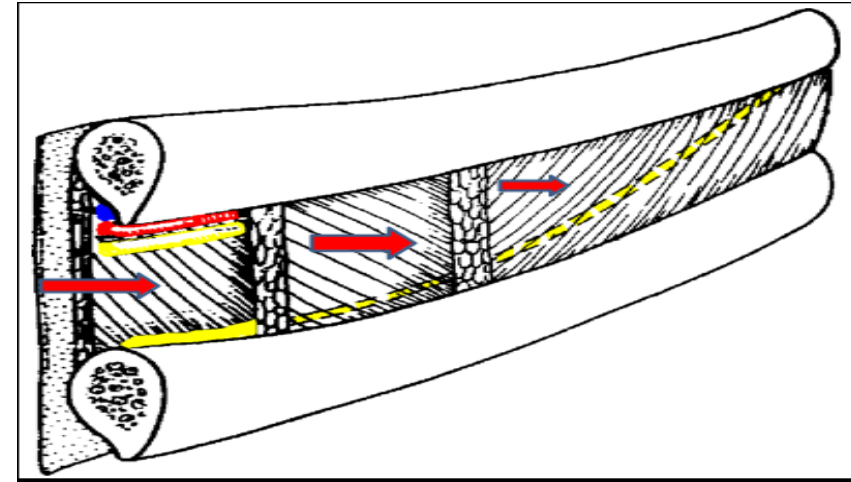


- ❖ Collateral branch : runs inferior to the main nerve near the upper border of the rib below

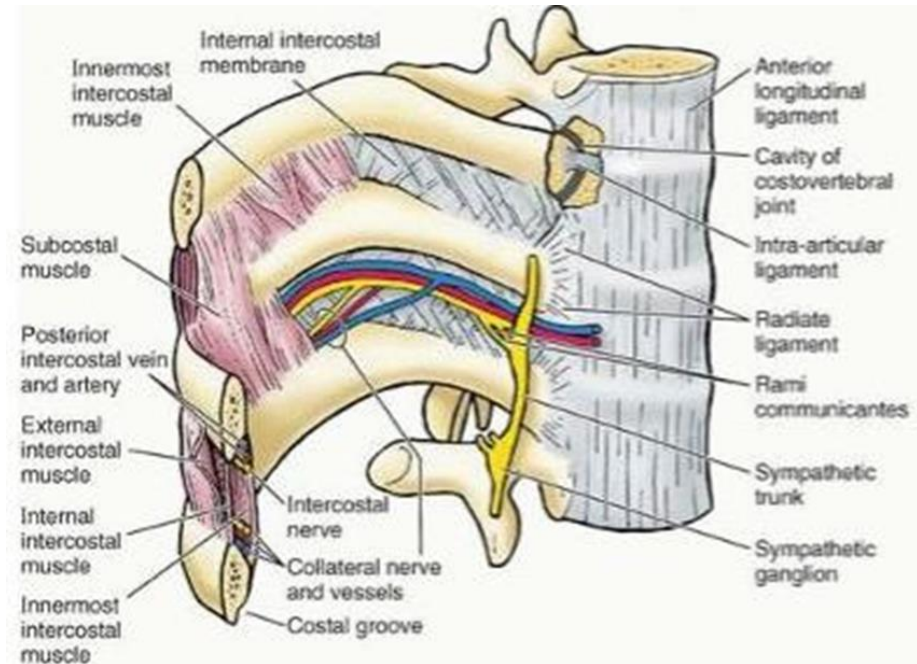


Branches of intercostal nerves

❖ Muscular (motor) branch: given off by the main nerve and its collateral to the intercostal muscles

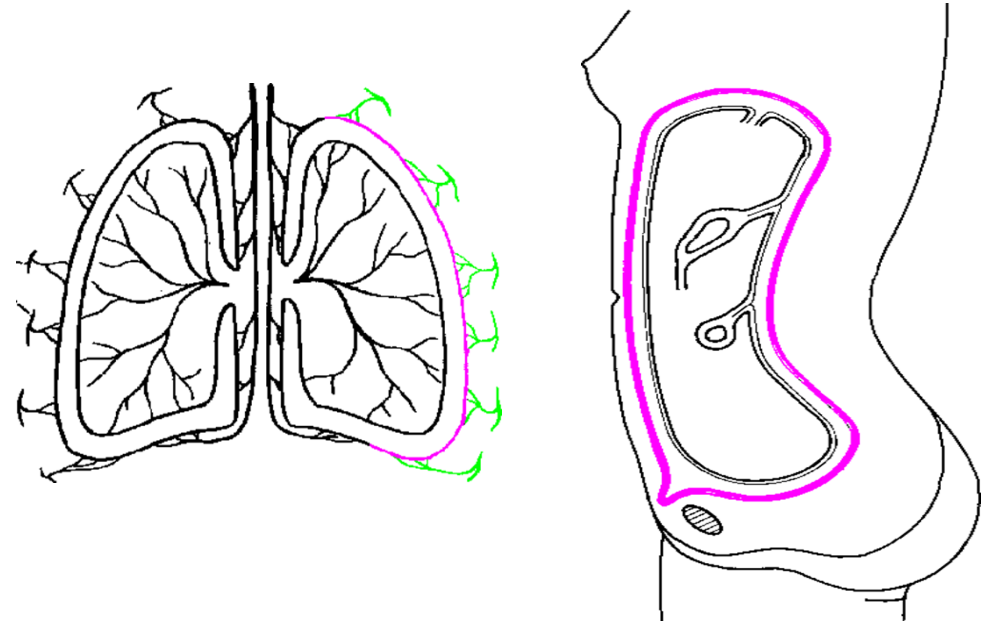


❖ Rami communicantes: connect the intercostal nerve to a ganglion of the sympathetic trunk



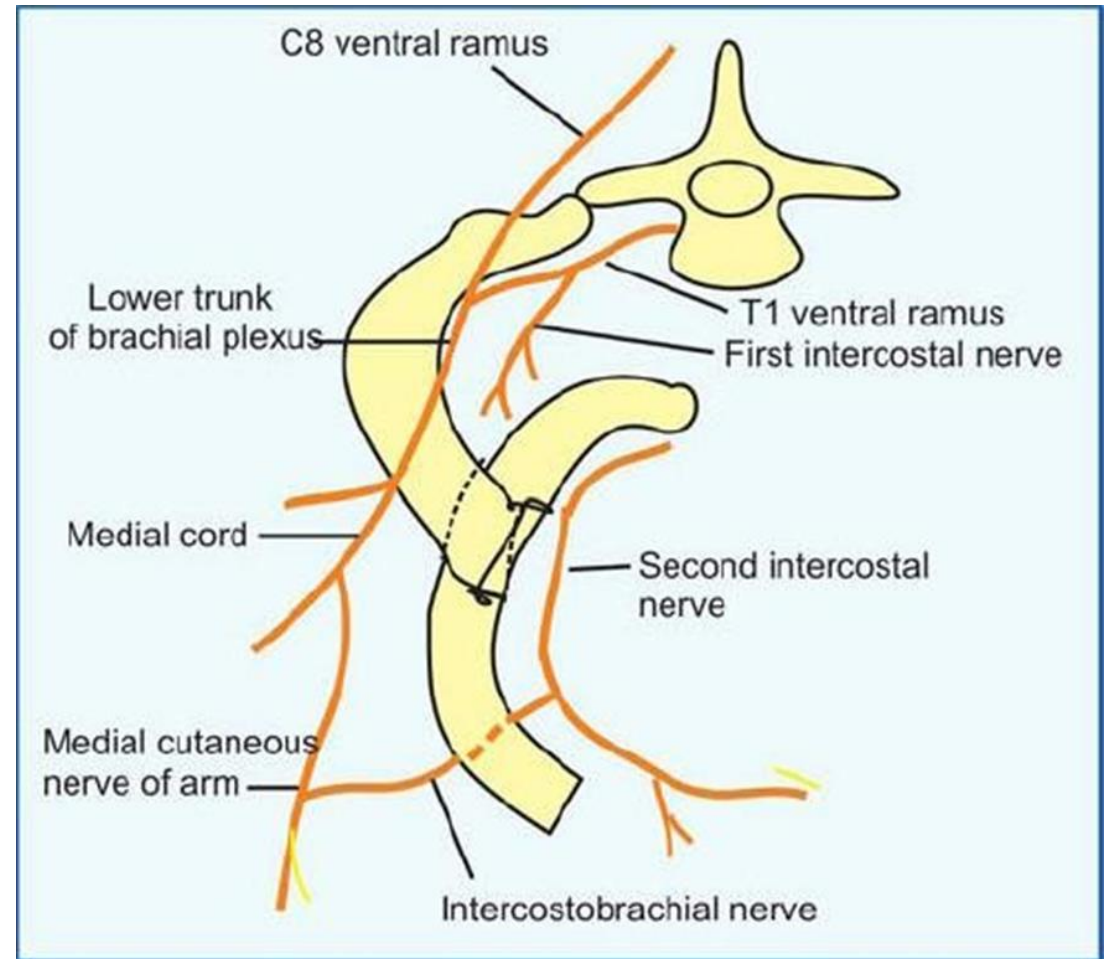
Branches of intercostal nerves

- ❖ Sensory branches to :
 - To the Pleura
 - To the peritoneum in the case of the 7th-11th intercostal nerves



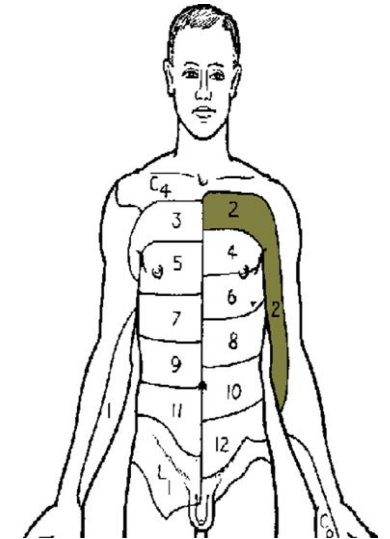
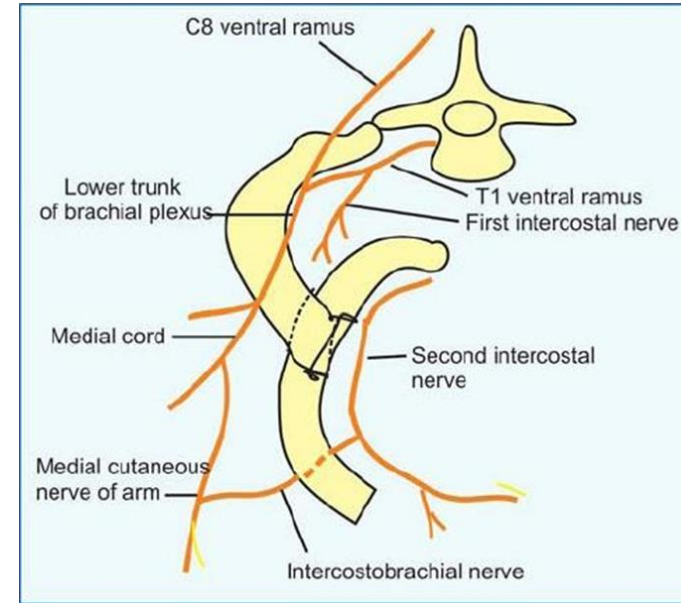
1st Intercostal nerve

- ❖ 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



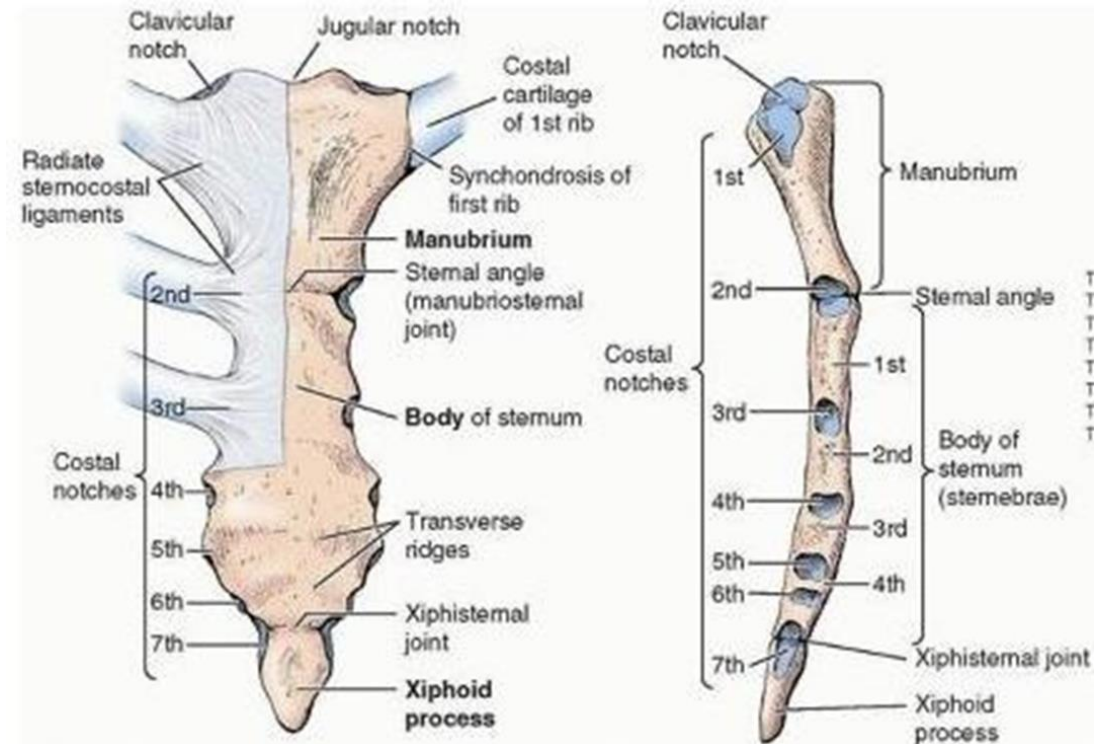
2nd Intercostal nerve

- ❖ 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**
- ❖ **Clinical relevance** : Because the second intercostal nerve is close to the heart, pain originating from cardiac conditions (like angina or a myocardial infarction) can sometimes be referred to the axilla or medial upper arm, mimicking the sensory distribution of the intercostobrachial nerve.



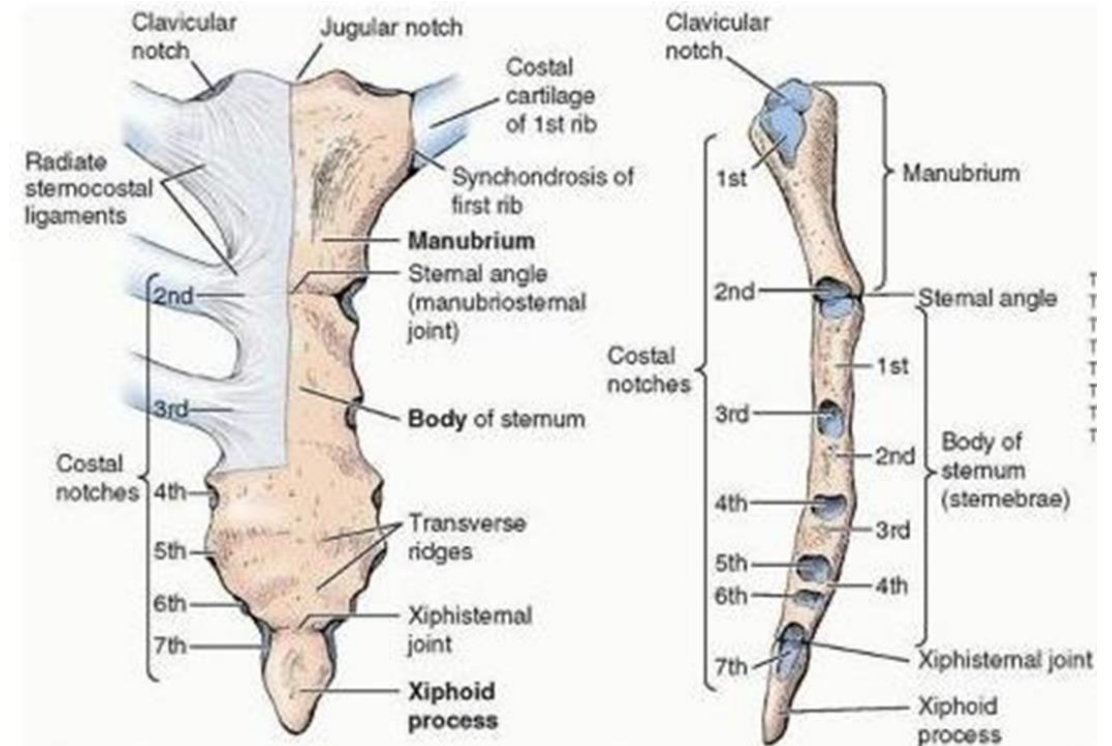
Manubriosternal joint

- ❖ 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.



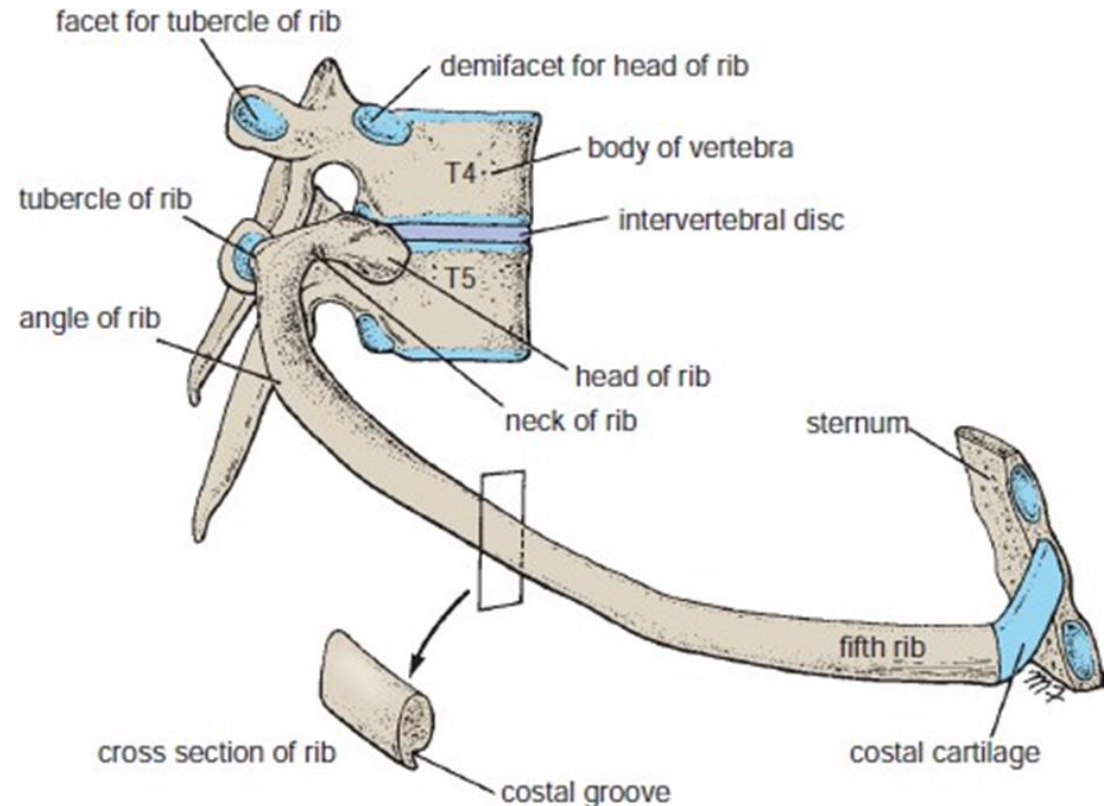
Xiphisternal joint

- ❖ 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.**



Joints of the Head/Tubercles 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
- ❖ 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.)



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**.
- ❖ 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**

