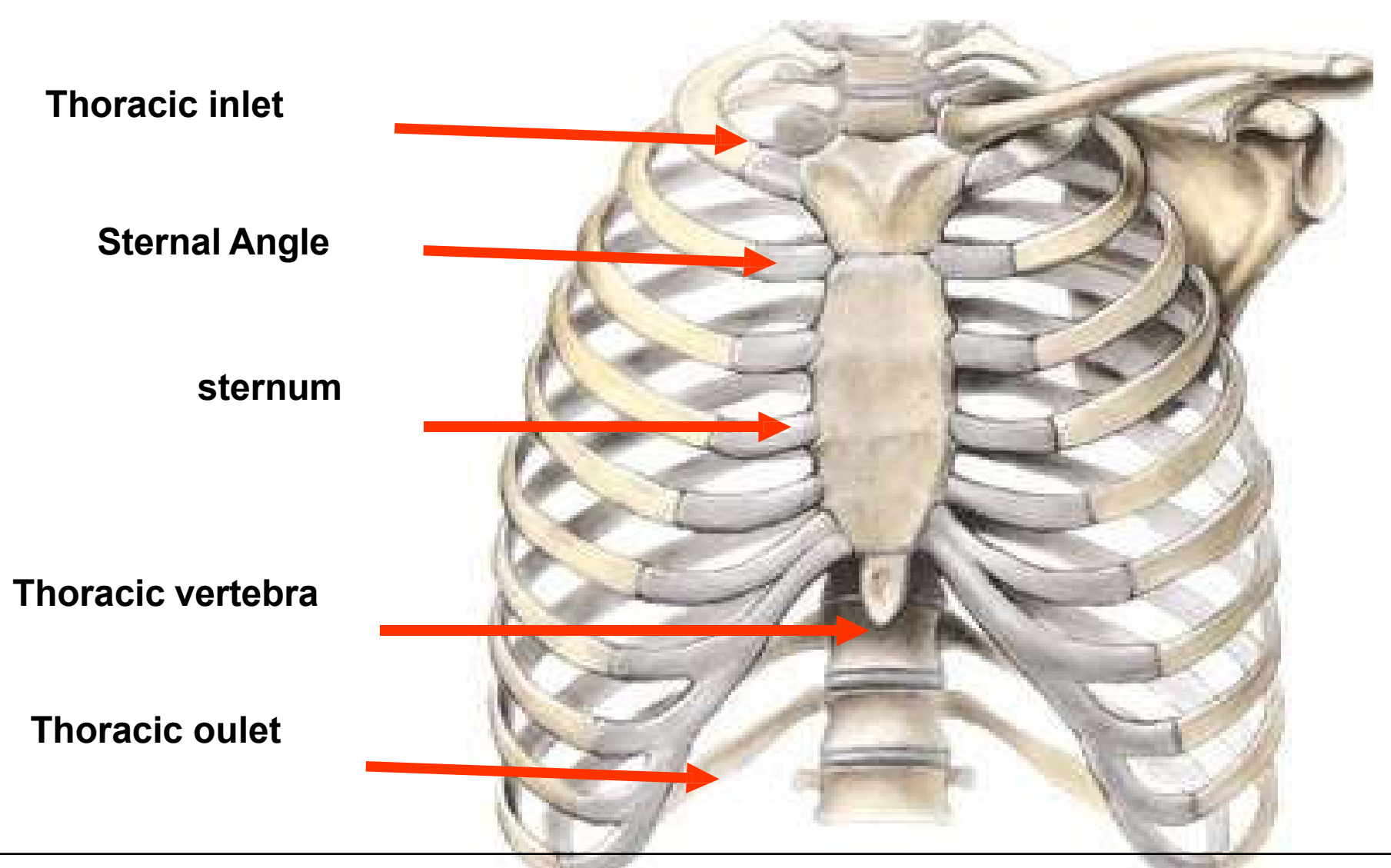


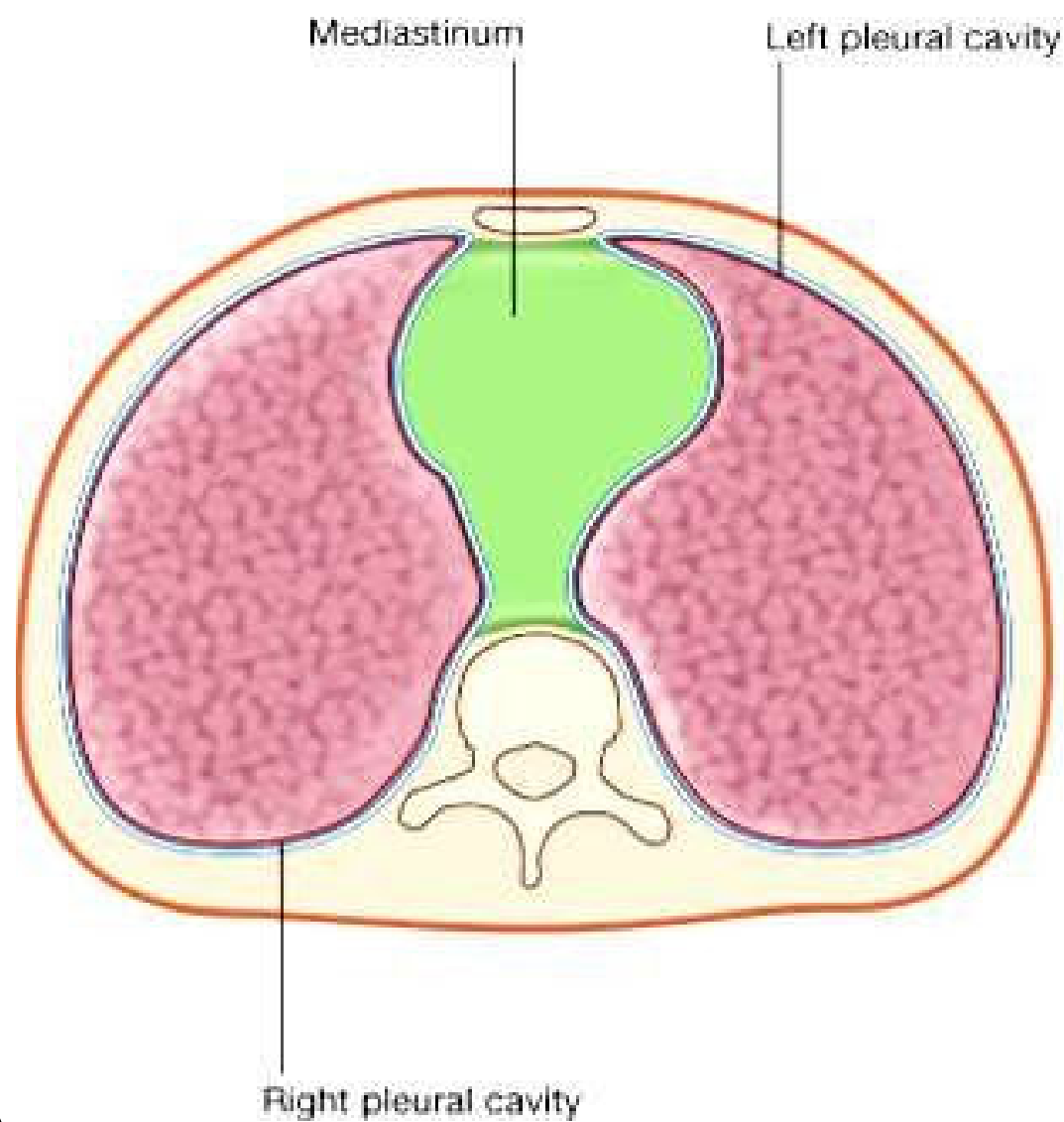
Learning Objectives

- Identify the divisions of the mediastinum and describe their contents.
- Describe the gross anatomy of structures in mediastinum.
- Describe the anatomy of nerves in the mediastinum.
- Correlate this knowledge to clinical conditions.

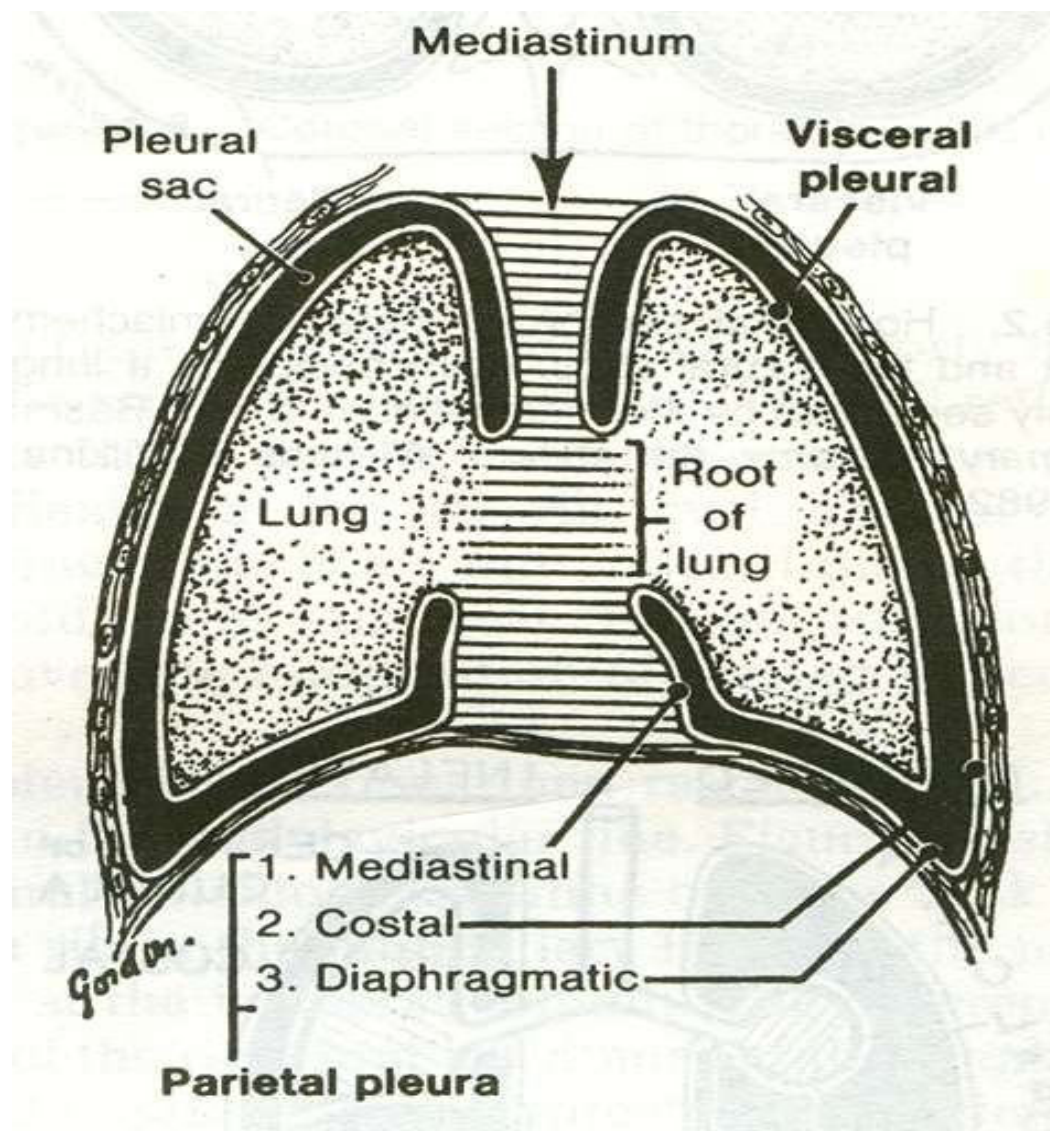
Boundaries of mediastinum



TS: Mediastinum



CS: Mediastinum

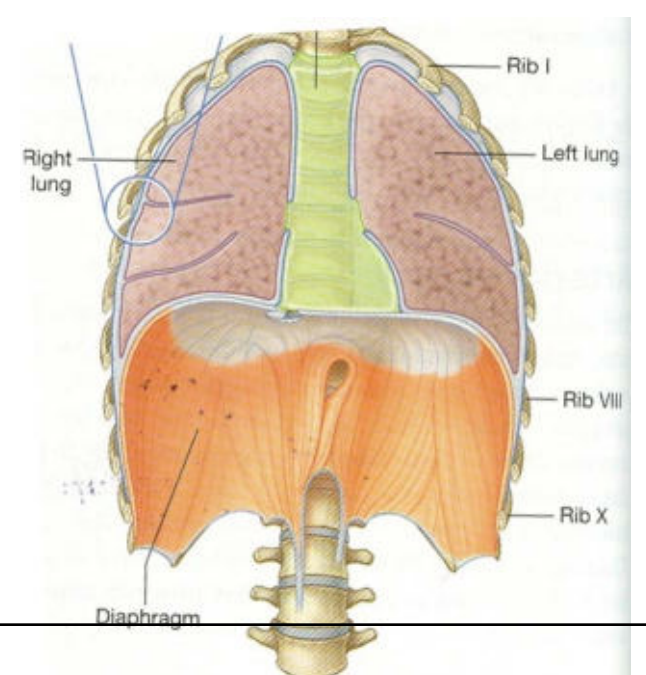
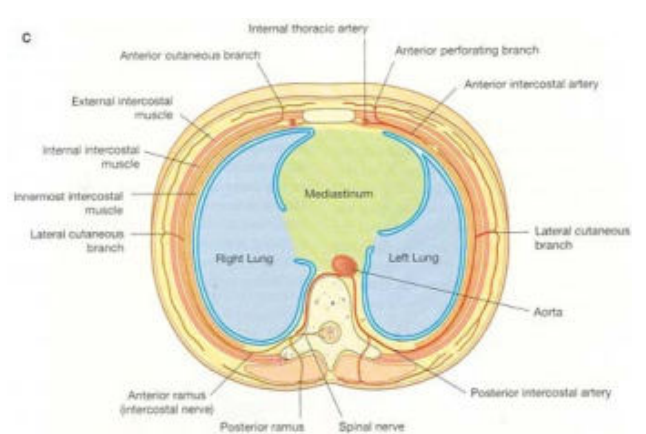
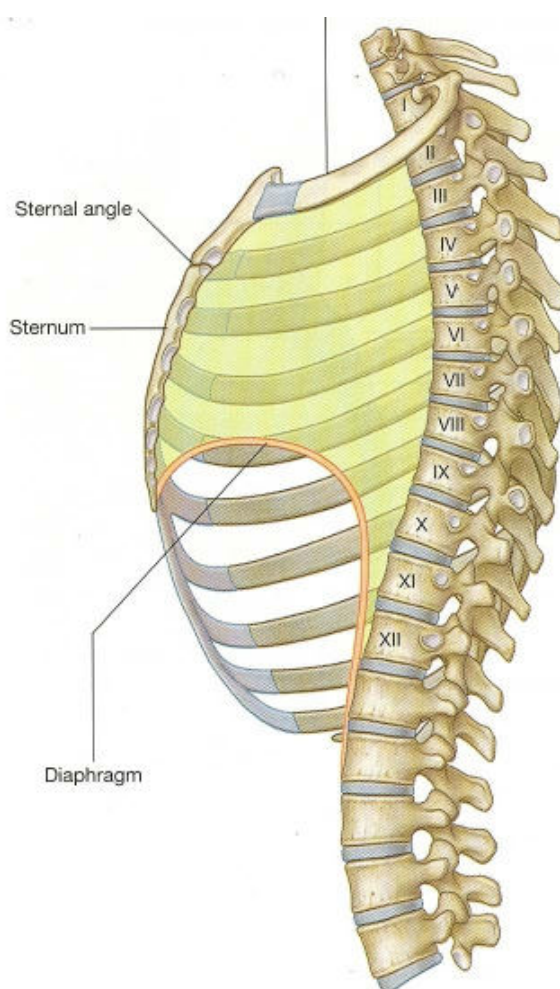


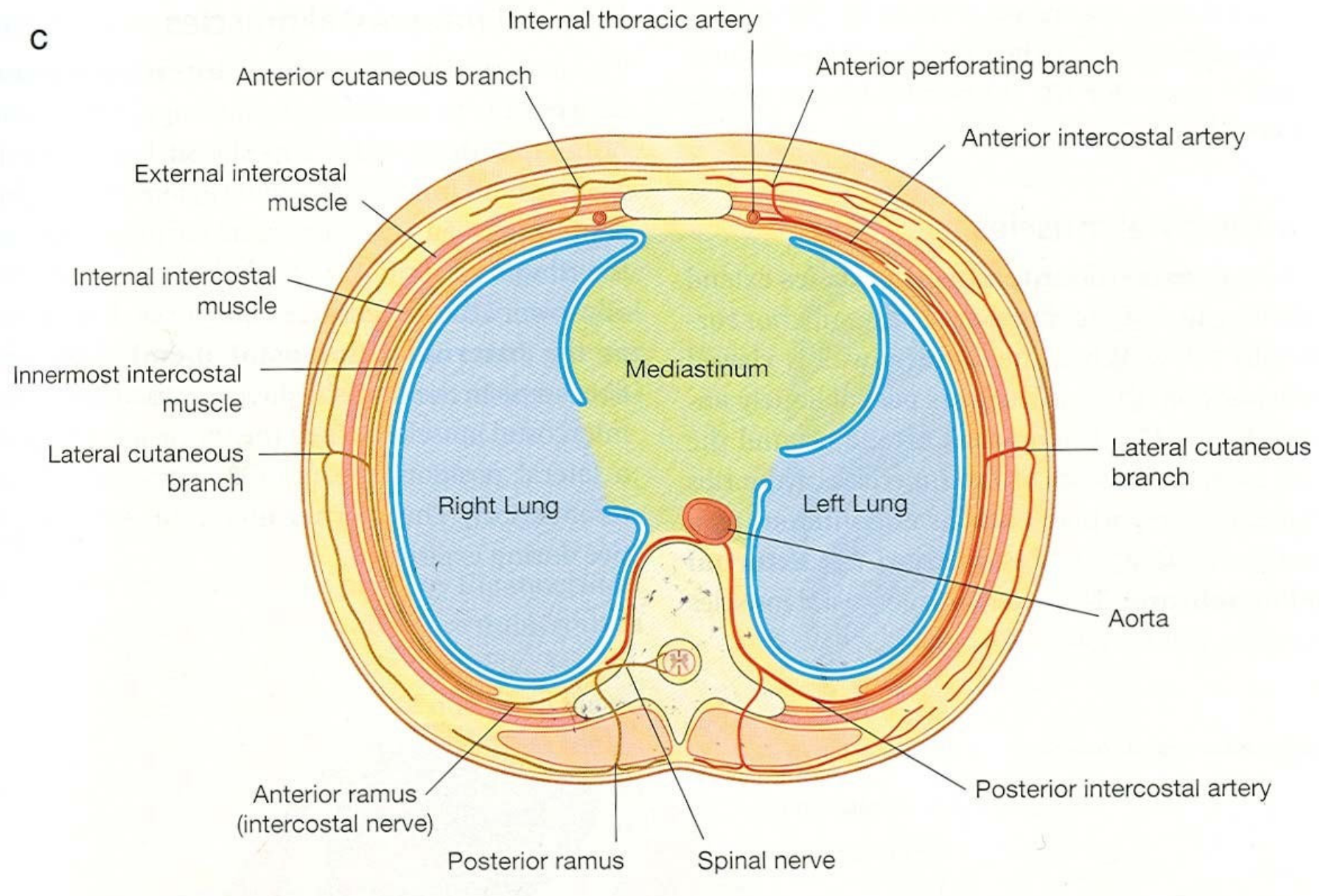
Mediastinum

- Bulky septum between the pleural cavities & lungs

Extends-

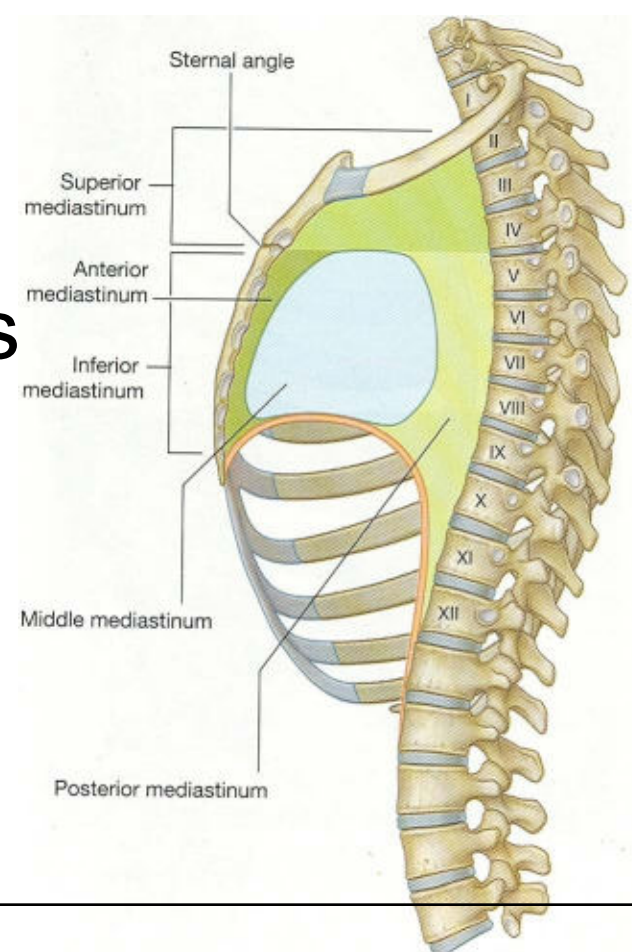
- Root of the neck to diaphragm
- From the sternum to vertebral column



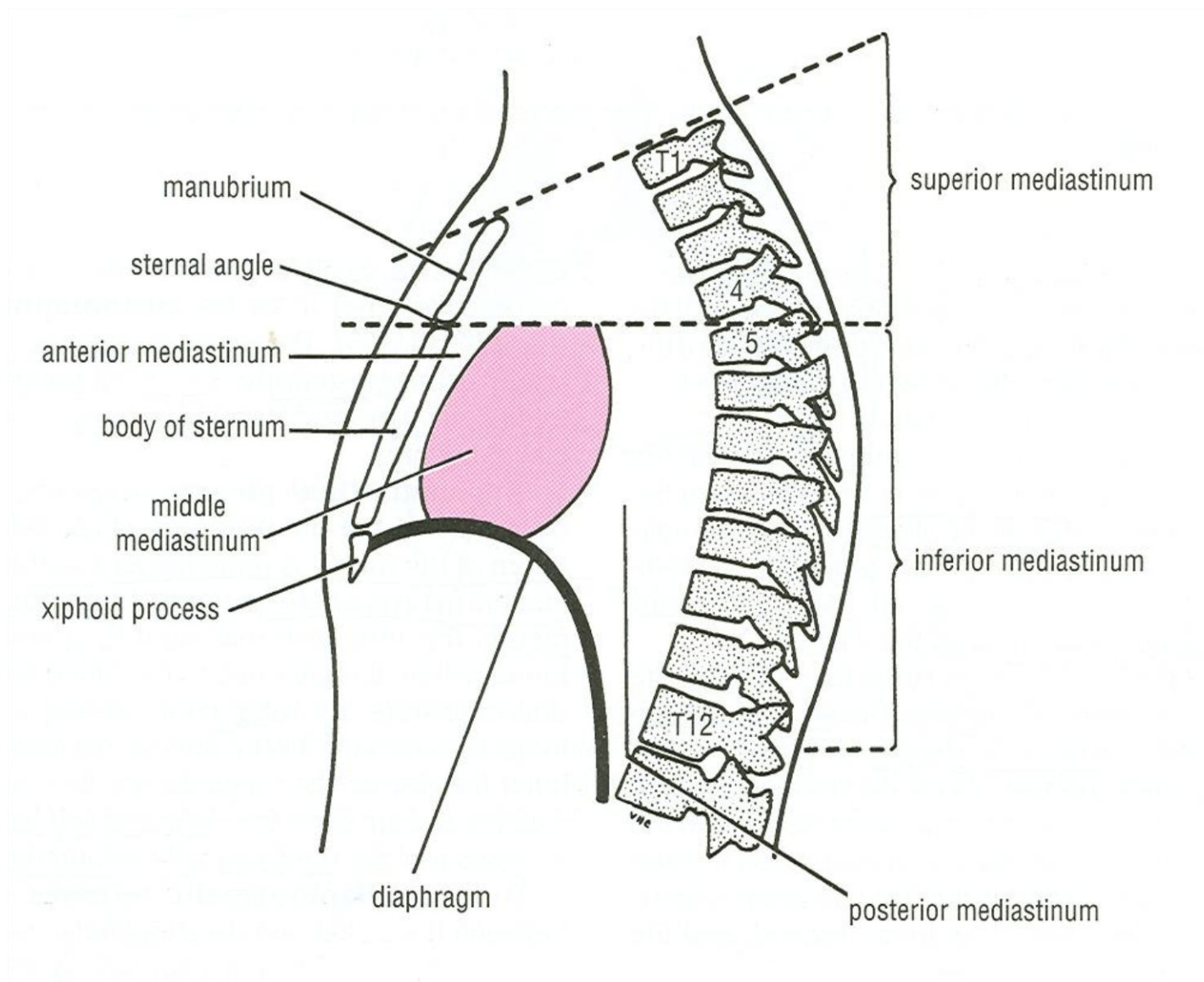


Divisions of mediastinum

- Divided by an imaginary horizontal plane from the sternal angle to the intervertebral disc between 4th & 5th vertebra in to
- superior mediastinum
- Inferior mediastinum –
Anterior Middle Pos



DIVISIONS OF MEDIASTINUM

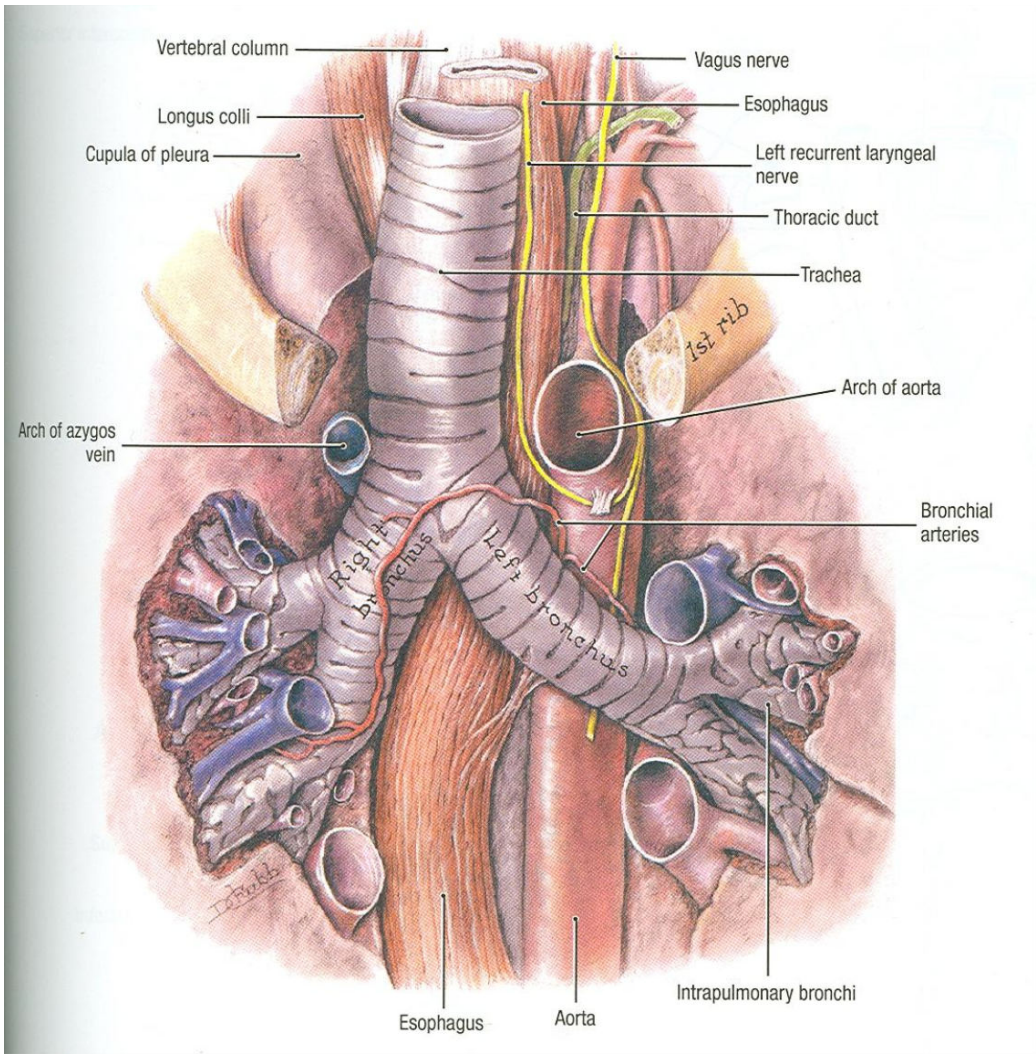


Boundaries Of Superior Mediastinum

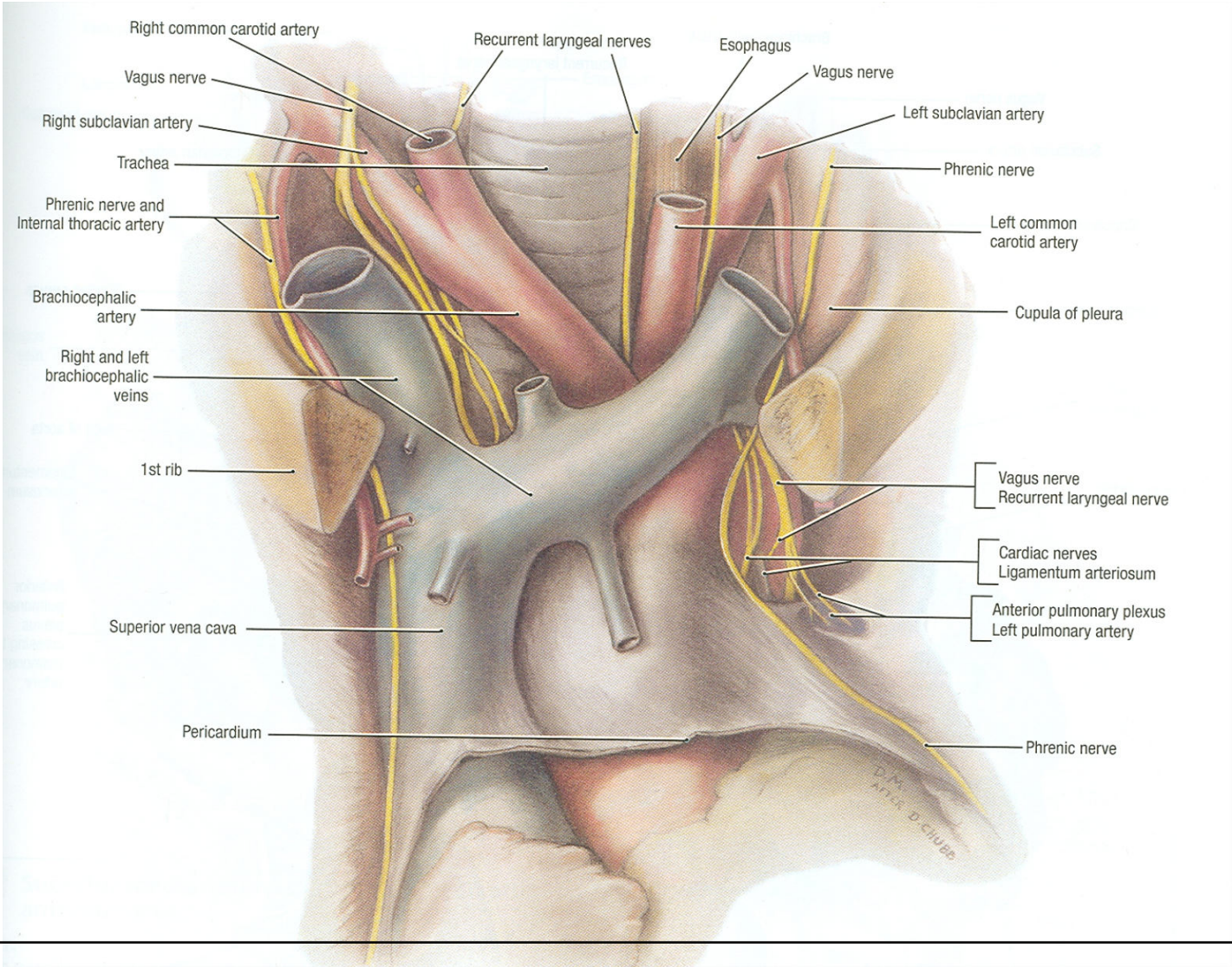
BOUNDARIES:

- **Anterior:** manubrium sterni
- **Posterior:** Upper 4 thoracic vertebrae
- **Superior:** Plane of thoracic inlet
- **Inferior:** Horizontal plane
- **On each side:** Pleura

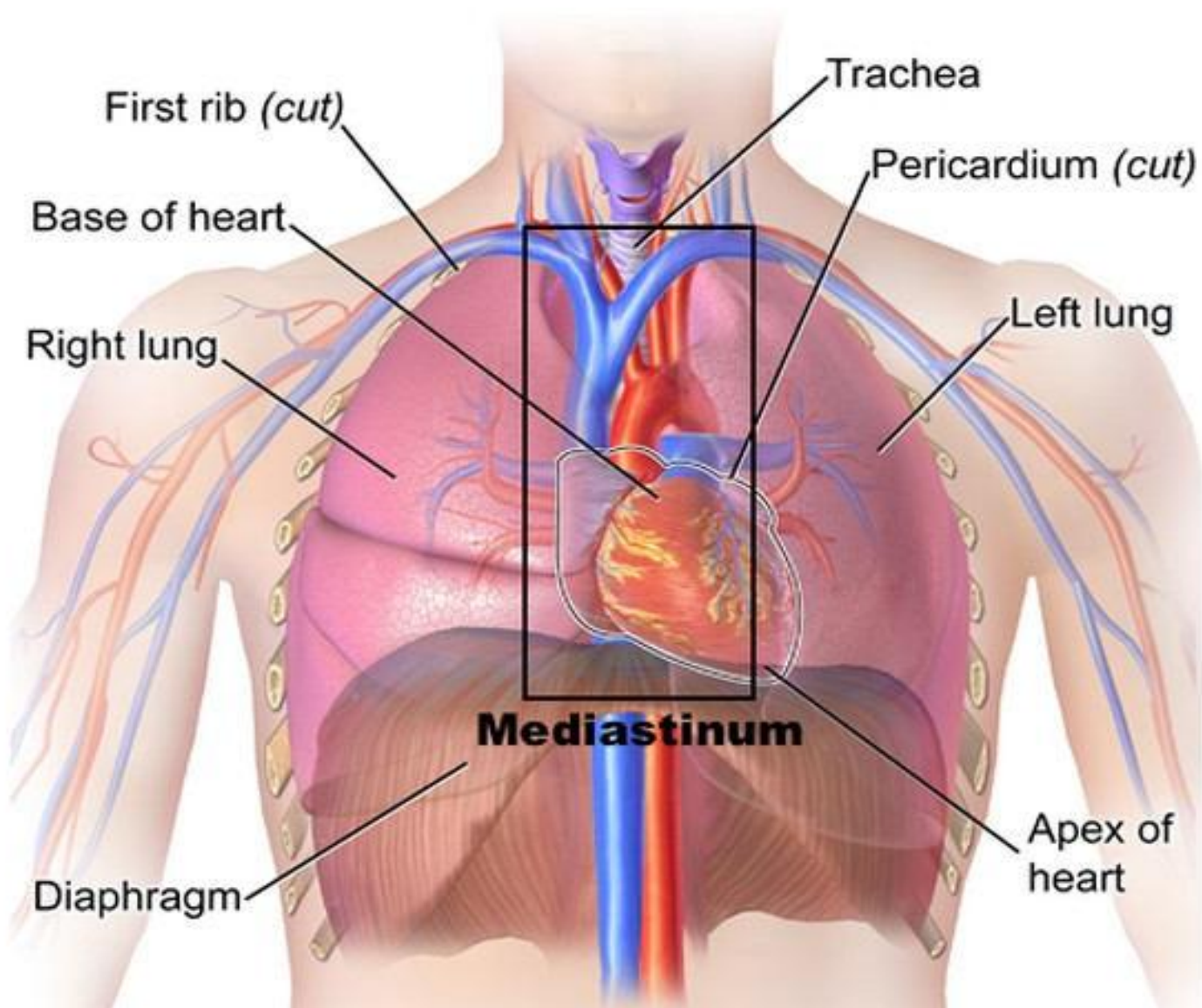
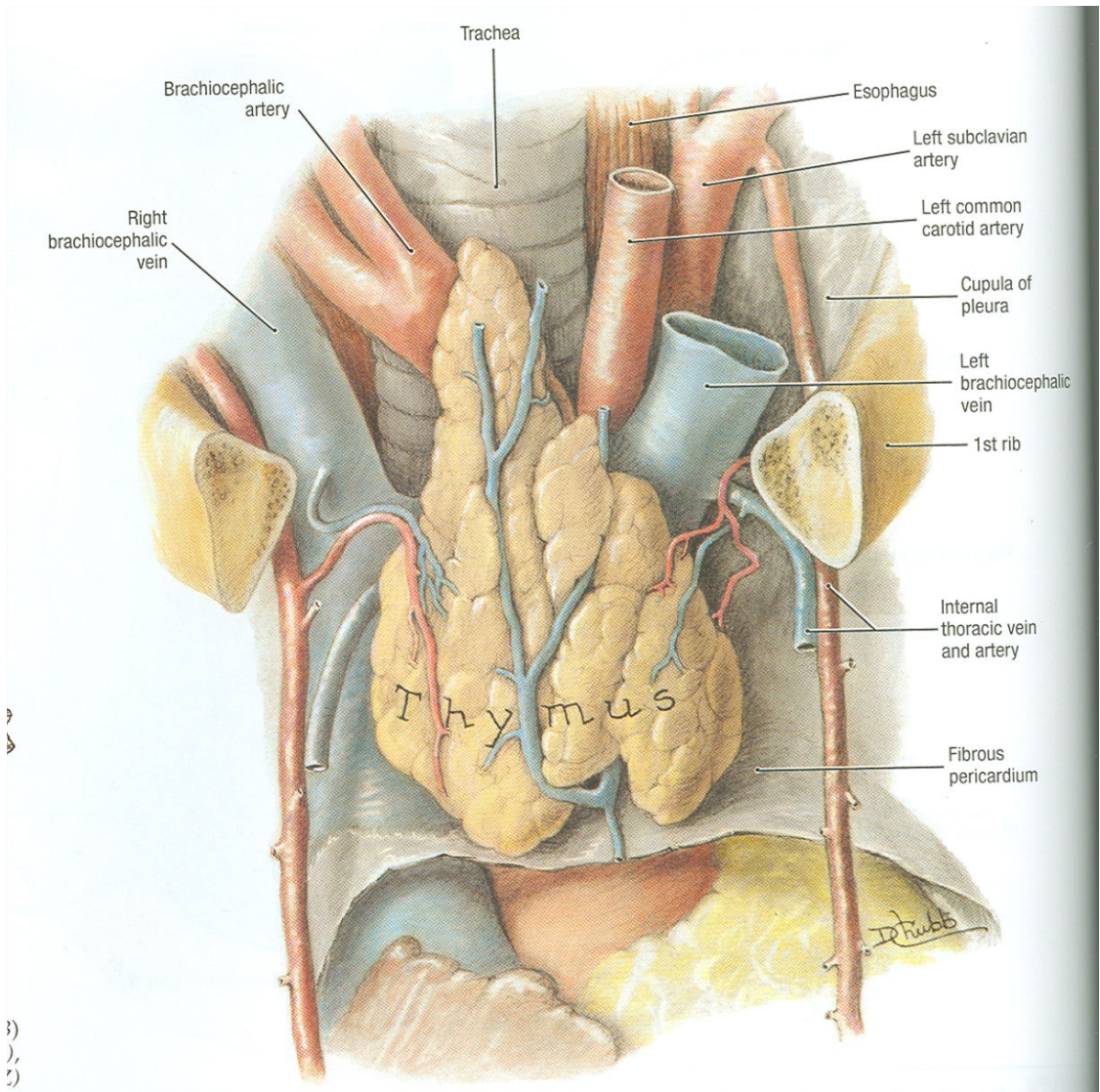
Superior mediastinum



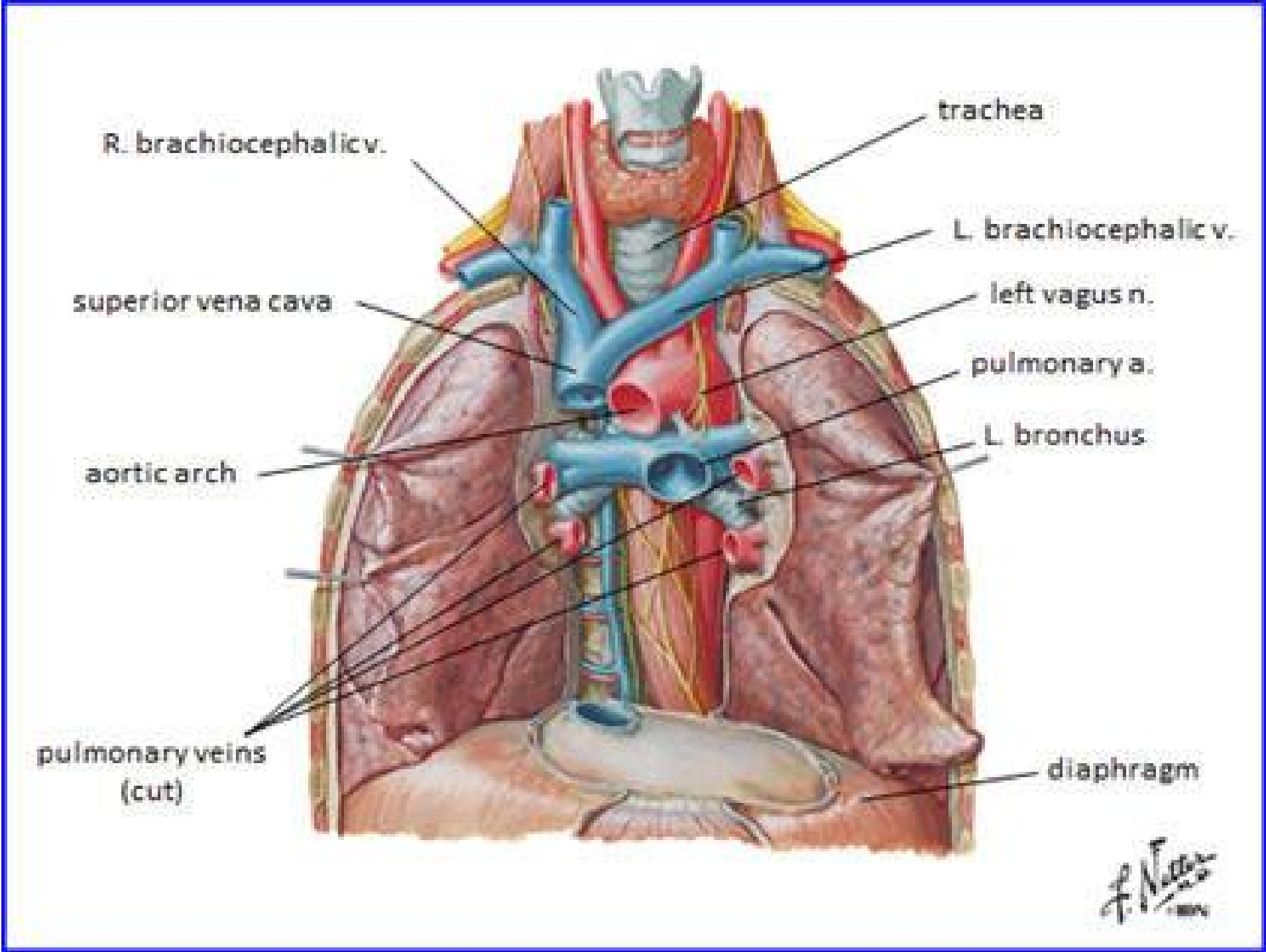
SUPERIOR MEDIASTINUM



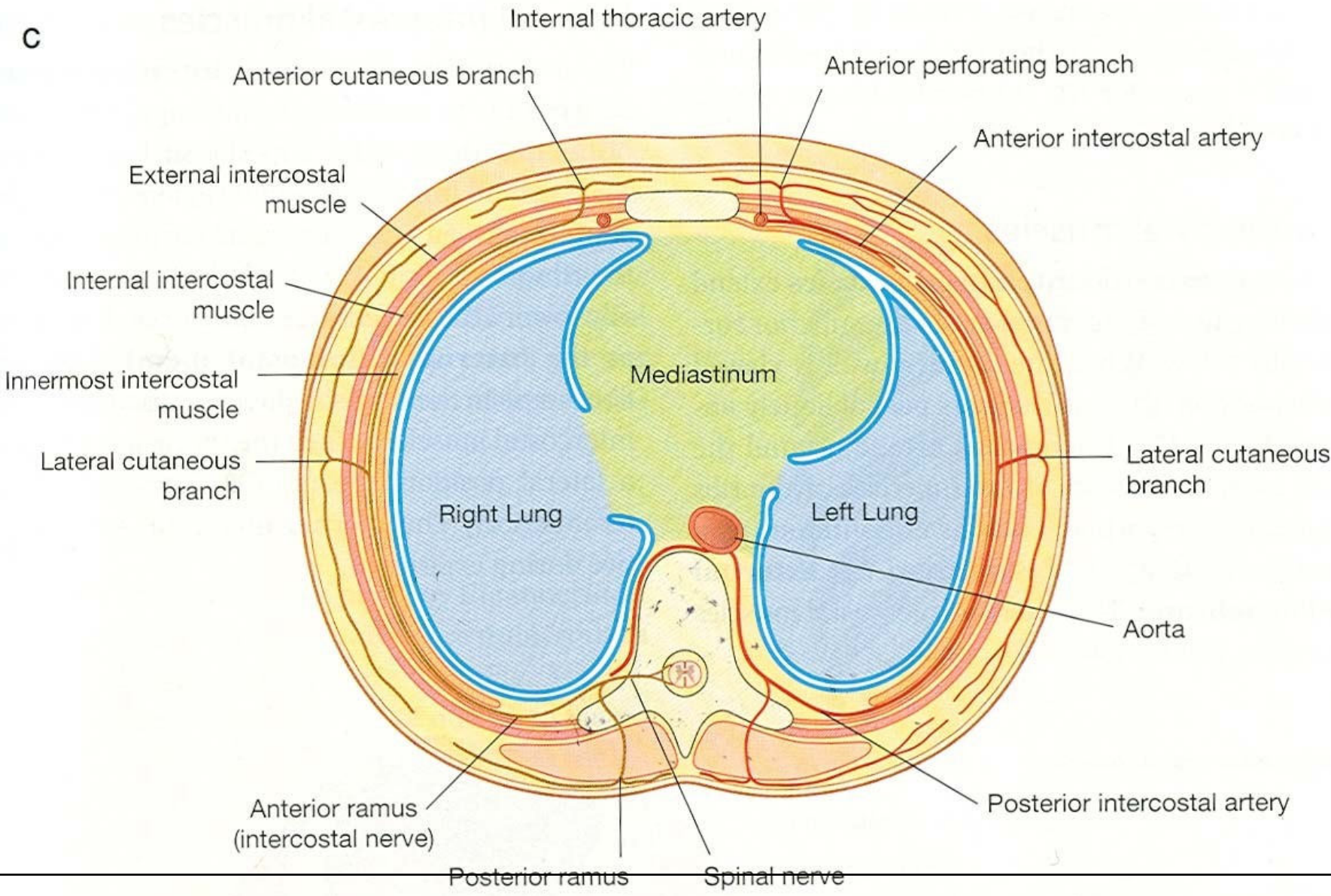
SUPERIOR MEDIASTINUM

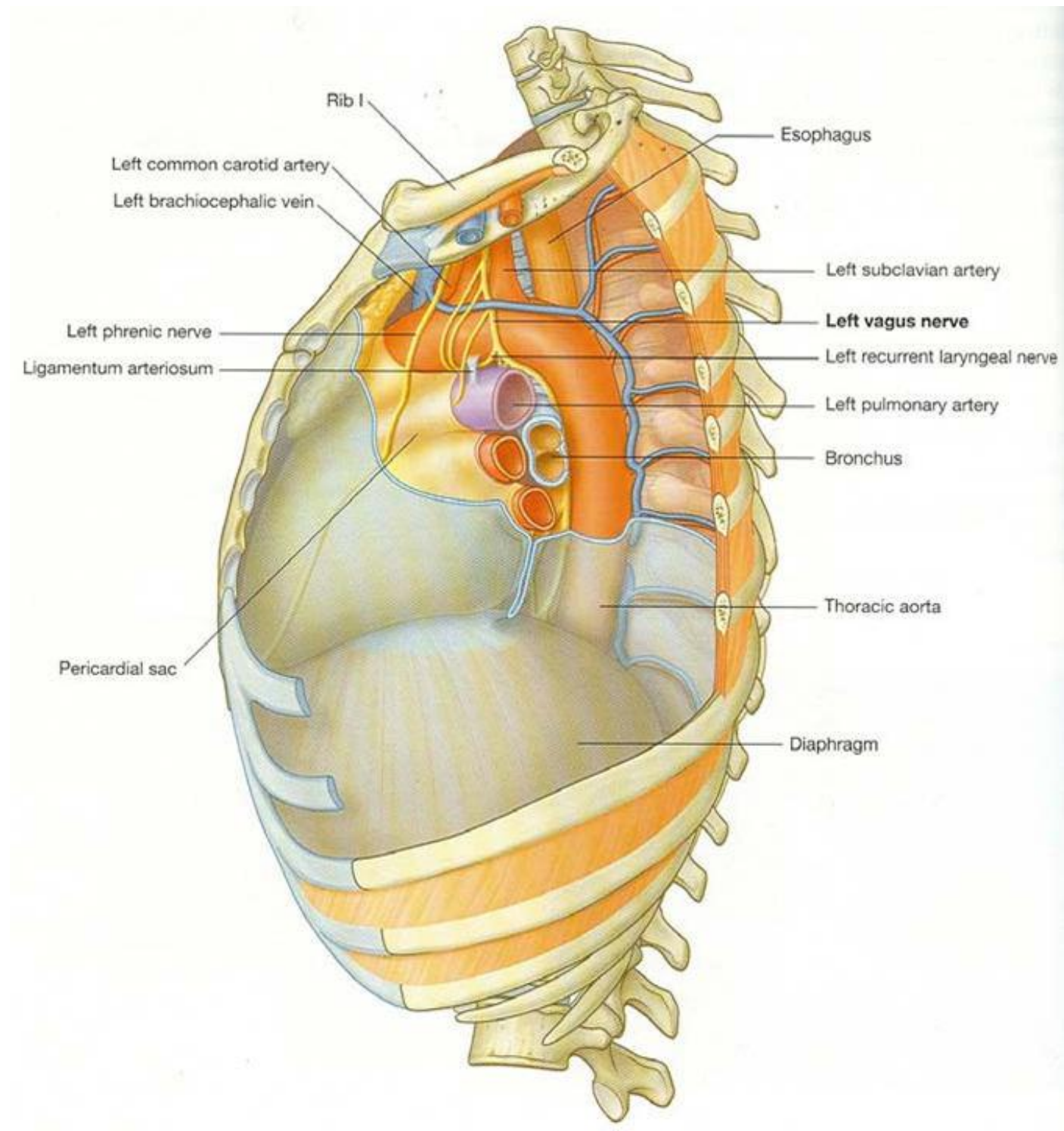


Location of Heart in Thoracic Cavity



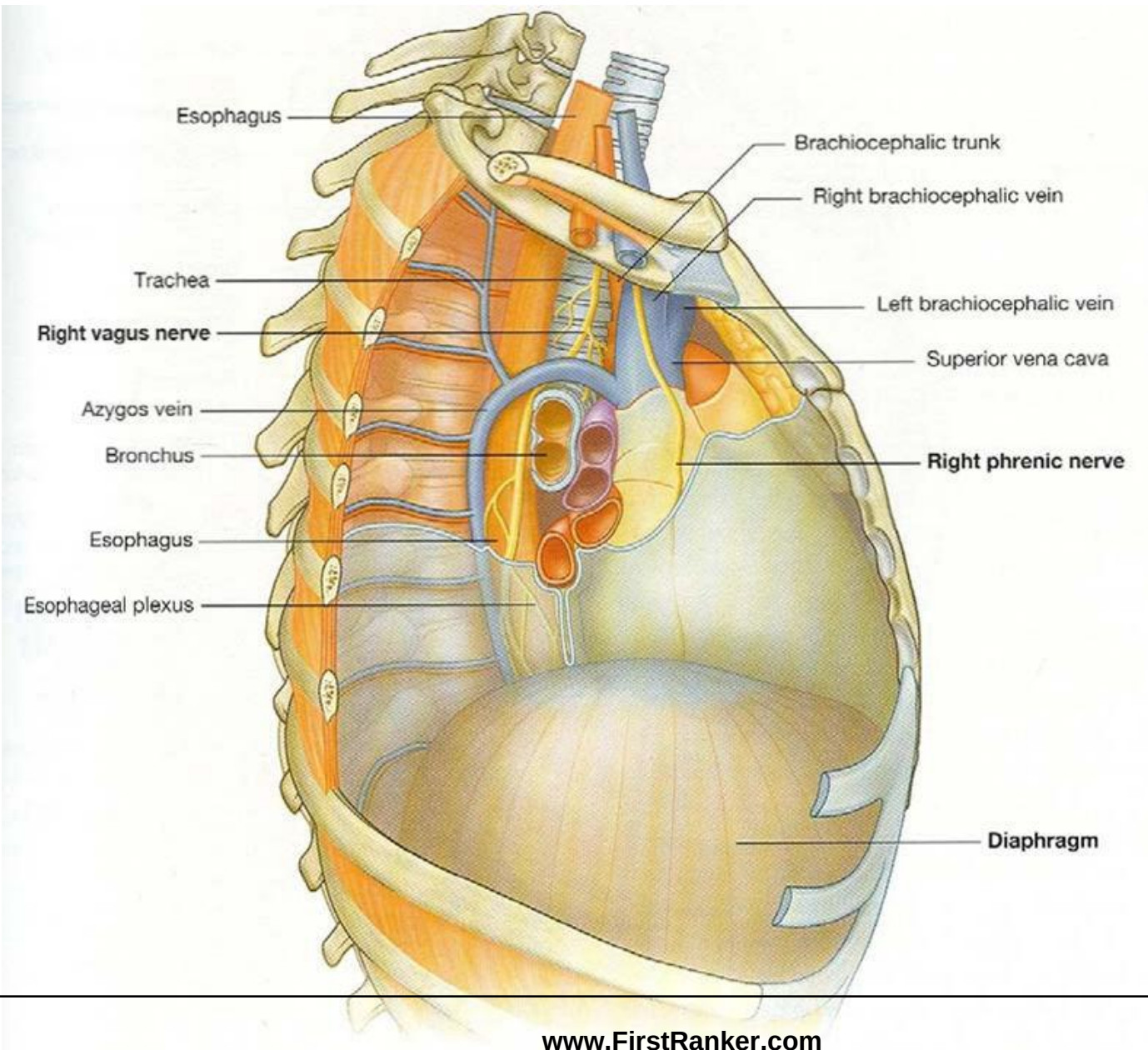
C





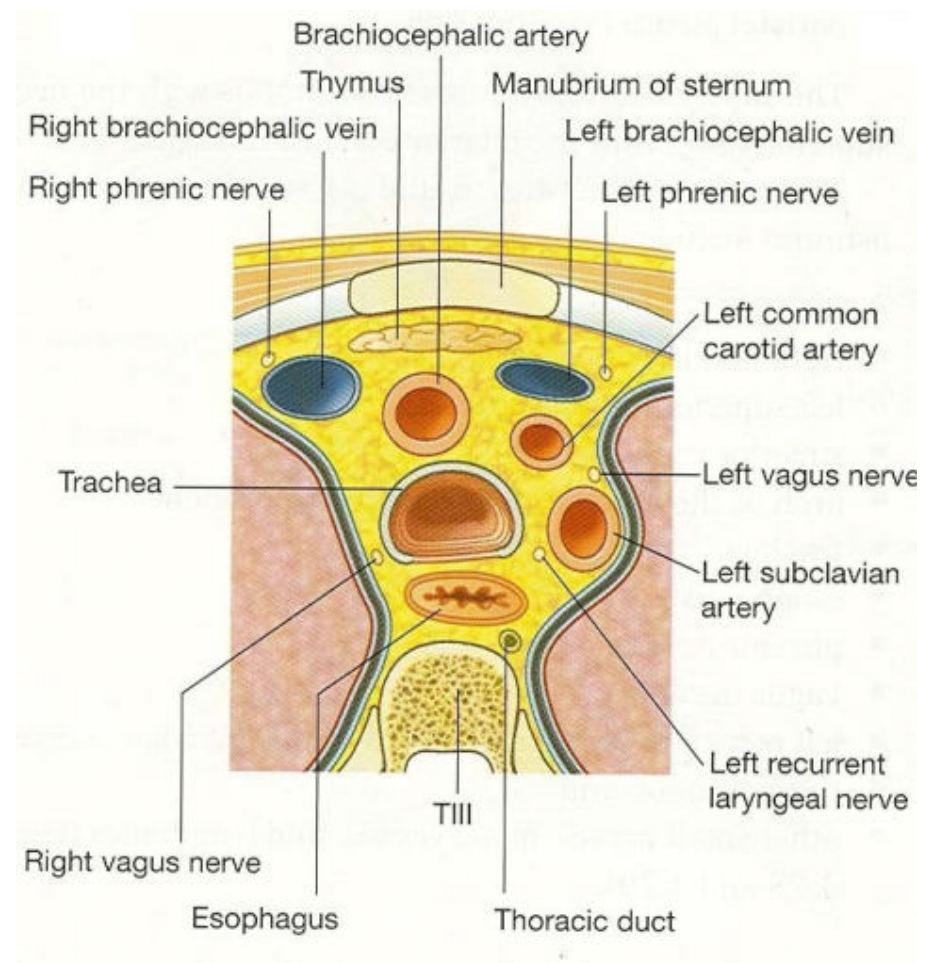
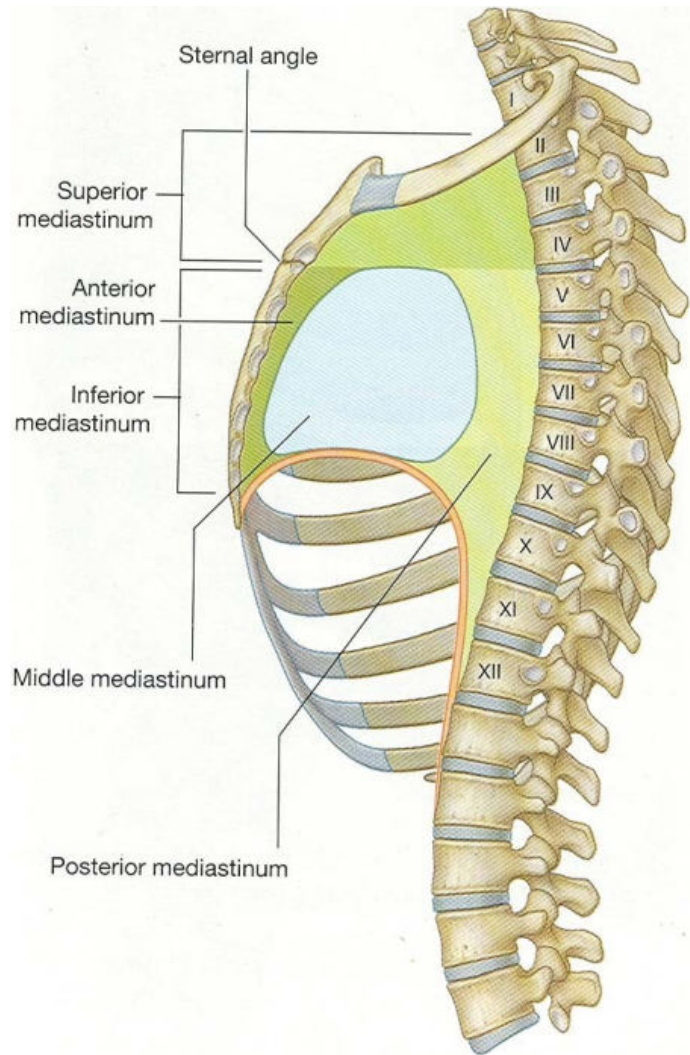
LEFT

RIGHT



Superior mediastinum

- Posterior to the sternum & anterior to the bodies of first four thoracic vertebra



Superior mediastinum

CONTENTS:

• **FROM BEHIND FORWARD:**

1. **Esophagus**
2. **Trachea**
3. **Arch of aorta & its 3 branches: brachiocephalic, left common carotid & left subclavian arteries**
4. **Right & left brachiocephalic veins & superior vena cava**
5. **Thymus gland**

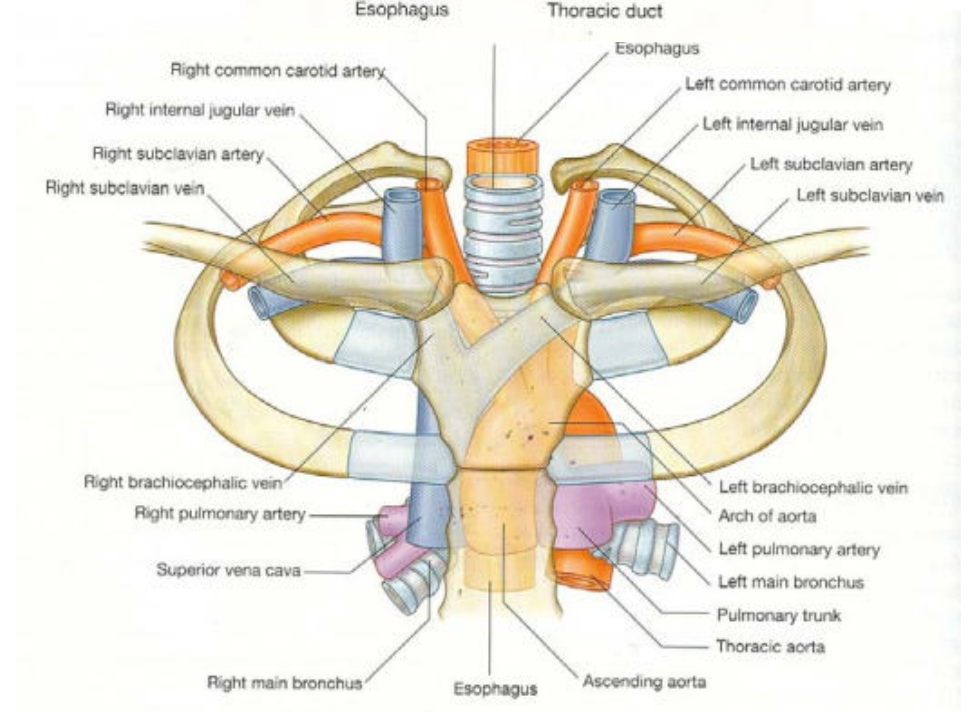
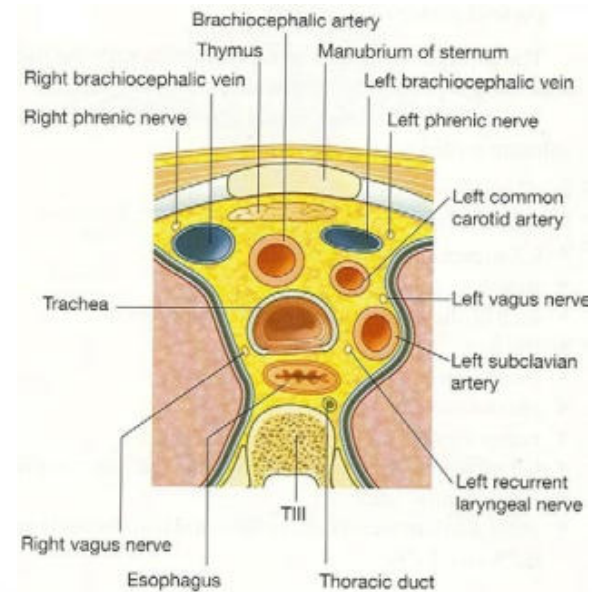
Other Contents of superior mediastinum

Nerves:

1. Right & left vagus
2. Right & left phrenic
3. Right & left sympathetic trunks
4. Left recurrent laryngeal

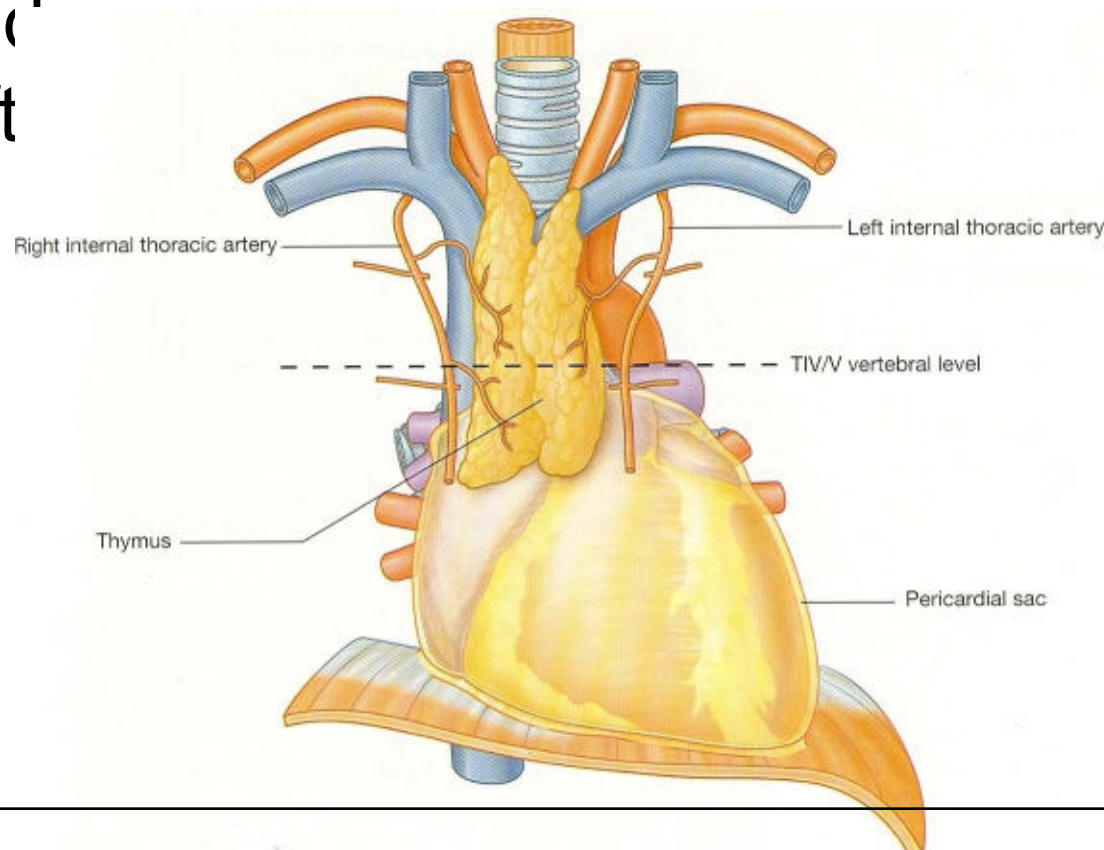
Lymphatic structures:

1. Thoracic duct
2. Lymph nodes



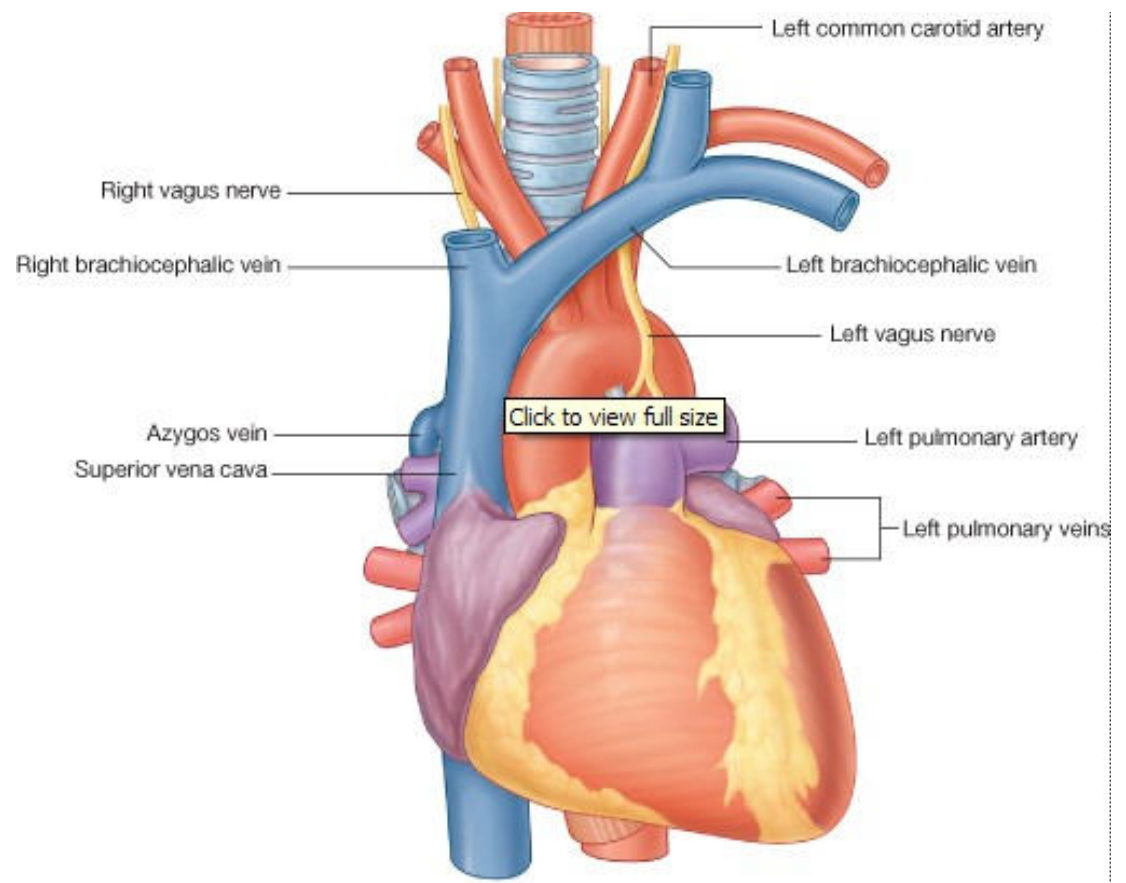
Thymus

- Asymmetric bilobed gland
- Upper extent may reach as high as thyroid gland
- Involved in early development of immune system
- Large in children
- Atrophies after puberty



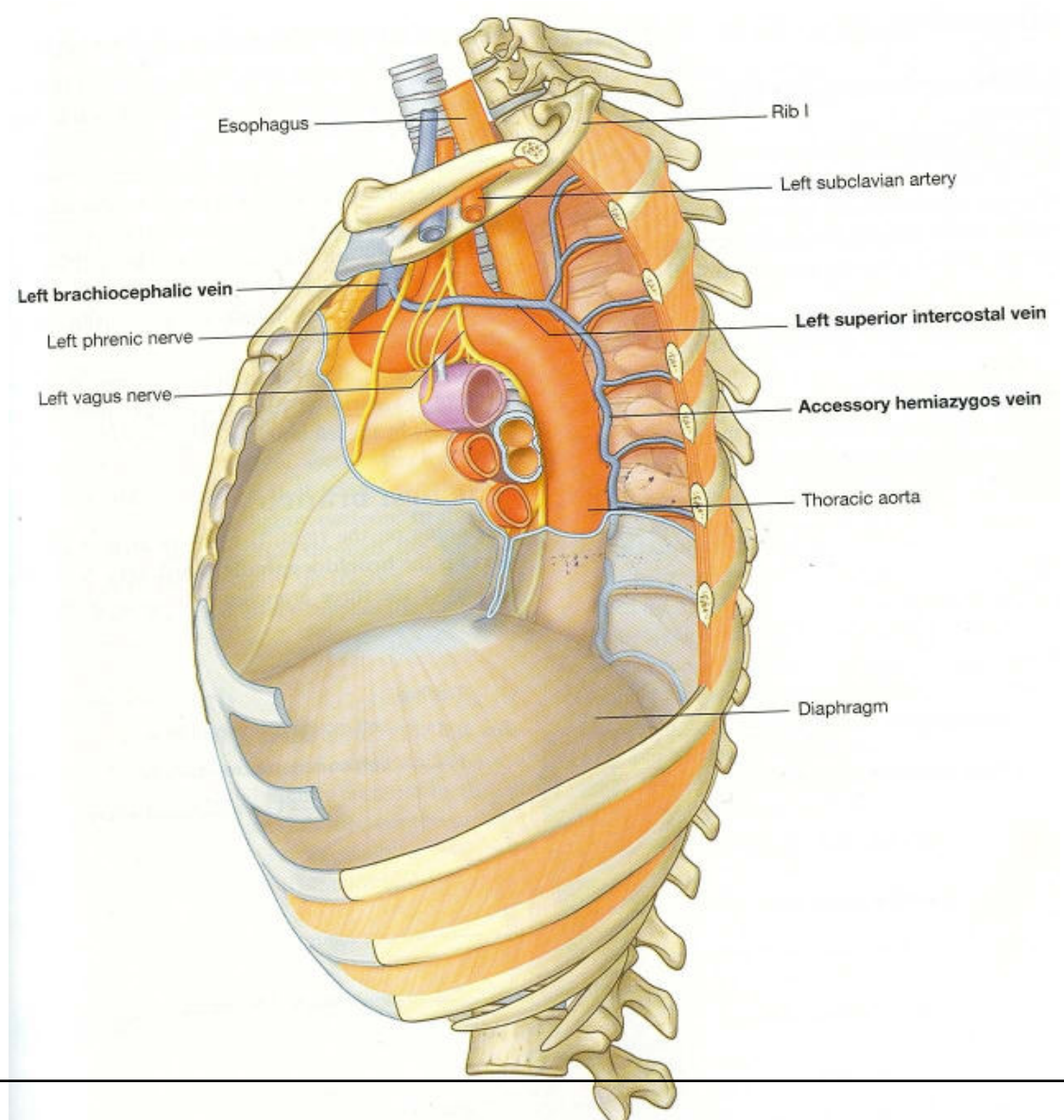
Brachiocephalic veins

- Located immediately posterior to thymus
- Formed at the jn. of IJ & subclavian veins.
- Begins post to clavicle
- Tributaries: vertebral, first post. Intercostal, int. thoracic, inf. Thyroid, thymic veins



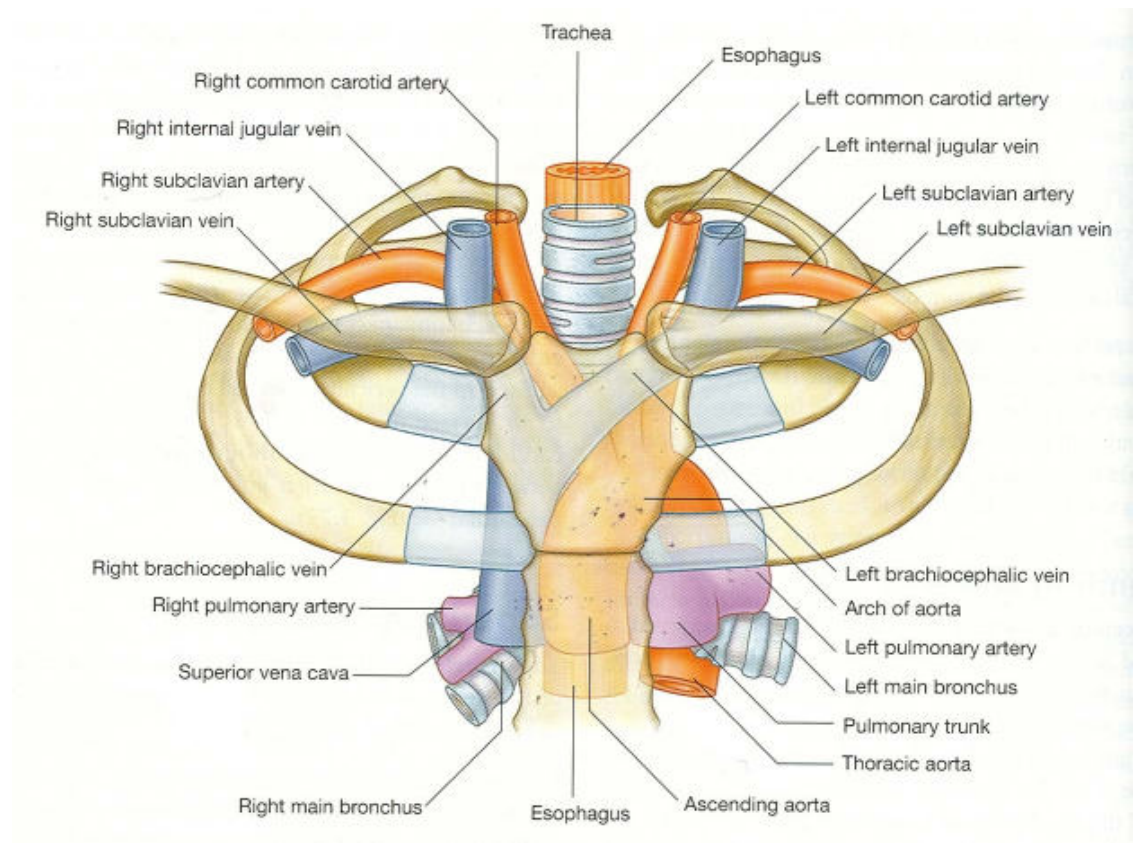
Left superior intercostal vein

- Drains upper two or three intercostal veins, left bronchial veins & left pericardiophrenic veins
- Drains in to left brachiocephalic veins



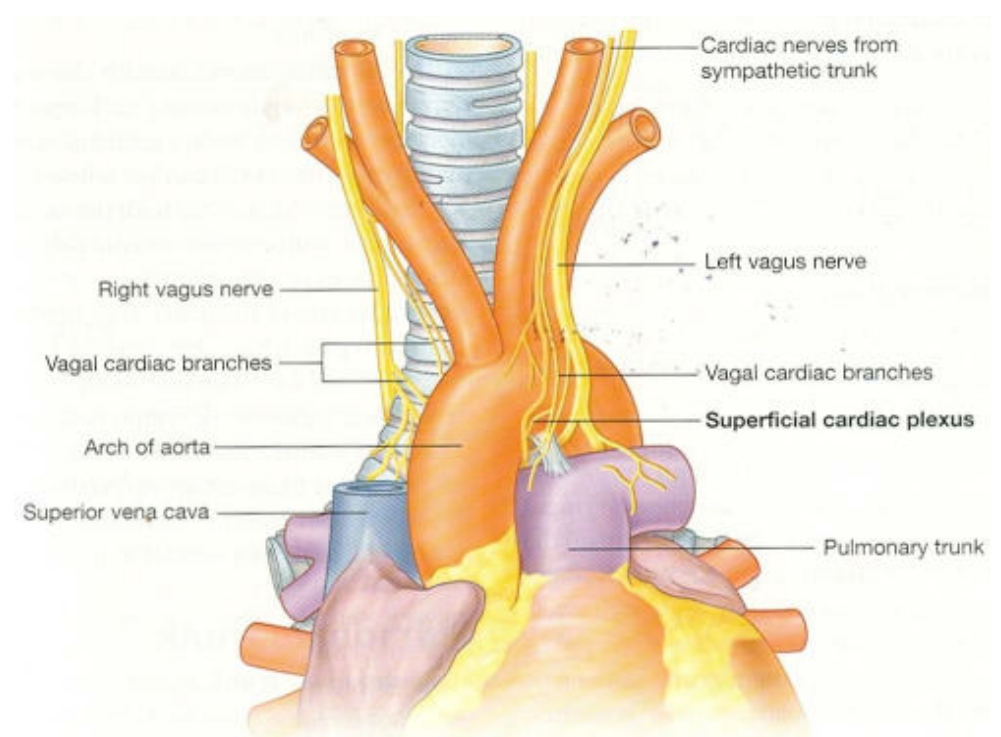
Superior vena cava

- Vertically oriented
- Begins posterior to the lower edge of first costal cartilage
- terminates at the lower border of right third costal cartilage



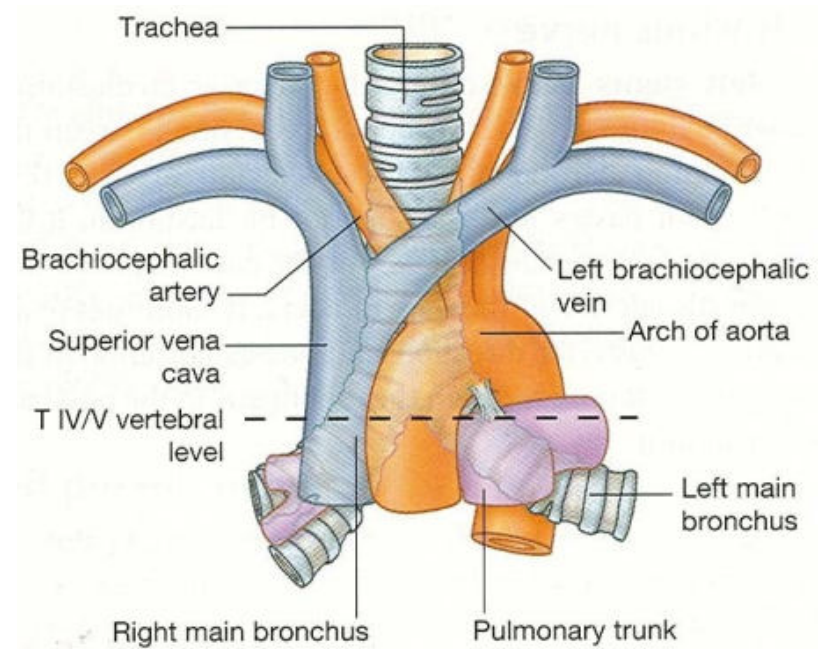
Arch of aorta & it's branches

- Begins when ascending aorta emerges from pericardial sac
 - Terminates on left side of vertebral level between Th 4th - 5th
- Branches-
- Brachiocephalic trunk
 - Left CCA
 - Left subclavian
 - Thyroid ima



Trachea

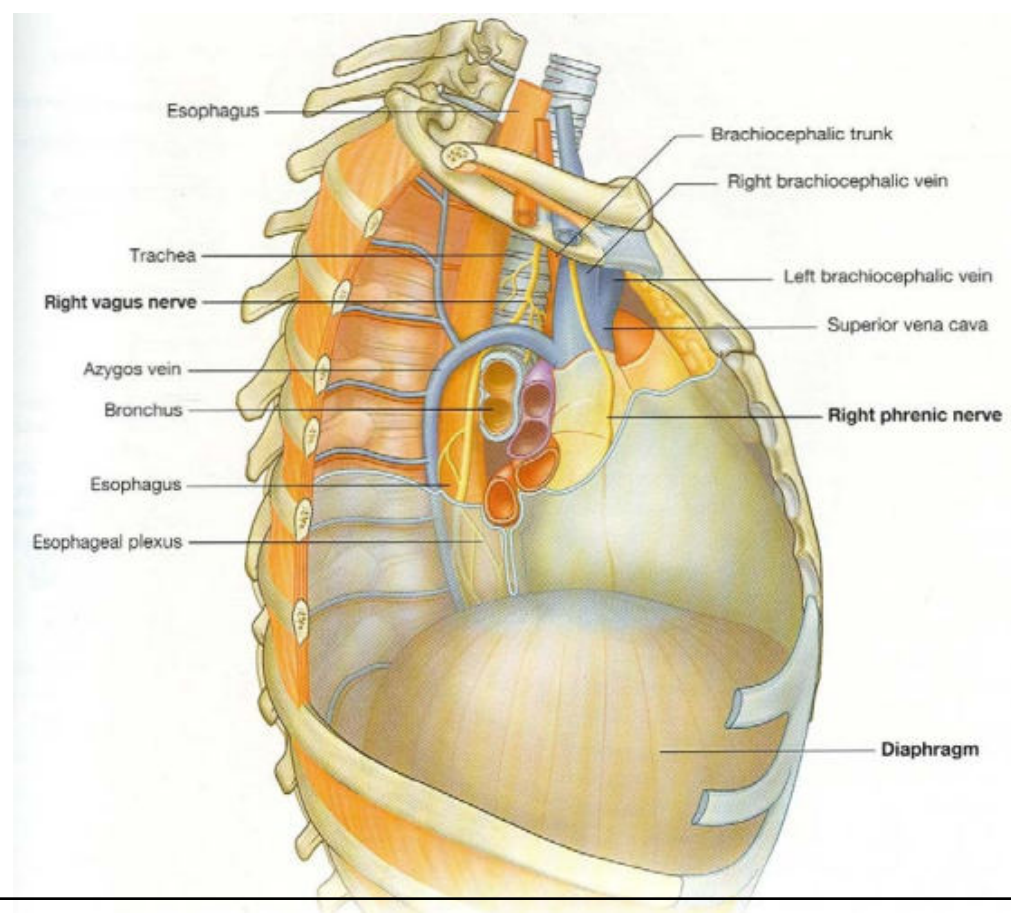
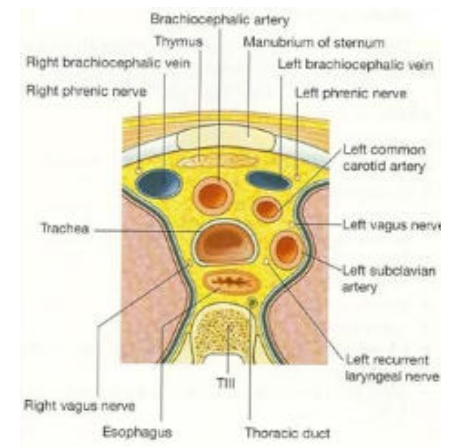
- Midline structure
- Present anterior to esophagus
- Swallowing, breathing, disease & specialized instrumentation causes shift of trachea
- divides just inferior to sternal angle (T3- T4) into Right & Left principal bronchus



Vagus nerve

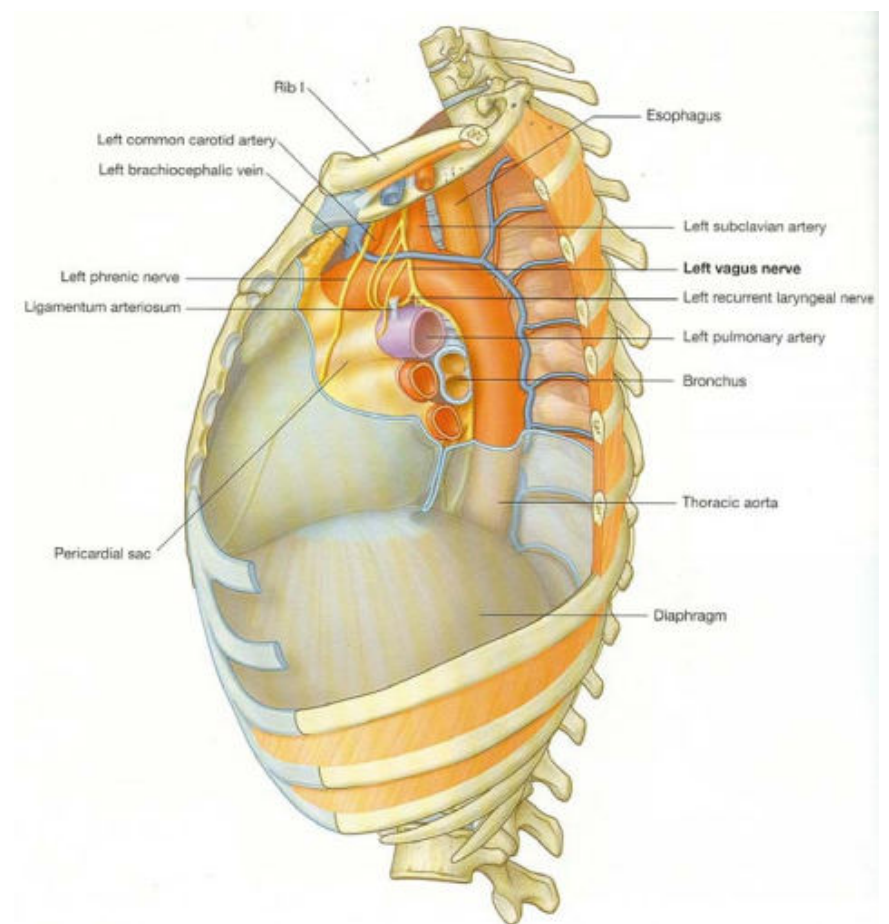
Right Vagus

- lies between right brachiocephalic vein & trunk
- Descends posteriorly to the root of Right lung to reach esophagus
- Gives branches to esophagus, cardiac plexus & pulmonary plexus



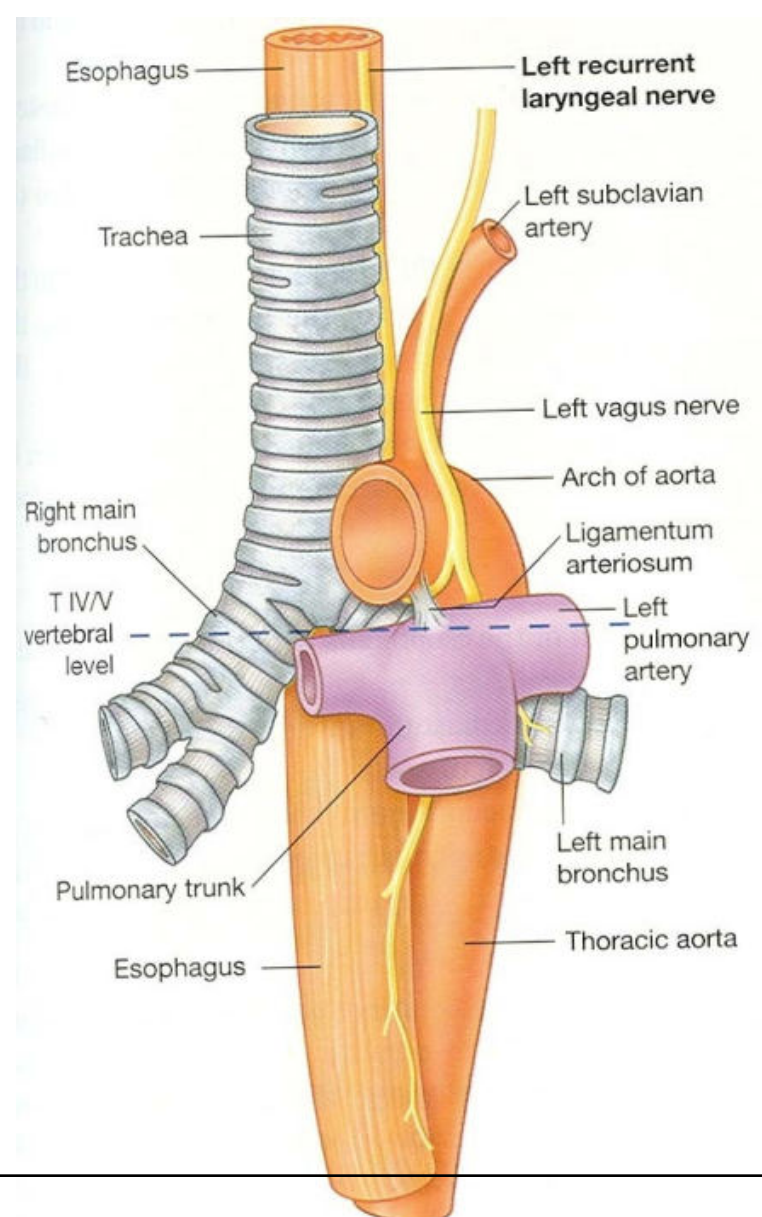
Left Vagus nerve

- Lies between Lt CCA & Lt subclavian artery
- Pass posterior to the root of lung to reach the esophagus
- Gives branches to esophagus, cardiac & pulmonary plexus
- Also gives Lt recurrent laryngeal nerve- arise at inferior margin of arch of aorta, winds around the aorta & reaches the groove between esophagus & trachea



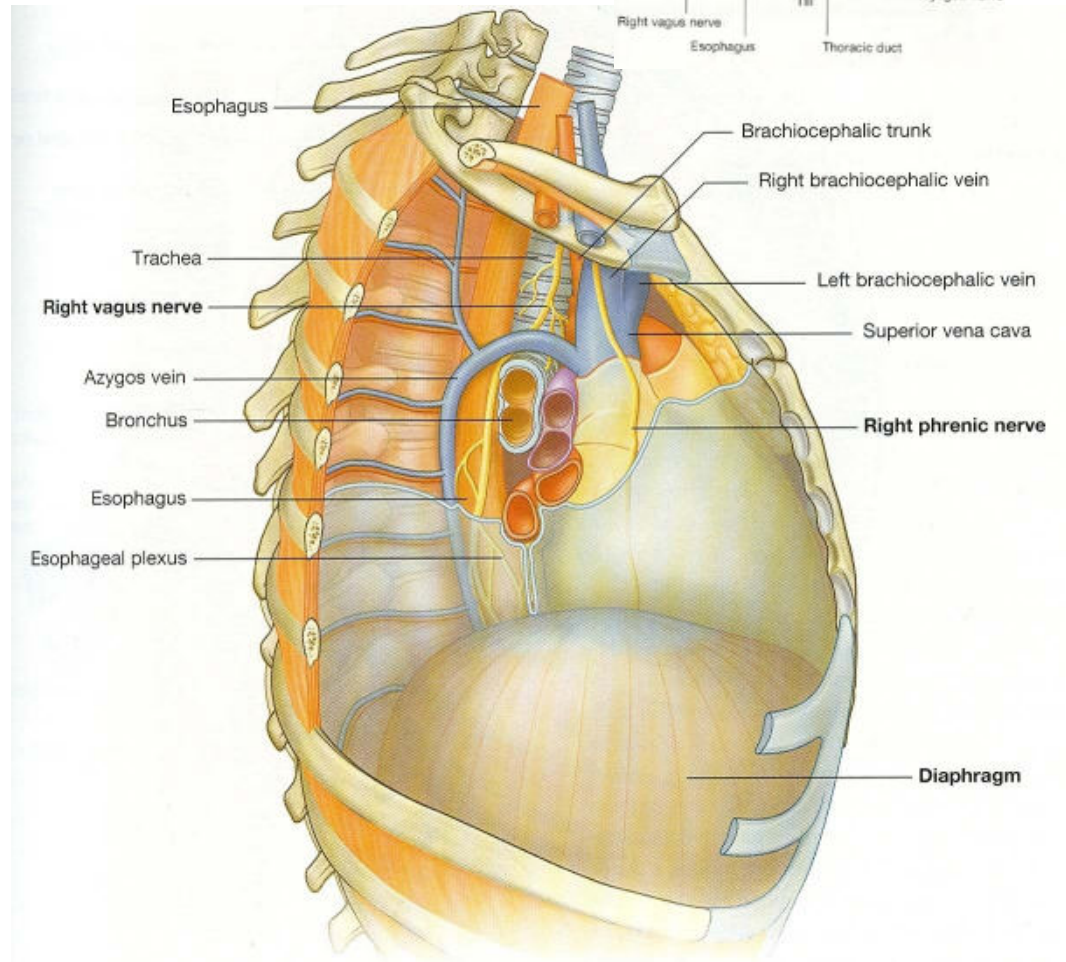
Left recurrent laryngeal nerve

- arise at inferior margin of arch of aorta, winds around the aorta & reaches the groove between esophagus & trachea



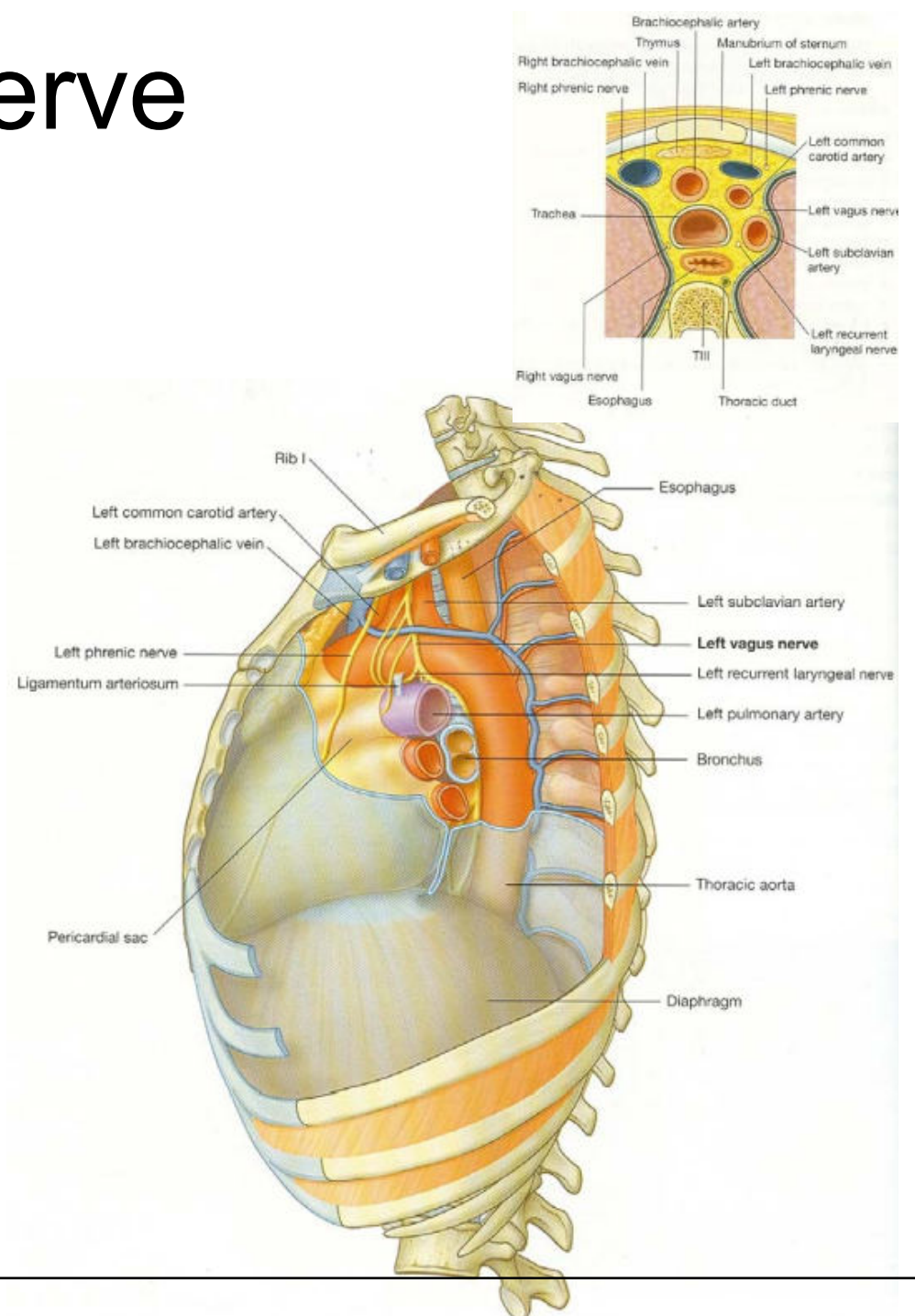
Phrenic nerve

- Right Phrenic –enters lateral to Right Vagus & beginning of Right brachiocephalic vein
- continues inferiorly on the Right side of sup vena cava, on entering middle mediastinum descends along the Rt side of pericardial sac anterior to the Rt lung root
- leaves the thorax with inferior vena cava



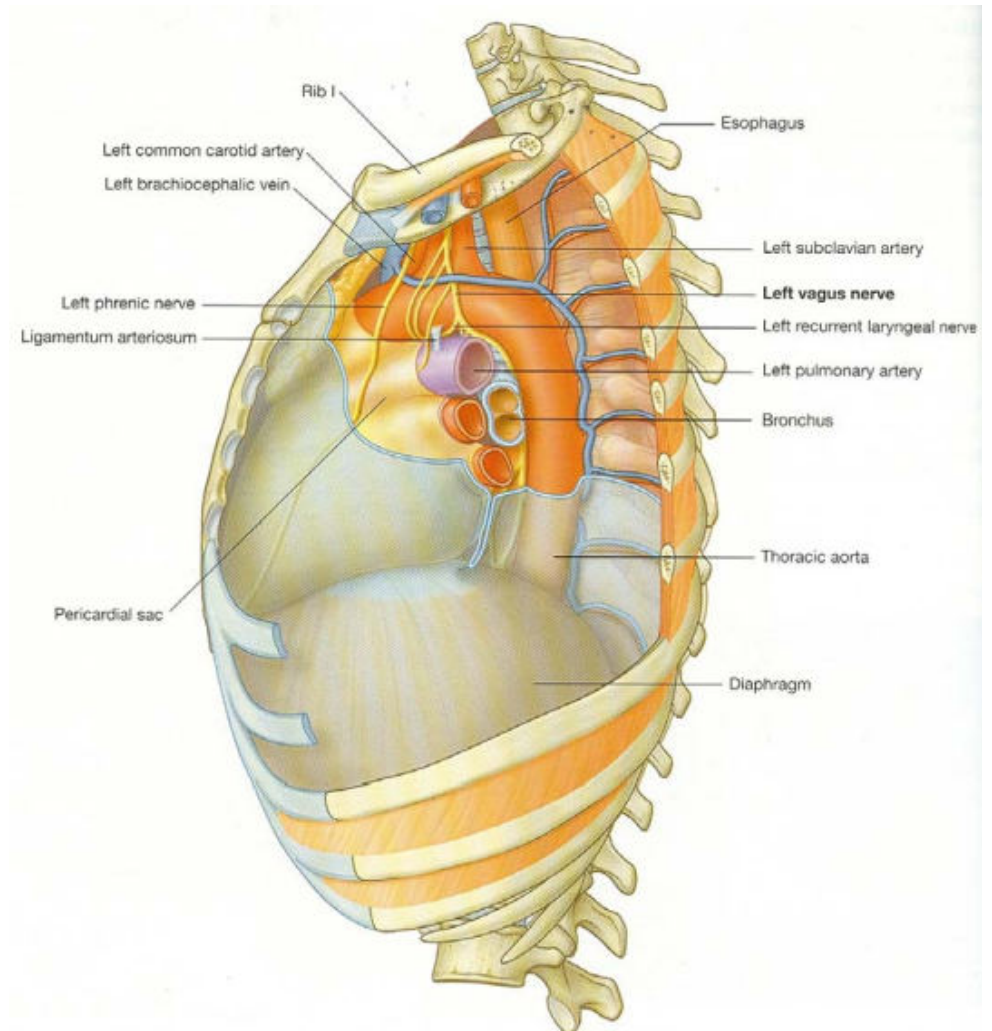
Left phrenic nerve

- enters similar to Right Phrenic nerve
- Lateral to Vagus & Lt brachiocephalic vein
- Descends on left lateral surface of arch of aorta
- Passes superficial to Lt vagus & superior intercostal vein



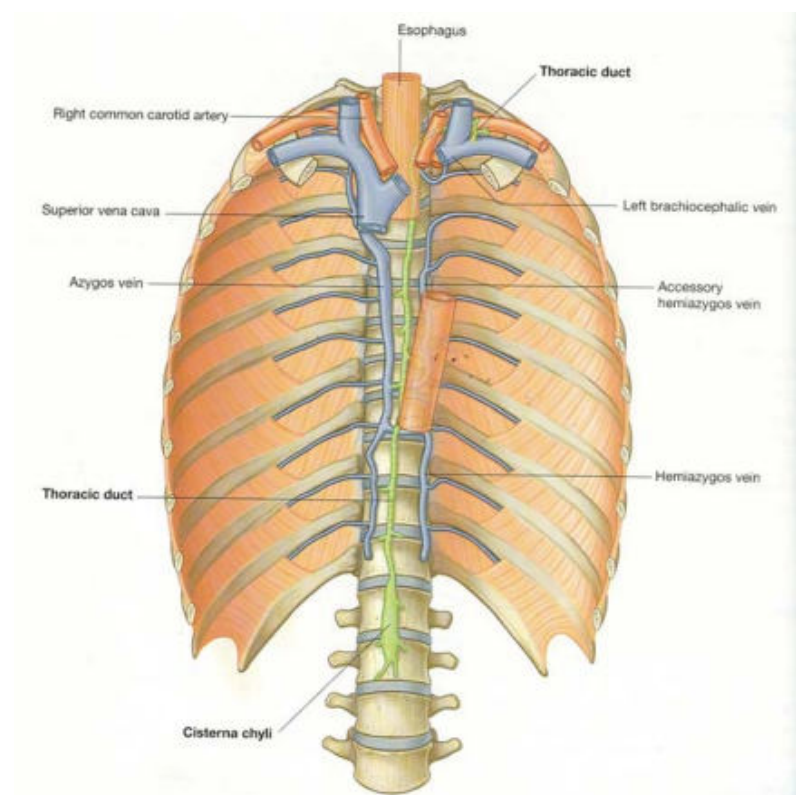
Left phrenic nerve

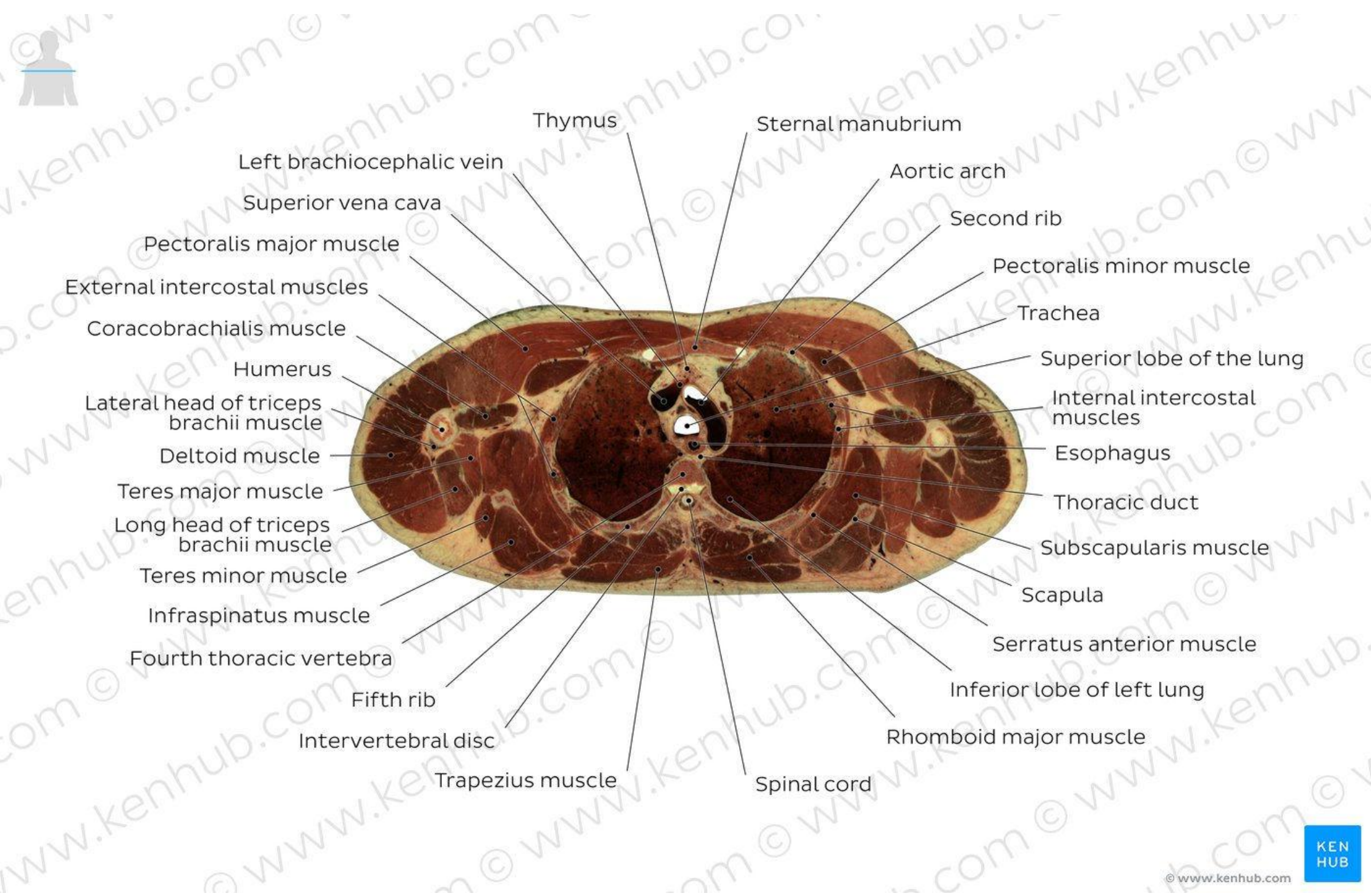
- In middle mediastinum lies on the Lt side of pericardial sac anterior to root of Lt lung
- Pierces the diaphragm near the apex of the heart



Thoracic duct

- Major lymphatic vessel of the body
- Enters sup. mediastinum from below at the level of T4/5
- continues through the superior med. posterior to arch of aorta between the esophagus & Lt pleura

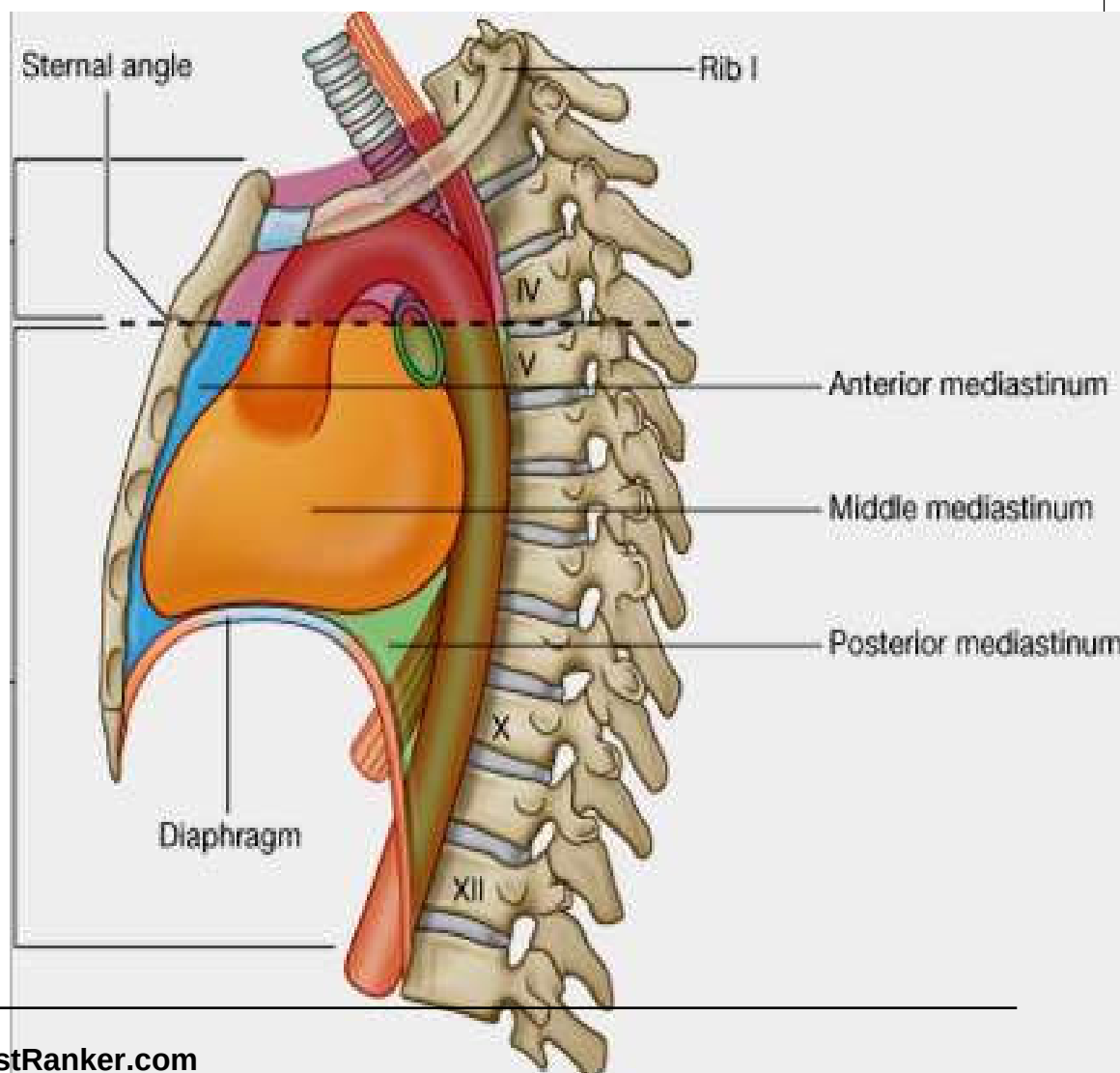




Anterior Mediastinum

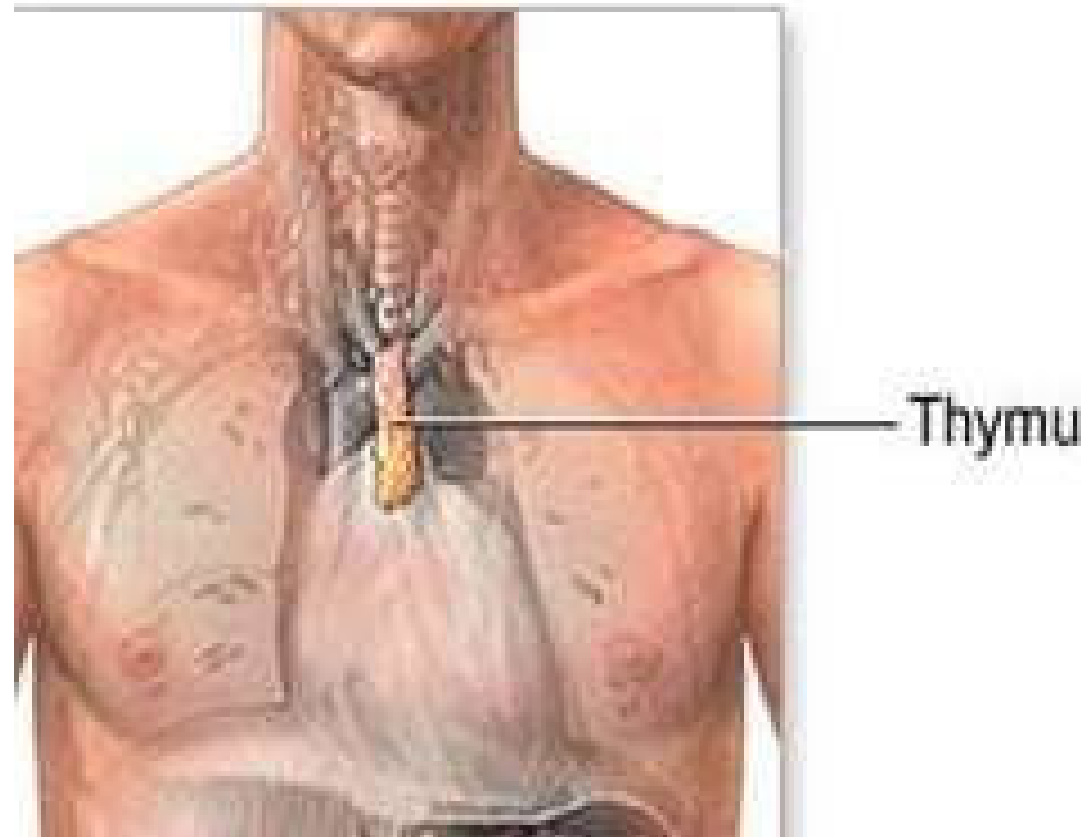
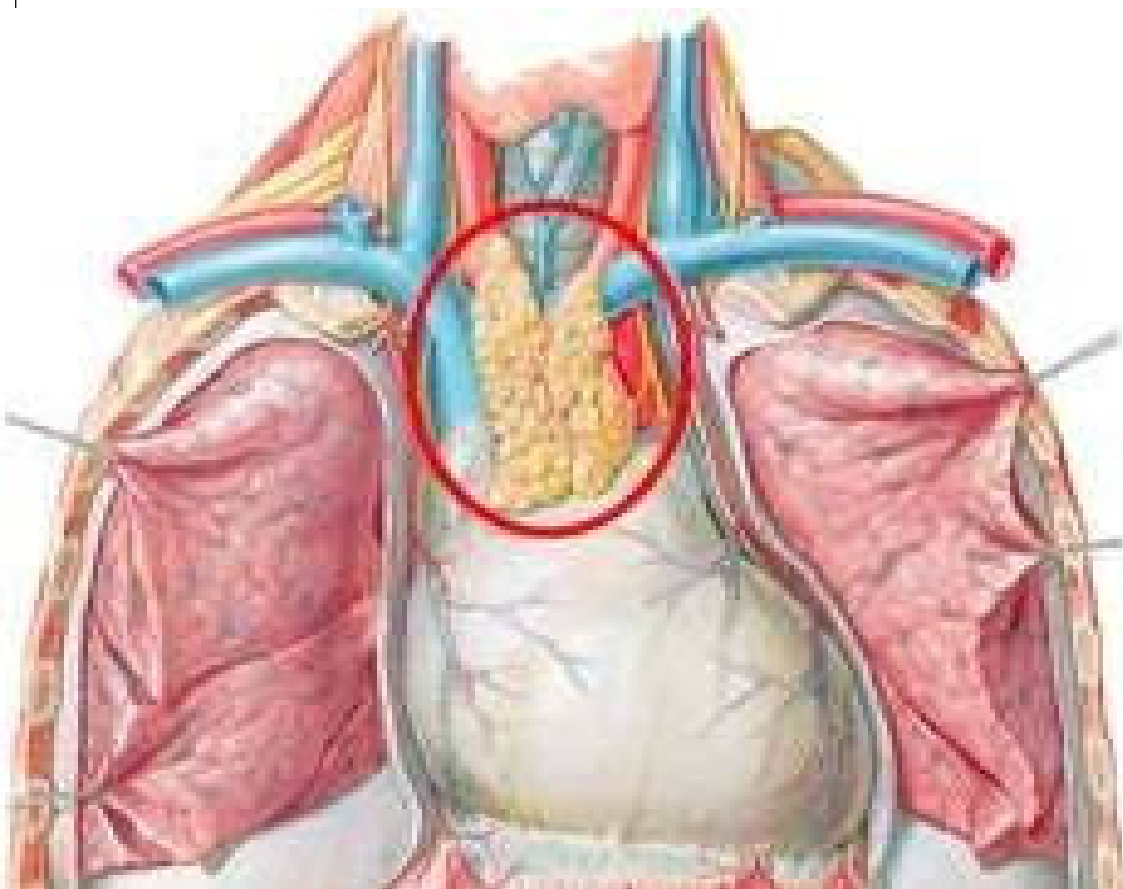
- Lies ant. to pericardium
- Boundaries:

- ❑ Anterior: body of sternum
- ❑ Posterior: pericardium
- ❑ superior: imaginary line separating sup. & inf. mediastinum
- ❑ Inferior: diaphragm
- ❑ Lateral: mediastinal pleura



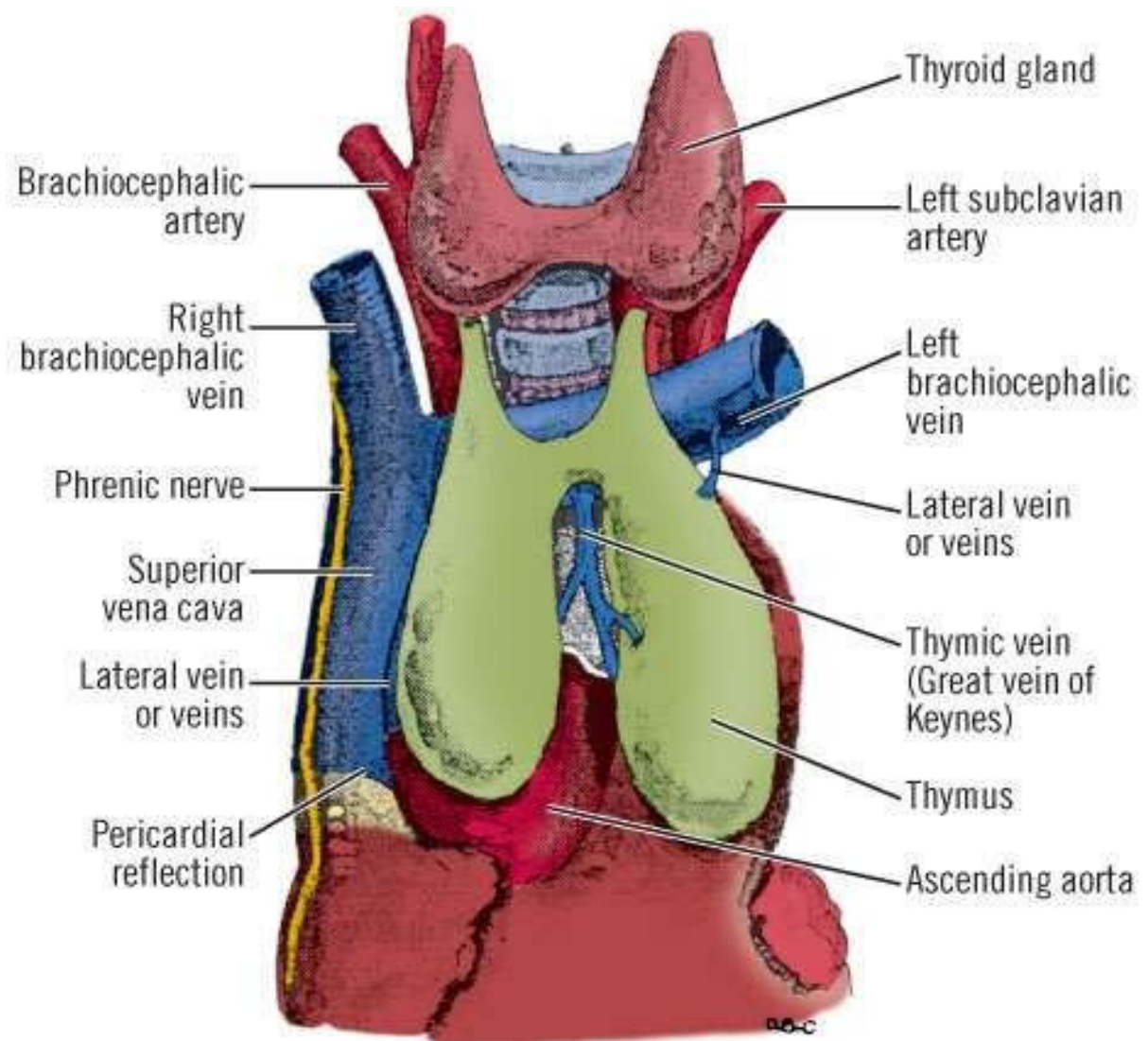
Anterior mediastinum contains:

Thymus
Lymph nodes
fat



Thymus

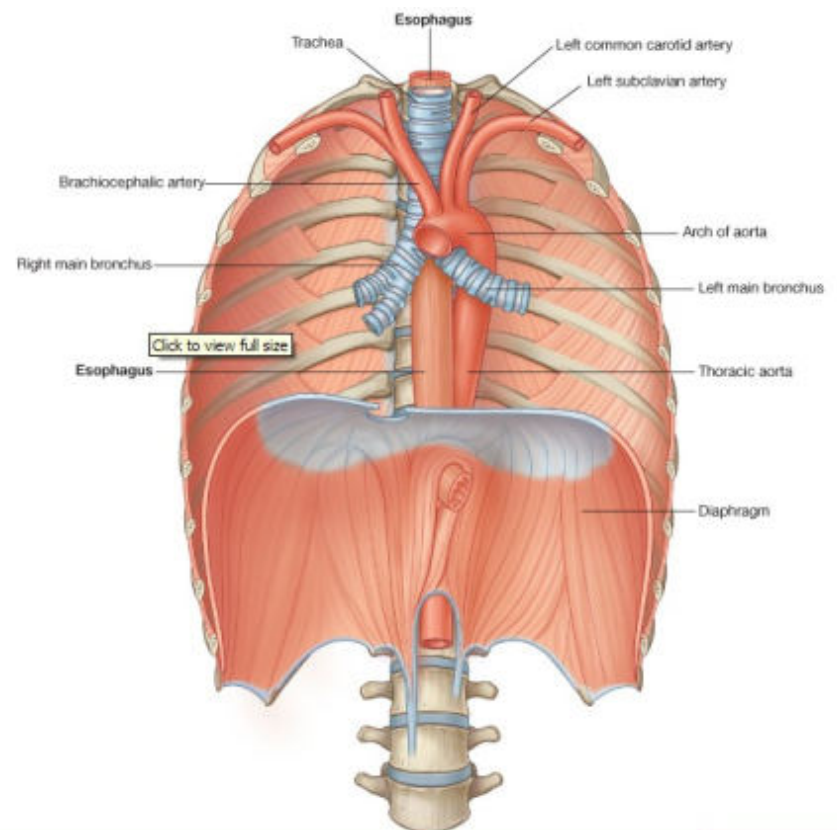
- ☐ Located in anterior mediastinum.
- ☐ Develops from endoderm of 3rd pharyngeal pouch
- ☐ Present in childhood, involutes in adults
- ☐ Blood supply
 - Arterial : i nt. Mammary arteries
 - Venous: internal thoracic veins
 - Lymphatic drainage: lower cervical, int. Mammary and hilar nodes



Copyright ©2006 by The McGraw-Hill Companies, Inc.
All rights reserved.

Esophagus

- Starts at the C₆th & terminates at cardiac opening of stomach (T₁₂)
- Descends anterior to vertebral bodies in midline
- Crossed laterally by the azygos vein on the right side & arch of aorta on the left side



Posterior Mediastinum

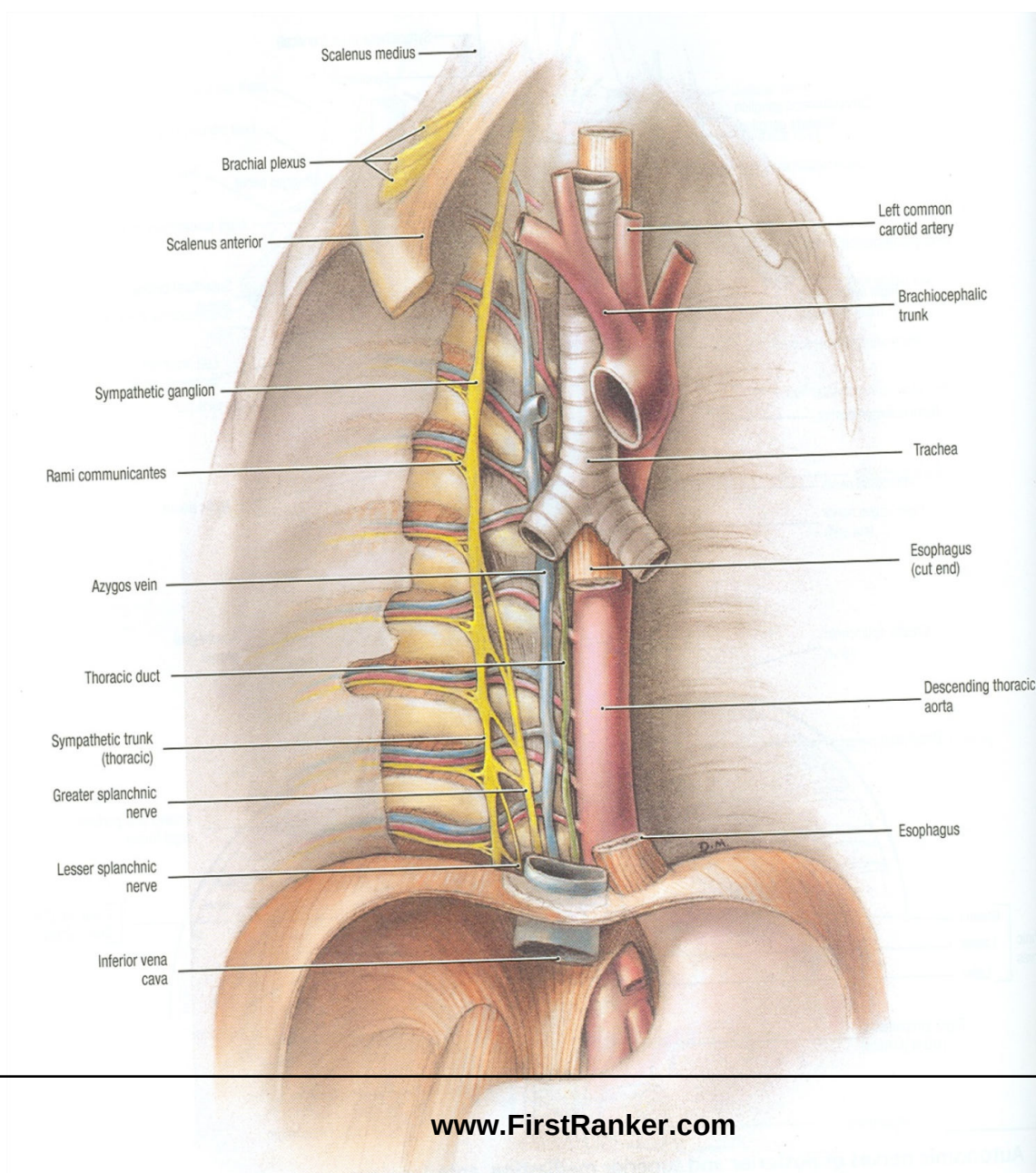
BOUNDARIES:

- **Anterior:** Pericardium & diaphragm
- **Posterior:** Lower 8 thoracic vertebrae
- **Superior:** Horizontal plane
- **Inferior:** Diaphragm
- **On each side:** Pleura

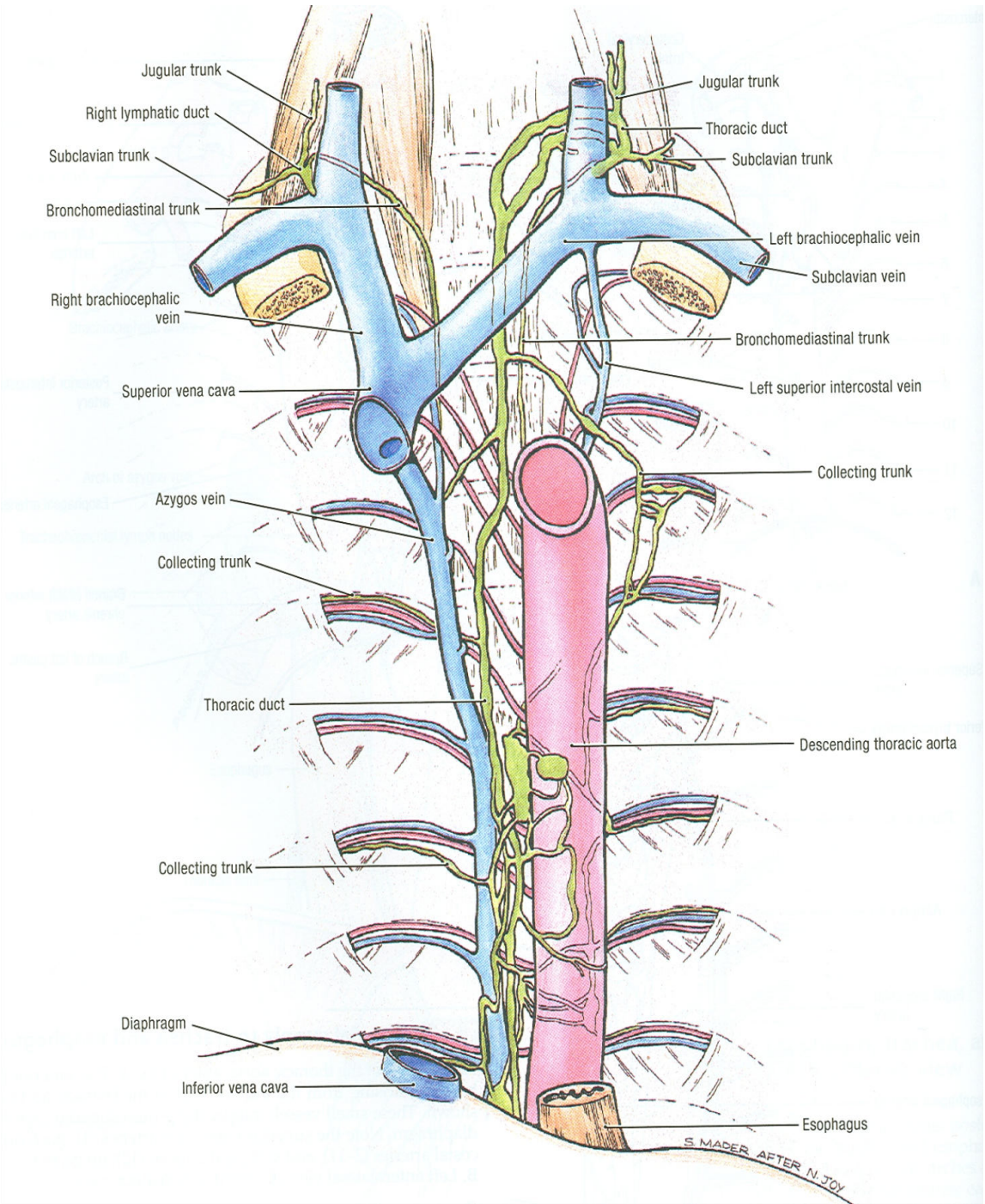
Posterior Mediastinum

- **CONTENTS:**
 1. **Esophagus** (most anterior structure)
 2. **Thoracic duct**
 3. **Right & left vagus**
 4. **Descending aorta**
 5. **Azygos & hemiazygos veins**
 6. **Right & left sympathetic trunks & their branches** (splanchnic nerves)
 7. **Lymph nodes**

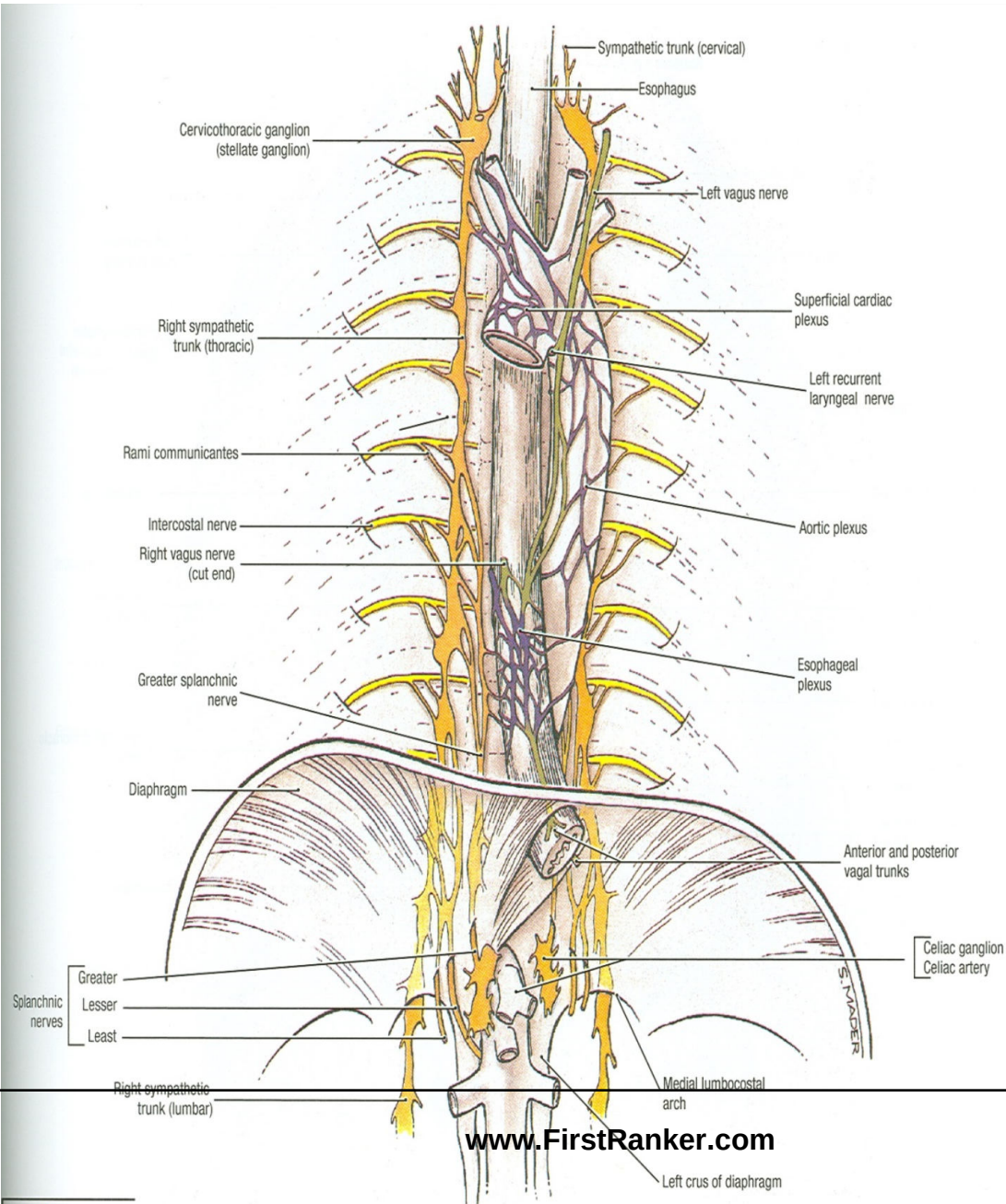
POSTERIOR MEDIASTINUM



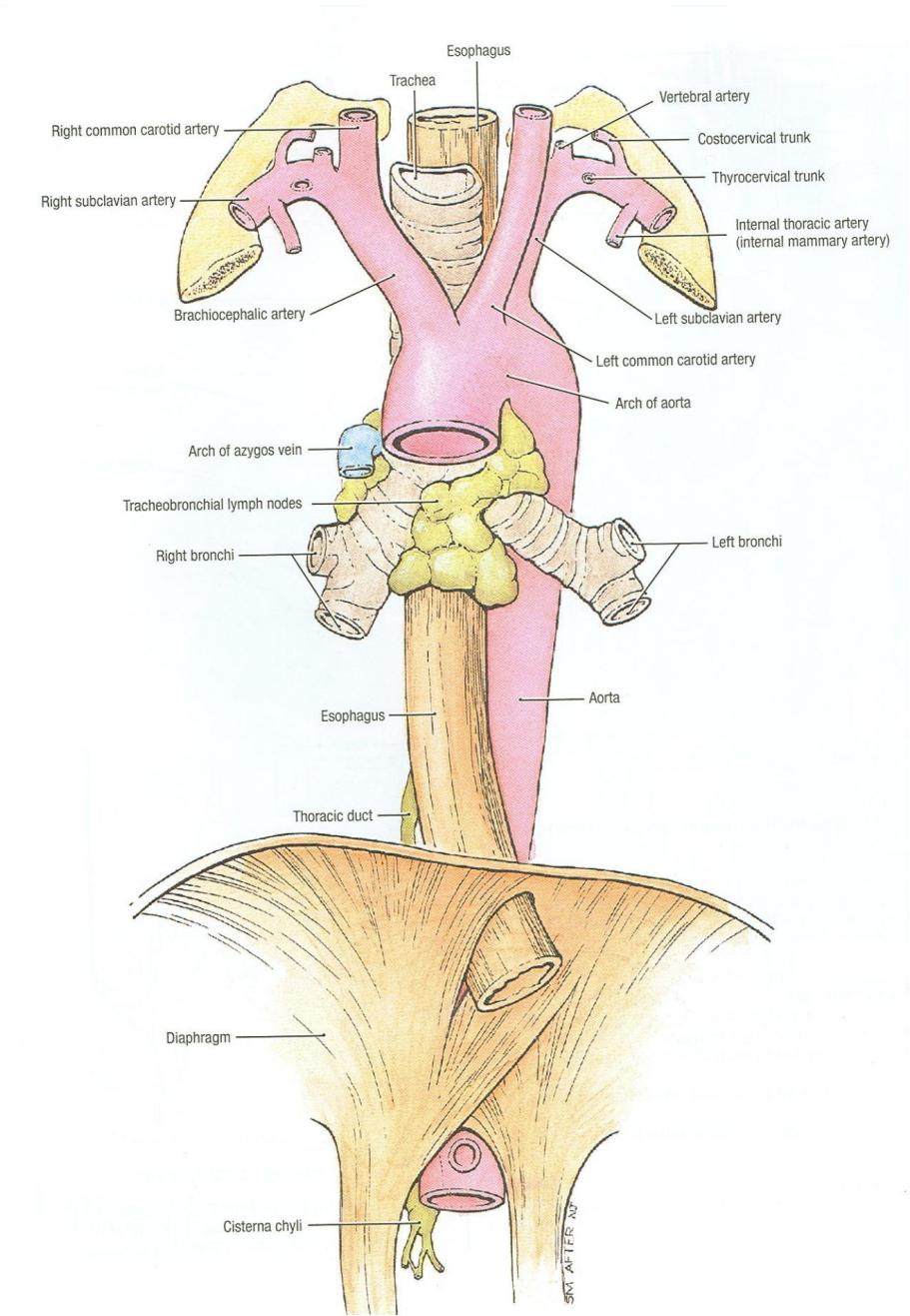
POSTERIOR MEDIASTINUM



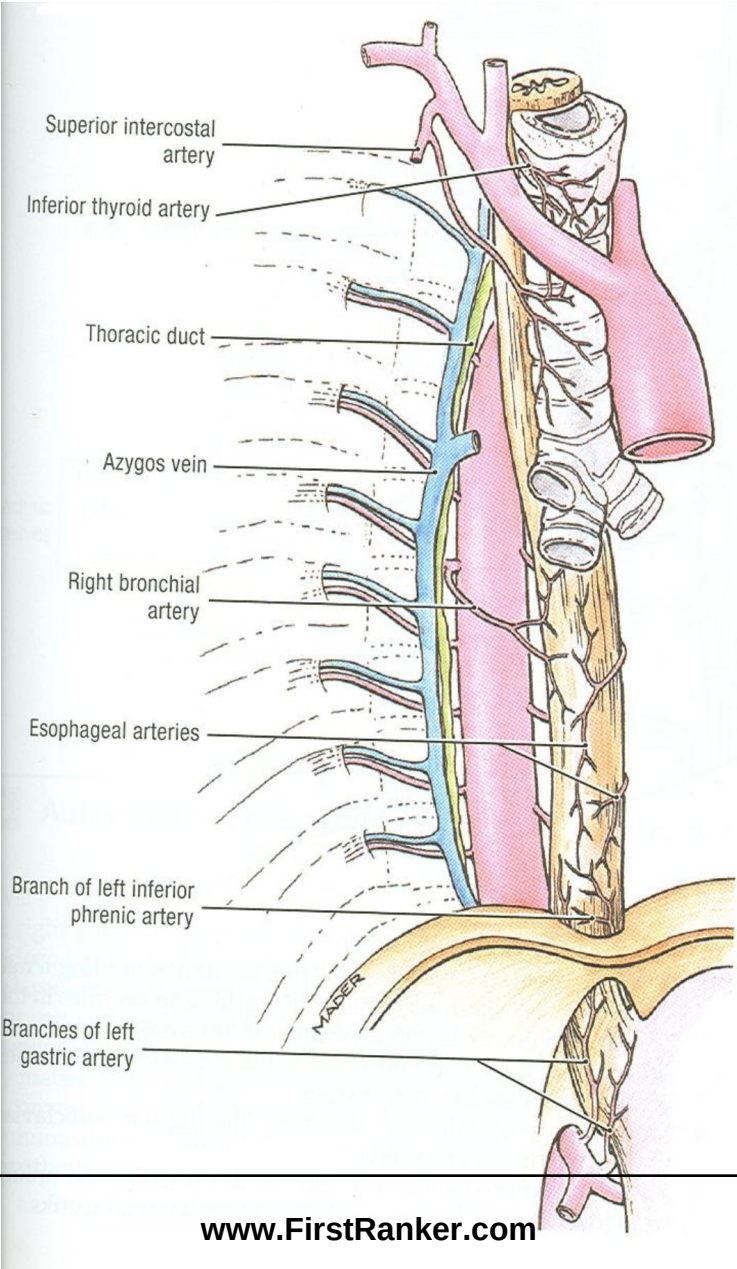
POSTERIOR MEDIASTINUM



POSTERIOR MEDIASTINUM



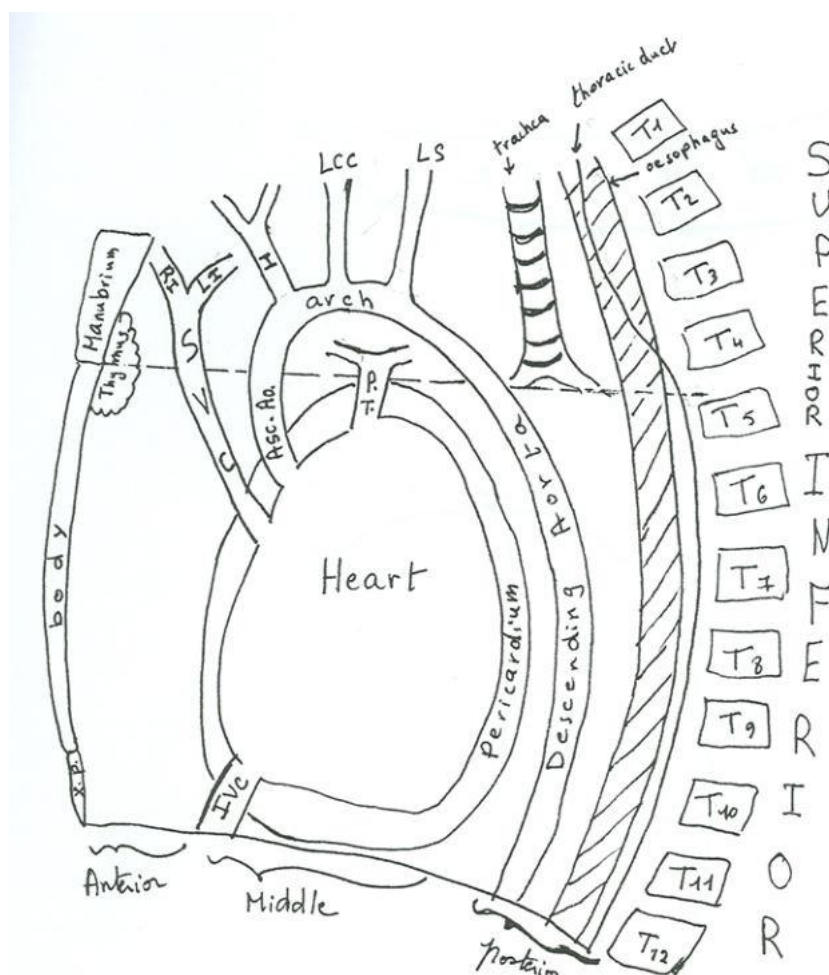
POSTERIOR MEDIASTINUM



MIDDLE MEDIASTINUM

- **CONTENTS:**
 1. **Pericardium & heart**
 2. **Arteries: *ascending aorta, pulmonary trunk***
 3. **Veins: *lower half of superior vena cava, terminations of inferior vena cava & pulmonary veins***
 4. **Nerves: *phrenic***
 5. **Lymph nodes**

Mediastinum



VEINS

BRACHIOCEPHALIC: (Superior mediastinum)

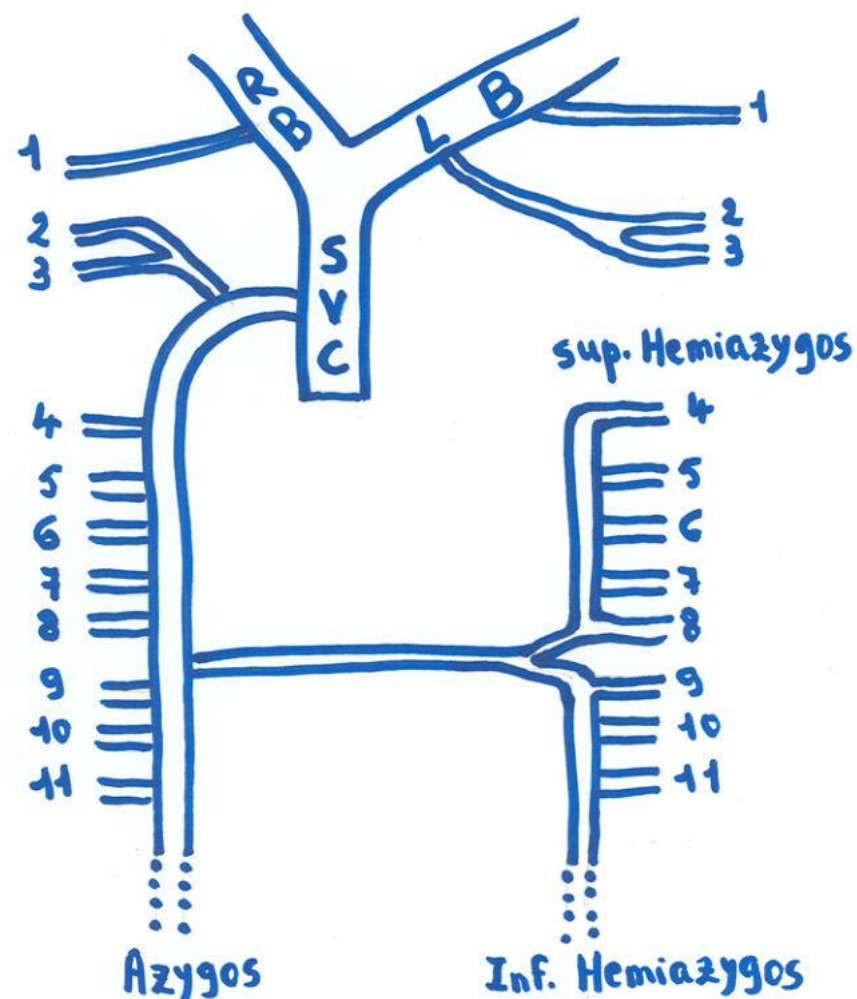
- **FORMATION:** by union of internal jugular & subclavian vein (behind medial end of clavicle)
- **END:** Both veins unite to form S.V.C.
- **RIGHT VEIN:** shorter & has a vertical course, related laterally to right phrenic nerve & right pleura & lung, its tributaries in thorax: right 1st posterior intercostal vein, right internal thoracic vein, right lymphatic duct
- **LEFT VEIN:** longer & has an oblique course, related anteriorly to manubrium & thymus gland, & posteriorly to branches of arch of aorta, its tributaries in thorax: left 1st posterior intercostal vein, left superior intercostal vein, left internal thoracic vein, thoracic duct

VEINS

SUPERIOR VENA CAVA: (Superior & middle mediastinum)

- **FORMATION:** by union of brachiocephalic veins, behind lower border of right 1st costal cartilage
- **END:** opens into right atrium behind right 3rd costal cartilage
- **TRIBUTARIES:** azygos vein

AZYGOS & HEMIAZYGOS VEINS



VEINS

AZYGOS VEIN: (Posterior mediastinum)

- **ORIGIN:** by union of right ascending lumbar & subcostal veins (passes through aortic opening of diaphragm)
- **END:** forms an arch above the root of right lung & ends in S.V.C. opposite lower border of T4
- **RELATIONS:**
 1. **Anterior:** esophagus
 2. **Posterior:** thoracic vertebra
 3. **Right:** right pleura & lung
 4. **Left:** thoracic duct
- **TRIBUTARIES:** superior & inferior hemiazygos veins, right superior intercostal vein, right posterior intercostal veins (from 4th to 11th), right bronchial veins, esophageal & pericardial veins

VEINS

INFERIOR HEMIAZYGOS: (Posterior mediastinum)

- **ORIGIN:** by union of left ascending lumbar & subcostal veins (passes through left crus of diaphragm)
- **END:** into azygos vein, opposite T8
- **TRIBUTARIES:** left posterior intercostal veins (9th to 11th), esophageal veins

VEINS

SUPERIOR HEMIAZYGOS: (Posterior mediastinum)

- **ORIGIN:** by left posterior intercostal veins (4th to 8th)
- **END:** into azygos vein, opposite T7
- **TRIBUTARIES:** left bronchial veins

INFERIOR VENA CAVA: (Posterior mediastinum)

- **END:** passes through vena caval opening of diaphragm & opens into right atrium behind right 6th costal cartilage

Arteries

AORTA:

- **ASCENDING AORTA:** (Middle mediastinum)
- 1. **ORIGIN:** at the base of left ventricle opposite lower border of left 3rd costal cartilage
- 2. **END:** ascends upward, forward & to the right & continues as arch of aorta
- 3. **BRANCHES:** right & left coronary arteries

Arteries

- **ARCH OF AORTA:** (Superior mediastinum)
- 1. **ORIGIN:** continuation of ascending aorta, opposite upper border of right 2nd costal cartilage
- 2. **COURSE & RELATIONS:** ascends *upward backward & to the left* (behind manubrium & in front of trachea) then *curves backward* (to the left of trachea) then finally *curves downward*
- 3. **TERMINATION:** continues as descending aorta, opposite lower border of T4

Arteries

- **BRANCHES OF ARCH OF AORTA: (Superior mediastinum)**
- 1. **BRACHIOCEPHALIC:** ascends *upward & to the right* (behind left brachiocephalic vein & in front of trachea) & divides into right common carotid & right subclavian arteries (behind right sternoclavicular joint)
- 2. **LEFT COMMON CAROTID:** ascends *upward & to the left* (to the left side of brachiocephalic artery) & enters the neck (behind left sternoclavicular joint)
- 3. **LEFT SUBCLAVIAN:** ascends *upward* (behind left common carotid artery, in front of esophagus, to the left side of trachea), arches over apex of left lung to enter neck

Arteries

DESCENDING AORTA: (Posterior mediastinum)

- **ORIGIN:** continuation of arch of aorta
- **TERMINATION:** passes through aortic opening of diaphragm (opposite T12) & continues as abdominal aorta
- **RELATIONS:**
 1. **Anterior:** esophagus
 2. **Posterior:** thoracic vertebrae
 3. **Right:** thoracic duct
 4. **Left:** left pleura & lung
- **BRANCHES:** posterior intercostal (from 3rd to 11th), subcostal, bronchial, esophageal, pericardial arteries

Arteries

PULMONARY TRUNK (Middle mediastinum)

- **ORIGIN:** from upper part of right ventricle, behind sternal end of left 3rd costal cartilage
- **COURSE:** ascends *upward & to the left* & divides (at lower border of T4) into:
 1. **Right pulmonary:** runs behind ascending aorta & S.V.C to enter root of right lung
 2. **Left pulmonary:** runs in front of descending aorta to enter root of left lung

TRACHEA

- **BEGINNING:** continuation of larynx, opposite C6
- **TERMINATION:** bifurcates into 2 bronchi, opposite lower border of T4
- **RELATIONS:** (in superior mediastinum)
 1. **Anterior:** arch of aorta, brachiocephalic & left common carotid arteries
 2. **Posterior:** left recurrent laryngeal nerve, esophagus
 3. **Right:** right vagus nerve
 4. **Left:** arch of aorta, left subclavian artery
- **NERVE SUPPLY:** sympathetic trunks & vagus
- **BLOOD SUPPLY:** inferior thyroid vessels
- **LYMPHATIC DRAINAGE:** pretracheal & paratracheal

ESOPHAGUS

- **BEGINNING:** continuation of pharynx, **opposite C6**
- **TERMINATION:** passes through esophageal opening of diaphragm (**opposite T10**) & joins stomach
- **RELATIONS: (in superior mediastinum)**
 1. **Anterior:** left recurrent laryngeal nerve, trachea, left subclavian artery
 2. **Posterior:** thoracic vertebrae
 3. **Right:** right pleura & lung
 4. **Left:** thoracic duct, left pleura & lung

ESOPHAGUS

- **RELATIONS: (in posterior mediastinum)**
 1. **Anterior:** pericardium, separating it from left atrium
 2. **Posterior:** thoracic duct, descending aorta, azygos vein
 3. **Right:** right pleura & lung
 4. **Left:** descending aorta, left pleura & lung
- **NERVE SUPPLY:** as trachea
- **ARTERIAL SUPPLY:** descending aorta
- **VENOUS DRAINAGE:** azygos & hemiazygos
- **LYMPHATIC DRAINAGE:** posterior mediastinal lymph nodes

THORACIC DUCT

- **ORIGIN:** from upper end of cisterna chyli (**opposite L1 & L2**)
- **COURSE:** passes through aortic opening of diaphragm, ascends in posterior mediastinum (behind esophagus) & in superior mediastinum (to the left of esophagus) to enter root of neck
- **END:** in left brachiocephalic vein
- **RELATIONS:** (**in posterior mediastinum**)
 1. **Anterior:** esophagus
 2. **Posterior:** thoracic vertebrae
 3. **Right:** azygos vein
 4. **Left:** descending aorta

THORACIC DUCT

TRIBUTARIES:

- It drains lymph from **both sides of the body below the diaphragm** through cisterna chyli
- It drains lymph from **left half of the body above diaphragm** through:
 1. **Left jugular lymph trunk:** drains left side of head & neck
 2. **Left subclavian lymph trunk:** drains left upper limb
 3. **Left bronchomediastinal lymph trunk:** drains left side of thorax

RIGHT LYMPHATIC DUCT

- **ORIGIN:** formed by union of:
 1. **Right jugular lymph trunk:** drains right side of head & neck
 2. **Right subclavian lymph trunk:** drains right upper limb
 3. **Right bronchomediastinal lymph trunk:** drains right side of thorax
- **END:** in right brachiocephalic vein

NERVES

PHRENIC NERVES: (Superior & middle mediastinum)

- **ORIGIN:** anterior rami of C3,4,5
- **COURSE & RELATIONS IN THORAX:**
 1. **RIGHT:** descends to the right side of: right brachiocephalic vein, S.V.C., pericardium, I.V.C.
 2. **LEFT:** descends to the left side of: arch aorta, pericardium
- **BRANCHES:**
 1. **Motor branches to:** diaphragm
 2. **Sensory branches from:**
 - Mediastinal & central part of diaphragmatic pleura
 - Fibrous pericardium & parietal layer of serous pericardium
 - Peritoneum covering central part of undersurface of diaphragm

NERVES

- **VAGUS NERVES:** (Superior & posterior mediastinum)
- **ORIGIN:** 10th cranial nerve
- **COURSE & RELATIONS IN THORAX:**
 1. **RIGHT:** descends to the right side of: trachea, behind root of right lung (pulmonary plexus), behind esophagus (esophageal plexus), passes through esophageal opening of diaphragm to reach posterior surface of stomach
 2. **LEFT:** descends to the left side of: arch aorta, behind root of left lung (pulmonary plexus), in front of esophagus (esophageal plexus), passes through esophageal opening of diaphragm to reach anterior surface of stomach

NERVES

BRANCHES IN THORAX:

- **BOTH VAGI:** to lungs & esophagus
- **RIGHT VAGUS:** to heart
- **LEFT VAGUS:** left recurrent laryngeal nerve: curves below arch of aorta, behind ligamentum arteriosum, ascends in groove between trachea & esophagus to reach the neck. It supplies: heart, trachea, esophagus (in thorax) & larynx (in neck)

NERVES

THORACIC PART OF SYMPATHETIC TRUNKS: (Superior & posterior mediastinum)

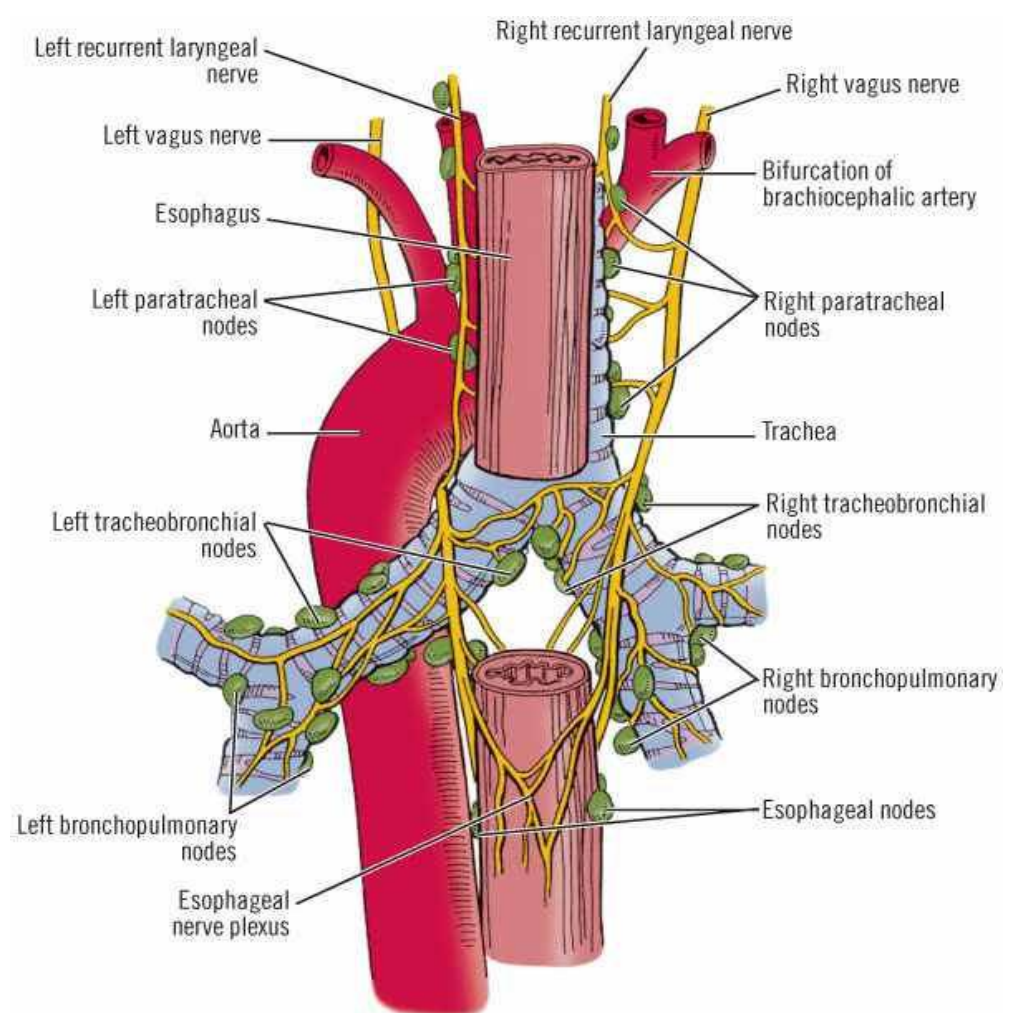
- **BEGINNING:** the cervical part continues as thoracic part by passing in front of neck of first rib
- **TERMINATION:** the thoracic part continues as lumbar part by passing behind medial arcuate ligament
- **COURSE:**
 1. **In upper part of thorax:** descend in front of heads of ribs
 2. **In lower part of thorax:** descend on the sides of bodies of vertebrae
- **GANGLIA:** usually 11 (1st thoracic ganglion fuses with inferior cervical ganglion forming stellate ganglion)

NERVES

- **BRANCHES:**
 1. **Rami communicantes:** each ganglion receives a white ramus (preganglionic) & gives a grey ramus (postganglionic) to corresponding thoracic spinal nerve
 2. **Visceral branches (postganglionic)** to thoracic organs (from upper 5 ganglia): to heart, lungs, esophagus, descending aorta
 3. **Visceral branches (preganglionic)** to abdominal organs:
 - Greater splanchnic nerve (from 5th to 9th ganglia)
 - Lesser splanchnic nerve (from 10th & 11th ganglia)
 - Lowest splanchnic nerve (from 12th ganglion)

Nerves in mediastinum

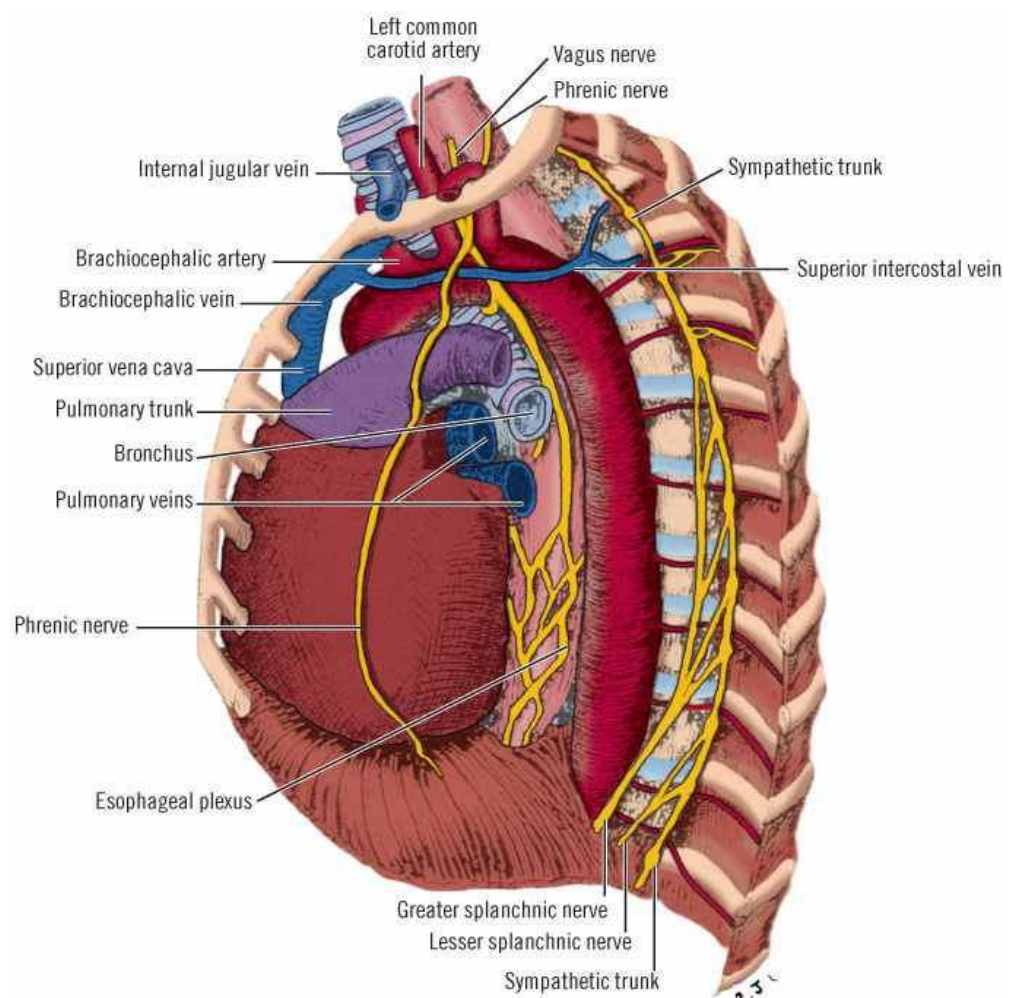
- The **right vagus nerve** descends in the thorax, first posterolateral to the brachiocephalic artery then lateral to the trachea
- Passes **behind** the root of the right lung and assists in the formation of the **pulmonary plexus**.
- On leaving the plexus, the vagus passes onto the posterior surface of the esophagus and takes part in the formation of the **esophageal plexus**.
- It then passes through the esophageal opening of the diaphragm.



Copyright ©2006 by The McGraw-Hill Companies, Inc. All rights reserved.

Nerves in mediastinum

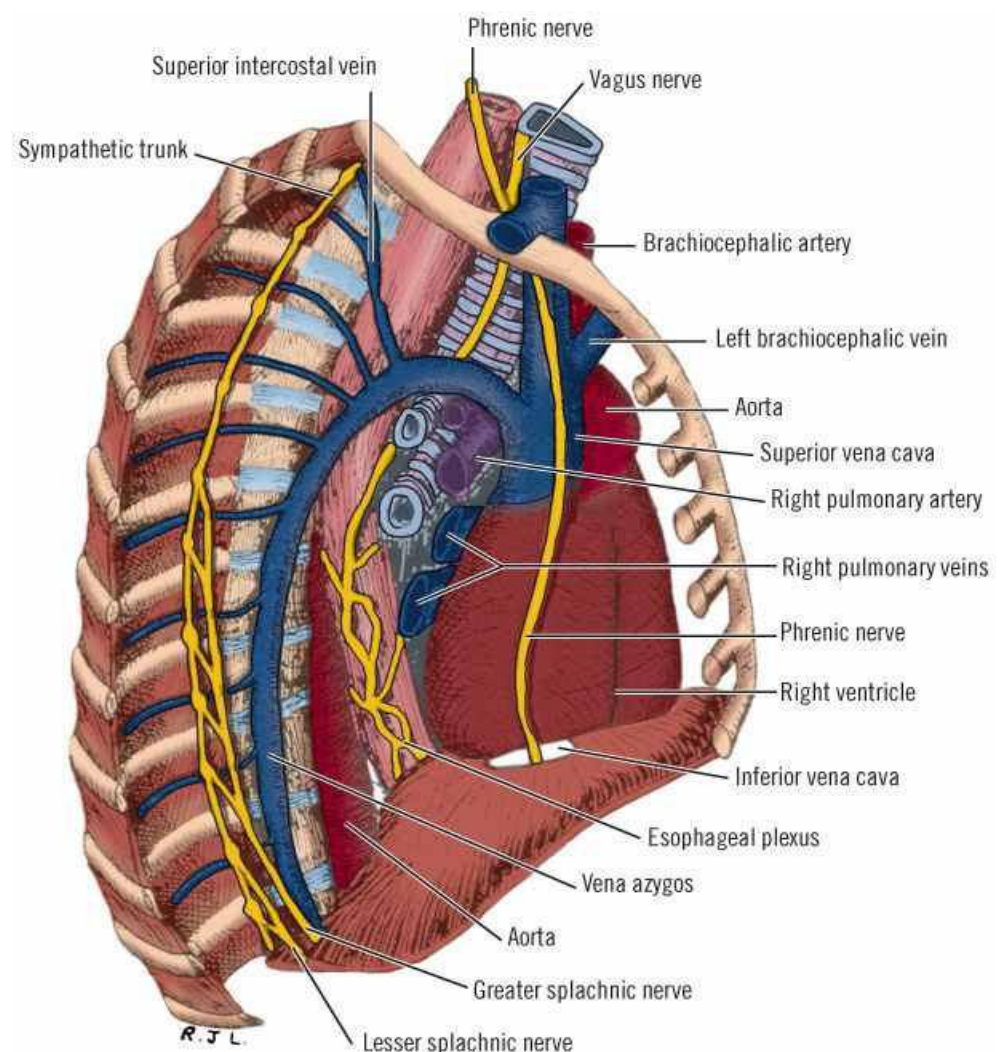
- The **left vagus nerve** descends in the thorax between the left common carotid and the left subclavian arteries
- It then crosses the left side of the aortic arch
- The vagus then turns backward **behind** the root of the left lung and assists in the formation of the **pulmonary plexus**.
- On leaving the plexus, the vagus passes onto the anterior surface of the esophagus and takes part in the formation of the **esophageal plexus**.



Copyright ©2006 by The McGraw-Hill Companies, Inc. All rights reserved.

Nerves in mediastinum

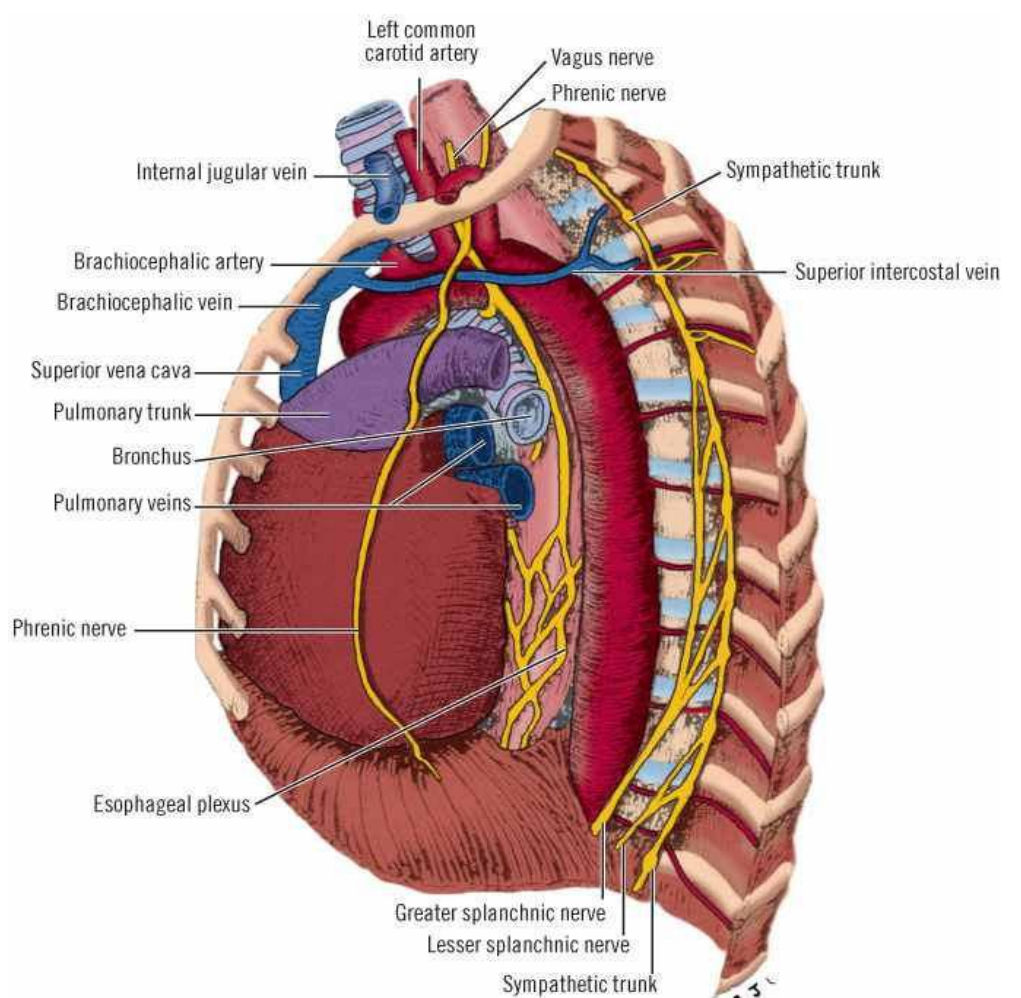
- The **right phrenic nerve** descends in the thorax along the right side of the right brachiocephalic vein and the superior vena cava .
- It passes **in front** of the root of the right lung and runs along the right side of the pericardium, which separates the nerve from the right atrium.
- It then descends on the right side of the inferior vena cava to the diaphragm.
- Its terminal branches pass through the caval opening in the diaphragm to supply the central part of the peritoneum on its under aspect.



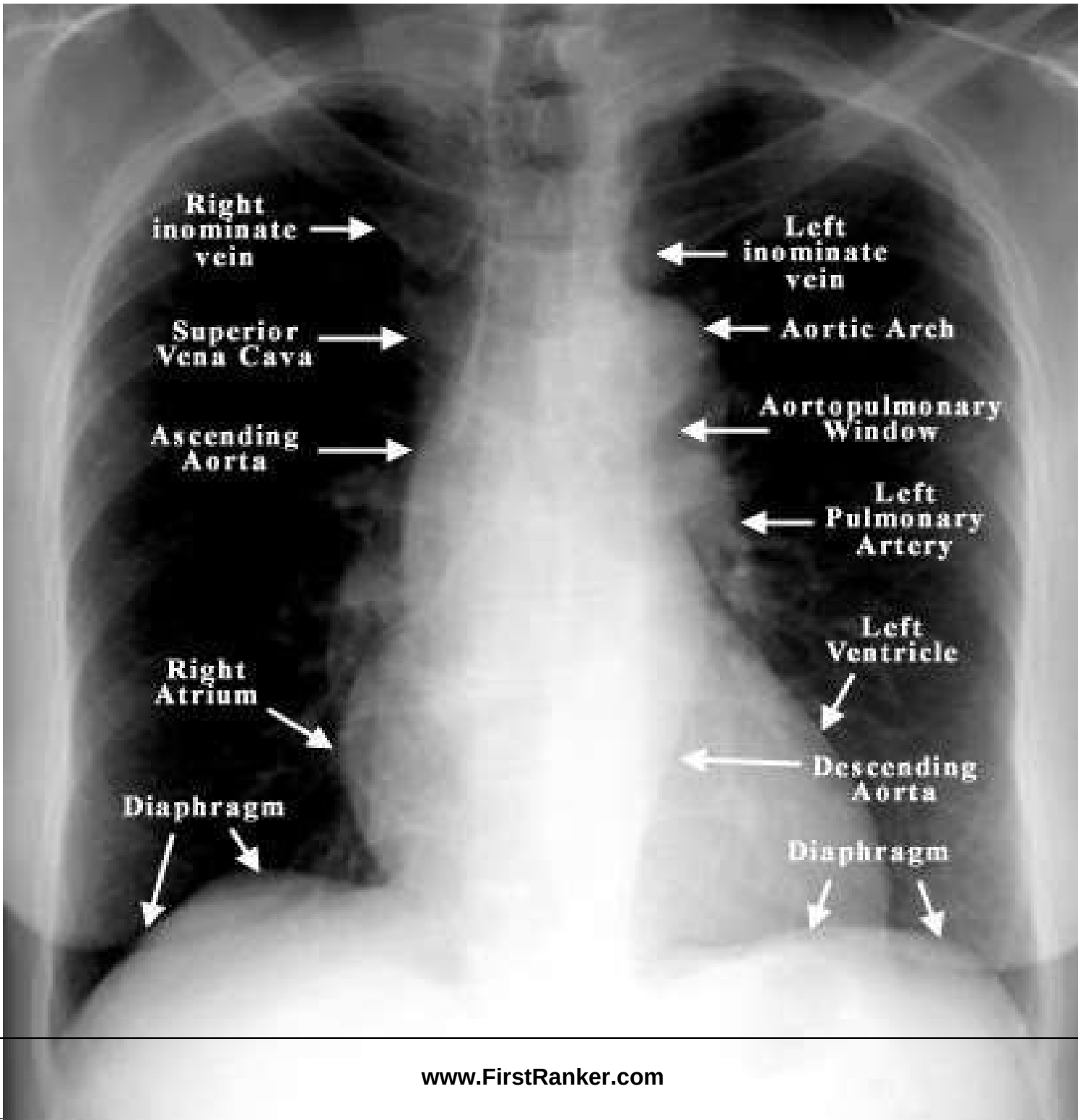
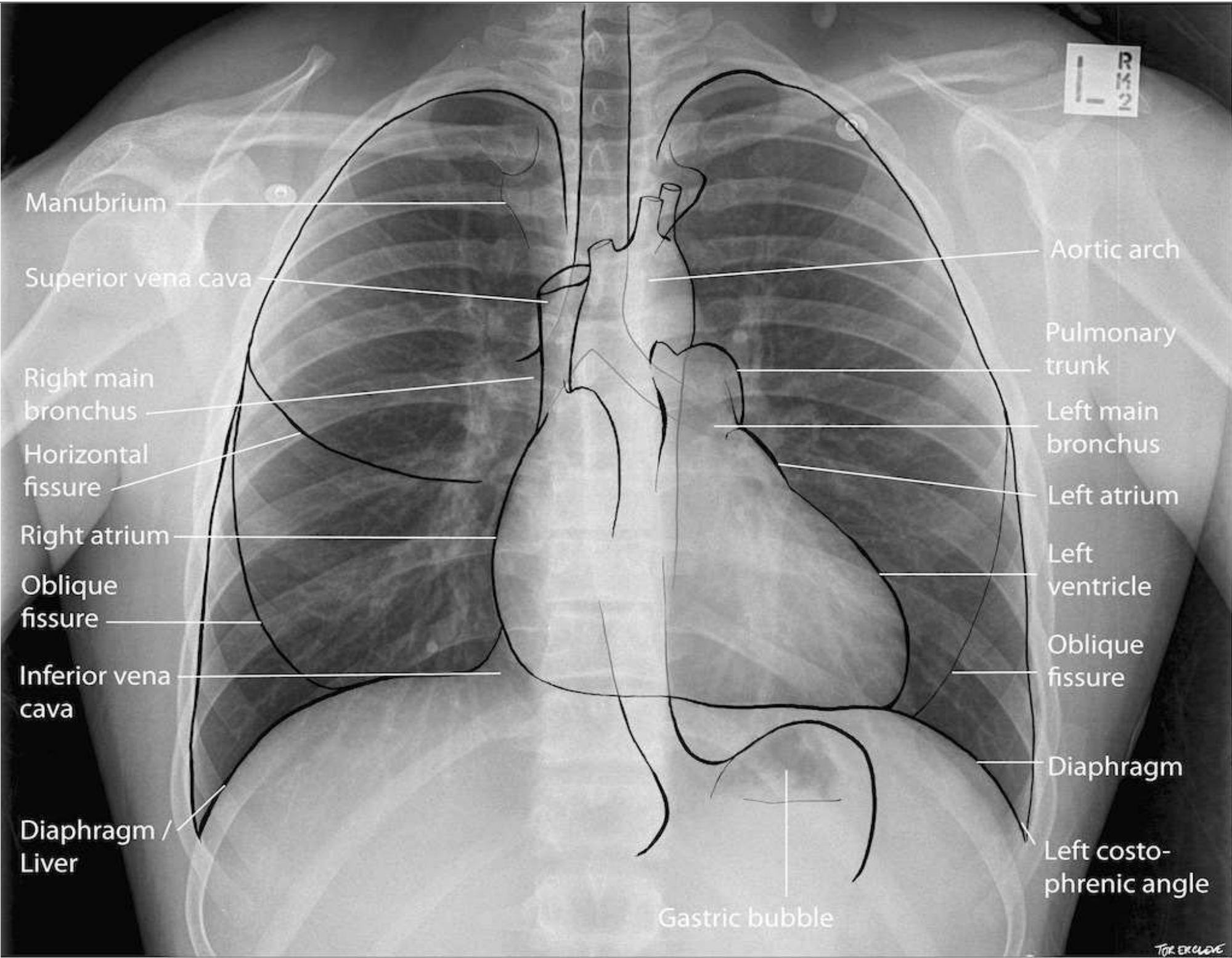
Copyright ©2006 by The McGraw-Hill Companies, Inc.
All rights reserved.

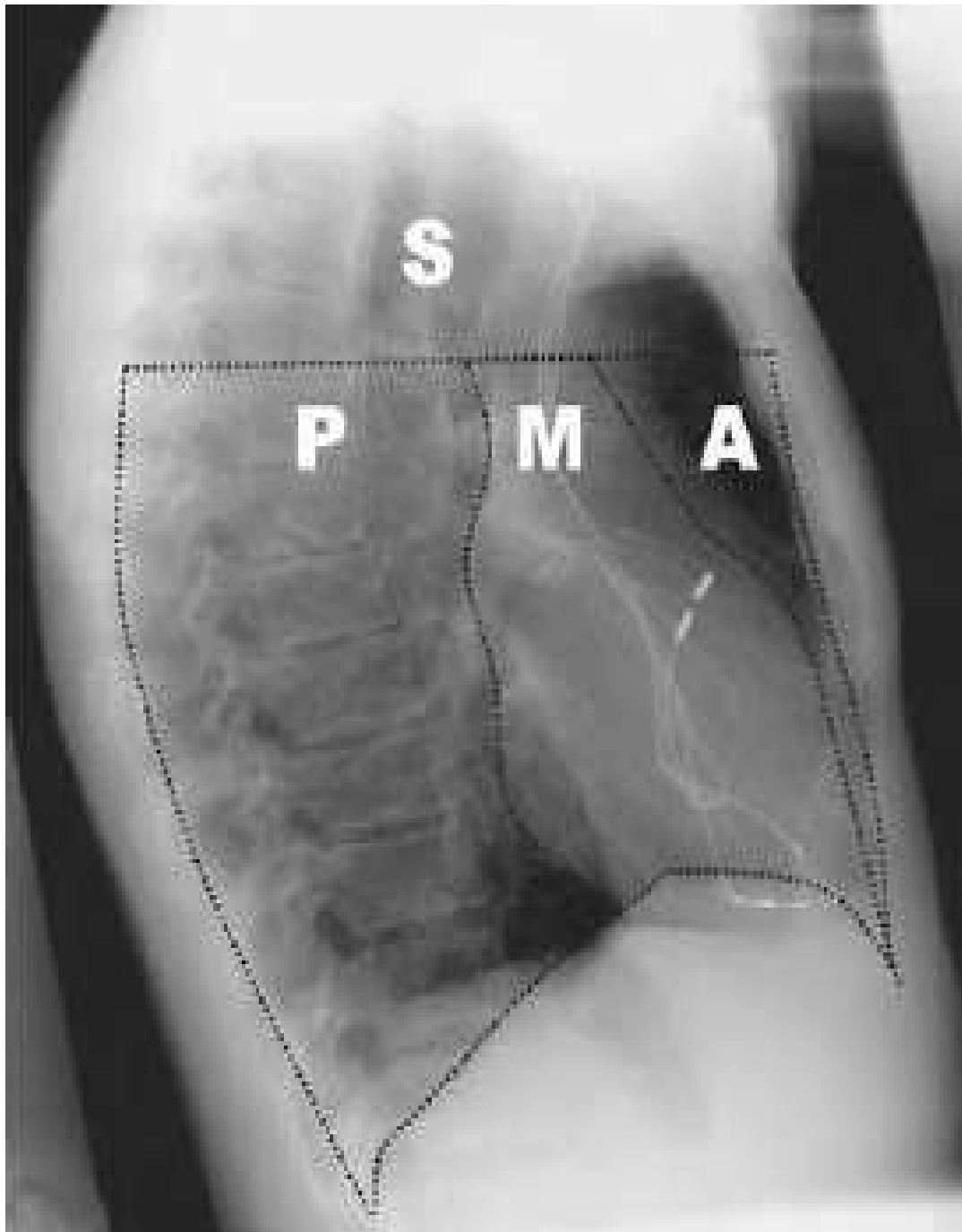
Nerves in mediastinum

- The **left phrenic nerve** descends in the thorax along the left side of the left subclavian artery.
- It crosses the left side of the aortic arch and here crosses the left side of the left vagus nerve.
- It passes **in front** of the root of the left lung and then descends over the left surface of the pericardium, which separates the nerve from the left ventricle.
- On reaching the diaphragm, the terminal branches pierce the muscle and supply the central part of the peritoneum on its under aspect.

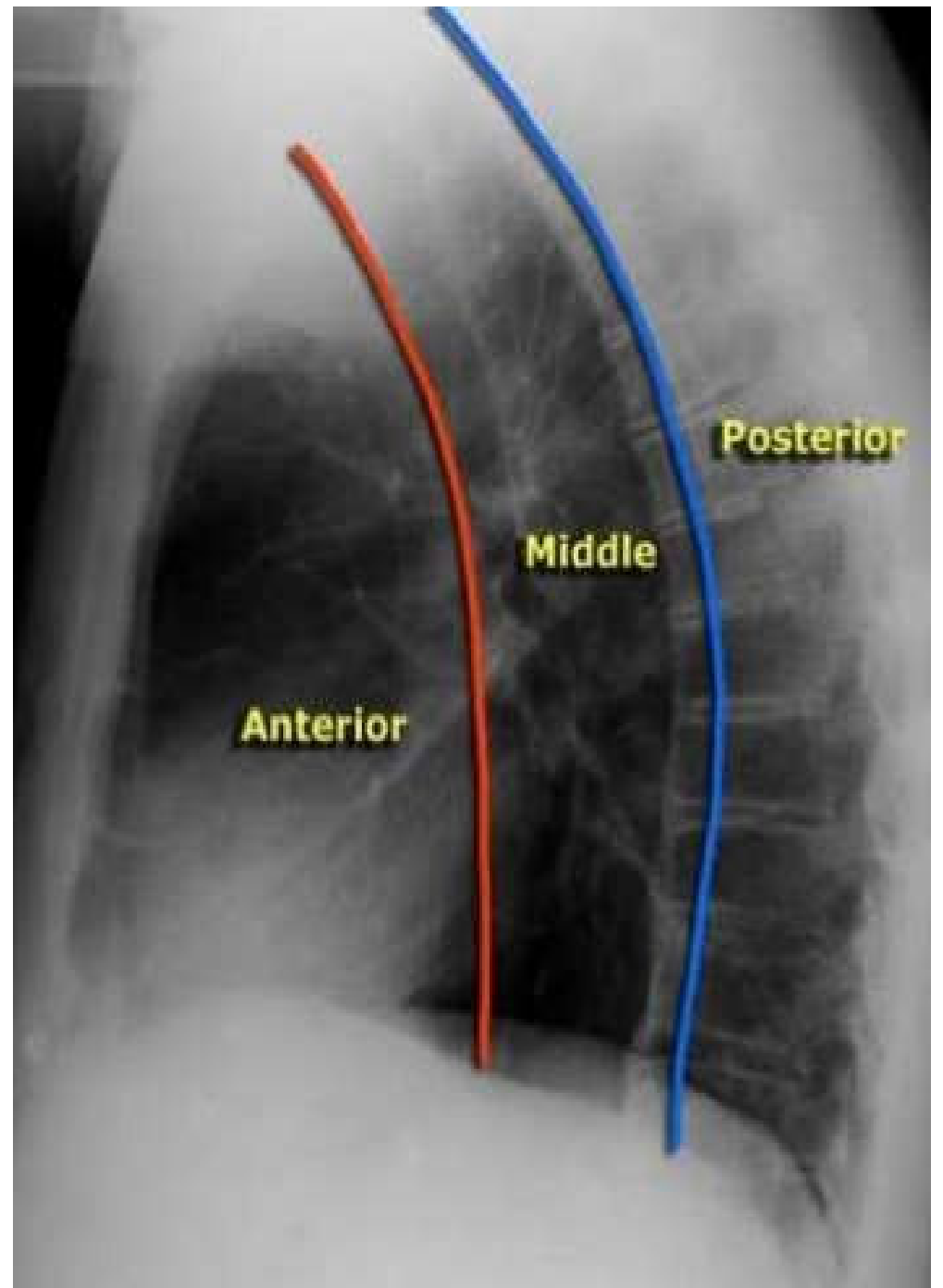


Copyright ©2006 by The McGraw-Hill Companies, Inc.
All rights reserved.





anatomical



Acc. To felson

Clinical correlations

• Deflection of Mediastinum

- ✓ If air enters the pleural cavity (a condition called **pneumothorax**), the lung on that side immediately collapses and the mediastinum is displaced to the opposite side.
- ✓ patient's being breathless and in a state of shock; on examination, the trachea and the heart are found to be displaced to the opposite side



Clinical correlations

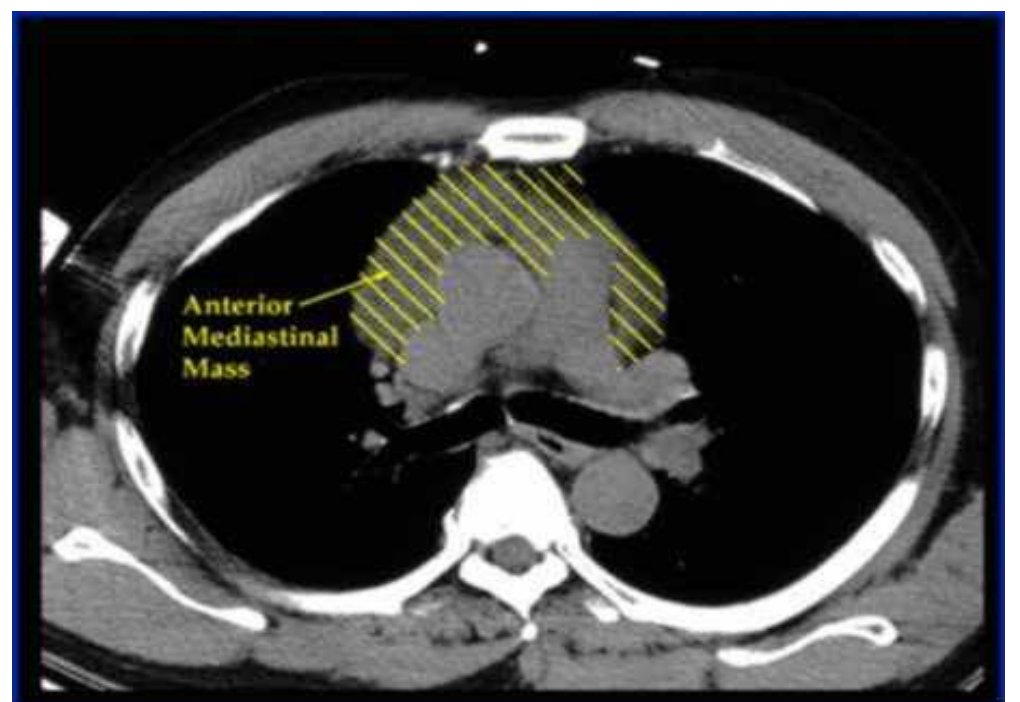
- **Mediastinitis**

- ✓ Deep infection of the neck spread readily into the thorax, producing a mediastinitis.
- ✓ Penetrating wounds of the chest involving the esophagus may produce a mediastinitis.

Clinical correlations

- **Mediastinal Tumors or Cysts**

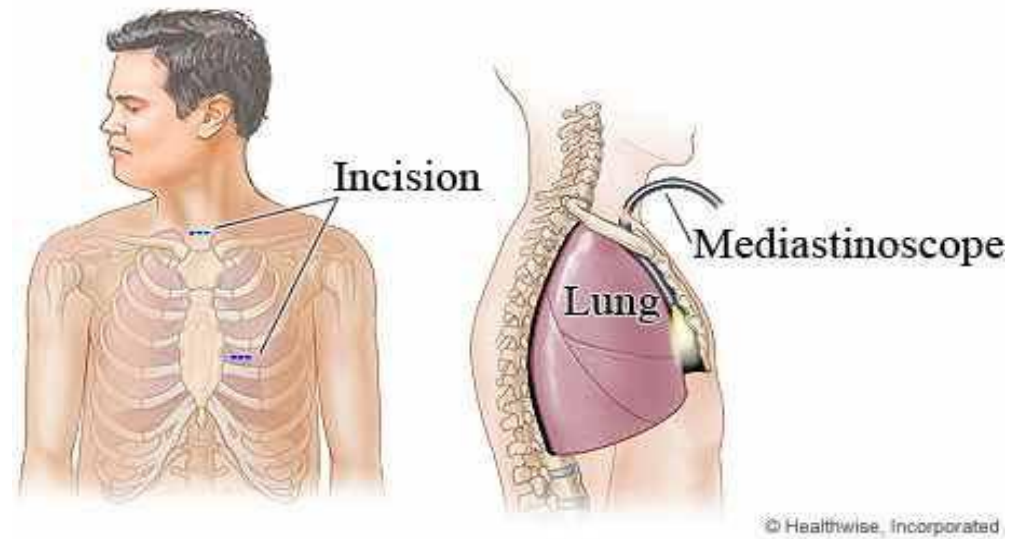
- ✓ Enlargement of mediastinal tumor may compress the left recurrent laryngeal nerve, producing paralysis of the left vocal fold.
- ✓ An expanding cyst or tumor can partially occlude the superior vena cava, causing severe congestion of the veins of the upper part of the body.
- ✓ Other pressure effects can be seen on the sympathetic trunks, phrenic nerves, and sometimes the trachea, main bronchi, and esophagus.



Clinical correlations

- **Mediastinoscopy**

- ✓ diagnostic procedure by which tracheobronchial lymph nodes are obtained without opening the pleural cavities.
- ✓ A small incision is made in the midline in the neck just above the suprasternal notch, and the superior mediastinum is explored down to the region of the bifurcation of the trachea.
- ✓ The procedure can be used to determine the diagnosis and degree of spread of carcinoma of the bronchus.



Summary

- Mediastinum: definition
- Extent and subdivisions
- Contents
- Nerves passing thorax
- Clinical correlations