

The Thoracic Wall: Bony Thoracic Cage

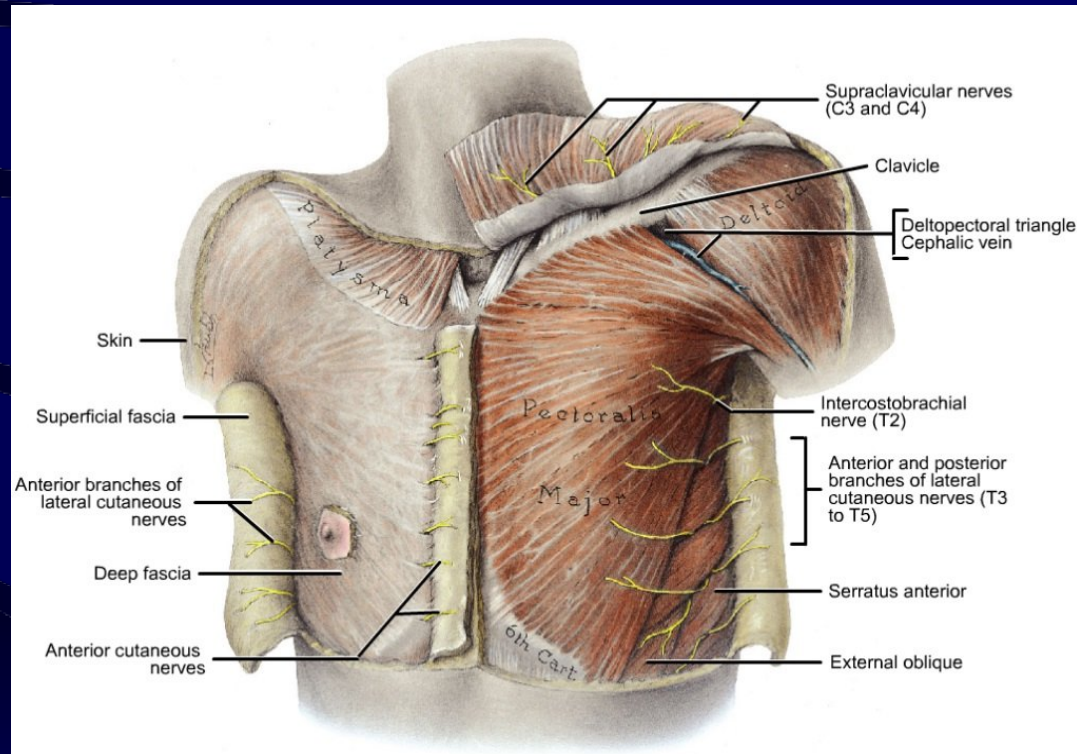
Thoracic Wall

- **Structure:**

Skin → Fascia → Muscle → Bone
→ Blood vessels & Nerves

- **Functions:**

1. Protection of thoracic viscera.
2. Provides the mechanical function of breathing.



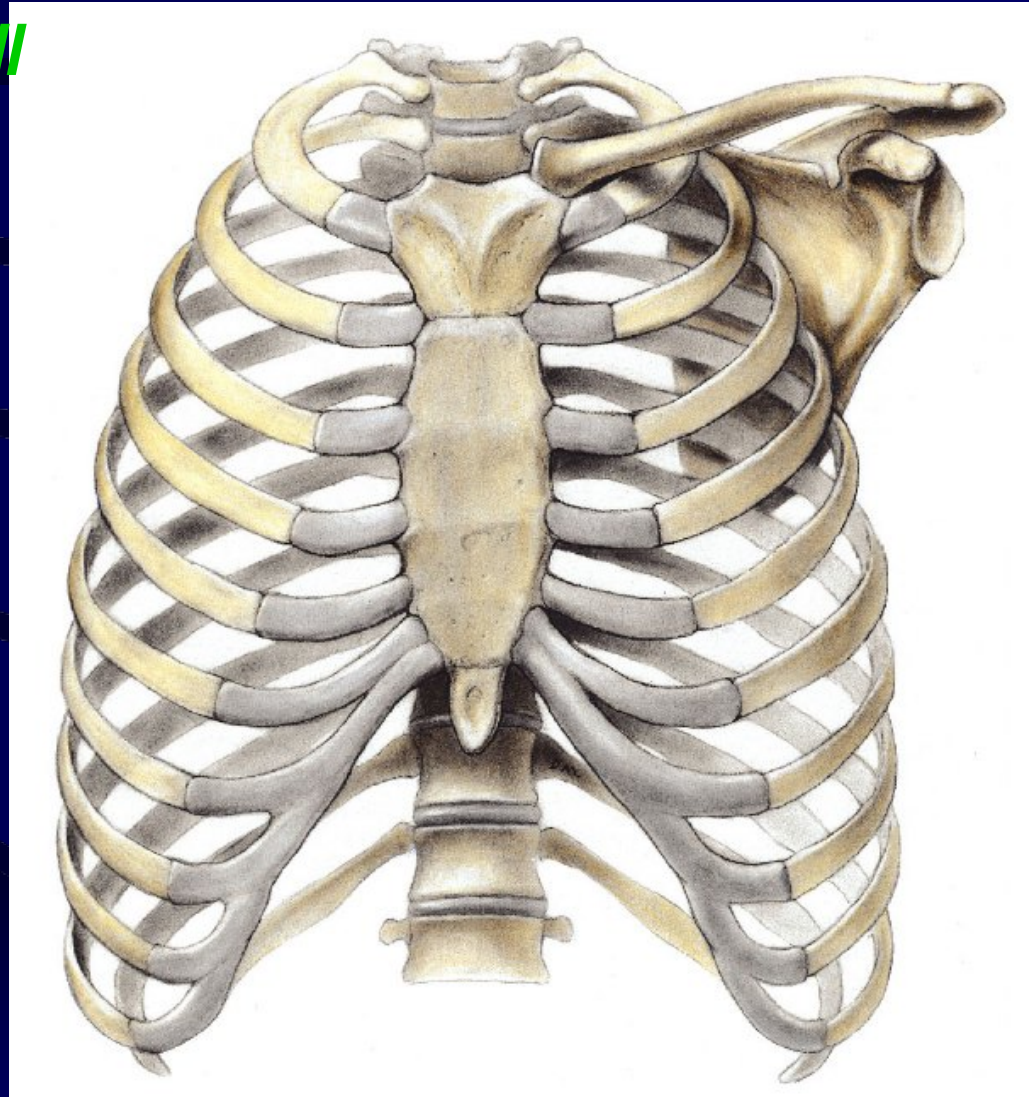
Thoracic Cage

The bony part of thoracic wall

12 pairs of Ribs & CC .

12 Thoracic vertebrae .

- Sternum .



Ribs

- Flat curved bones with high resilience.
- Form most of the thoracic cage.

2 Types:

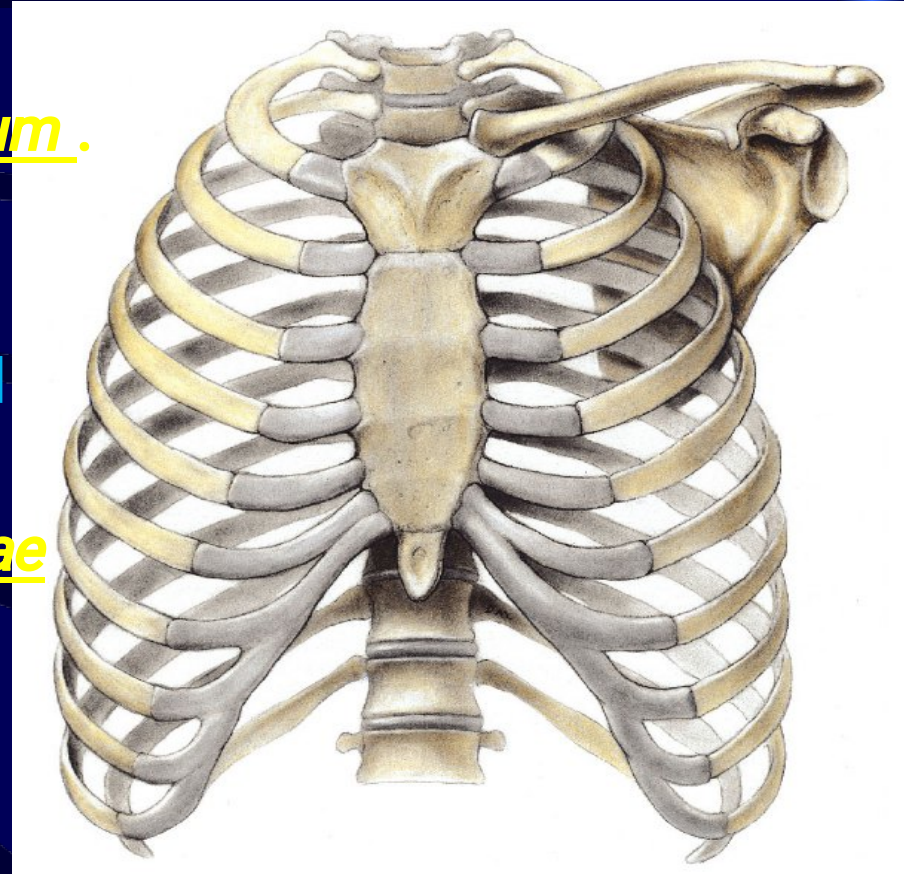
According to there relation to sternum .

1. True ($1^{\text{st}} - 7^{\text{th}}$) vertebra - Sternal.
2. False ($8^{\text{th}} - 10^{\text{th}}$) vertebra - Chondral
3. Floating : (11^{th} & 12^{th}).

According to there relation to vertebrae

Typical: (3-9)

Atypical ribs: (1-2 10-11 12)



Features of Typical Ribs

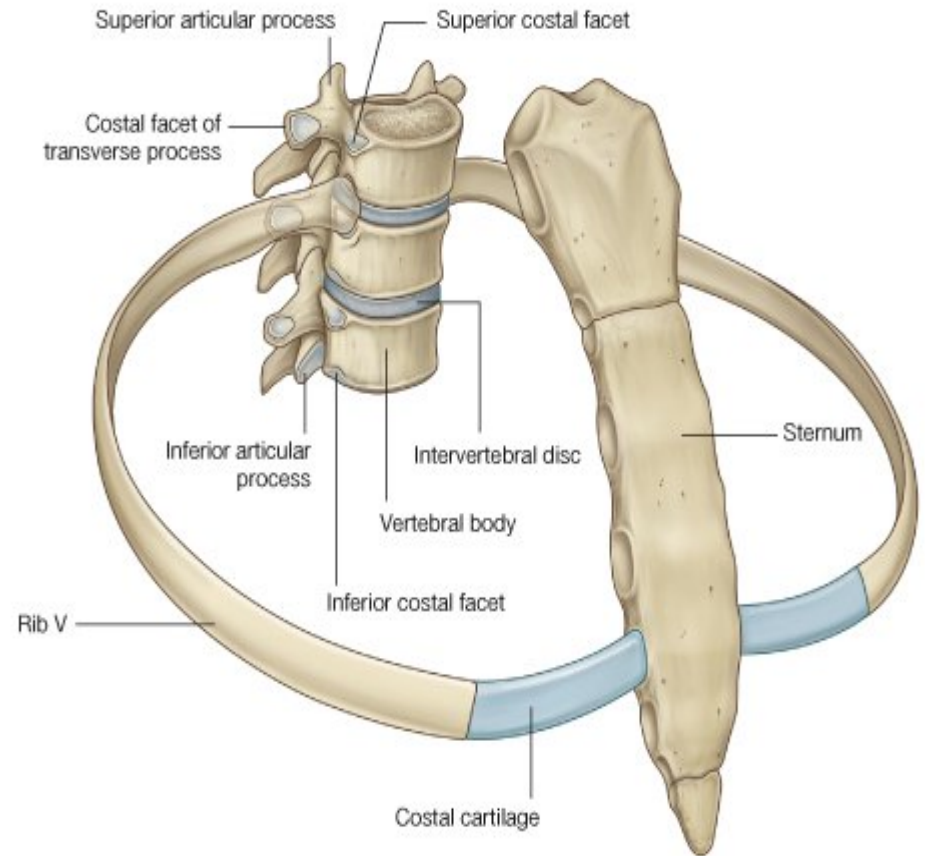
The post end is higher than ant end. Most ribs run Downwards , CC run upward

1. Head: wedge-shaped with 2 articular facets, crest in between.

2. Neck: connects the head with the tubercle.

3. Tubercle: articular smooth non-articular rough parts.

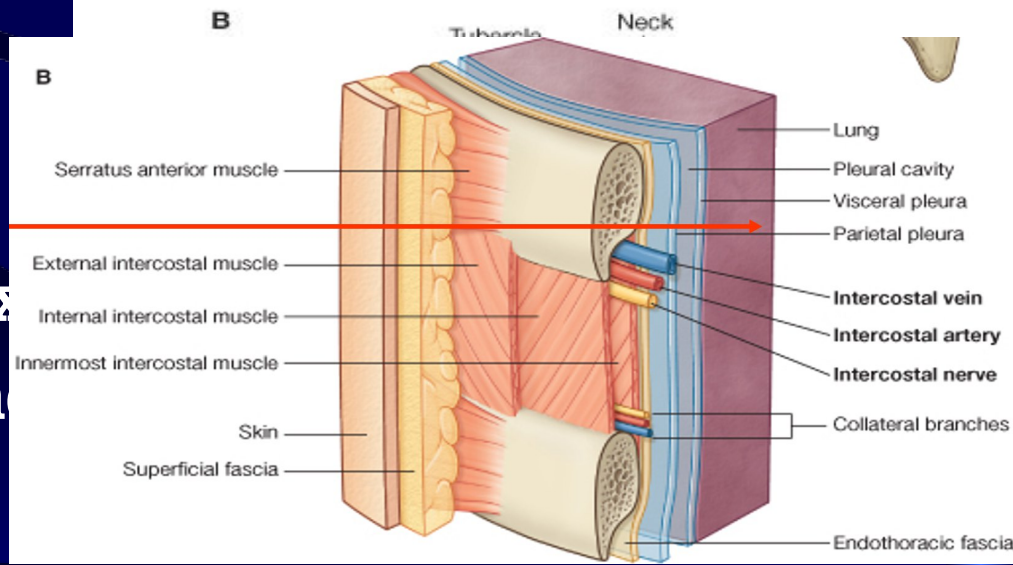
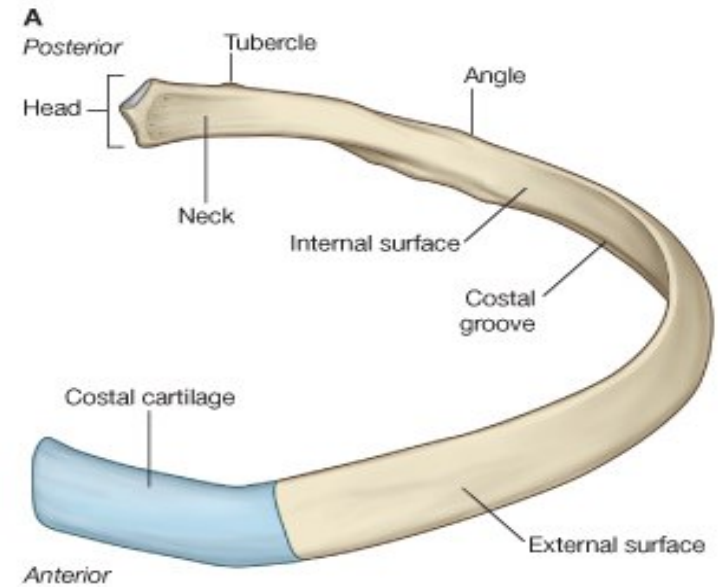
4. Shaft (Body): angle & costal groove.



Typical Ribs

3rd – 9th ribs are considered typical

1. Articular facets for body of its own vertebra, and one above it.
2. Tubercle of Head Articulate with tip of TP of its own vertebra.
3. Neck: Between head and tubercle
4. Angle: Between Post $\frac{1}{4}$ of rib is cylindrical, Ant $\frac{3}{4}$ is flattened, has upper, lower border.
5. Costal groove: lower aspect of inner surface
6. Shaft: Outer surface is convex covered by muscles, inner surface concave covered by pleura.



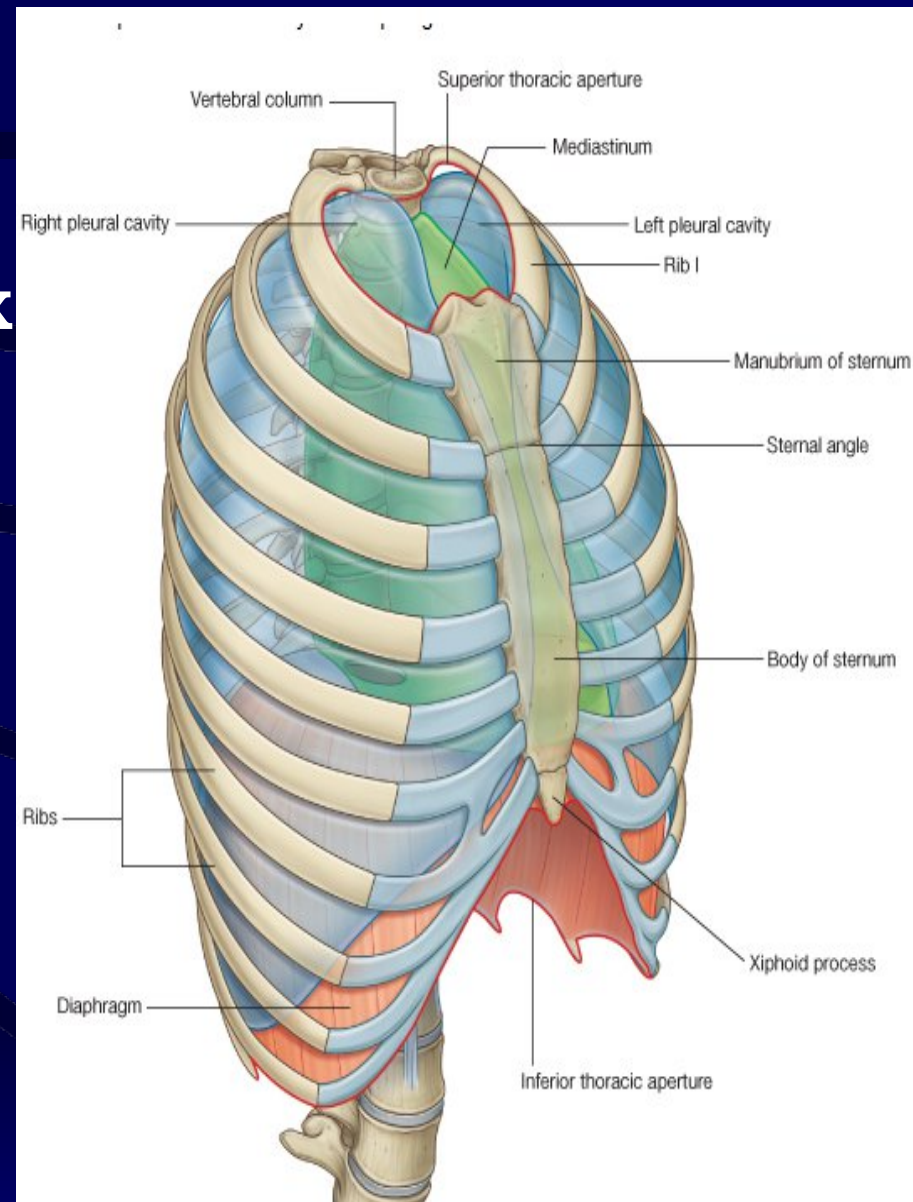
Special features

- Ribs and costal cartilage increase in length 1-7.

Rib 7 is the longest rib.

Transverse diameter of thorax increase 1-8. Rib 9 is most oblique

- Cartilage of rib 10 is lowest point when palpated from front



Clinical: Cervical Rib

- Extra rib arise from C7 vertebra , causes pressure on structures which lie on upper surface of first rib.
- Present in ~1% of people.
- Bony or ligamentous band.
- Complications:

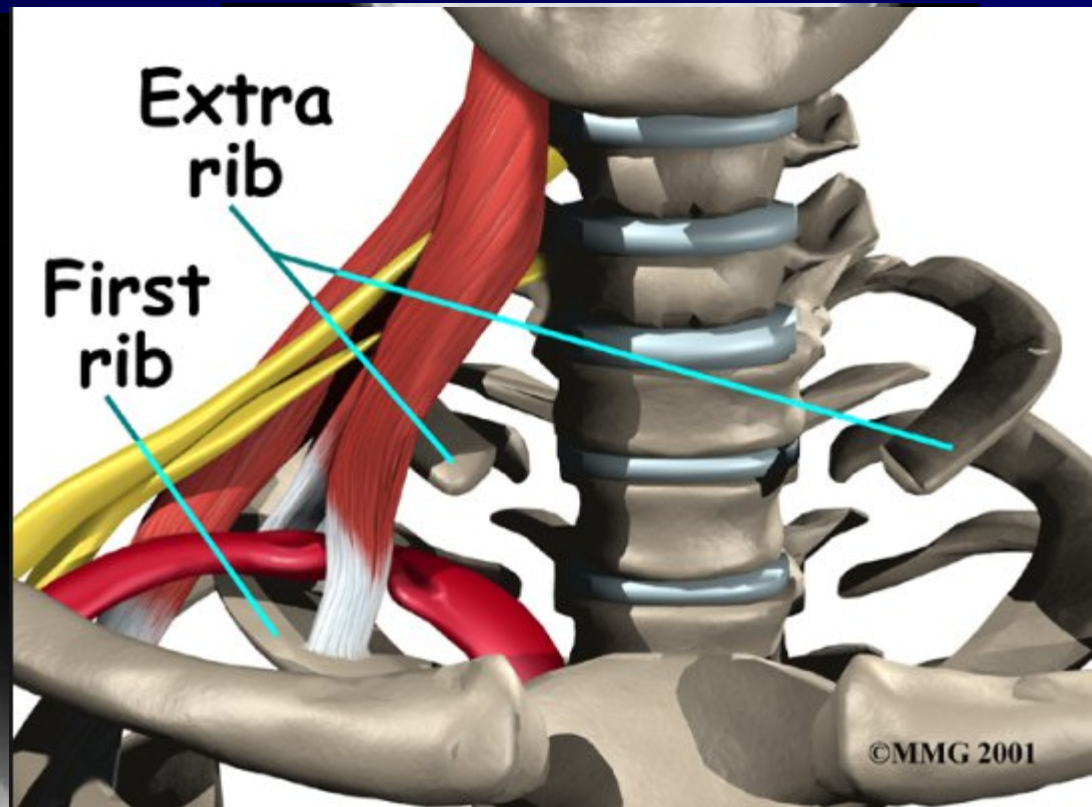
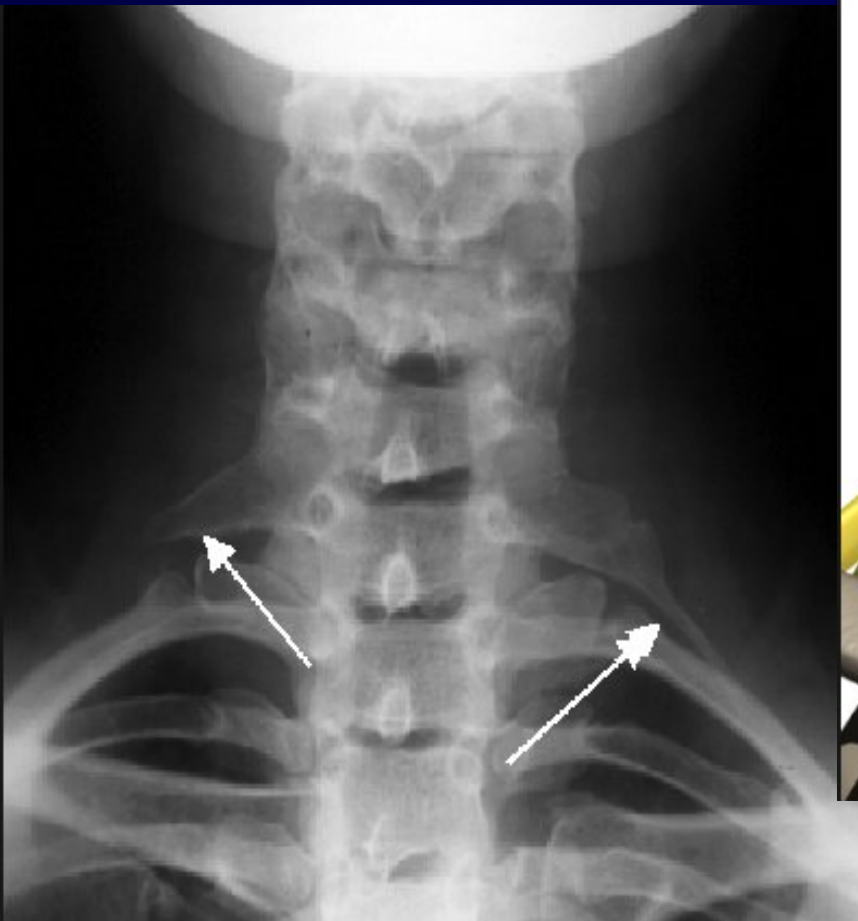
Causes pressure on Nerves & Arteries supplying the upper limb.

Tingling & Numbness **Partial** paralysis (Ulnar side of forearm and hand).

Ischemic muscle pain (Pallor-Coldness).

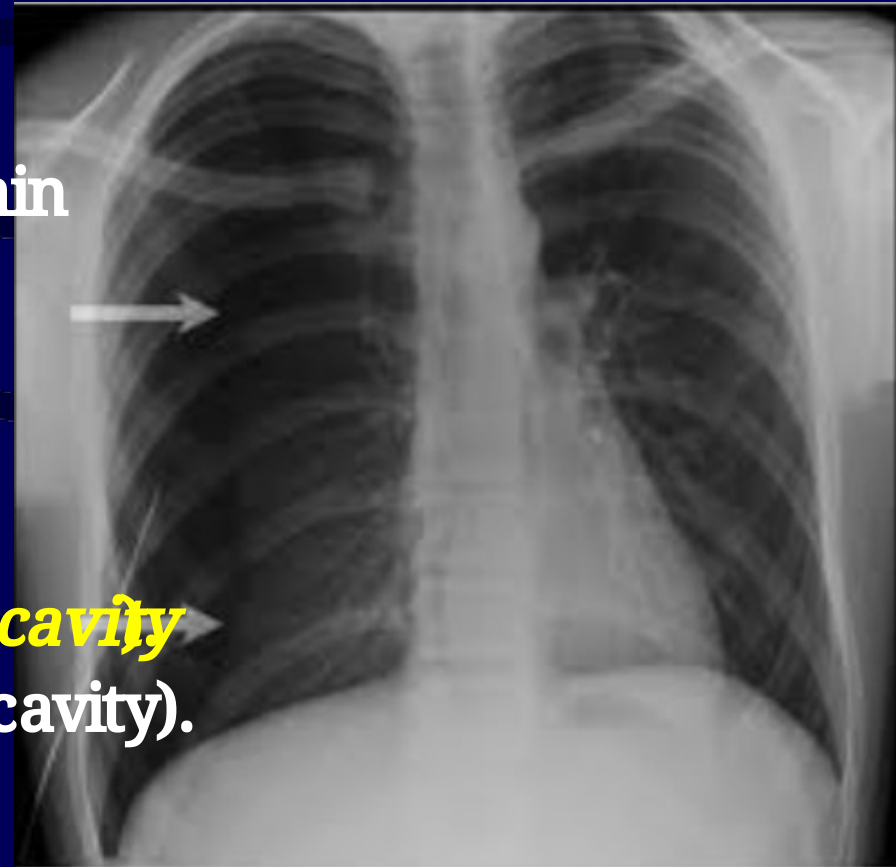


Cervical Rib



Rib Fractures

- Common chest injuries (*middle ribs, 5-10*)
- Mostly in weakest part anterior to (*the angle*).
- Present as a Severe localized pain on coughing-sneezing , laughing).
- **Complications:**
- Inj. to underlying structures (lung – spleen-liver).
- **Pneumothorax**(*air in pleural cavity*)
- **Haemothorax**(blood in pleural cavity).



Signs of rib fracture

- Localized pain, tenderness .
- Pain worse with palpation.
- Pain worse with coughing, deep breathing .

- Management

Analgesia is essential in treatment (Multi Modal Pain Control Strategy).

High concentration of O₂.

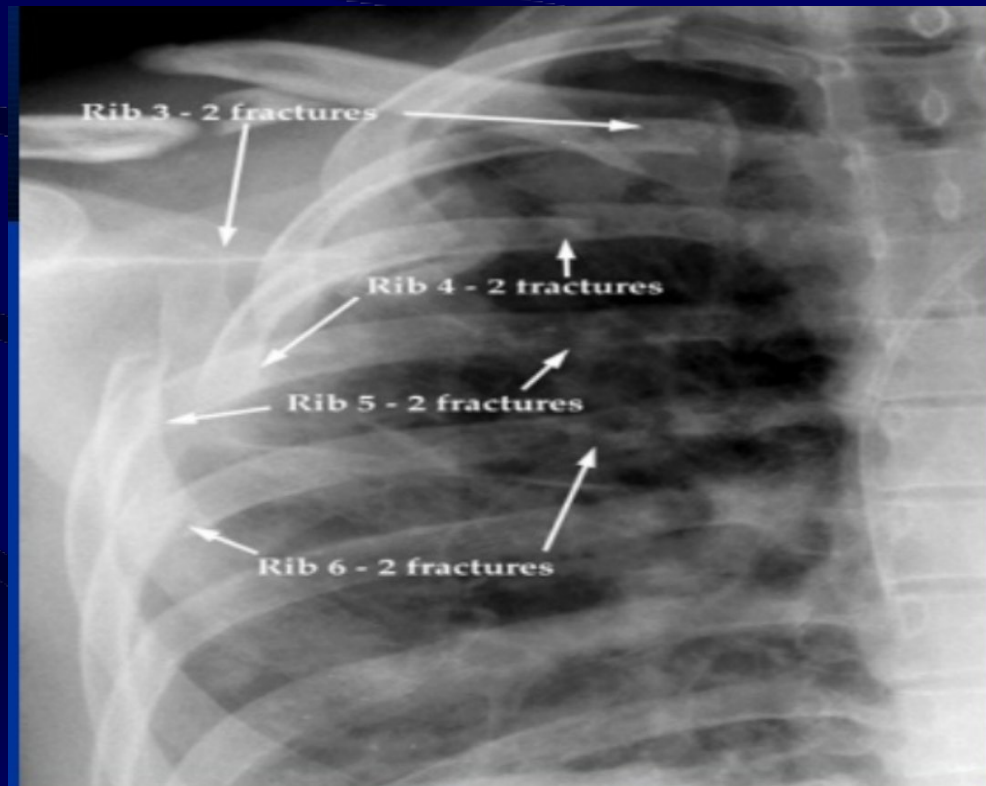
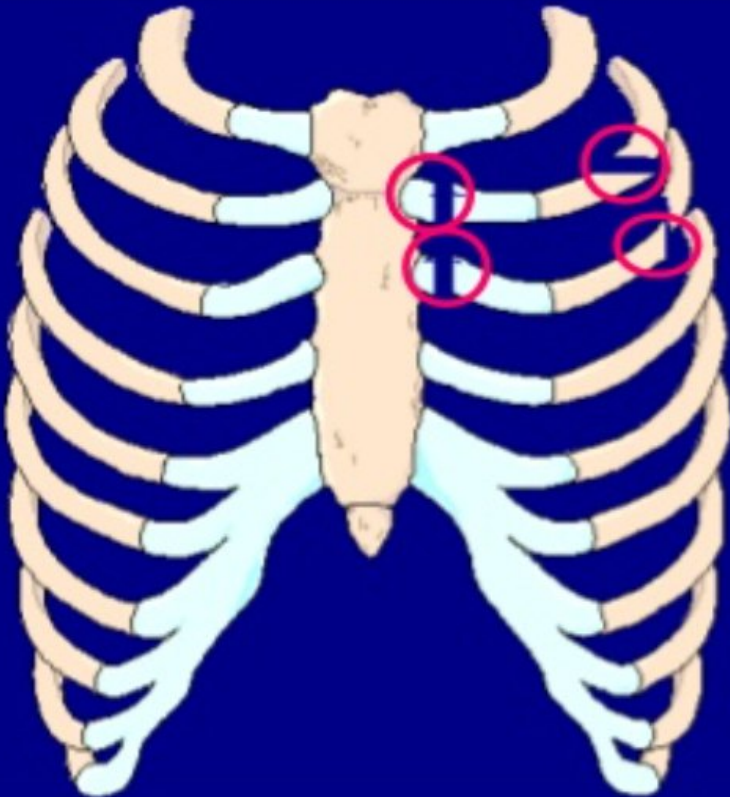
Positive pressure ventilation.

Non-circumferential splinting.

SSRE.

Flail Chest

- Two or more adjacent ribs fractured in two or more places.
- ***A segment of the Chest Wall does not have Bony Continuity with the rest of the thoracic cage.***

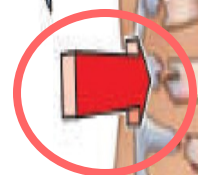


S/S of flail chest

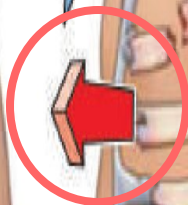
- Shortness of breath.
- Paradoxical movement with respiration.
- Bruising , swelling.
- Crepitus.
- May not be obvious soon after injury.
- **80%needs ICU admissions, 50%need ETL**

Inspiration

Expiration



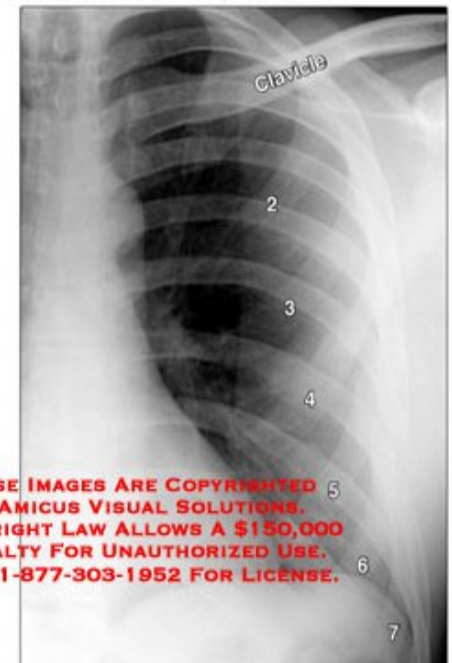
Flail segment



A

Costochondral
disruption

B



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Bulky Dressing for splint of Flail Chest

Clip slide



- Use Trauma bandage and Triangular Bandages to splint ribs.

Sternum

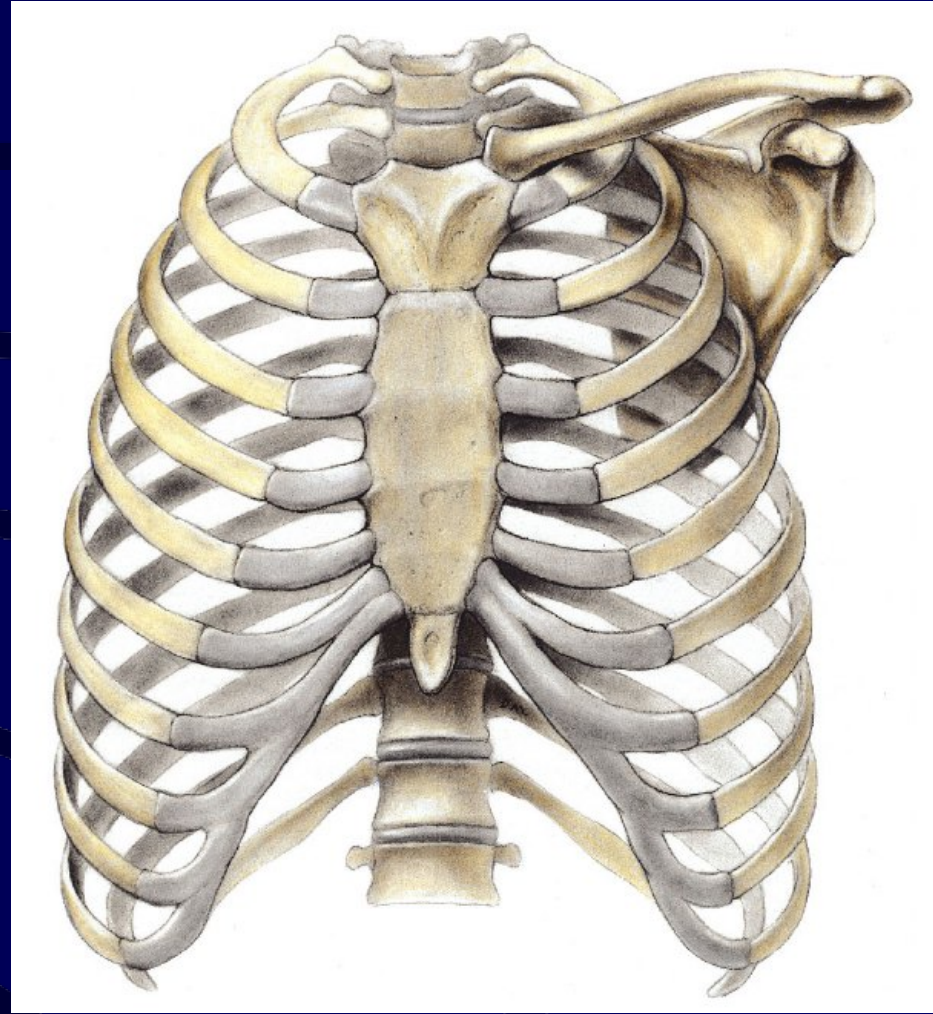
(G, Sternon: chest bone)

Flat, vertically elongated bone that forms the middle anterior part of the thoracic cage.

3 parts:

Manubrium : 2 inches long

Body : 4 inches long



Manubrium

▼ Shaped 2 inches long

(Handle of dagger)

Lies opposite 3^d, 4th TV

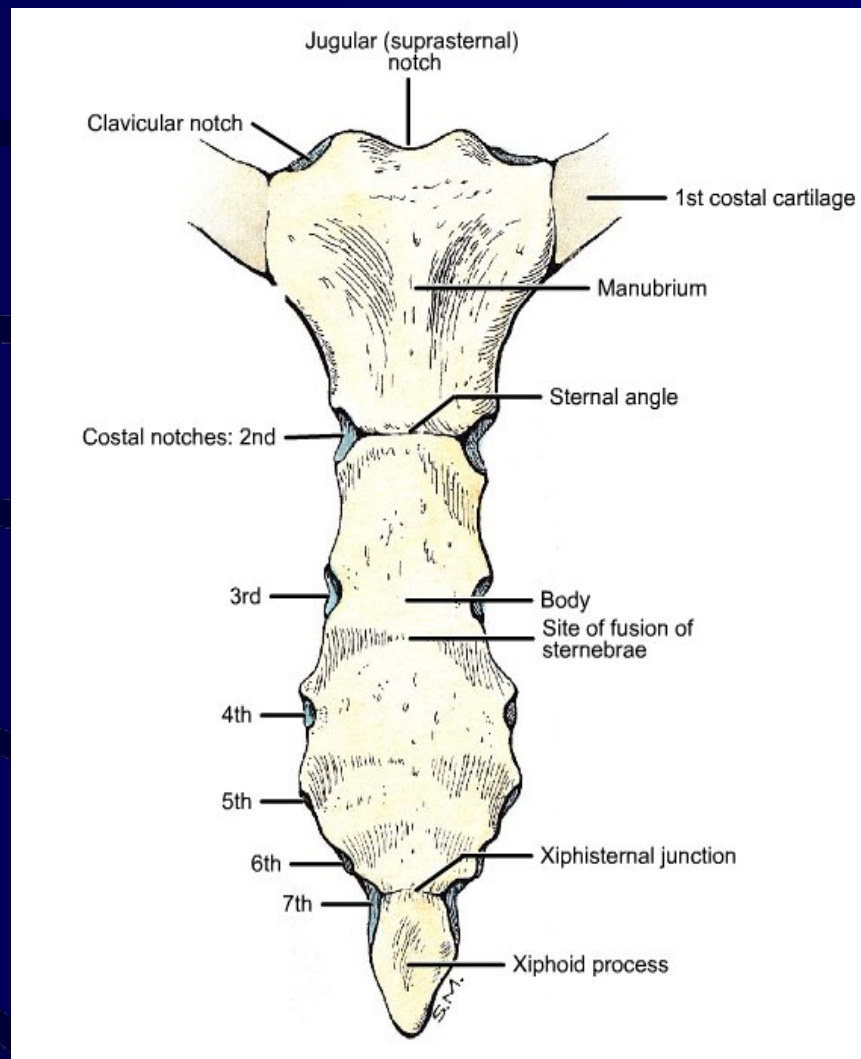
* Several notches:

Jugular ☒ Clavicular ☒ Costal

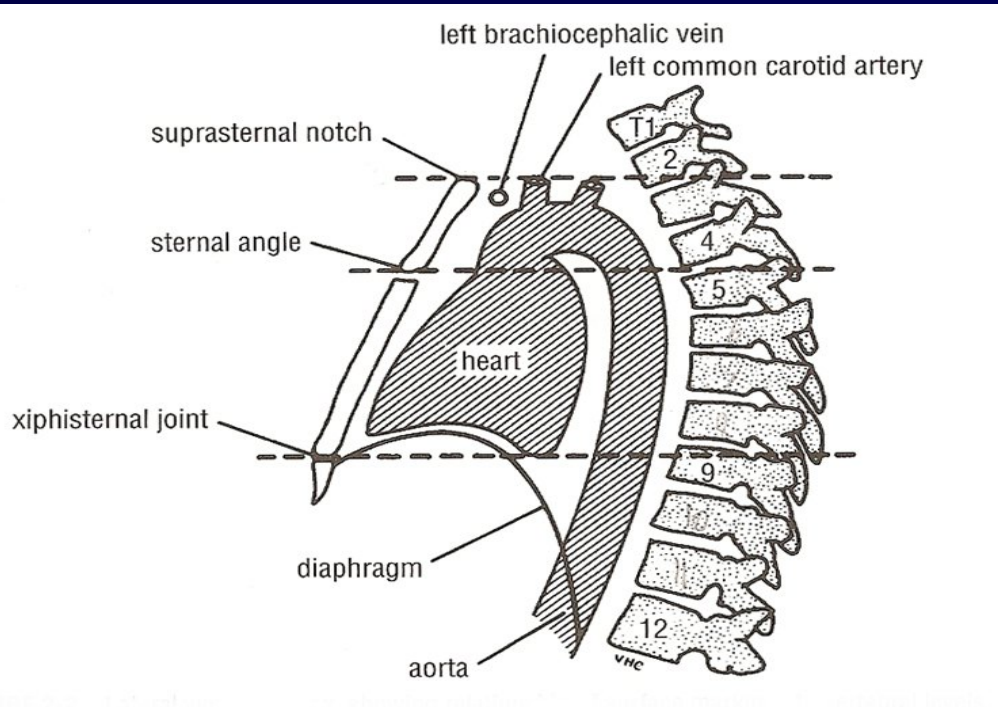
* Manubriosternal Joint:

2° fibro cartilaginous joint

Sternal angle.



Sternal Angle

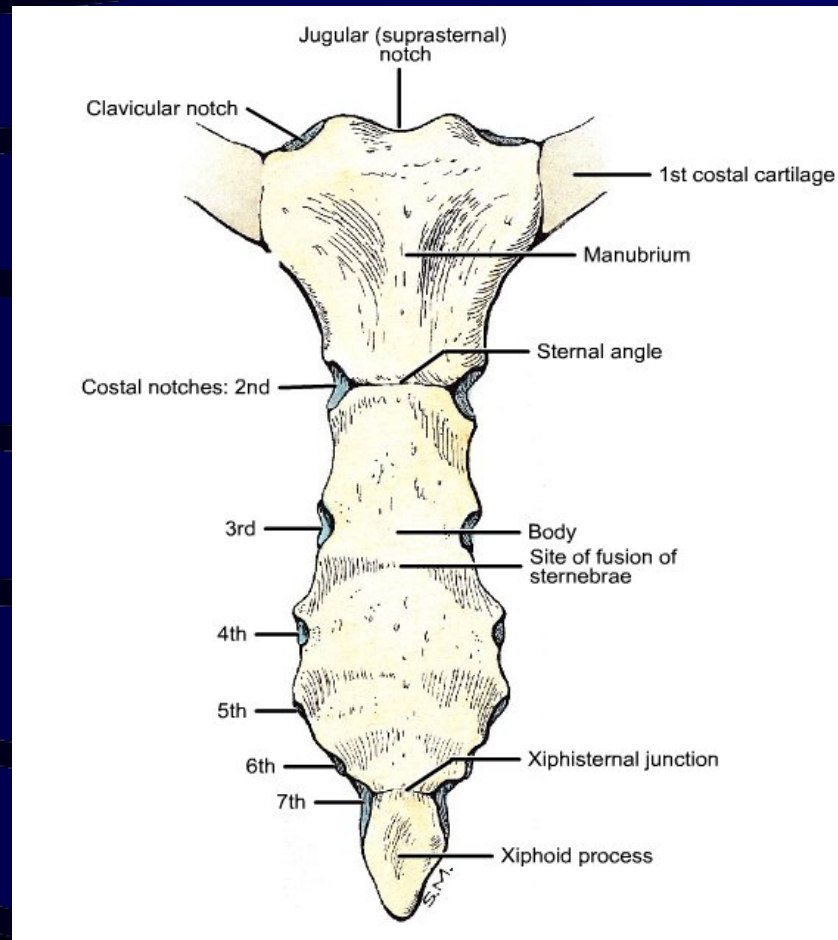


Angle of Lewis

Manubrio-sternal joint

Easily palpated

2nd costal cartilage:
Counting the ribs & intercostal spaces



Body: T5 – T9, costal notches 3rd – 7th

Xiphoid process: T9, hyaline cartilage ☒ ossified 40y

Clinical points related to sternum

- **Sternal Puncture**

Specimen of BM can be taken from sternum.

- It contains Red bone marrow through life.
- It lies Subcutaneously.
- Thin layer of cortical bone.

Sternal Splitting Longitudinally in cardiac surgery.

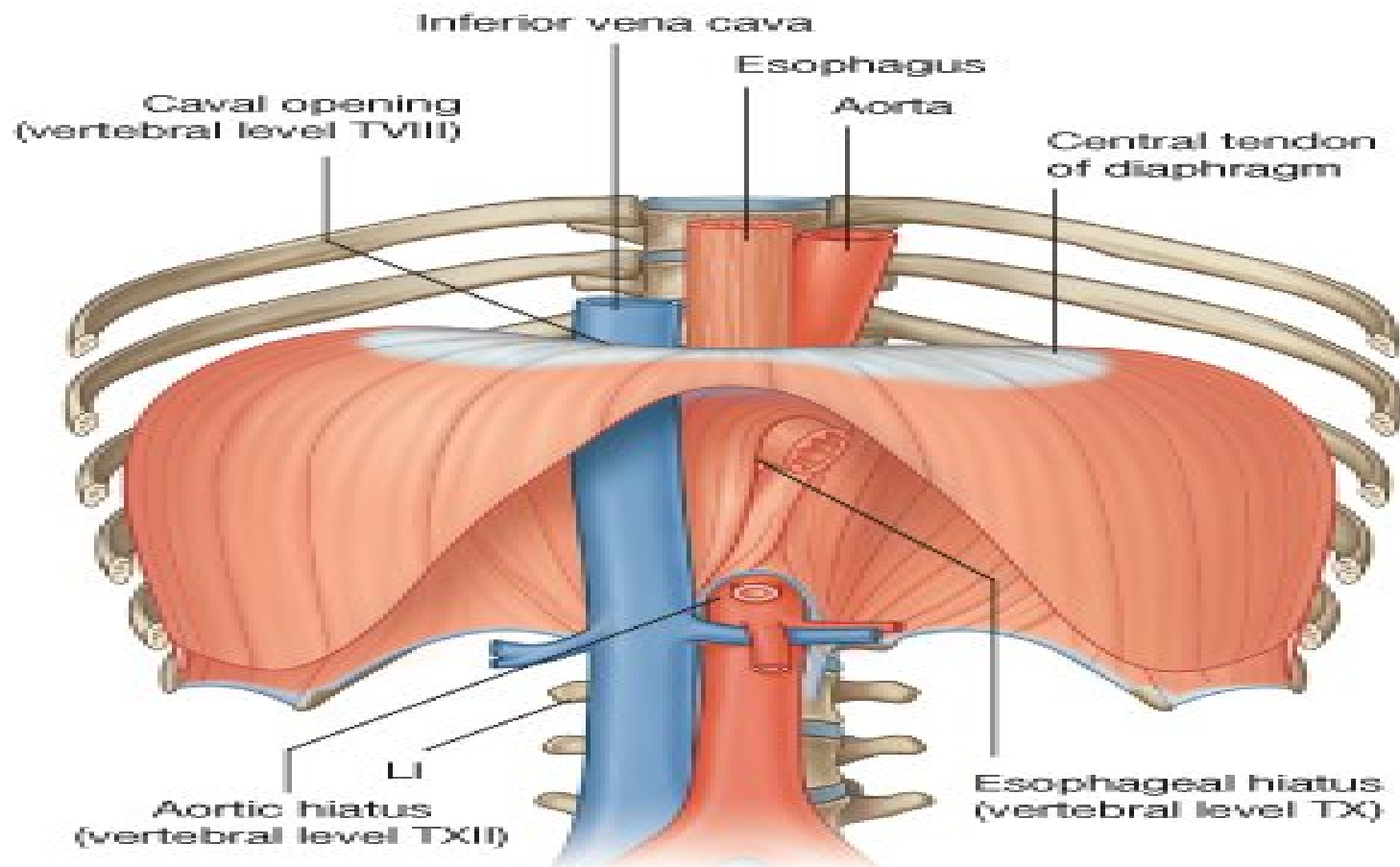
Sternal Fracture Blunt trauma RTA.

Muscles of Thoracic Wall:
**Diaphragm, IM's, Accessory muscles of
respiration**

Diaphragm

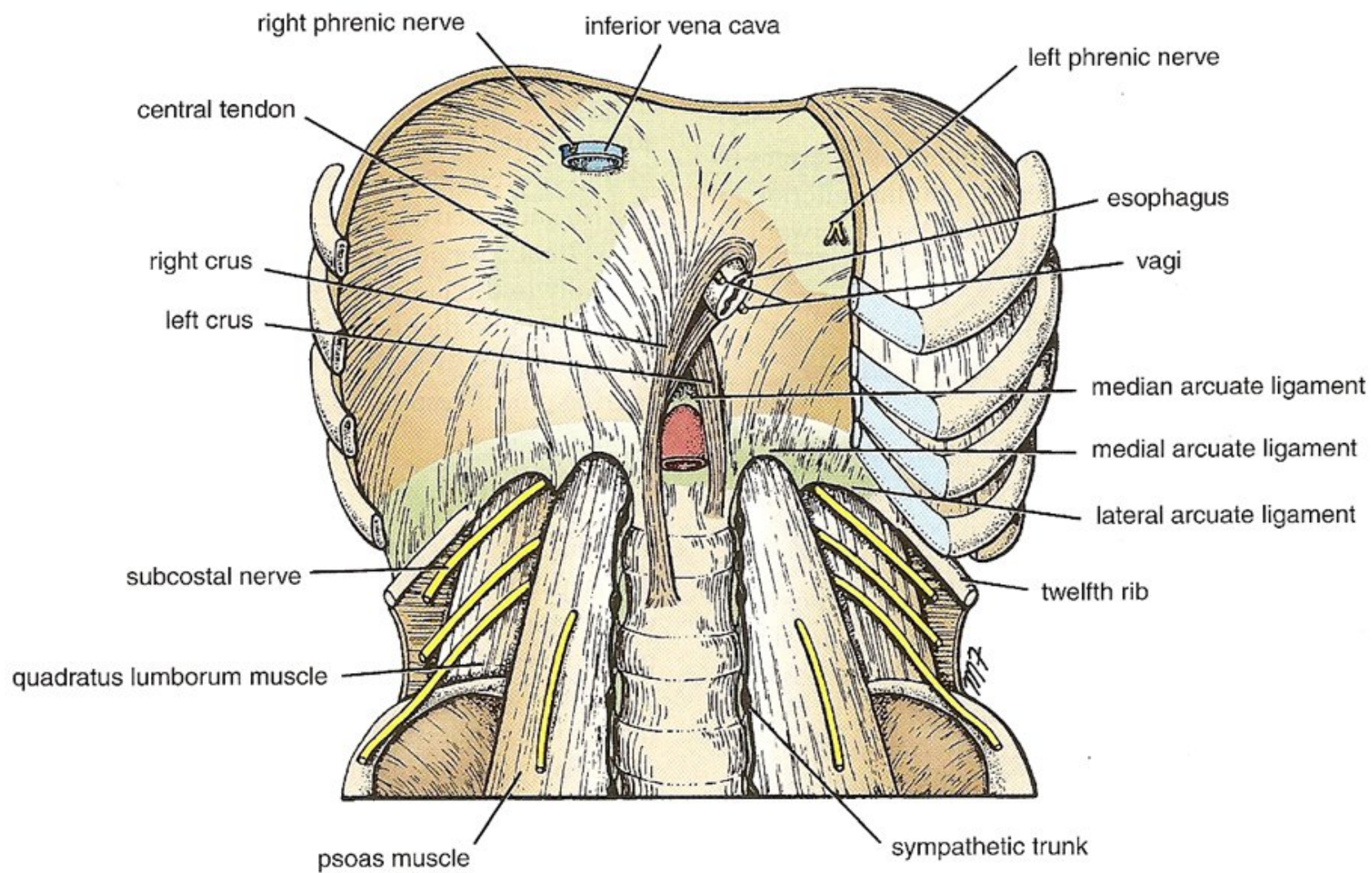
A Thin Muscular & Tendinous sheet that separates the thoracic cavity from the abdomen

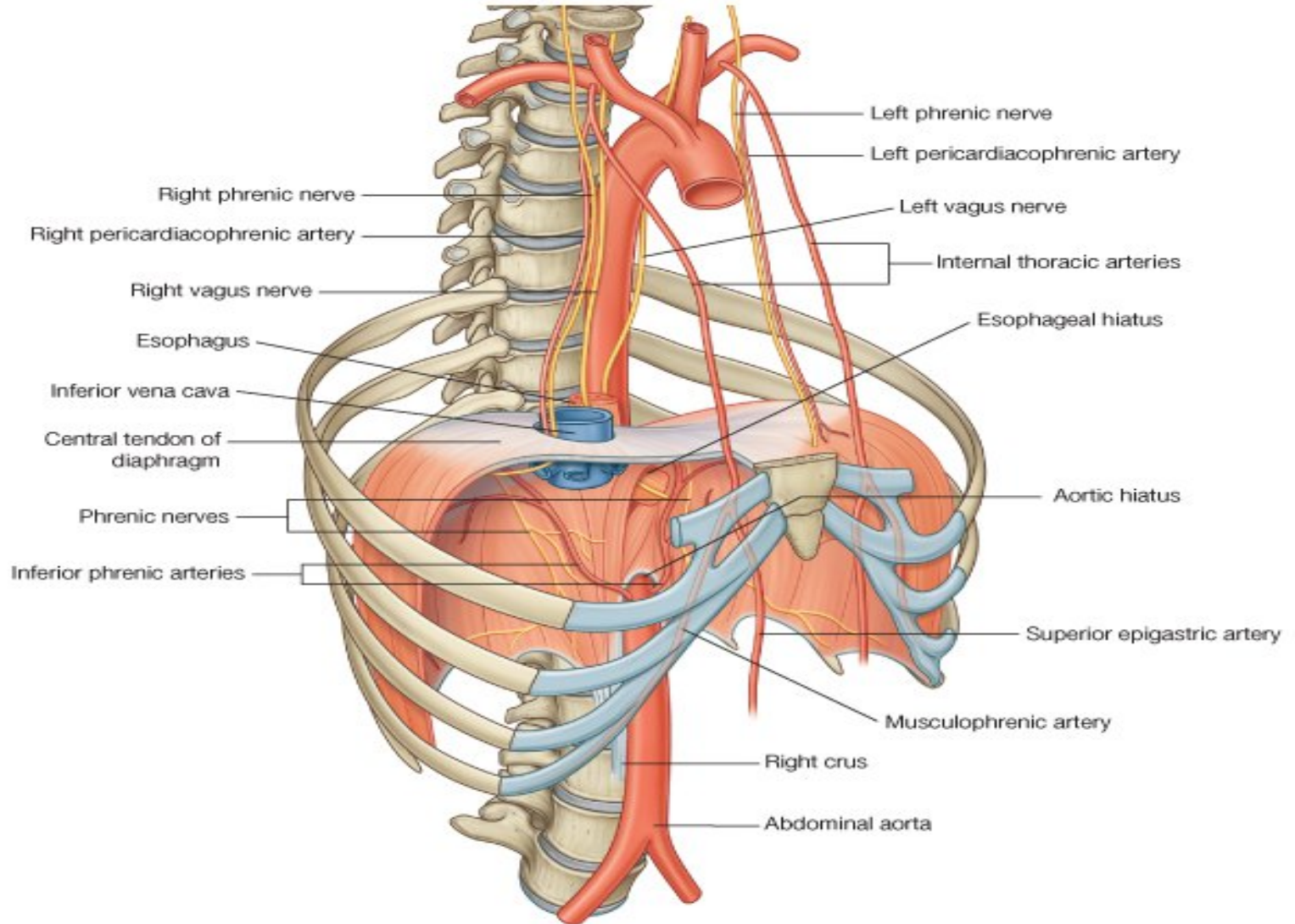
(Primary Muscle of Respiration)



Diaphragm

- Origin:
- (Sternal): 2 fleshy slips from back of xiphoid process.
- Costal origin: fleshy slips from Inner surface of lower 6 ribs & CC (7th-12th).
- Vertebral origin: 2 strong muscular crura 1st 3rd bodies of lumbar Vertebra & IV discs, and 5 actuate lig.
- RT Crus: Bodies and IV Discs, of 1-3 lumbar vertebra.
- LT crus: Bodies and IV Discs, of 1-2 lumbar vertebra.
- Insertion
Central Tendon
- Innervation
Motor: Phrenic nerve (C3, 4 & 5)
Sensory: Central: phrenic nerve
Lateral: intercostal nerves (T7-T12).





Vertebral Origin of Diaphragm

Crura: vertical columns of muscle bundles **Rt:**
L1-L3 & Inter Vertebral discs

Forms a sling around esophagus

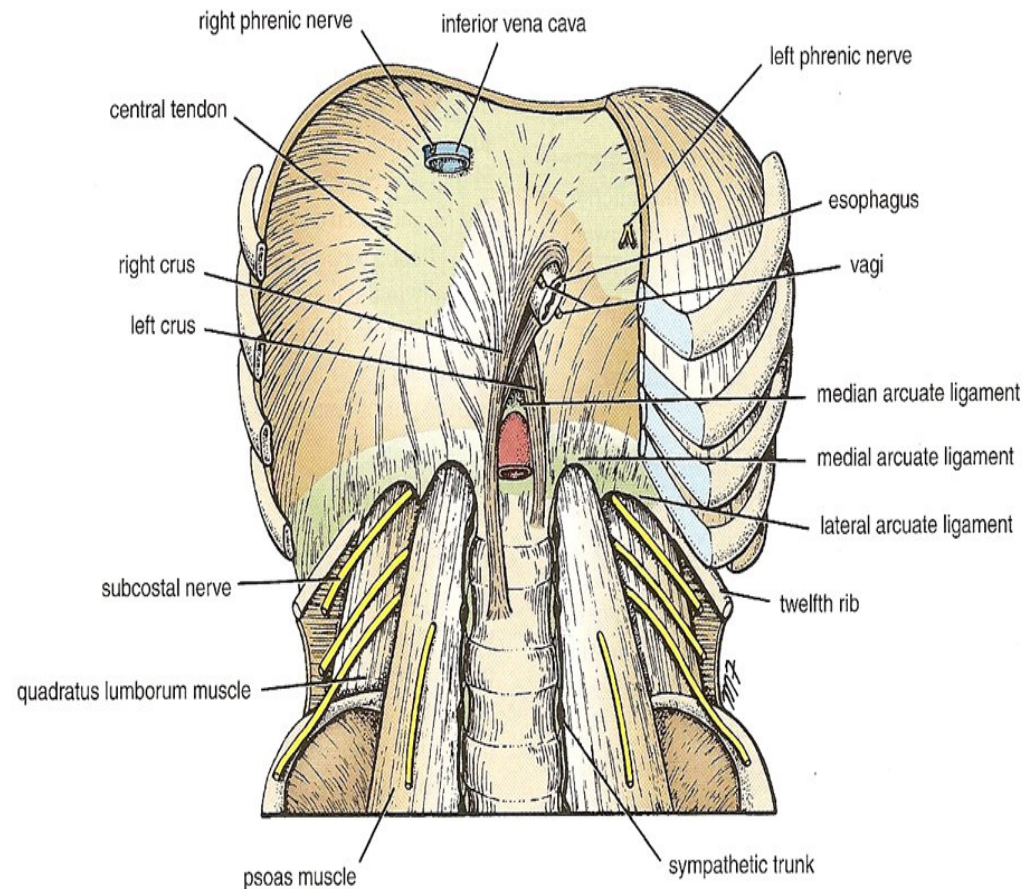
Lt: L1-L2 & IV disc

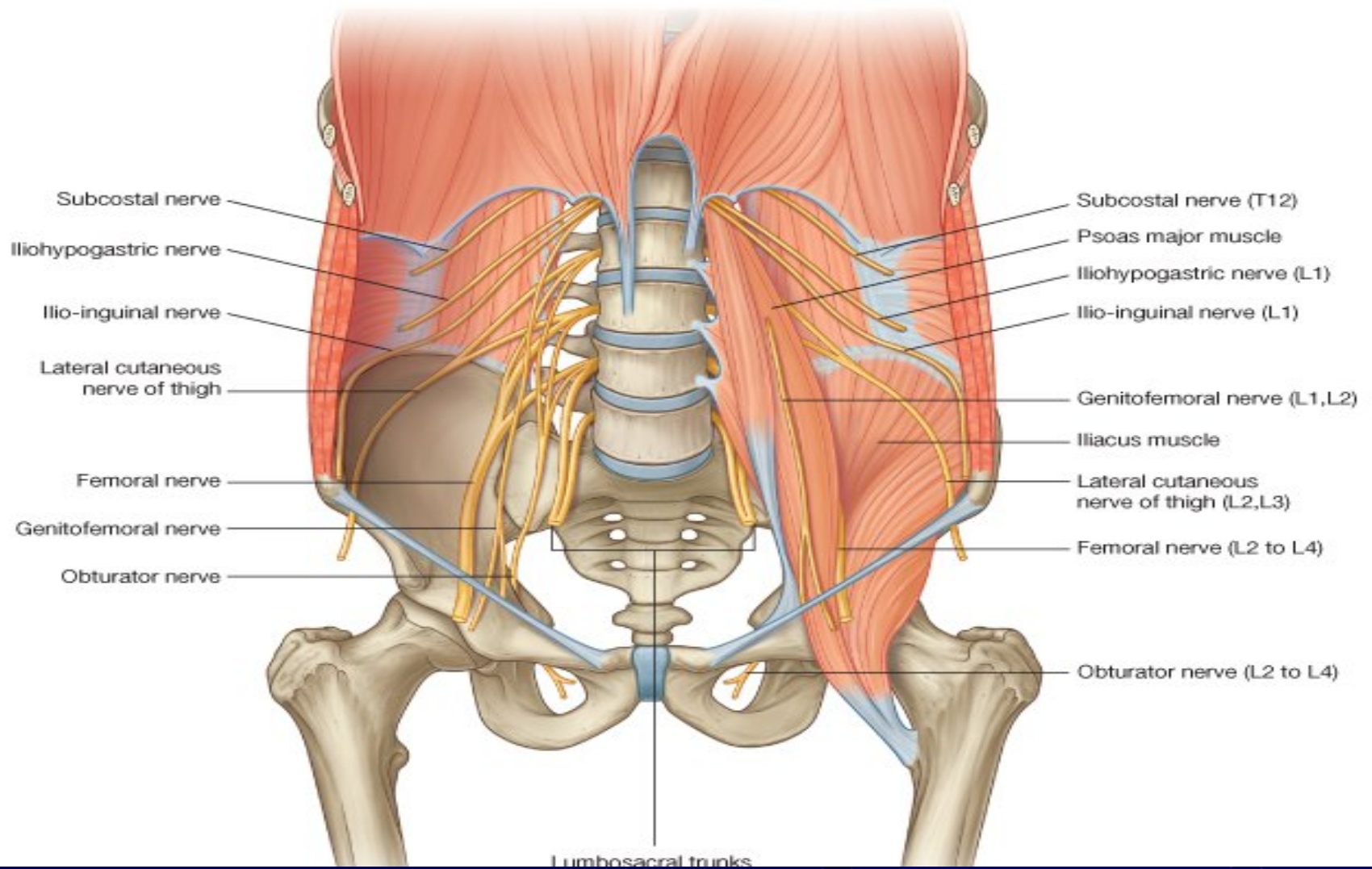
Arcuate Ligaments:

Medial: L2 body → L1 Trans. P.

Lateral: L1 TP → 12th rib

Median: medial borders of
crura





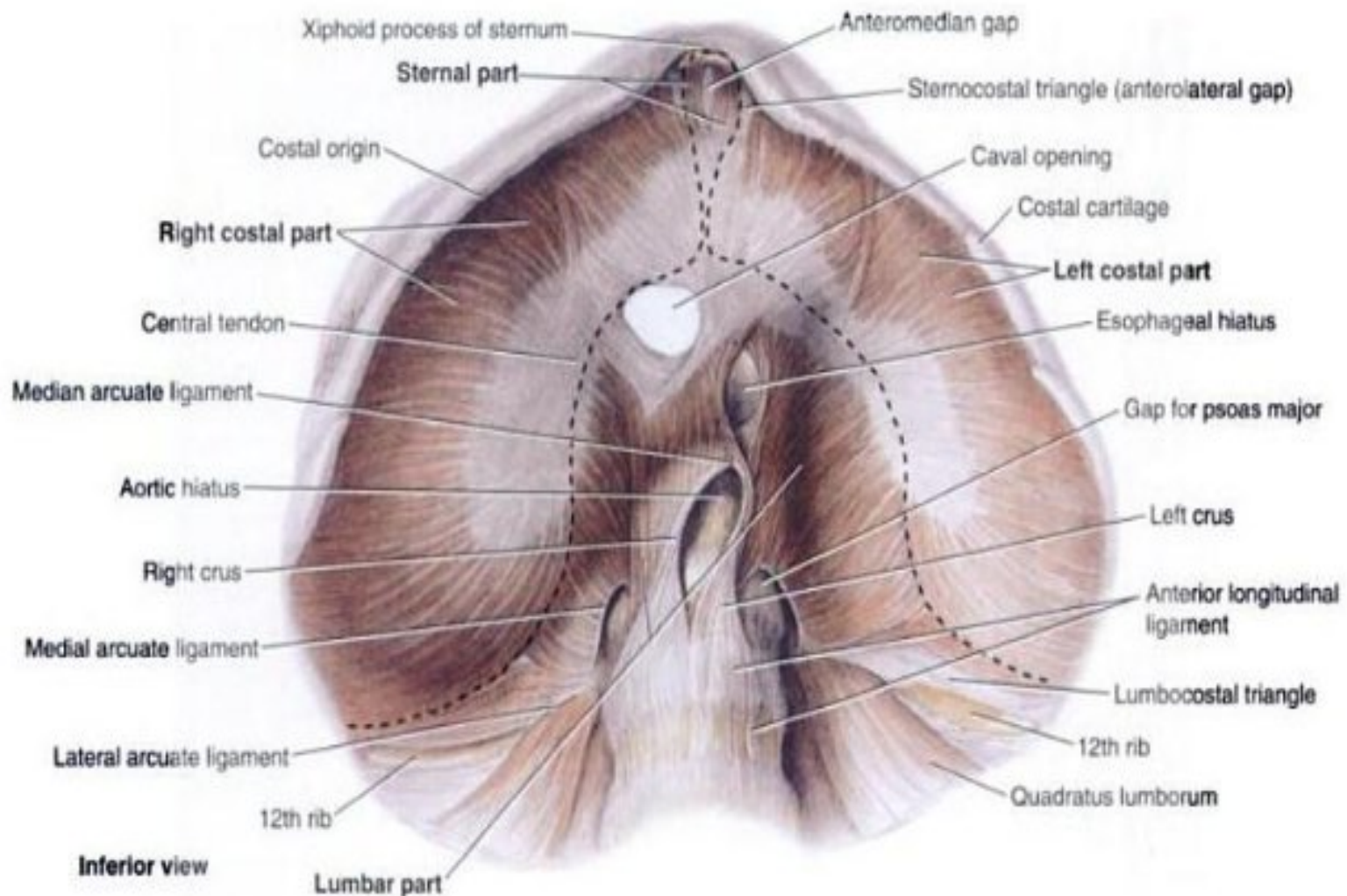


Figure 2.71. Abdominal surface of diaphragm and its attachments. The fleshy sternal, costal, and lumbar origins of the diaphragm attach centrally to the trefoil-shaped central tendon, the aponeurotic insertion of the diaphragmatic muscle fibers.

Shape of Diaphragm

2 domes:

Rt: Upper border of 5th rib.

Supports Rt. Lung.

Lf: Lower border of 5th rib

Supports Lf. Lung.

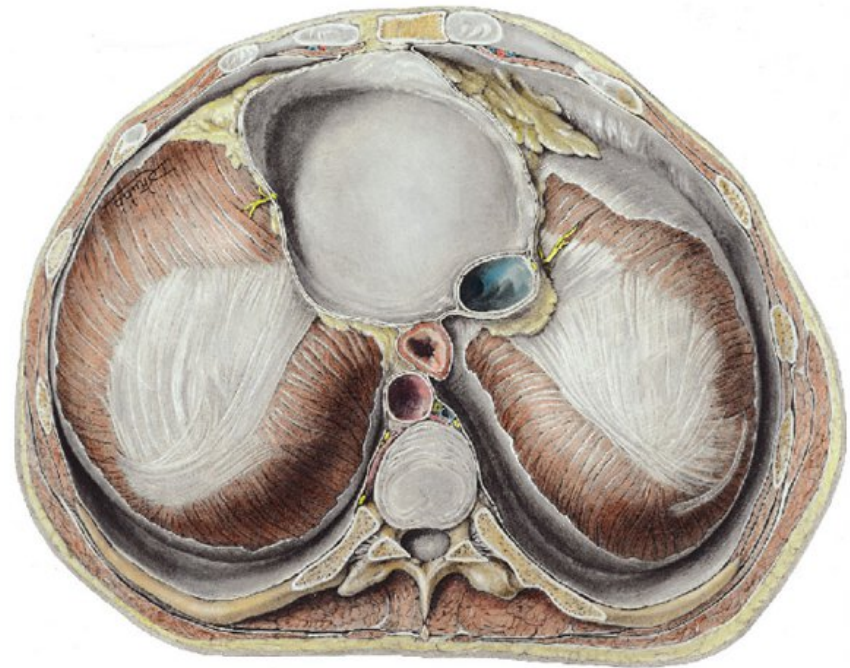
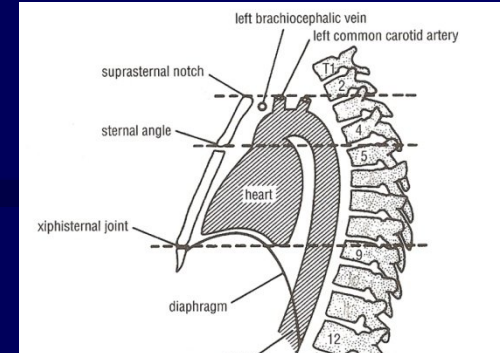
Central Tendon: Near to front than the back.

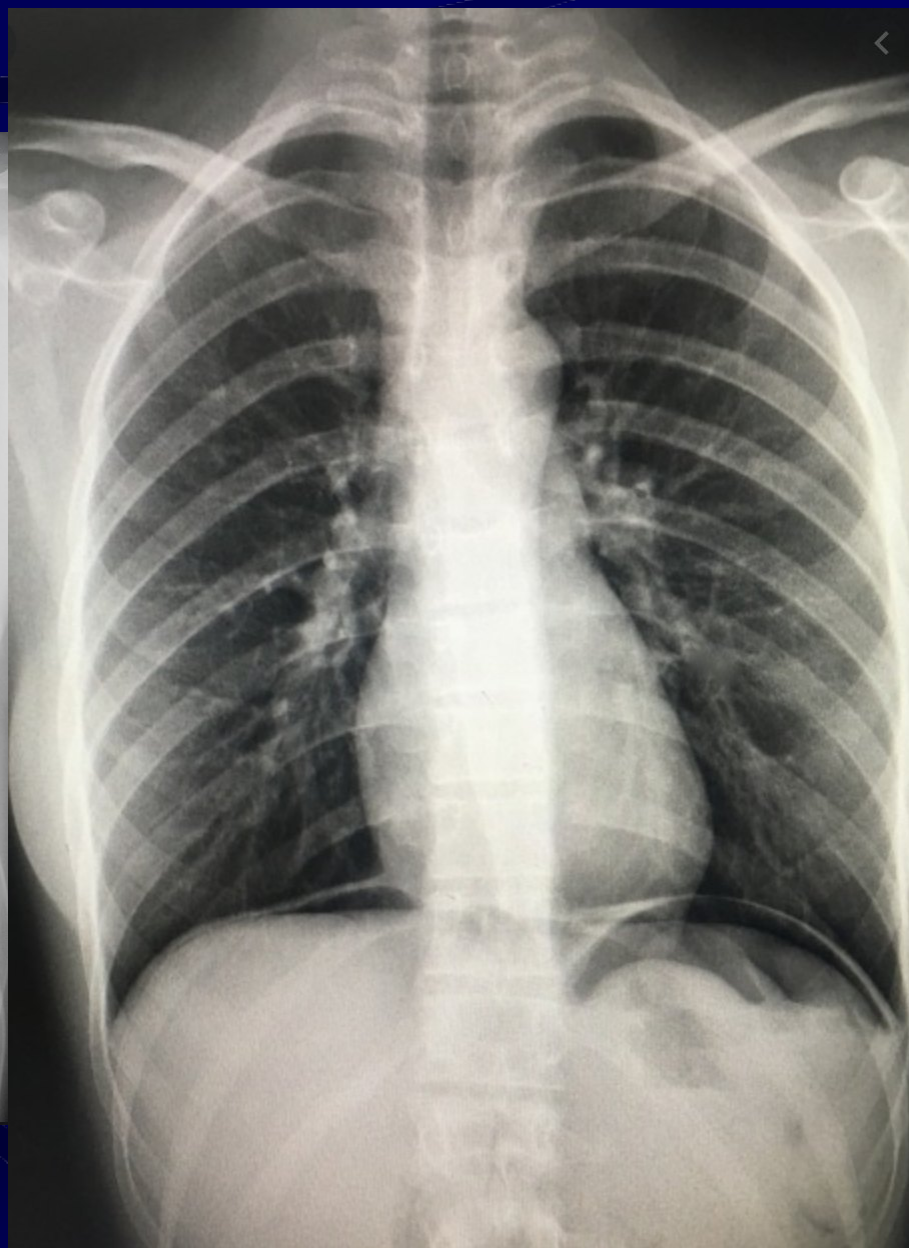
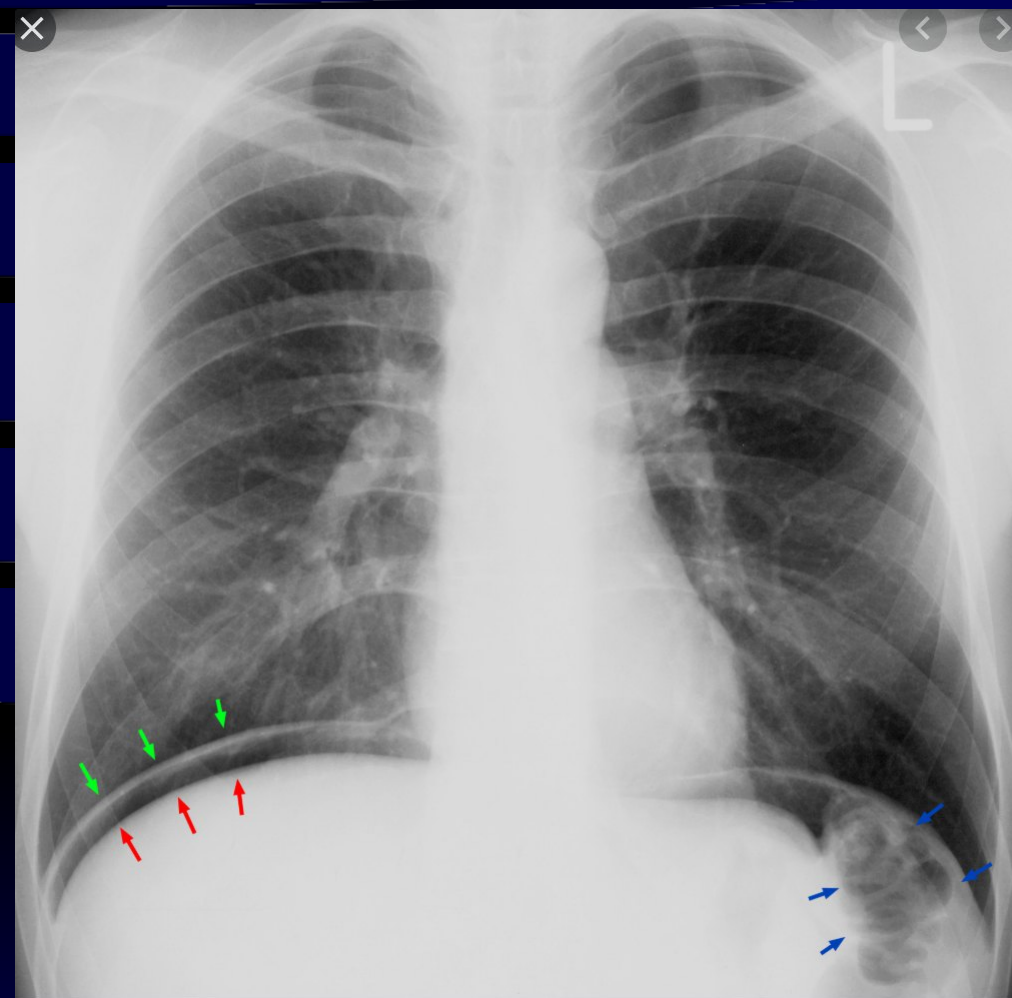
3 leaves

At xiphisternal joint T9.

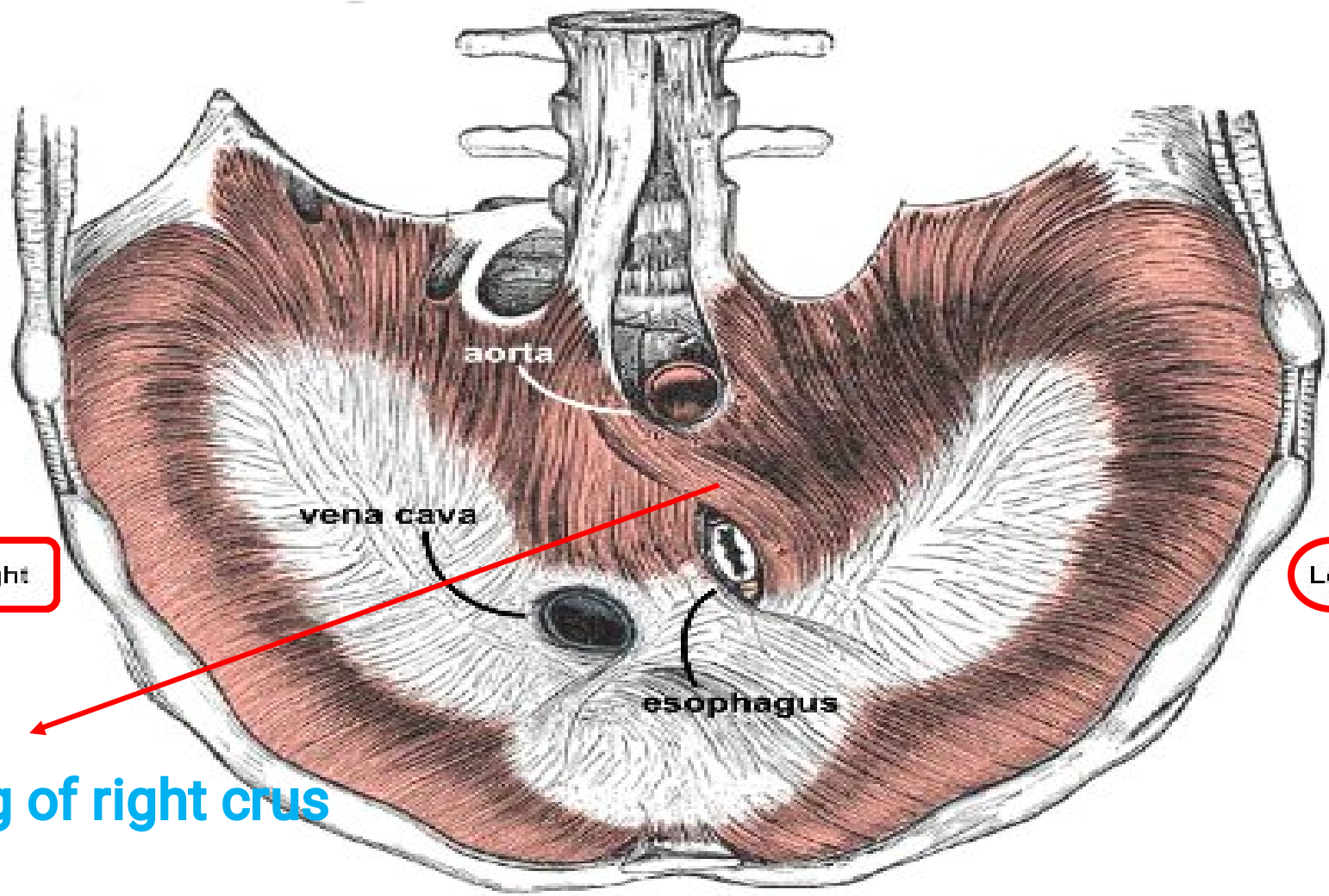
Supports the heart.

Merges with fibrous pericardium.





Posterior



Right

Left

vena cava

esophagus

Anterior

Sling of right crus

Openings in The Diaphragm

3 Main openings:

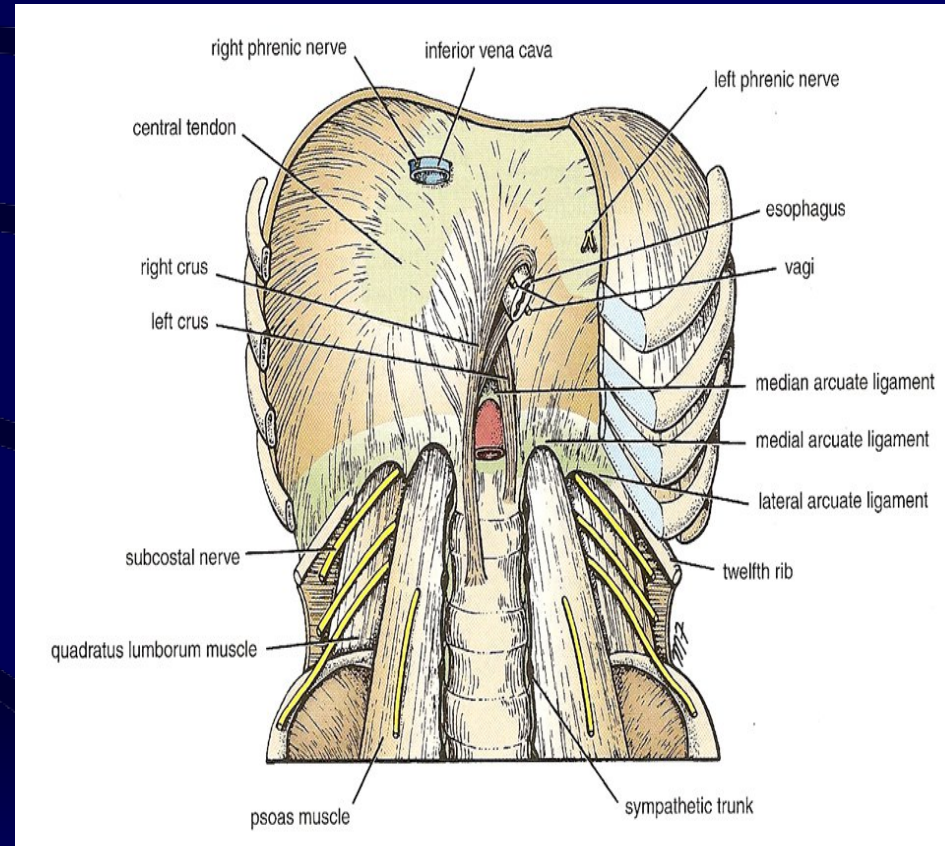
1. Aortic opening: lie in midline At T12, between crura
Aorta, Azygos vein & Thoracic duct.

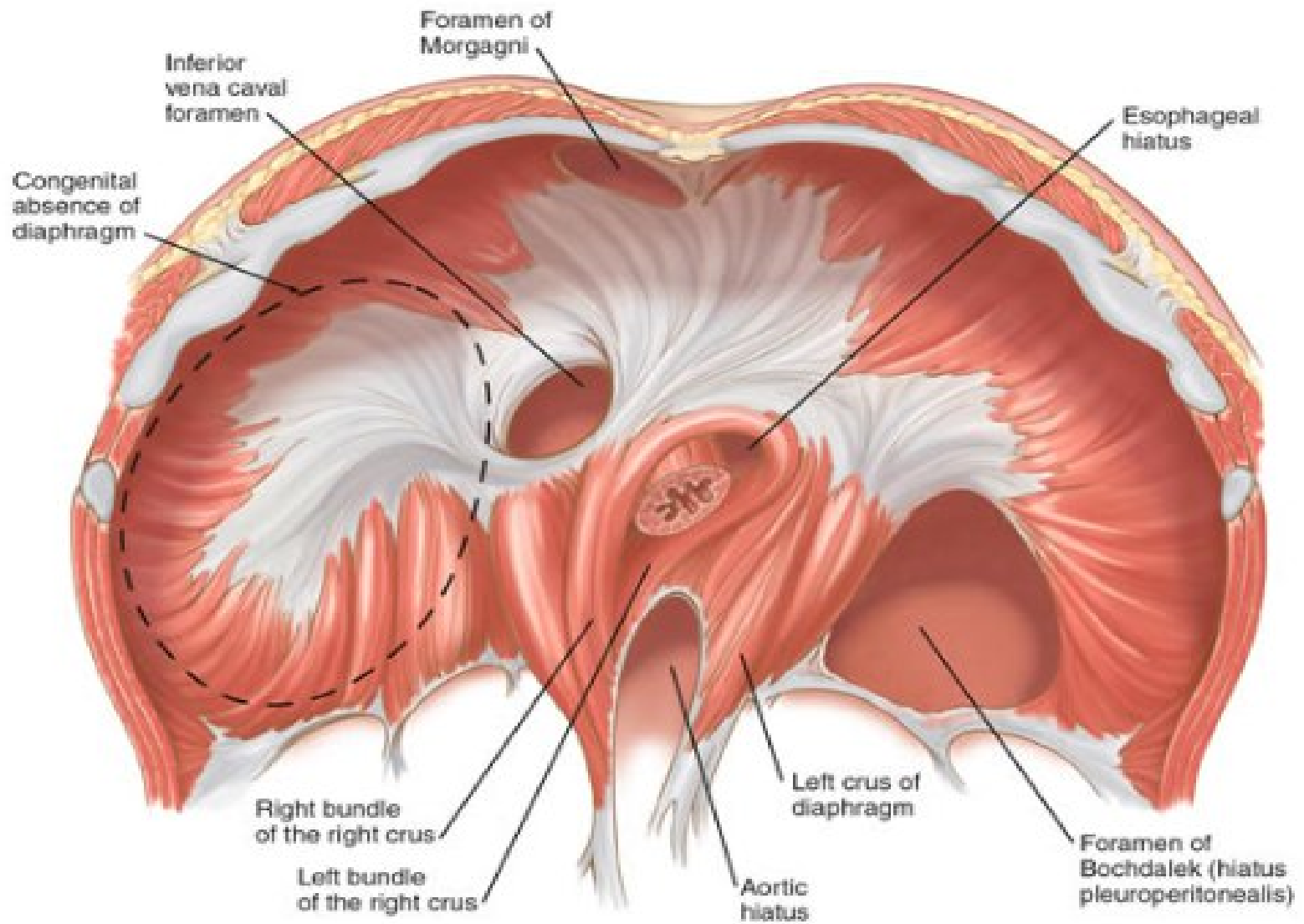
2. Esophageal opening : 1 inch
to LT At T10, in sling of right crus
Esophagus & vagus nerves.

Esophageal branches Lt gastric artery.

3. Caval opening : 1 Inch to Rt
At T8, in central tendon.

IVC, & Rt phrenic n Rt side of IVC



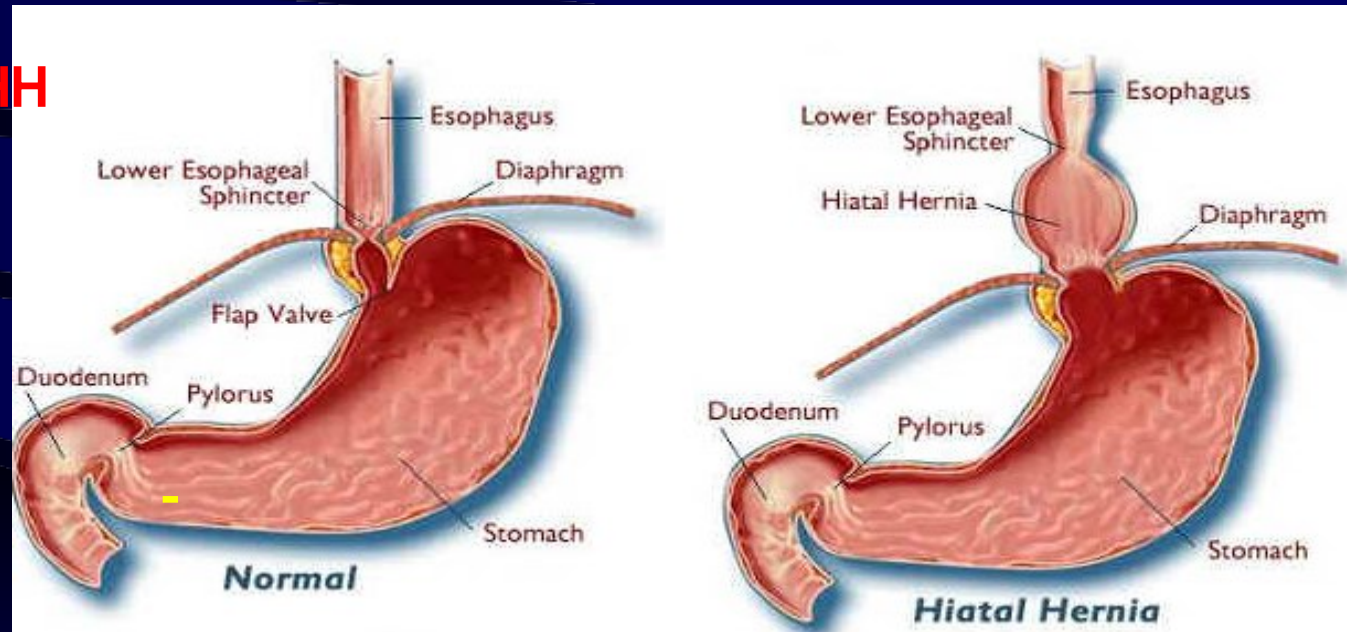


Hiatus Hernia

Is an Anatomical Abnormality in which part of the stomach protrudes through the diaphragm and up into the central chest.

Types

- Sliding HH
- Para esophageal HH
- Mixed type

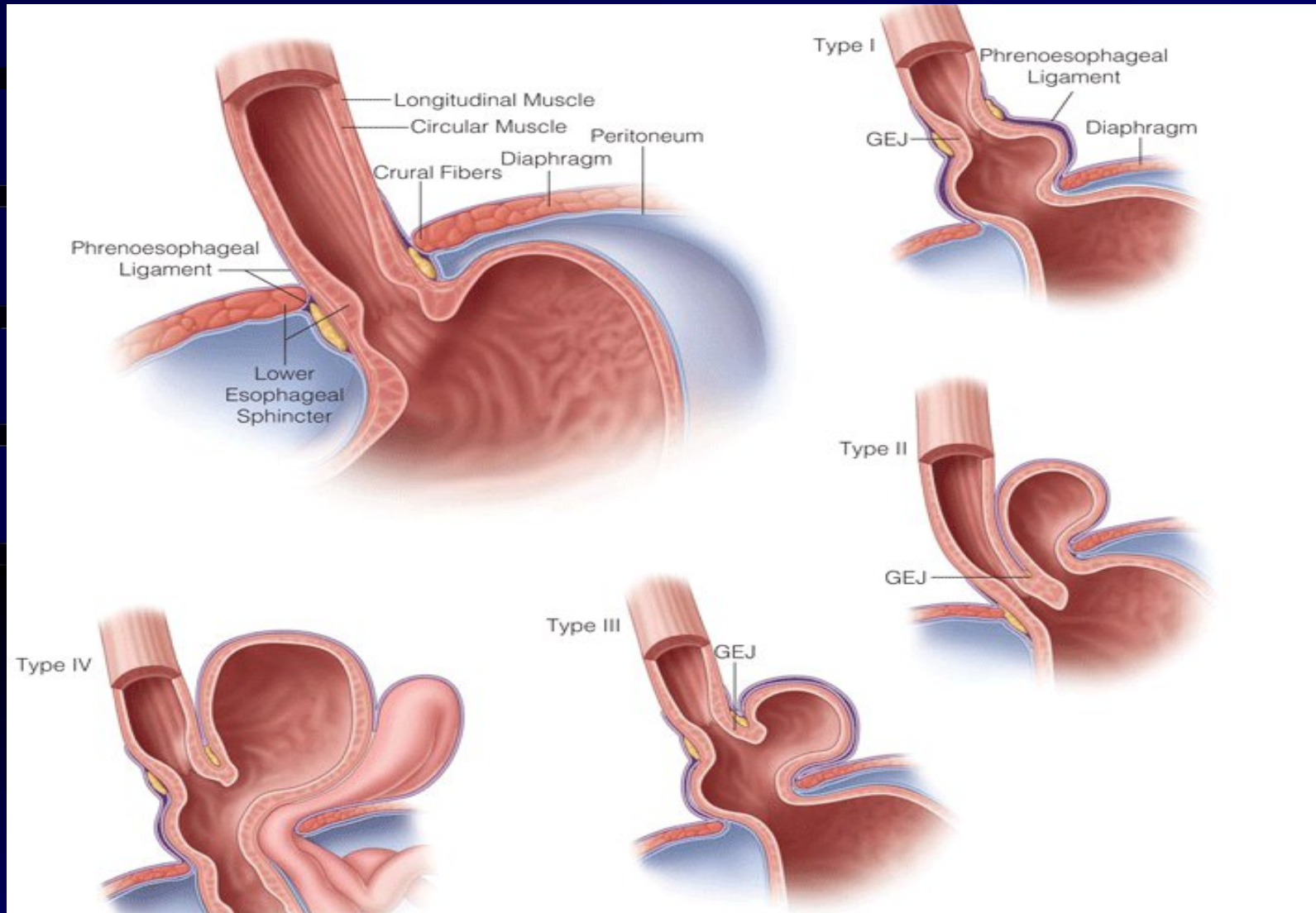


Hiccup

Involuntary contractions of the diaphragm.

- After eating or drinking → irritation of vagus n.

Types of HH



Clinical points

Phrenic nerve injury:

- Elevated copula of diaphragm
- Paradoxical movement w/ respiration.



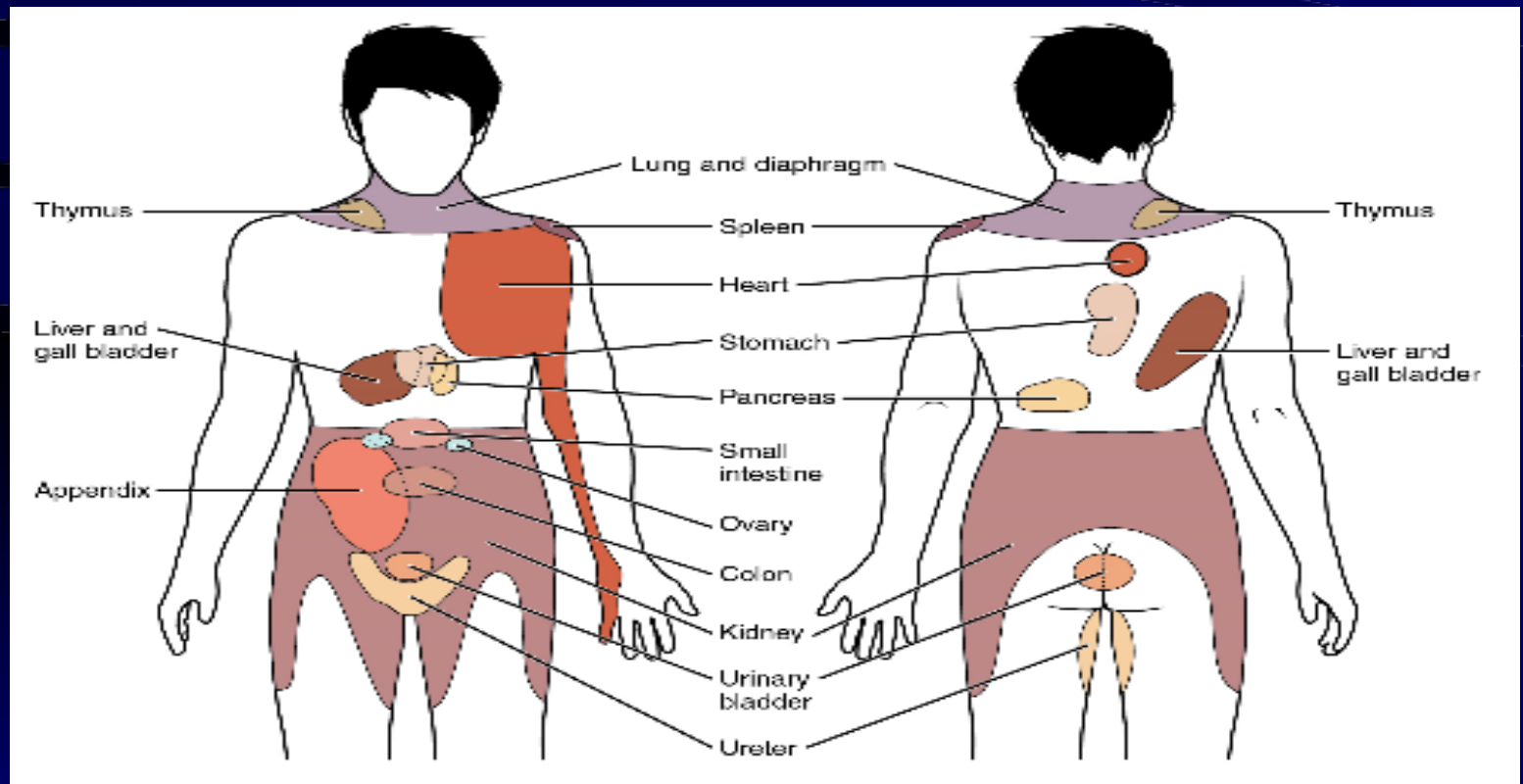
Small opening of diaphragm

- Sup epigastric artery.
- Musculo-phrenic artery.
- Lower 5 intercostal nerves.
- Subcostal nerve and vessel behind lateral arcuate lig
- Sympathetic trunk behind medial arcuate lig
- Inf hemi azygos pierce Lt crus
- Lt phrenic pierce muscle of Lt dome
- Greater and lesser splanchnic nerves

Keher's sign

Irritation of Under surface of Diaphragm C3-C4- C5

Lead to shoulder pain due to shared embryological development.



Intercostal Muscles

3 layers of m. that cover intercostal spaces

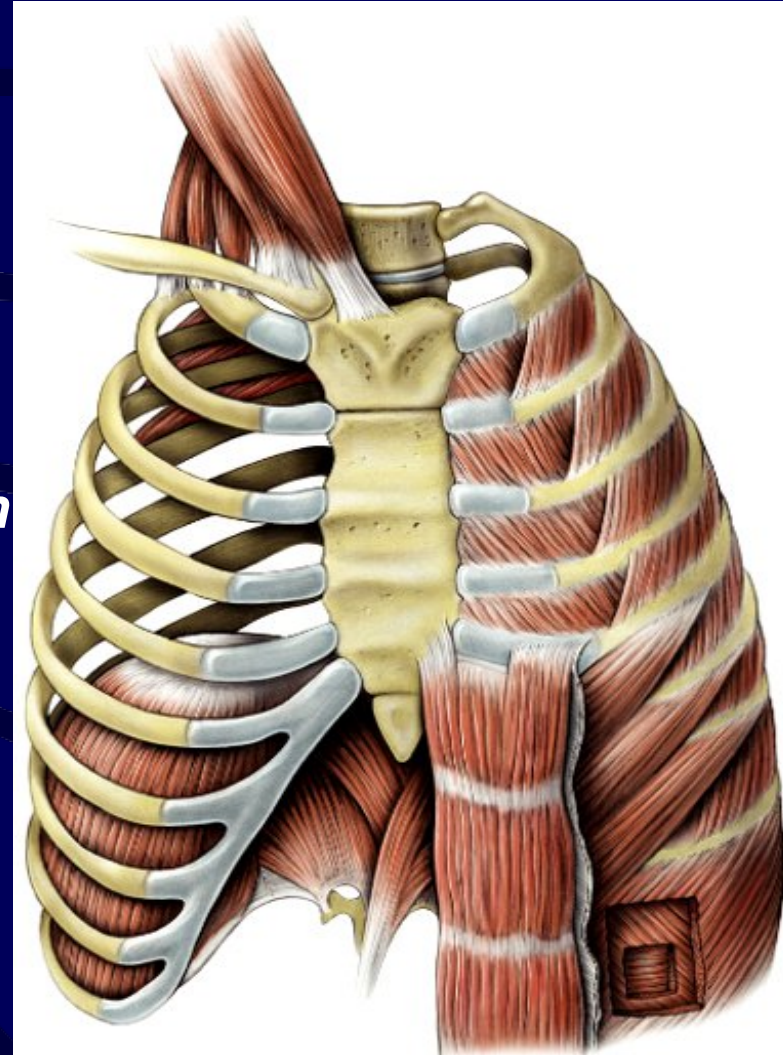
From outside to inside:

1. External intercostal m.:

Extend from Tubercle of Rib Behind till
junction of rib with their costal cartilage.

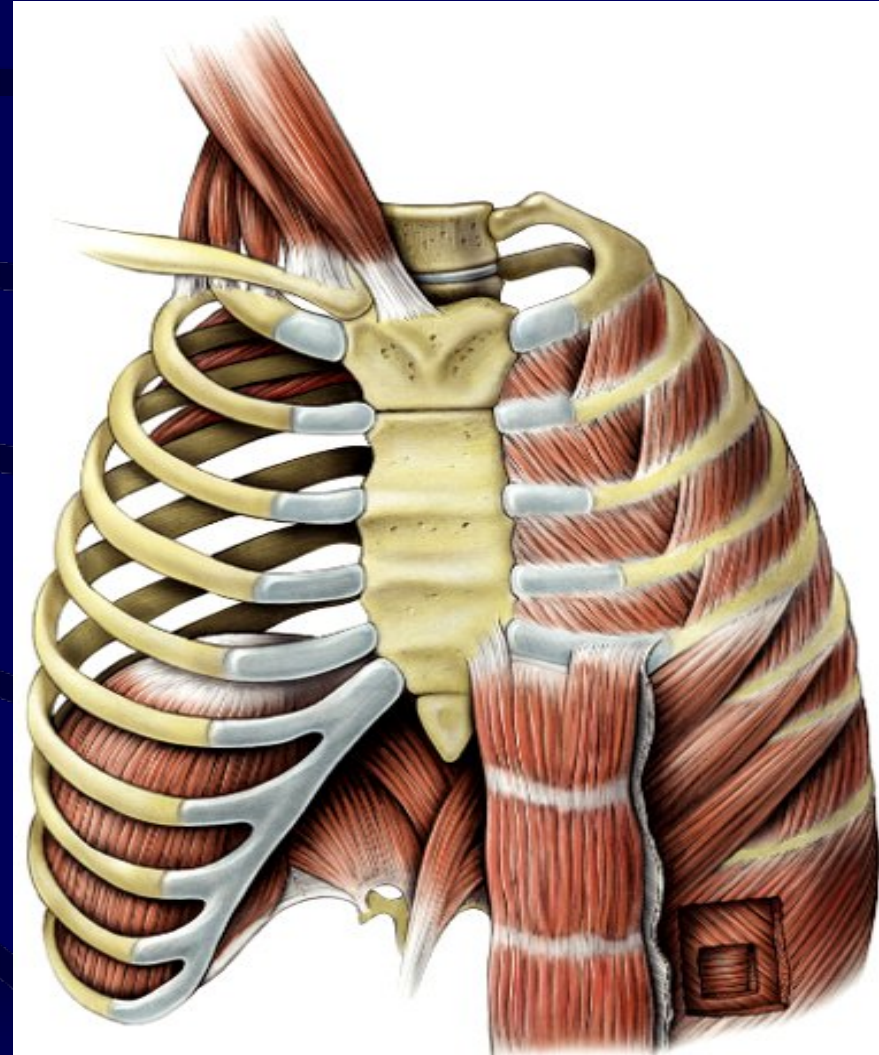
Runs downward forward toward sternum *from
lower border of rib above to upper border of
rib below.*

Replaced anteriorly by ant intercostal
membrane .



Intercostal Muscles

- 2. Internal intercostal m.:
 - Runs downward and backwards from Sternum To a little Behind Midaxillary line replaced posteriorly by posterior intercostal membrane.
 - Fibers pass *downward and backwards, from outer lip of costal groove of rib above , to upper border of rib below.*



3. Innermost intercostal & Transversus Thoracic

Ilm:

On lateral sides only

- From in front of midaxillary line to Angle of rib.
- Fibers pass downward and backward from inner lip of cg of rib above, to upper border of rib below
- Occupies middle 2/4 of IC space

T Tm sternocostalis:

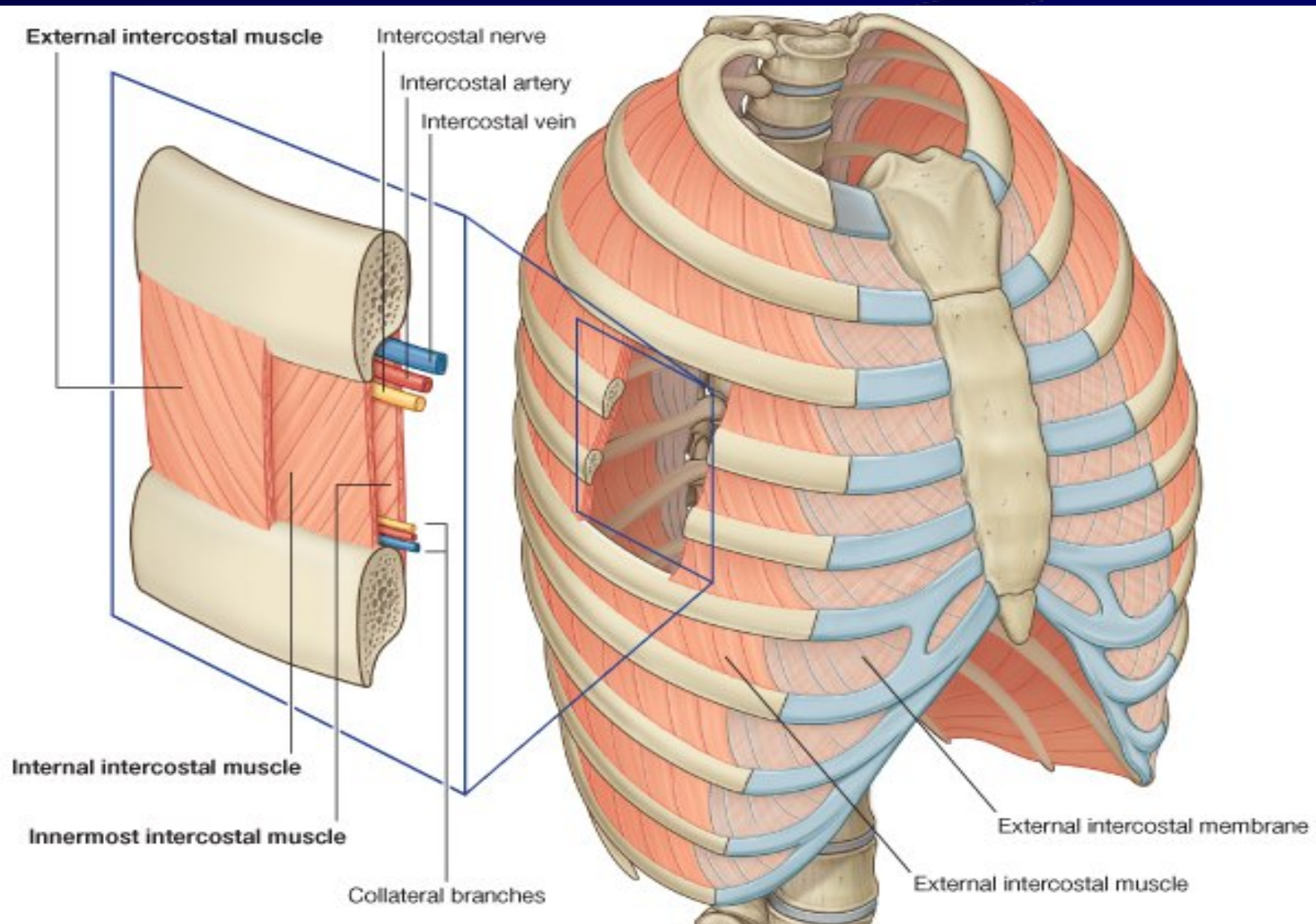
4-5 slips of muscles

From post. surface of lower ½ sternum

To 2nd-6th costal cartilages



*Bld. Vessels & nerves run between:
Internal & innermost IMs*



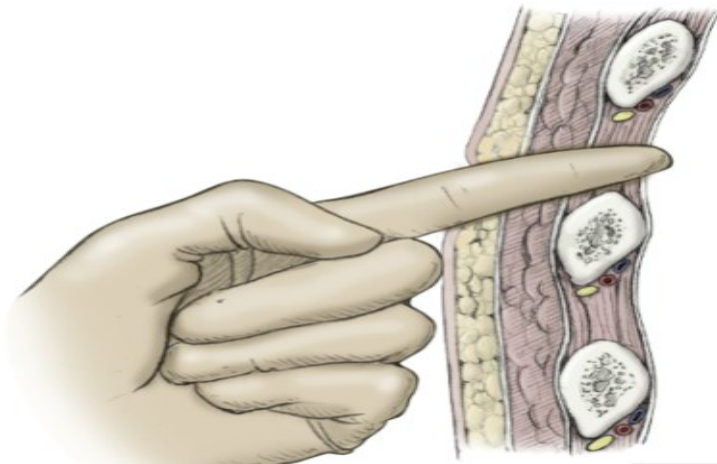
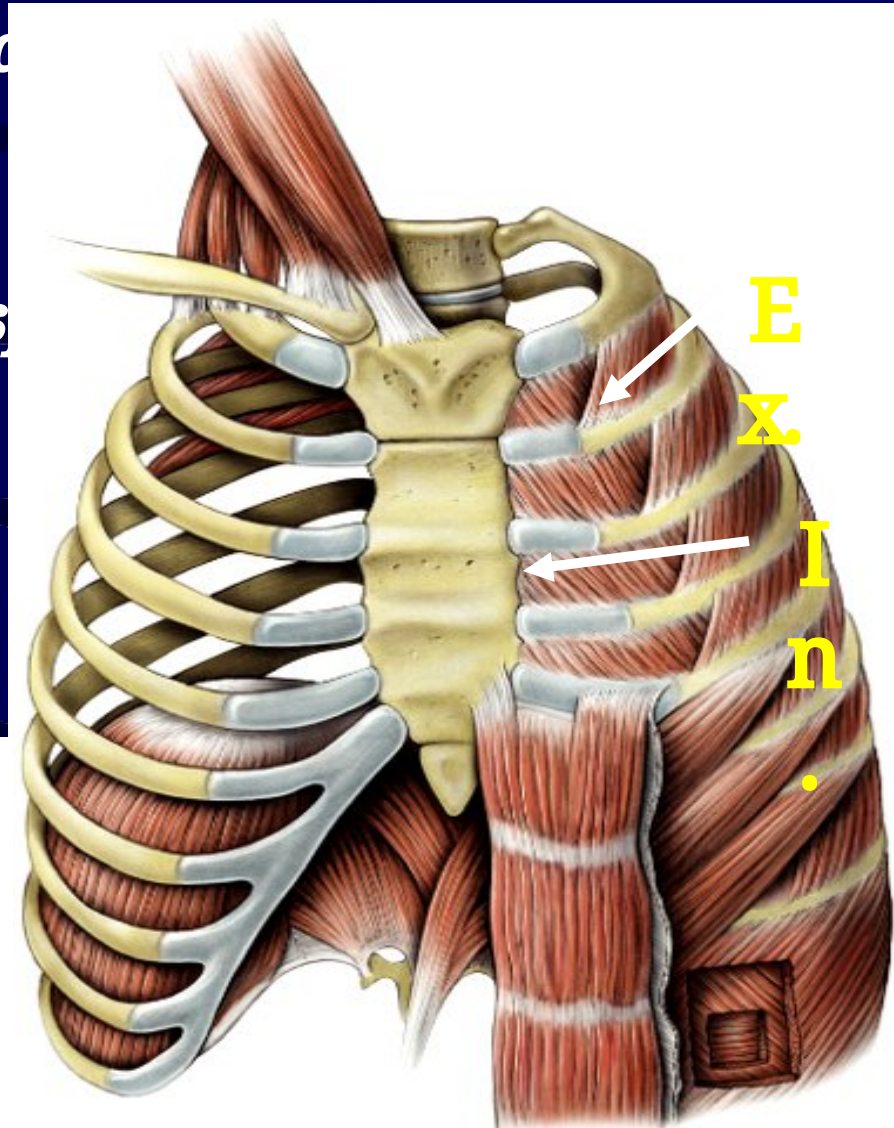
Intercostal Muscles

Intercostal muscles are arranged in

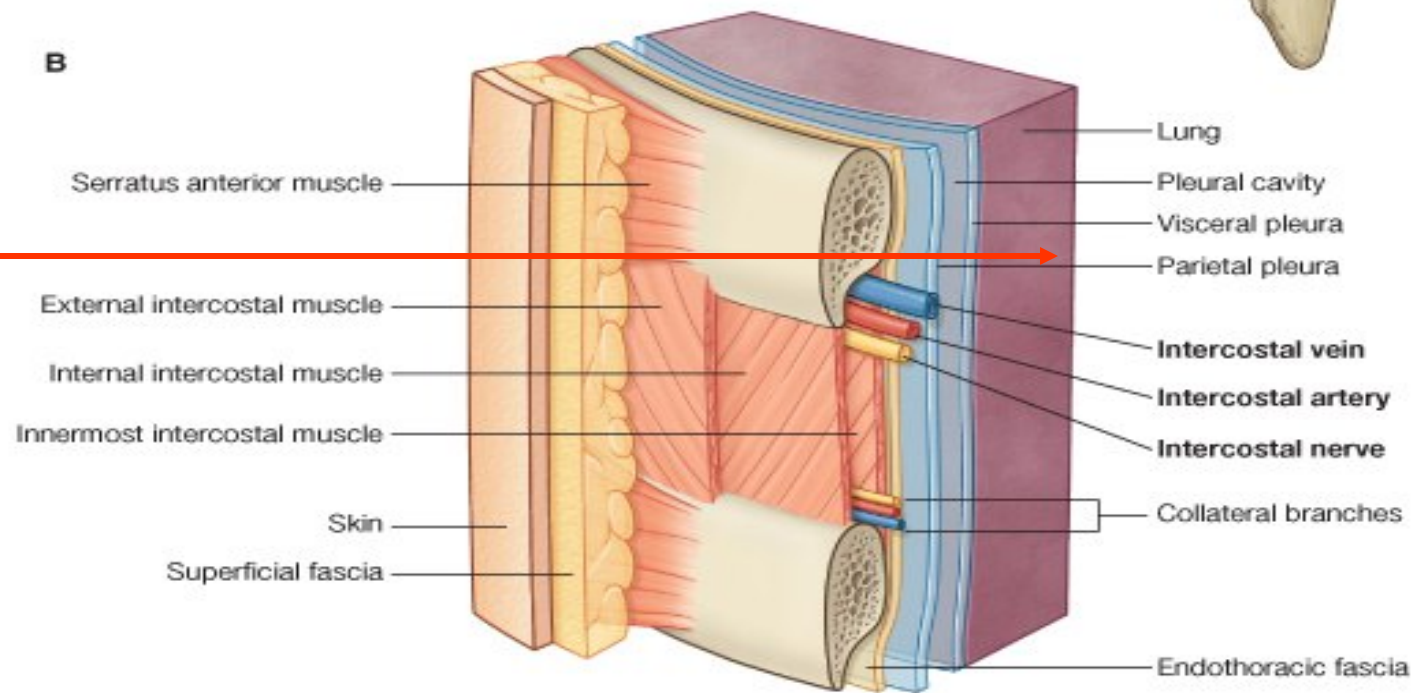
3 layers like abdominal muscles.

Intercostal groove lie in lower aspect of inner surface of rib.

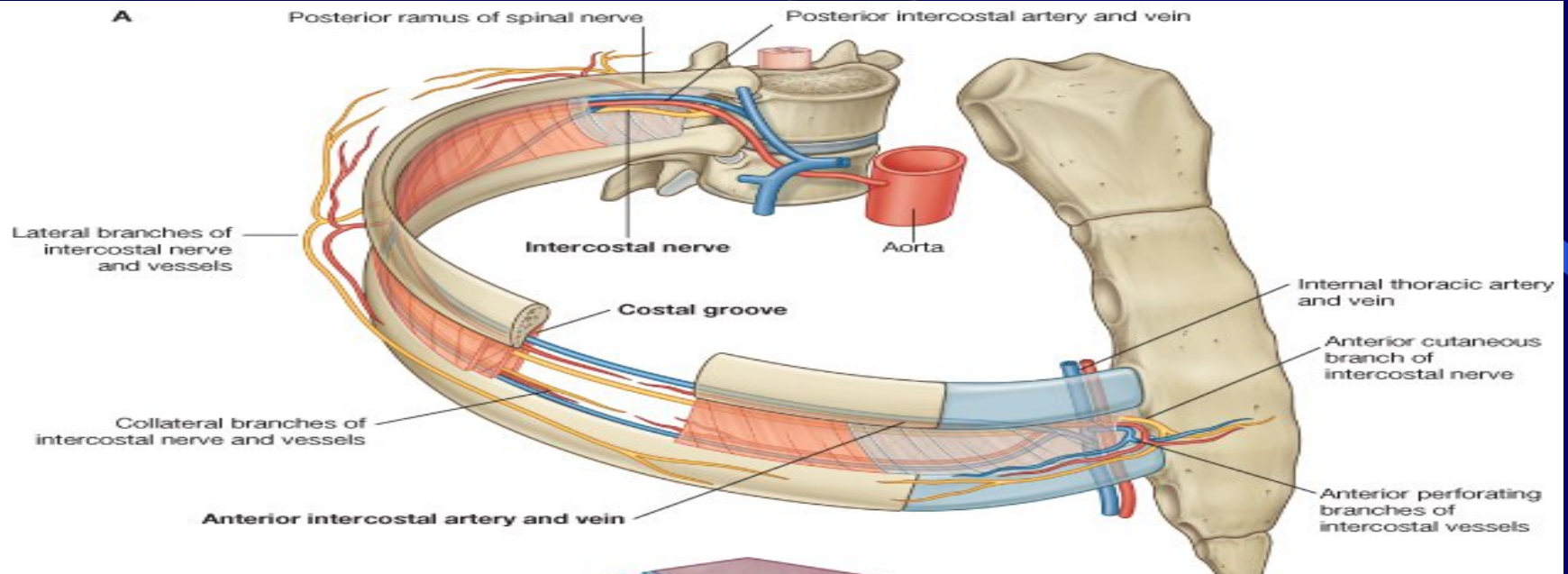
*So needle and chest tube should be passed **above rib** to avoid injury of intercostal nerves and vessels.*



B



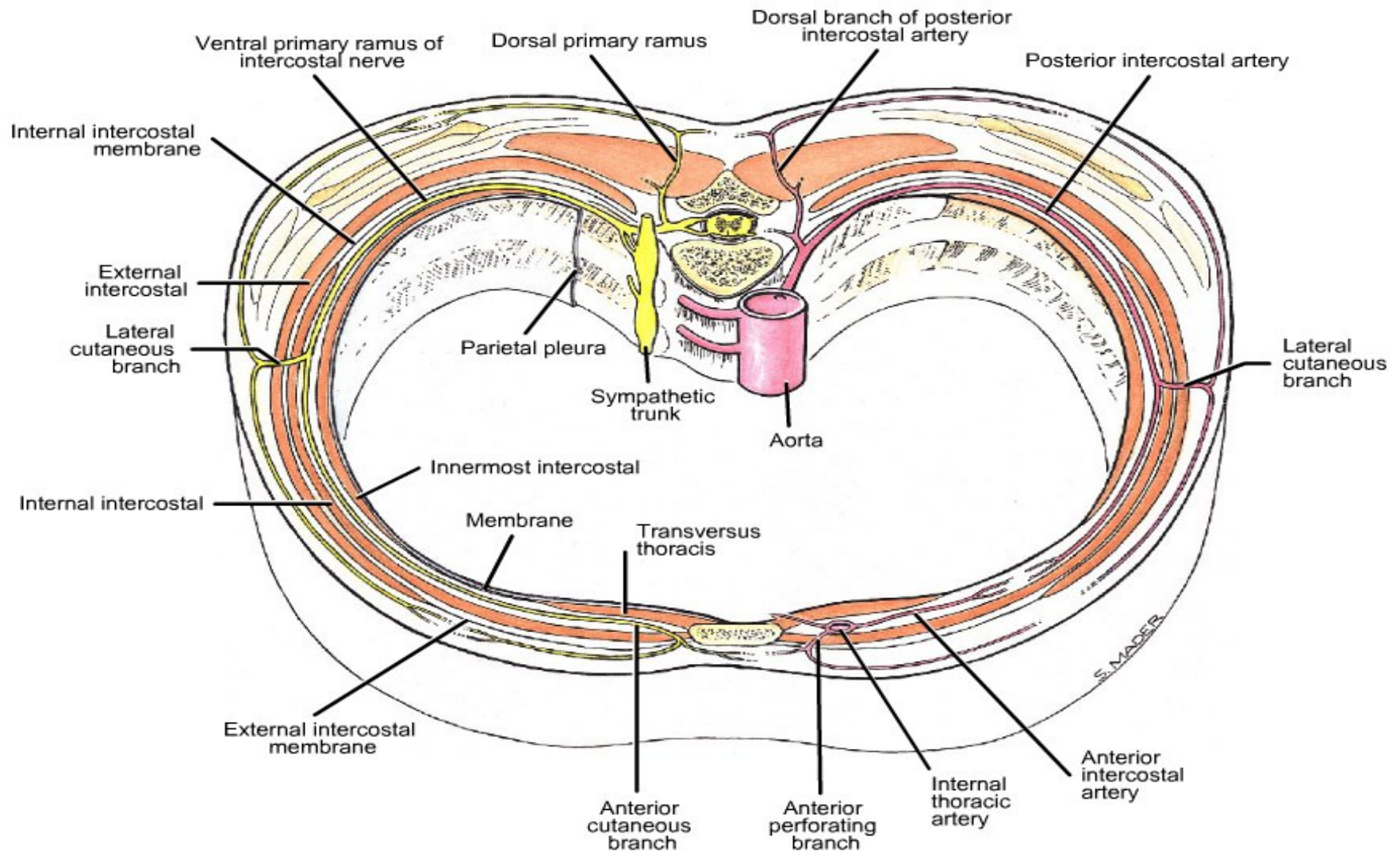
A



Continue

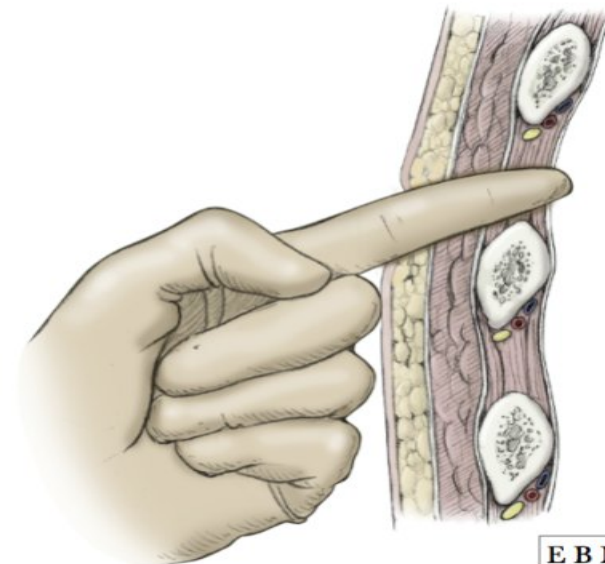
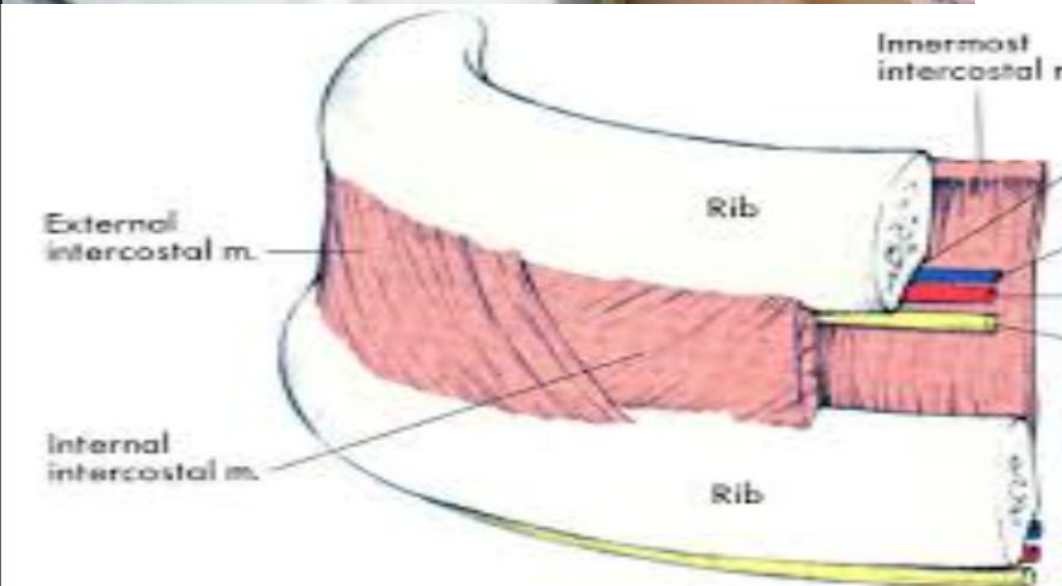
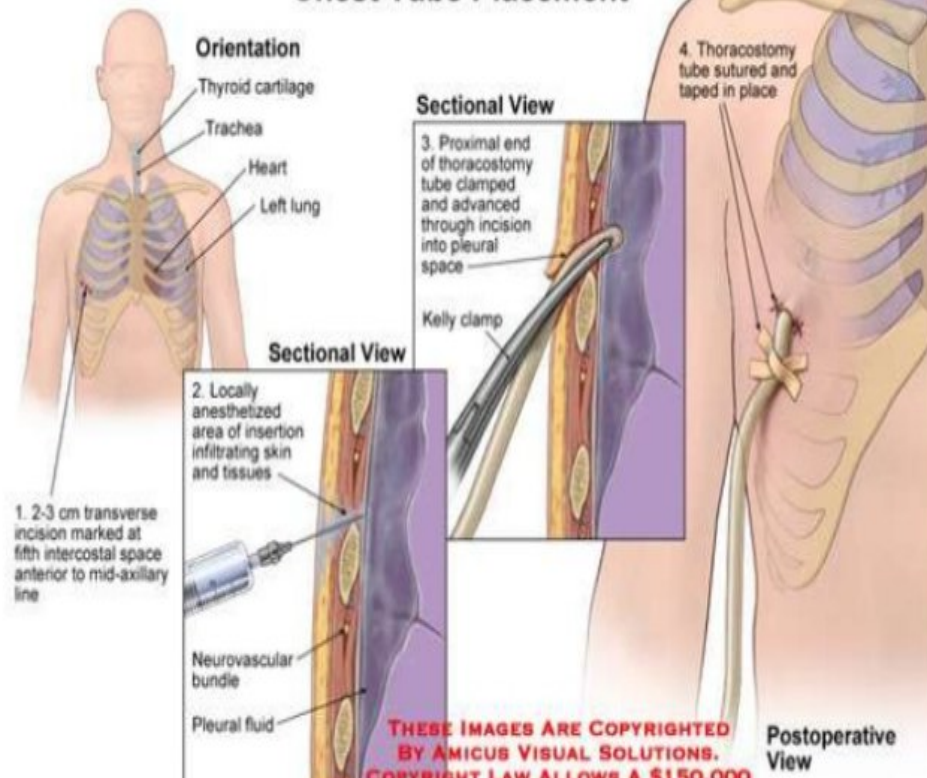
- **Nerve supply of ICM** Anterior primi rami of corresponding IC nerve, and collateral branch.
- **Action**
- Elevation of ribs in inspiration
- Tension of ICM prevents Ballooning and drawn inwards in breathing.

Intercostal Muscles



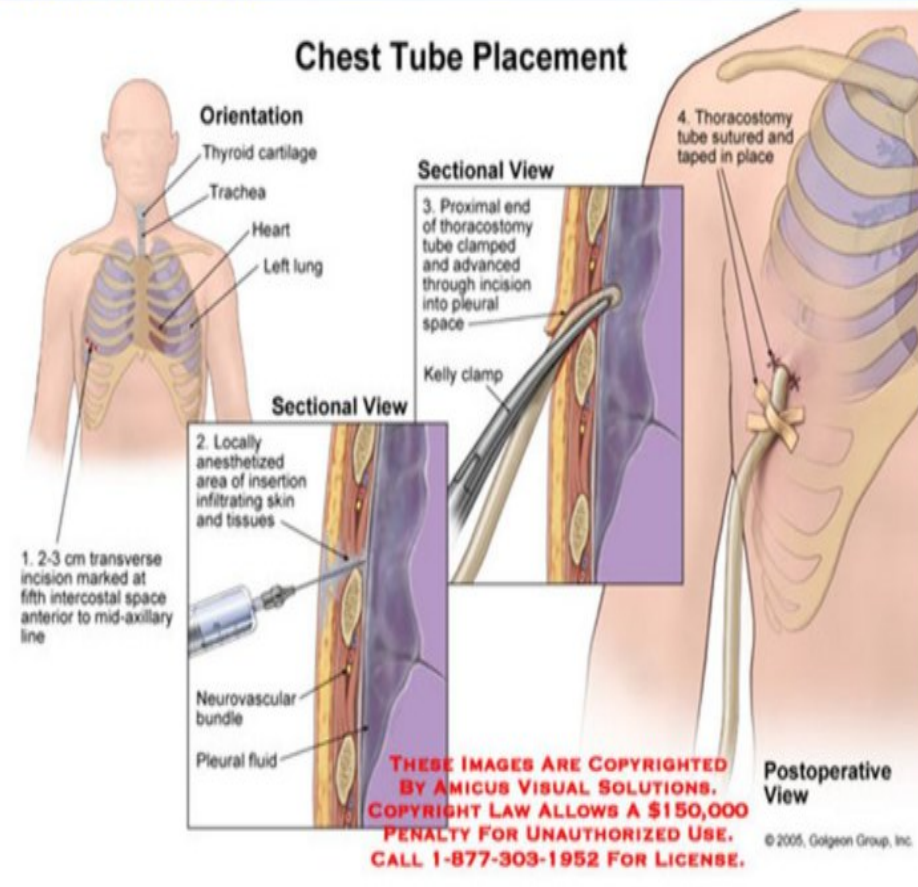


Chest Tube Placement



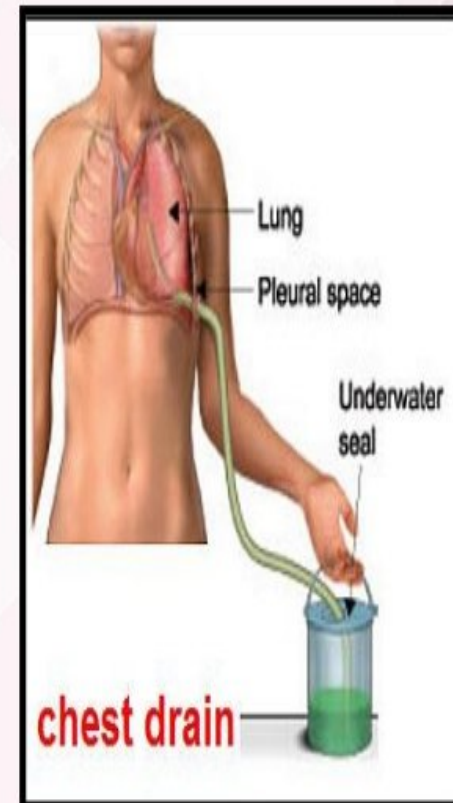
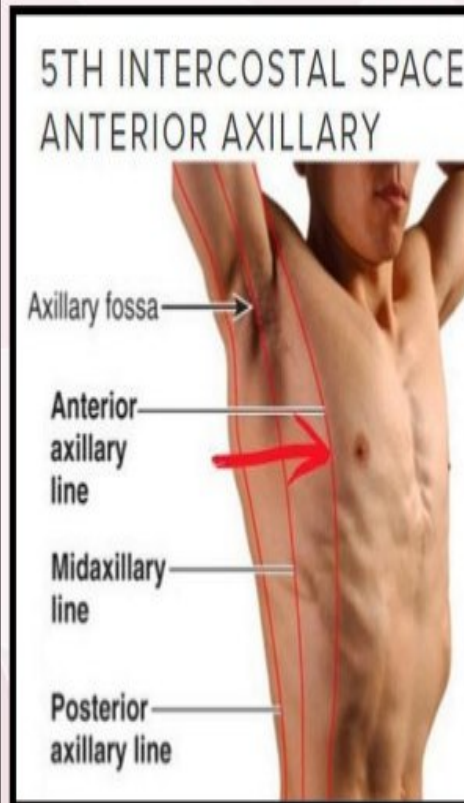
Chest tube indicated to drain the contents of the pleural space , usually air or blood ,but may include other contents .

Chest Tube Placement



Pneumothorax Treatment

Tube thoracostomy :



Intercostal Neuro Vascular Bundle

Costal Groove:

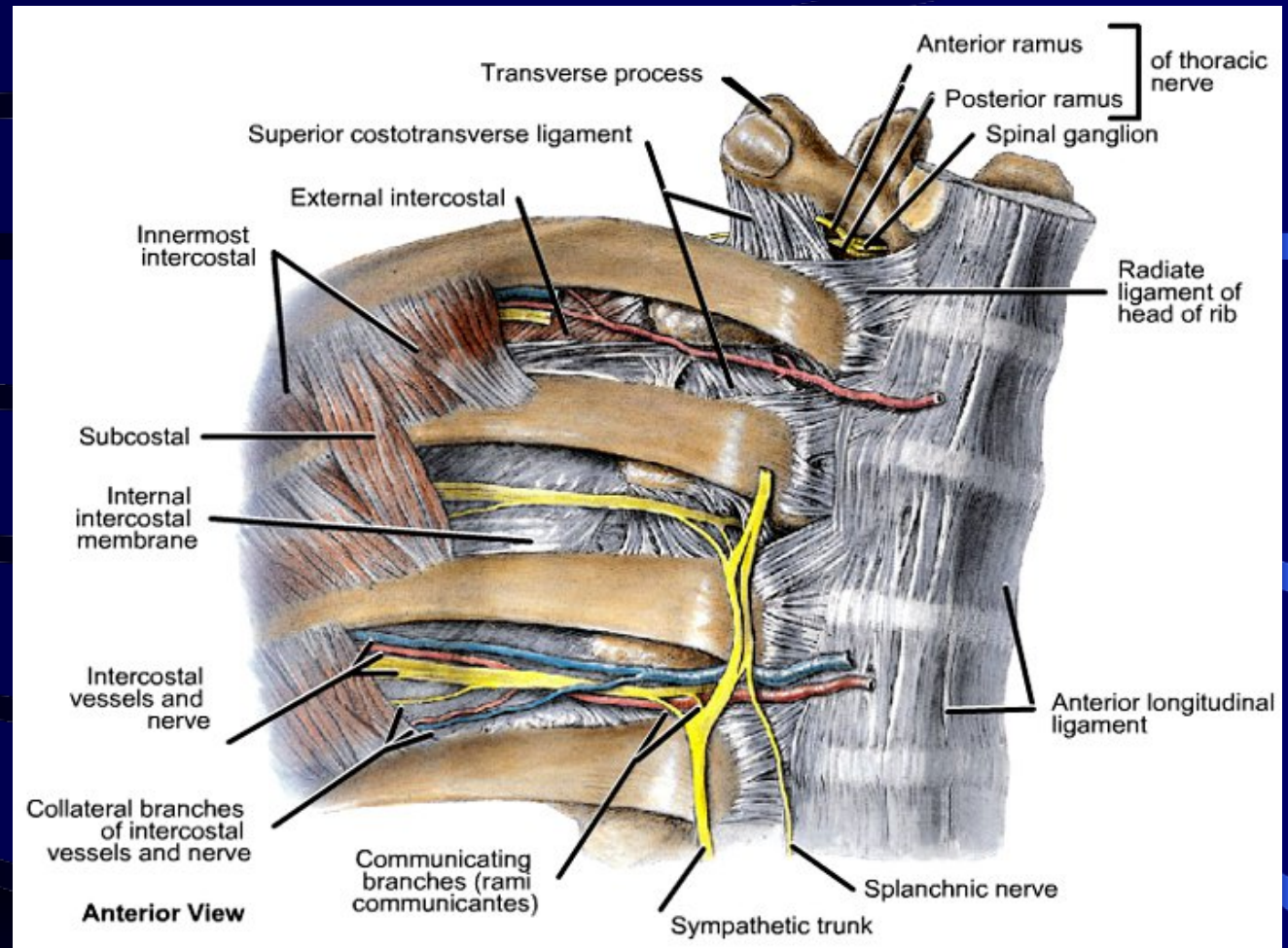
Vein



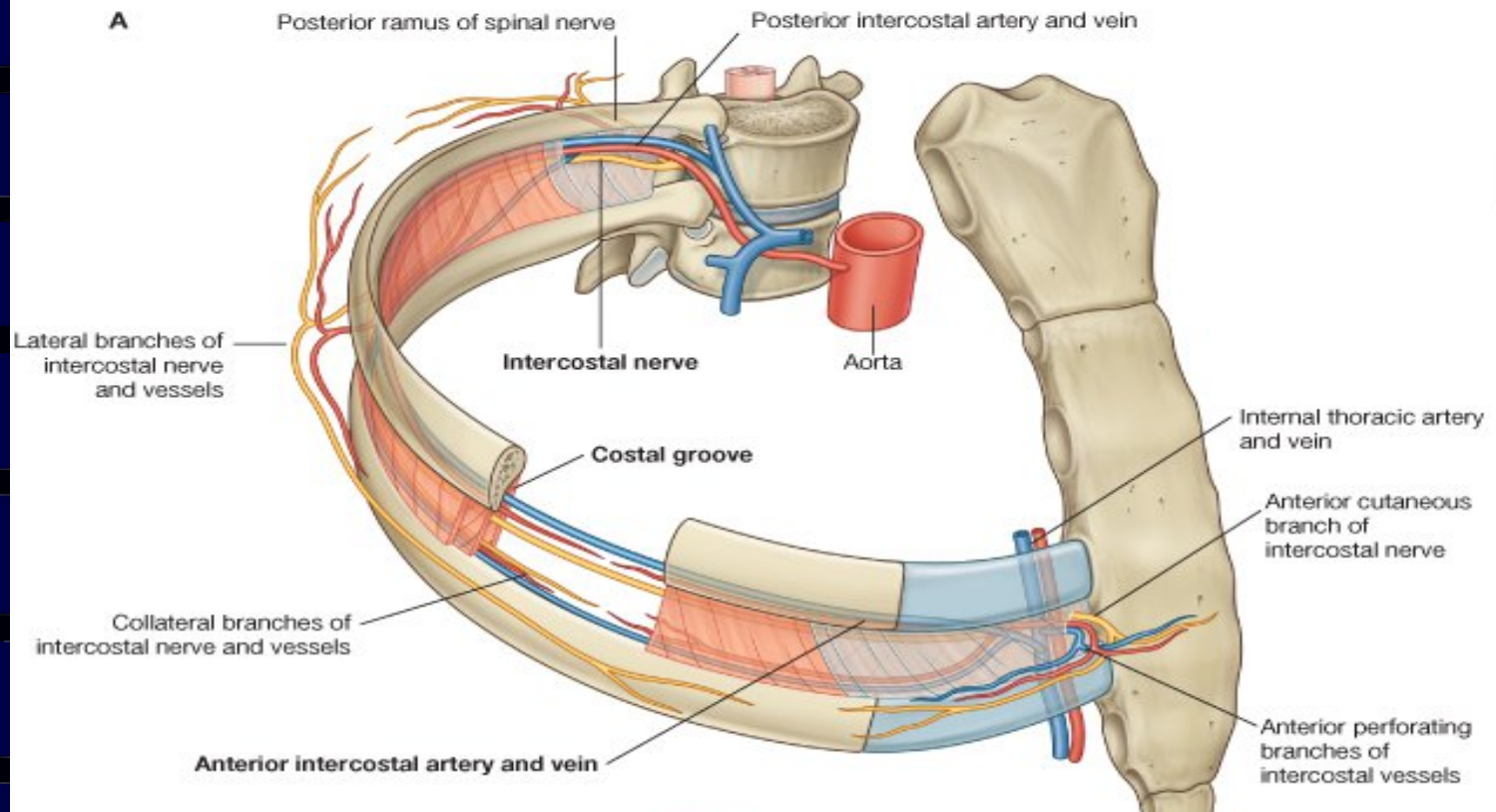
Artery



Nerve

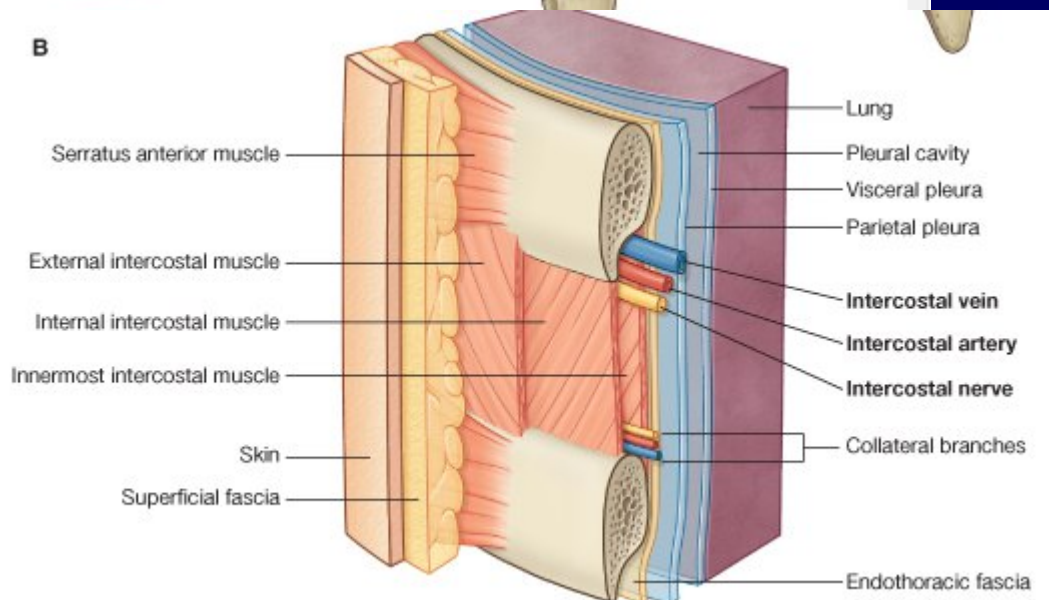


Collateral neurovascular bundle: over upper borders of the ribs



B

B



Intercostal Arteries

Each intercostal space:

1 Large post. Inter c. artery

2 small ant. Inter c. Arteries

Post.:

Descending aorta 3-12

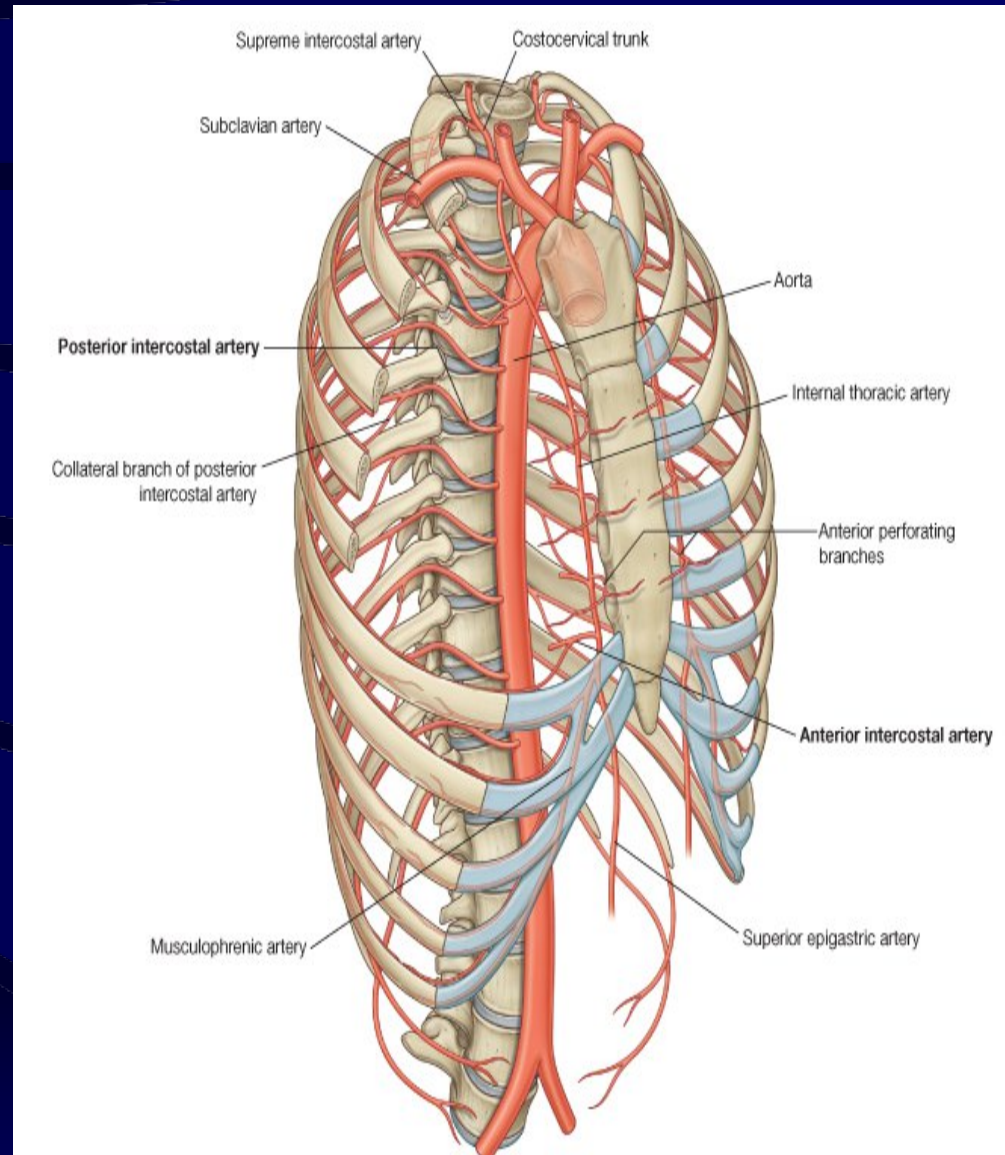
& Costocervical trunk

(sup. Inter. A.) 1st, 2nd PIA

Ant.:

Internal Thoracic a. 1-9 spaces

& musculophrenic a.

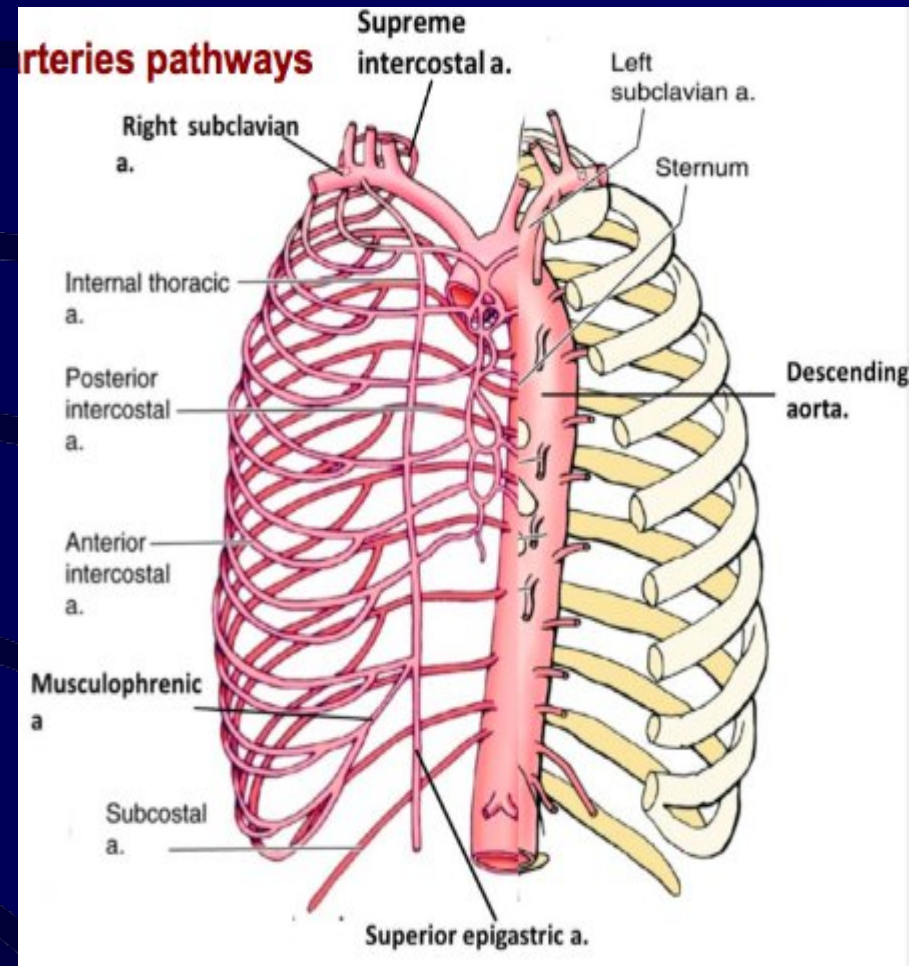


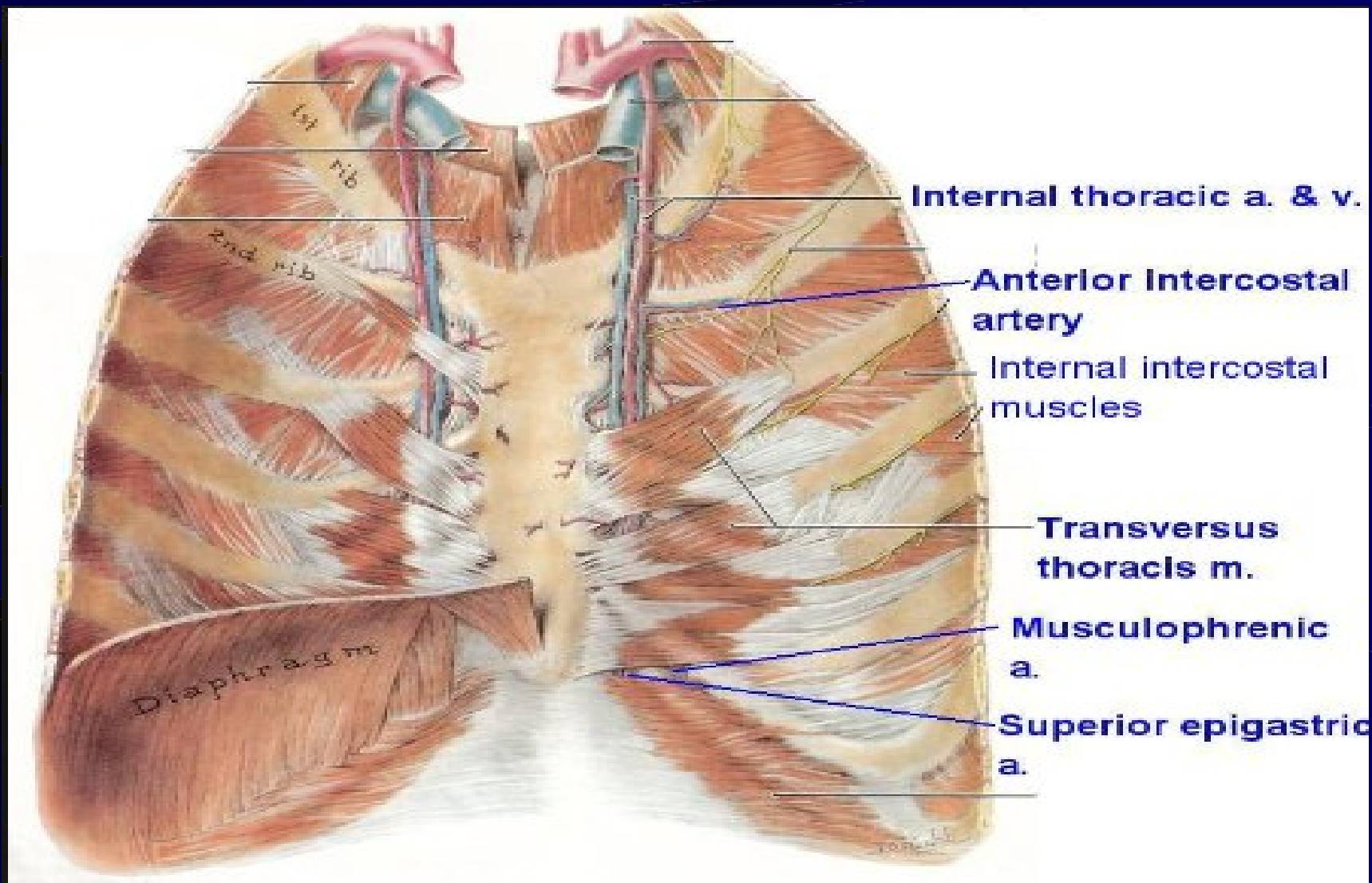
Internal mammary artery

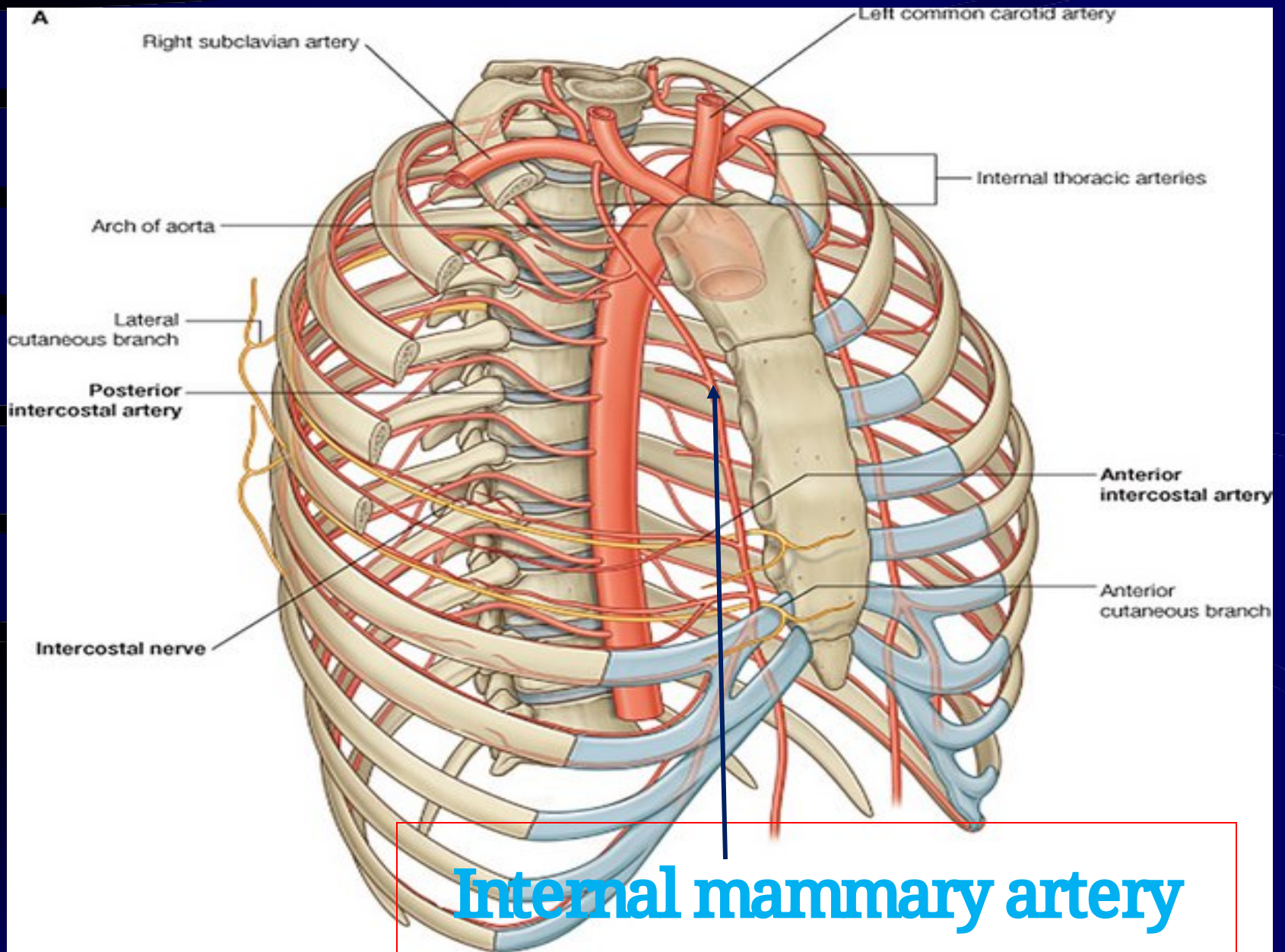
- Arise from 1st part of subclavian artery in RON.
- Descend vertically downward, behind upper 6 CC.
- 1 ½,cm lateral to lat border of sternum.
- End opposite 6th ICS by dividing
- Superior epigastric artery.
- Musculophrenic arteryth 8th, 9th, Spaces.

Branches

- 6 pairs of anterior intercostal arteries
- Perforating branches to breast 2nd, 3rd, 4th, ICS
- Pericardio - phrenic artery. Pericardium, pleura, diaphragm.







Intercostal Veins

Each intercostal space:

Large post. inter. vein

2 small ant. inter. veins

Post.:

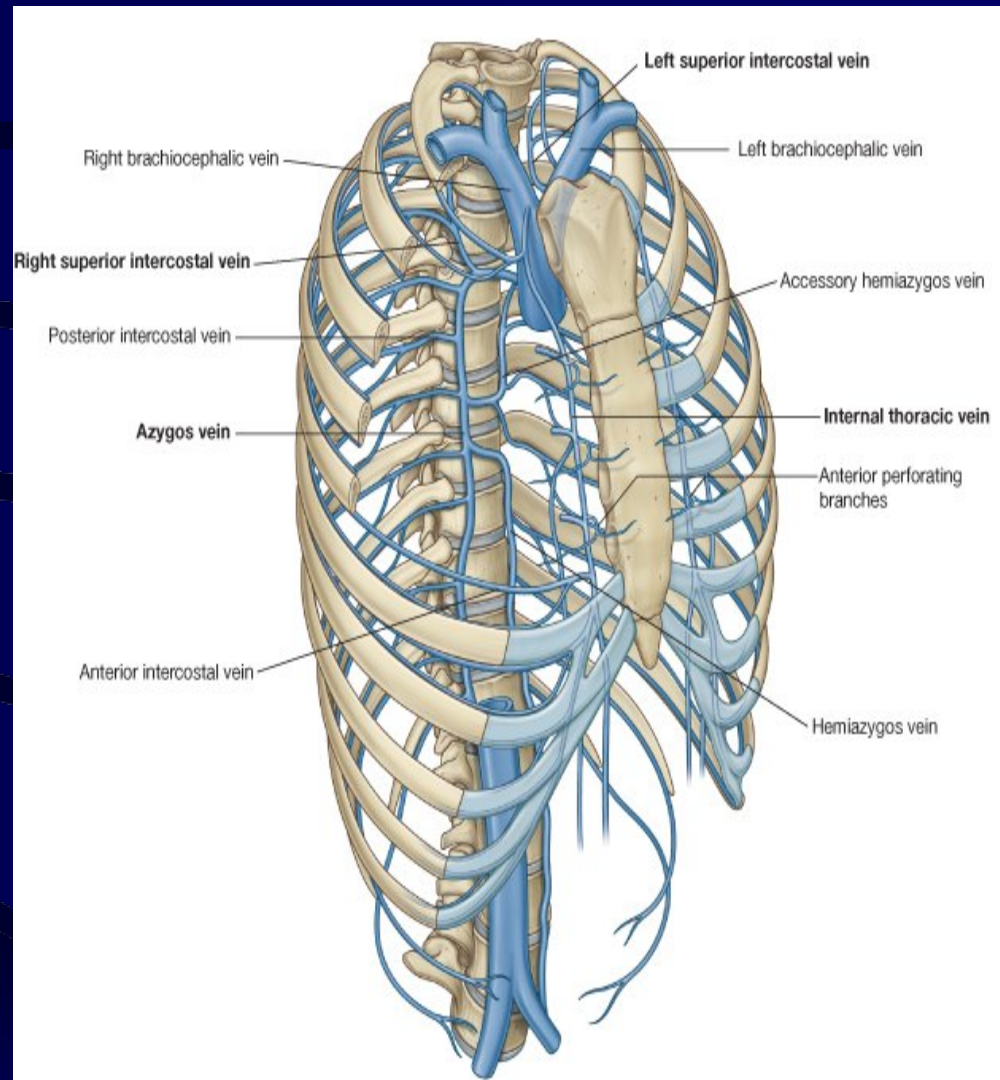
Azygos Vein

& Hemiazygos

Ant.:

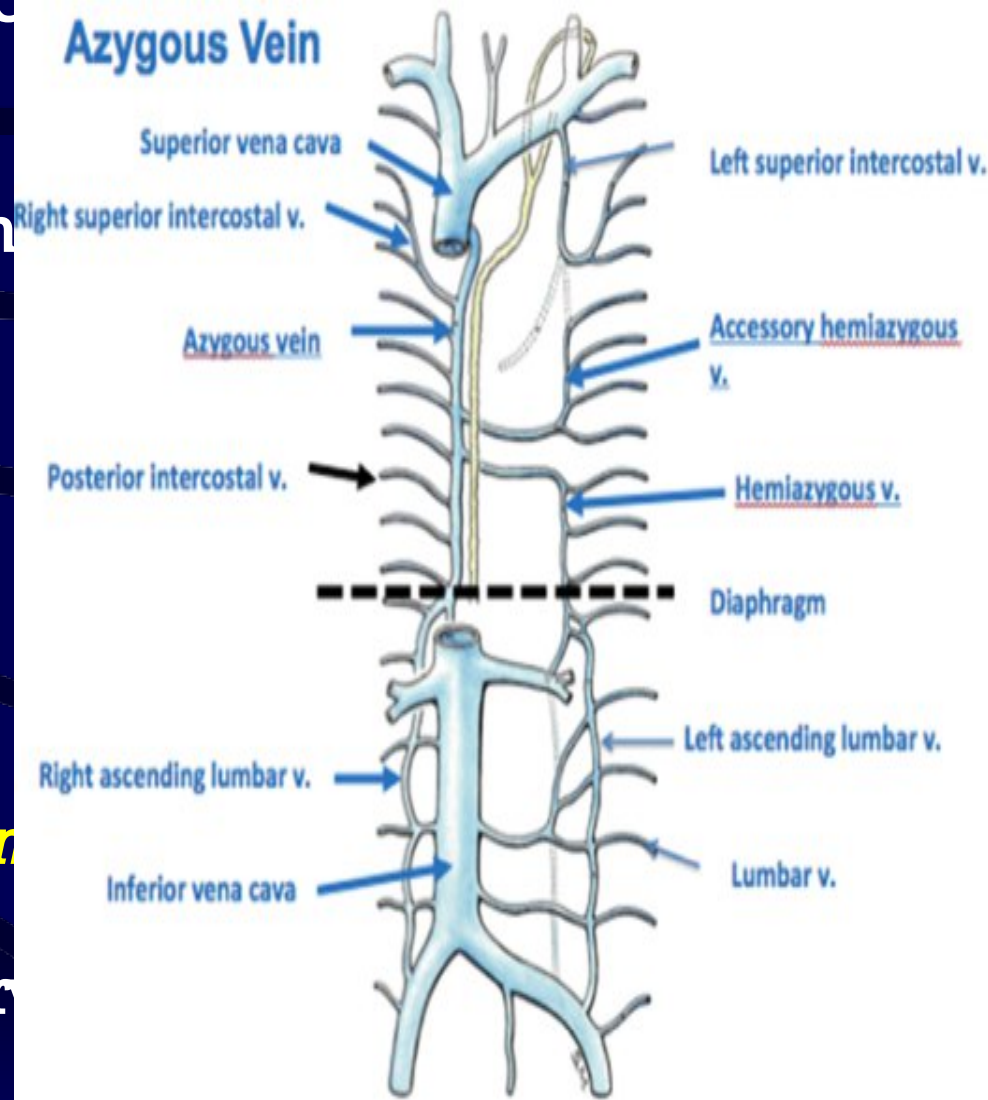
Internal Thoracic V.

& musculo-phrenic V.



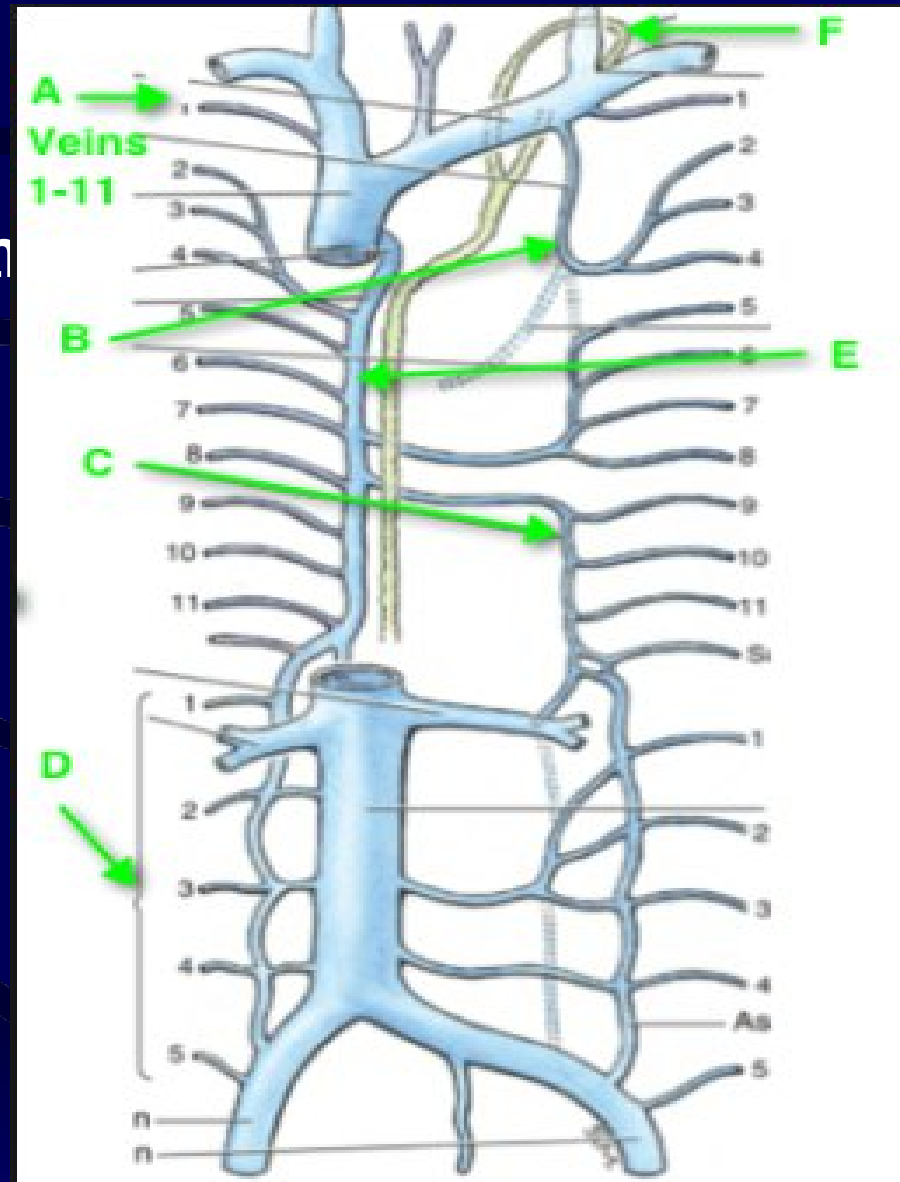
The Azygos Vein

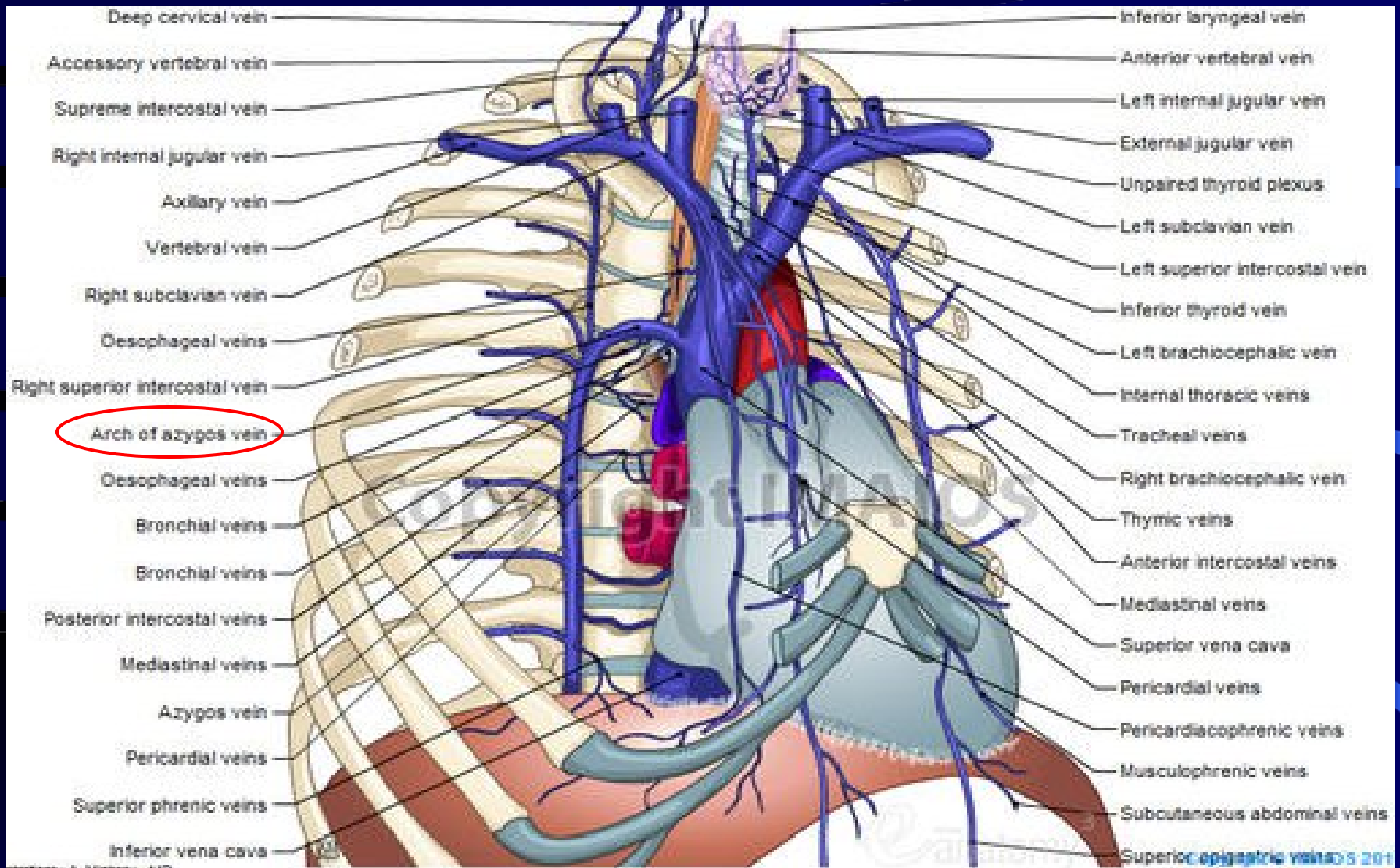
- Venous channel which connect the back of IVC, with back of SVC
- Enters thorax through aortic opening of diaphragm.
- It ascend first in pos mediastinum till disc between T4-T5, then superior M.
- **In PM:** It rest on RT side of bodies o T12-T5, on Rt side of descending Thoracic aorta, but separated by thoracic duct.
- **In SM:** make an arch from ***Behind forward, Above Root of Lum***
- It cross Rt side of esophagus, trachea, Rt vagus nerve



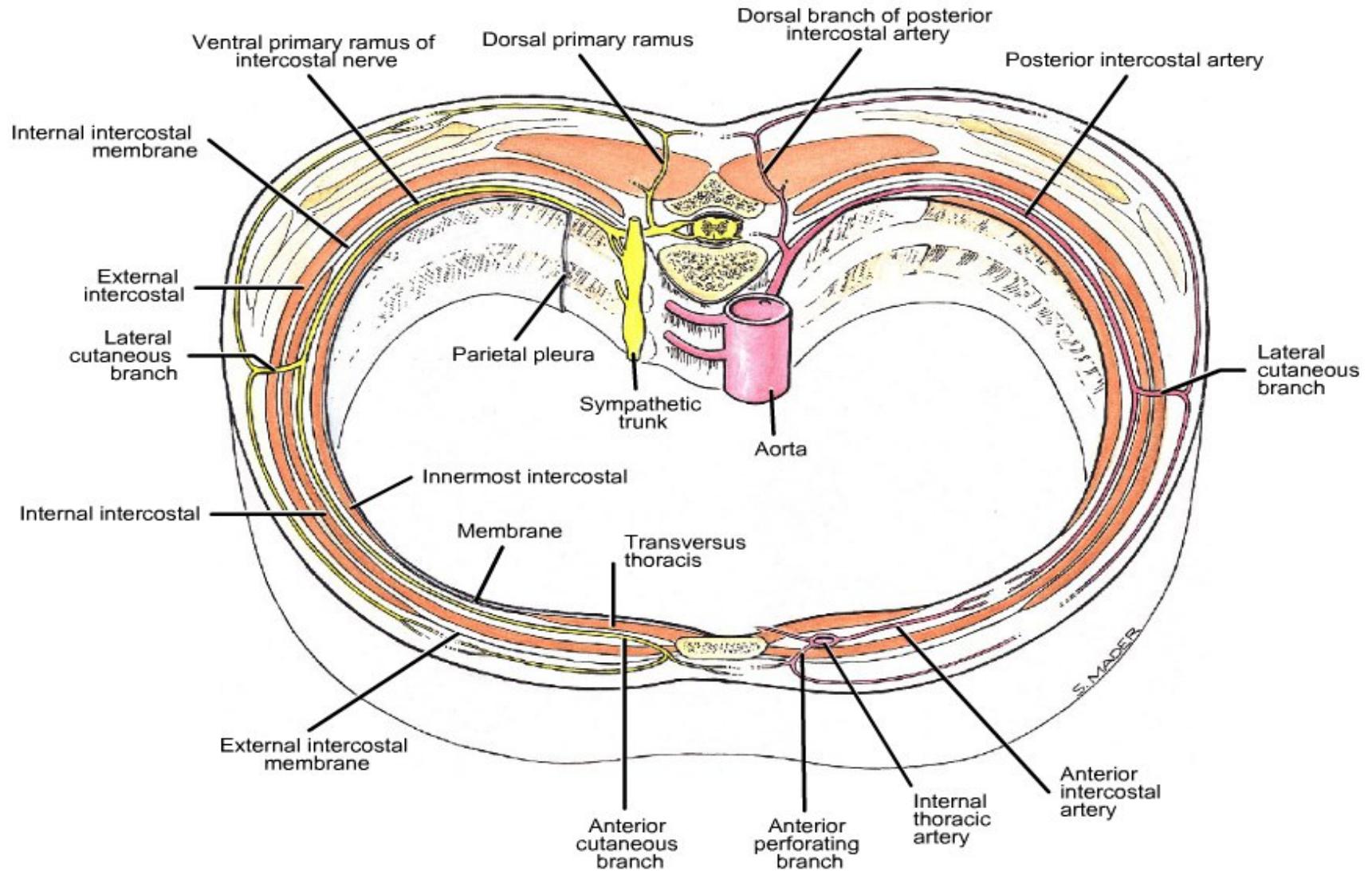
Tributaries of Azygos Vein

- Rt ascending lumbar vein.
- Rt subcostal vein.
- Rt pos intercostal vein 11-5 end separately.
- Rt superior intercostal vein union of 2-3-4, pos intercostal veins, end in arch of azygos.
- Superior hemiazygos T8.
- Inferior hemiazygos T9.
- Bronchial, pericardial veins.





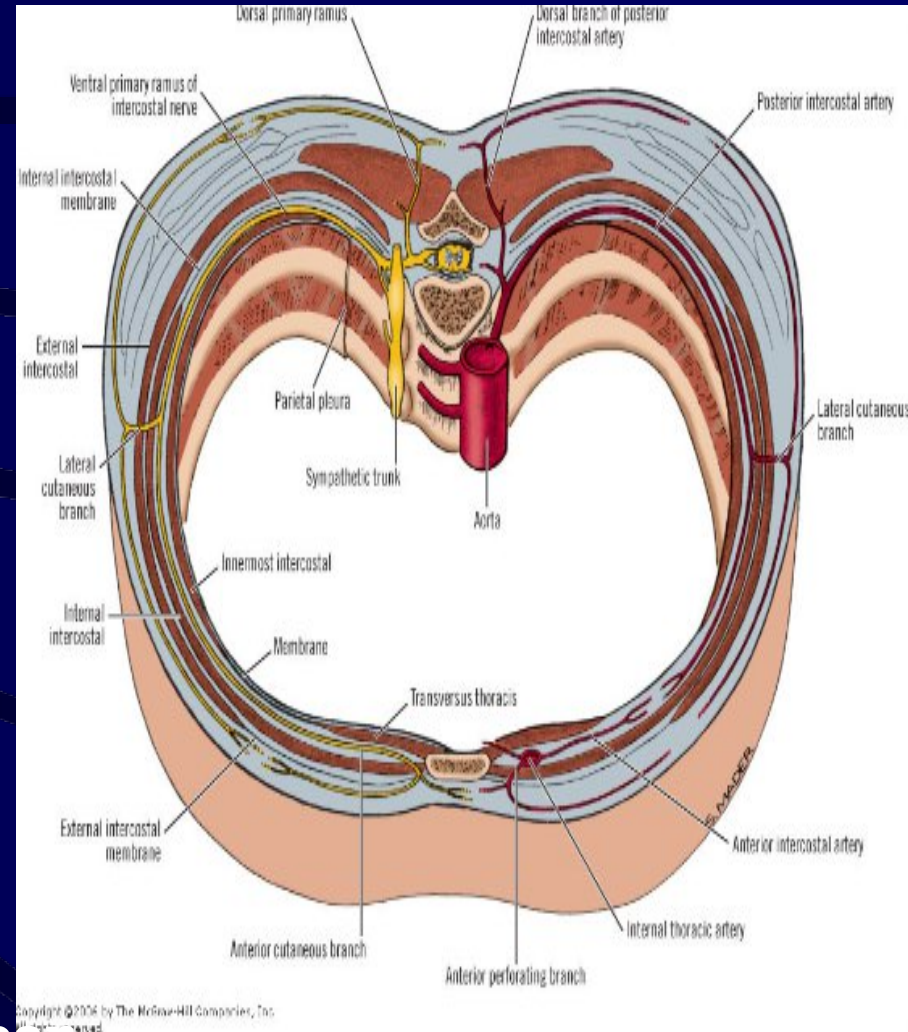
Intercostal Nerves

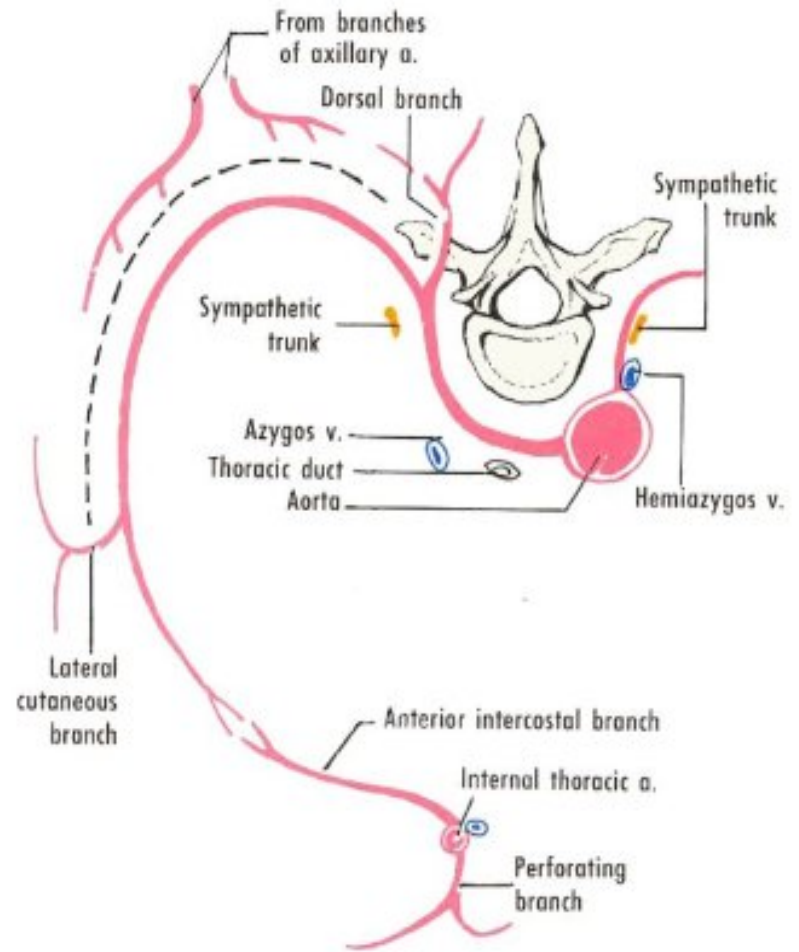
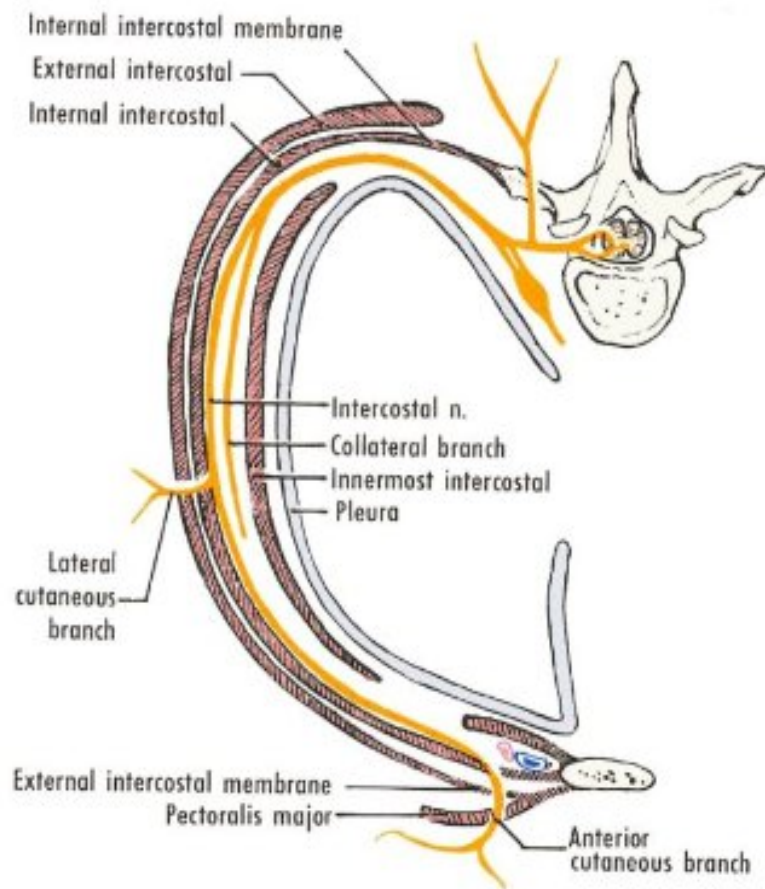


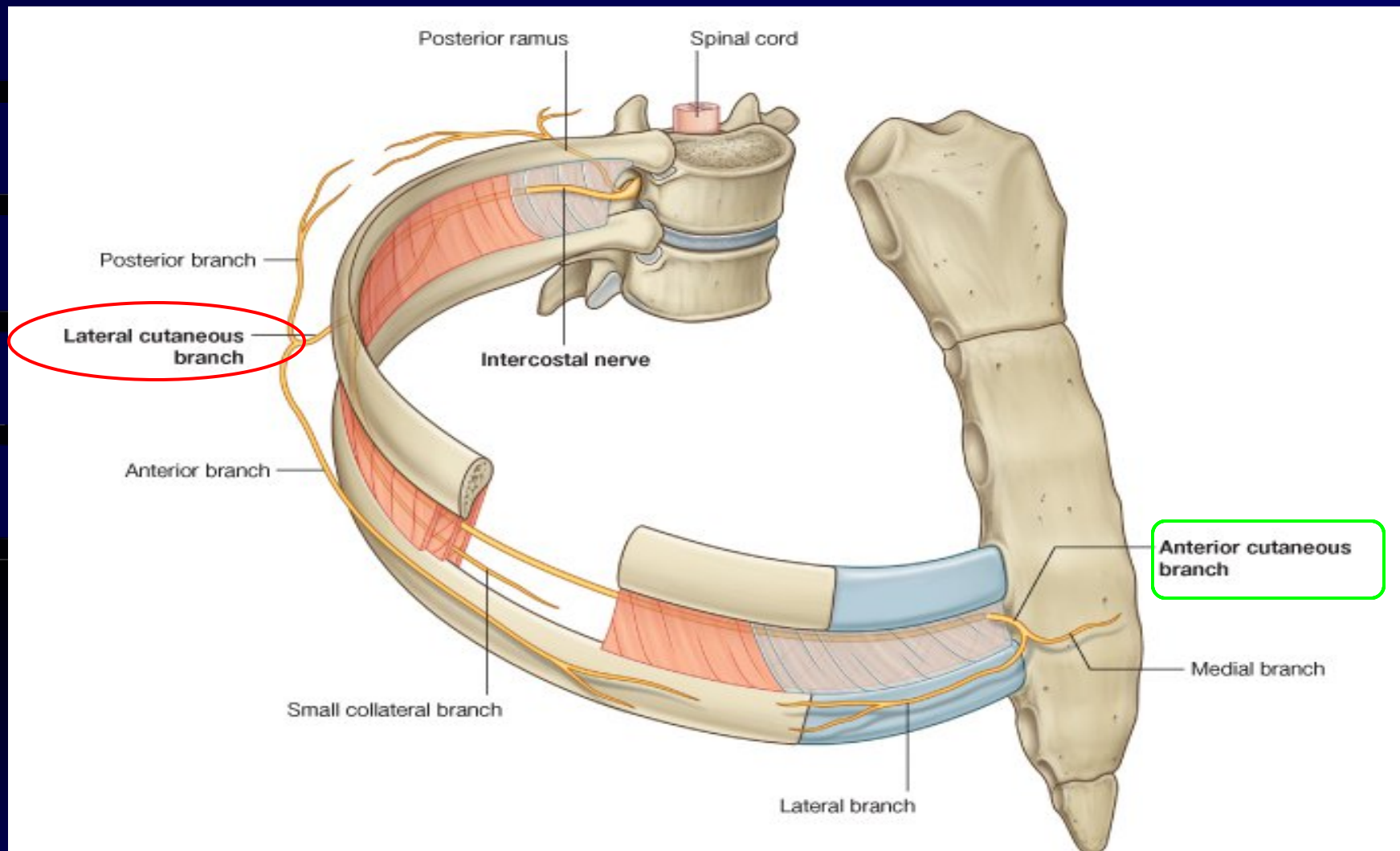
Course

- First from near VC ,pass beneath pleura.
- Lie first between external and innermost intercostal m.
- Pierce PIM , to lie between inner and innermost ICM .
- Curve till reach $\frac{1}{2}$ inch lateral to sternum, pierce AIM,PM muscle end as Anterior cutaneous n .
- Branches
- Collateral branch arise before costal angle, run along upper border of rib
- White ramus communicant to SG
- Muscular branches 3 IM.
- Lateral cutaneous nerve, arise near angle of rib divide to ant, pos branches

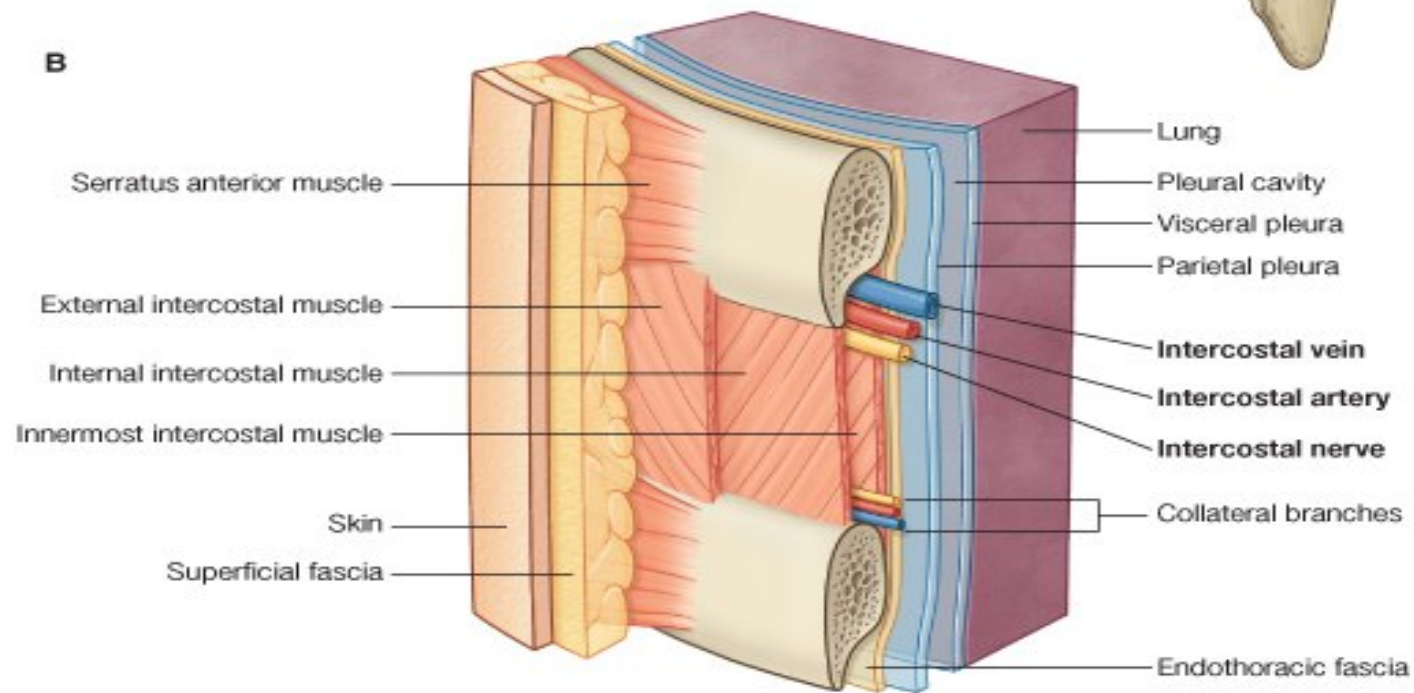
Intercostal nerves



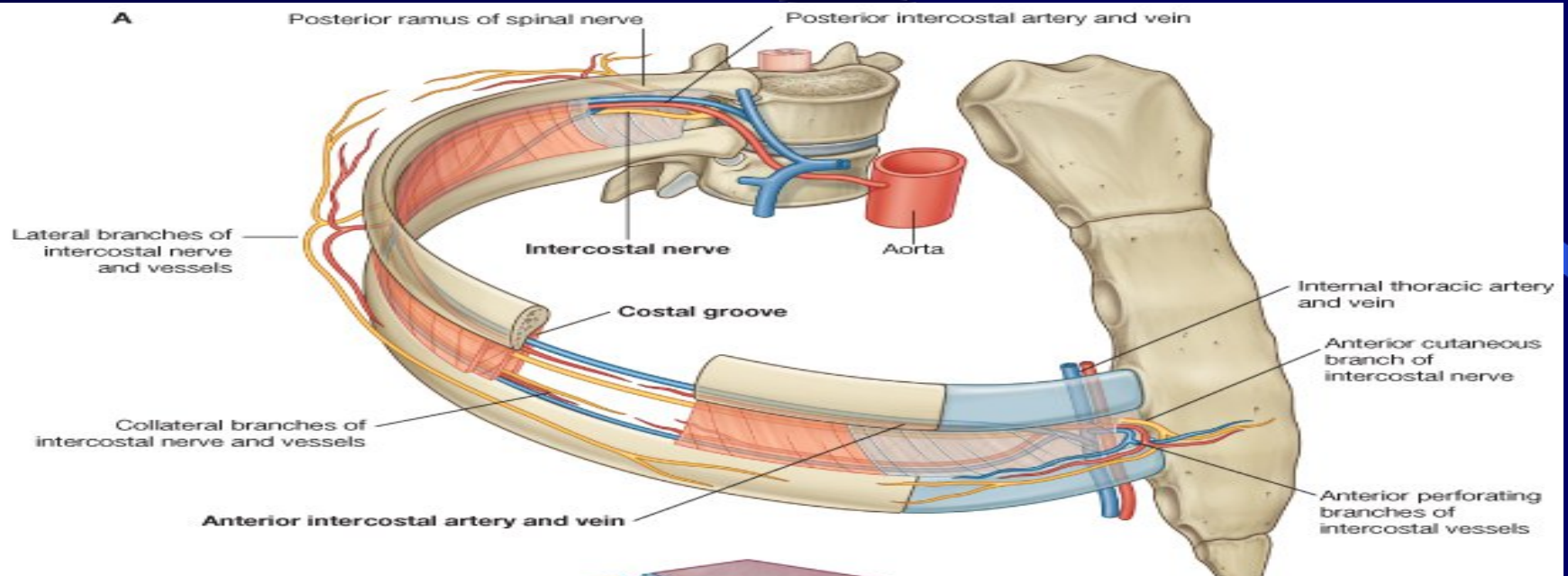




B



A



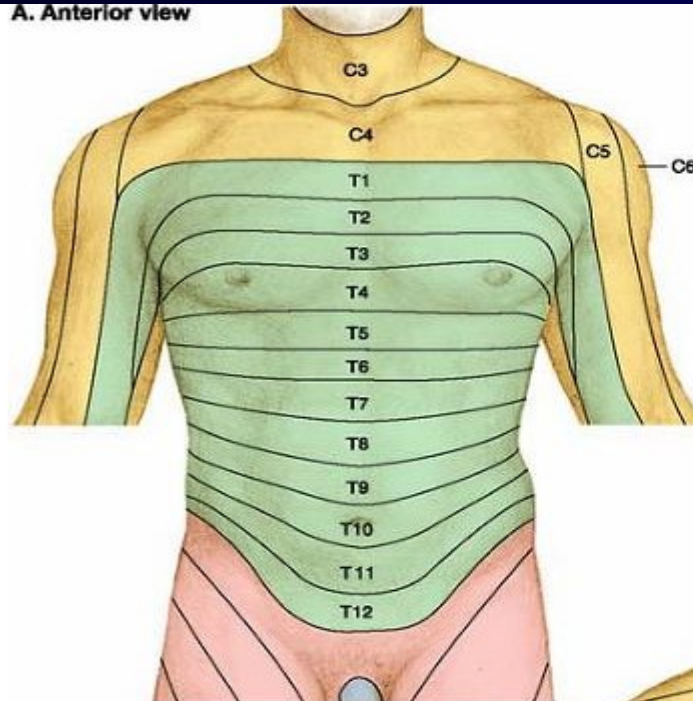
Intercostal nerves

- 11 intercostal and one subcostal nerve
- Anterior primary rami of 12 thoracic spinal nerves.
- The first nerve most of fibers ascend to join brachial plexus , smaller part run in st1ICS, to supply ICM , gives no ant cutaneous nerve.
- Subcostal nerve all its course is abdominal , ends above Symphysis pubis, Lateral cutaneous n supply gluteal region.
- Typical intercostal nerve 2-3-4-5-6
- All course in thorax.
- Non typical 7-8-9-10-11
- part of course in thorax part in abdomen.

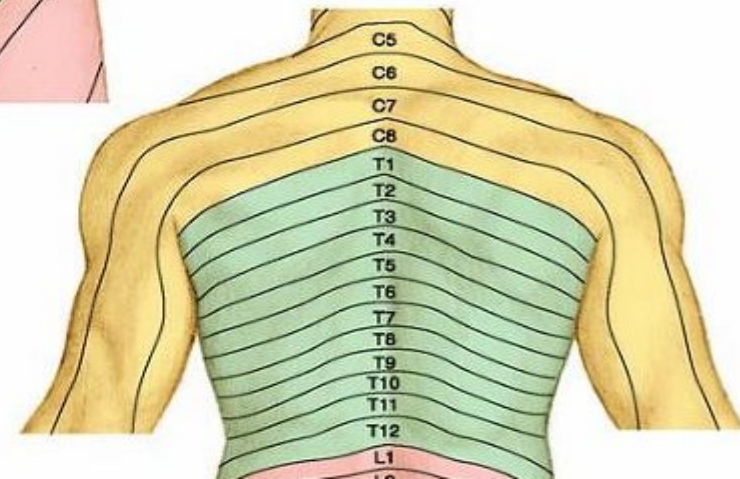
Cutaneous innervation of thoracic and abdominal wall

Above level sternal angle :skin is supplied by C3-C4

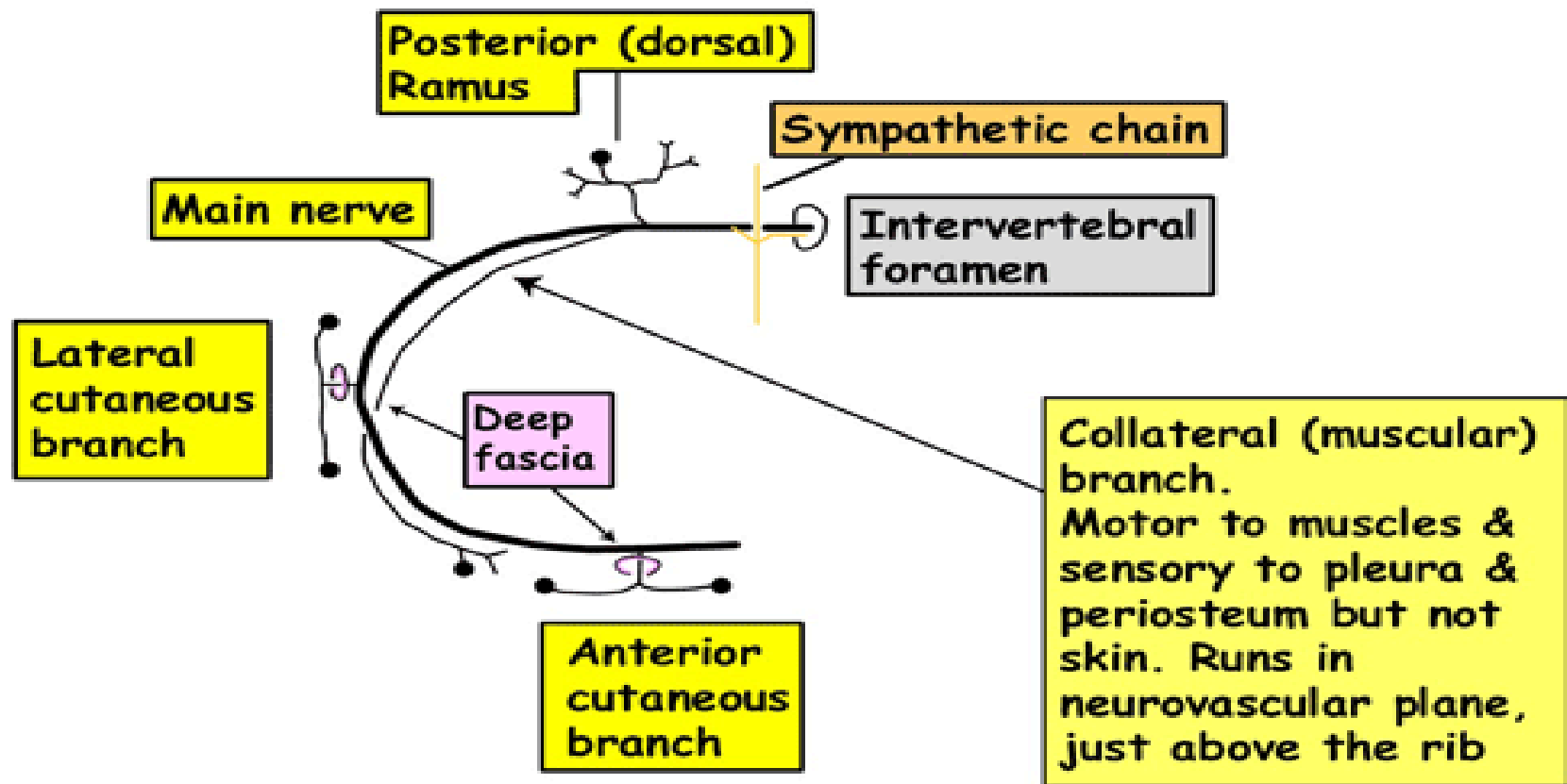
A. Anterior view



B. Posterior view



TYPICAL INTERCOSTAL NERVE



Surface markings of Ant. Chest

Clavicle

Sternum:

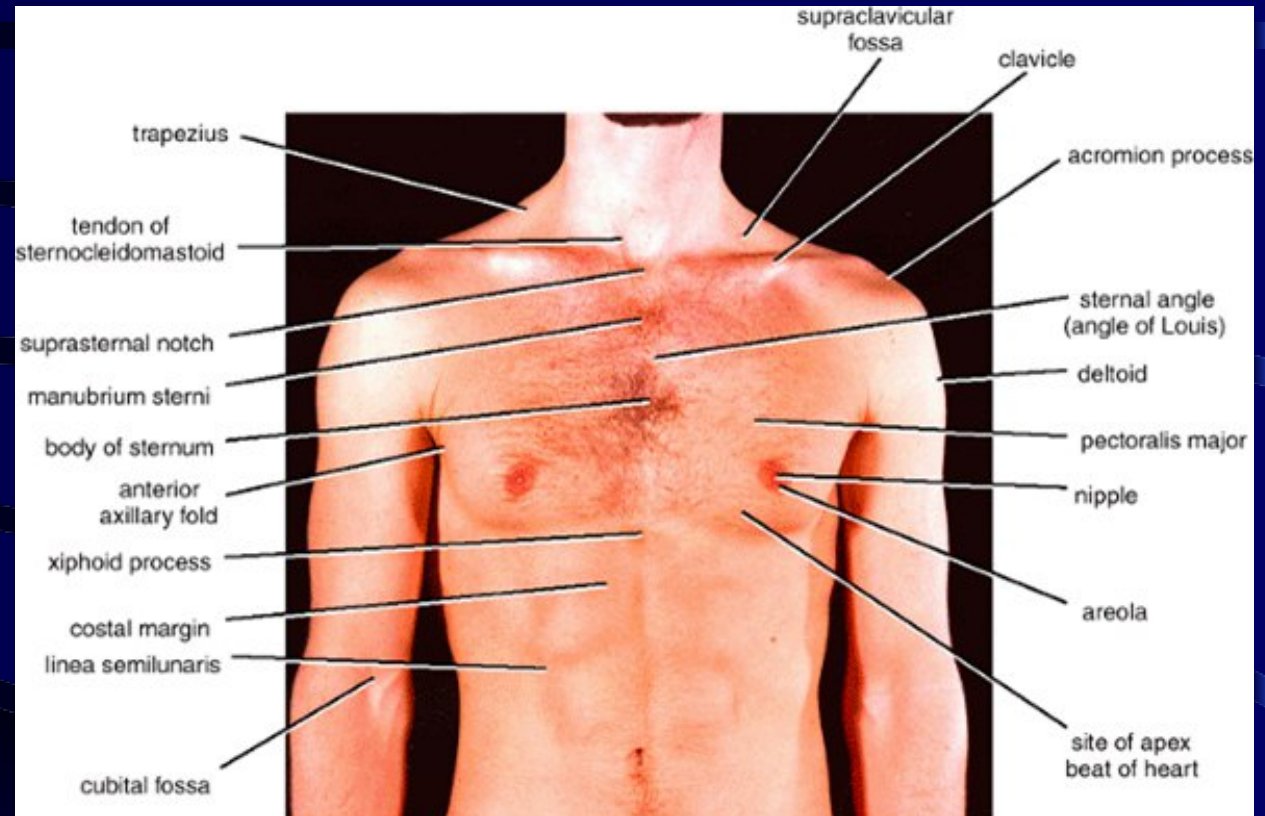
Jugular notch

Sternal angle

Body of sternum

Xiphoid process

Costal margins



Surface Anatomical Lines

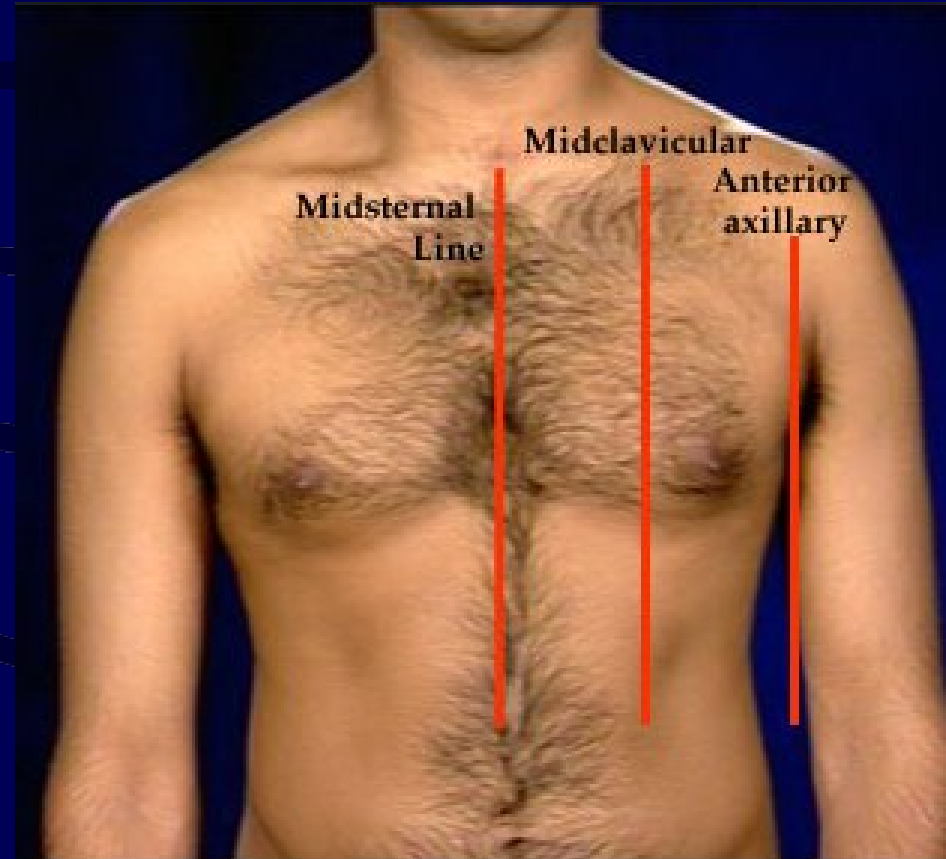
Anterior:

1. Median sagittal line:

intersection of median plane with
ant. chest wall

2. Midclavicular lines:

Midpoints of clavicles
to inguinal region



Lateral:

1. Ant. axillary line:

Along ant. axillary fold

(formed by border of Pec. Major m.)

2. Post. axillary line:

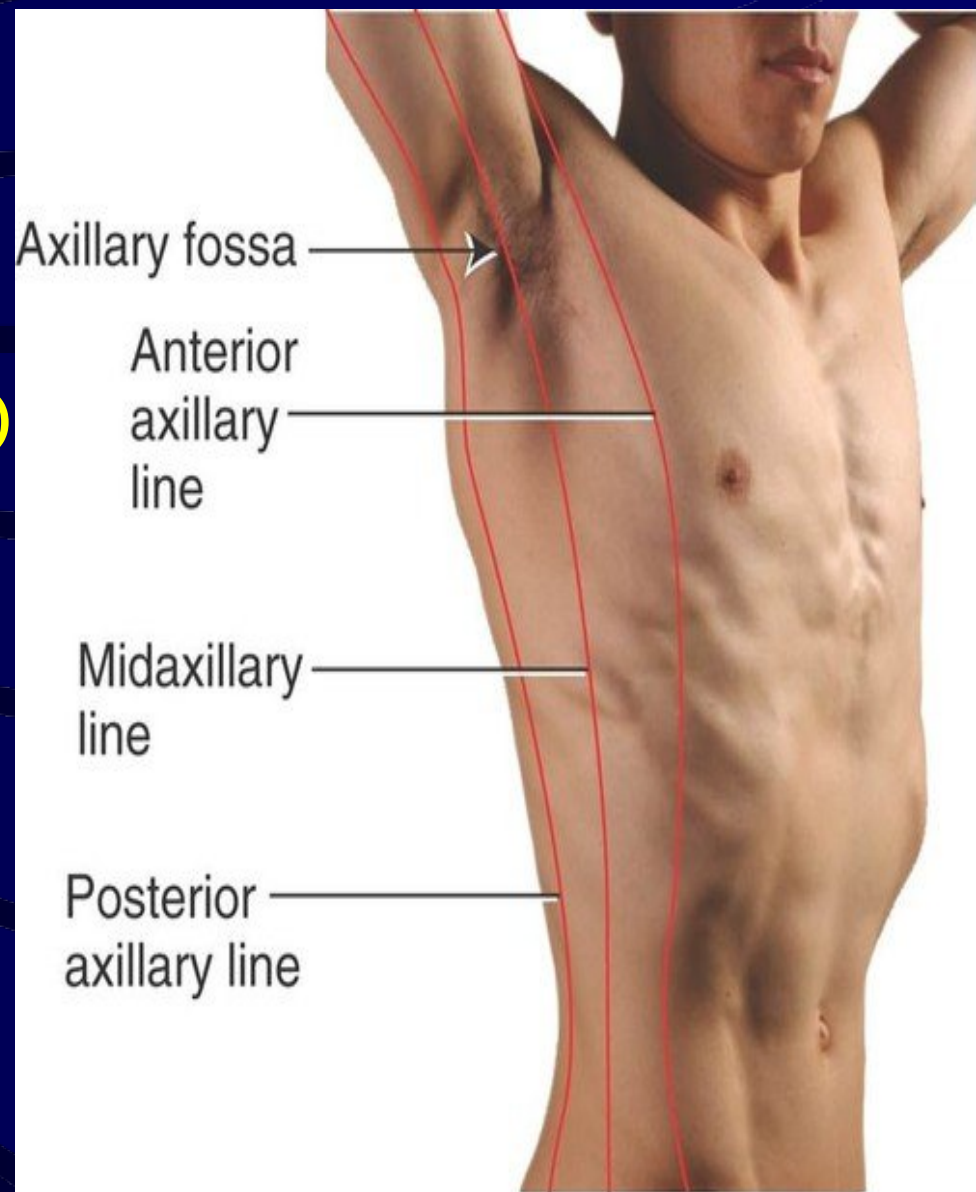
Along post. axillary fold

(formed by latissimus dorsi & teres major M.)

3. Mid axillary line:

Runs from the apex of axilla

Parallel to ant. & post. lines



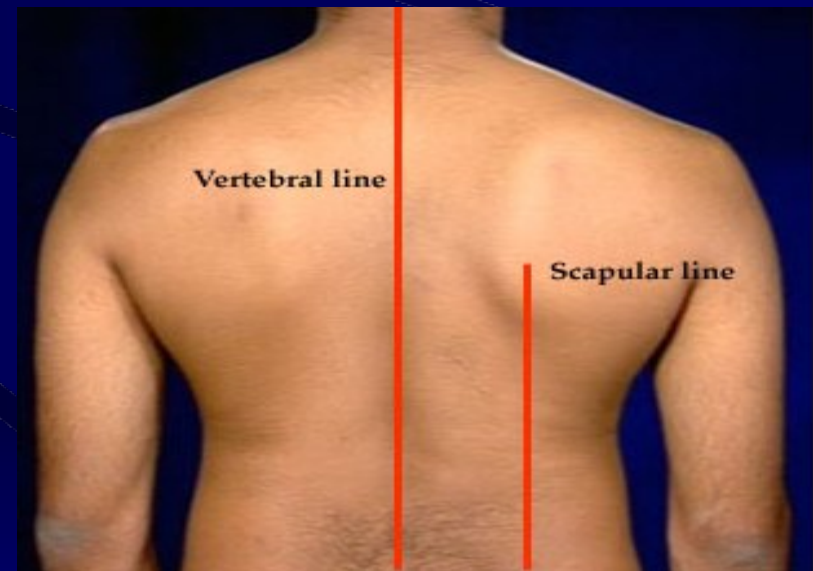
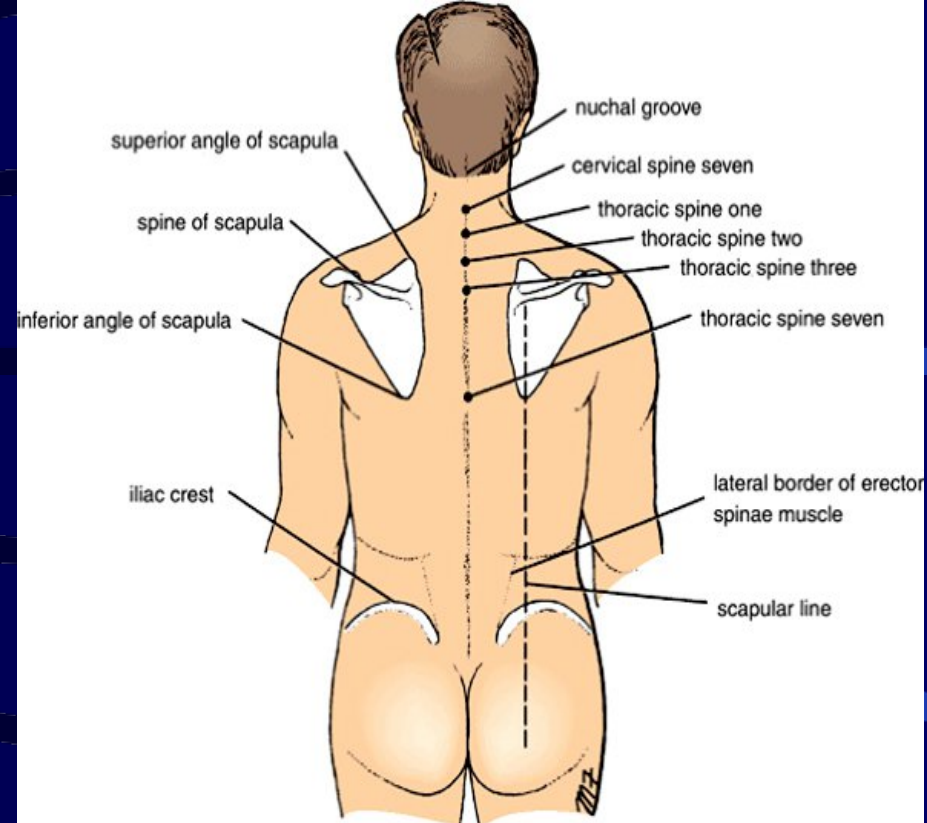
Posterior:

1. Post. median line:

Over the tips of spinous processes of all vertebrae

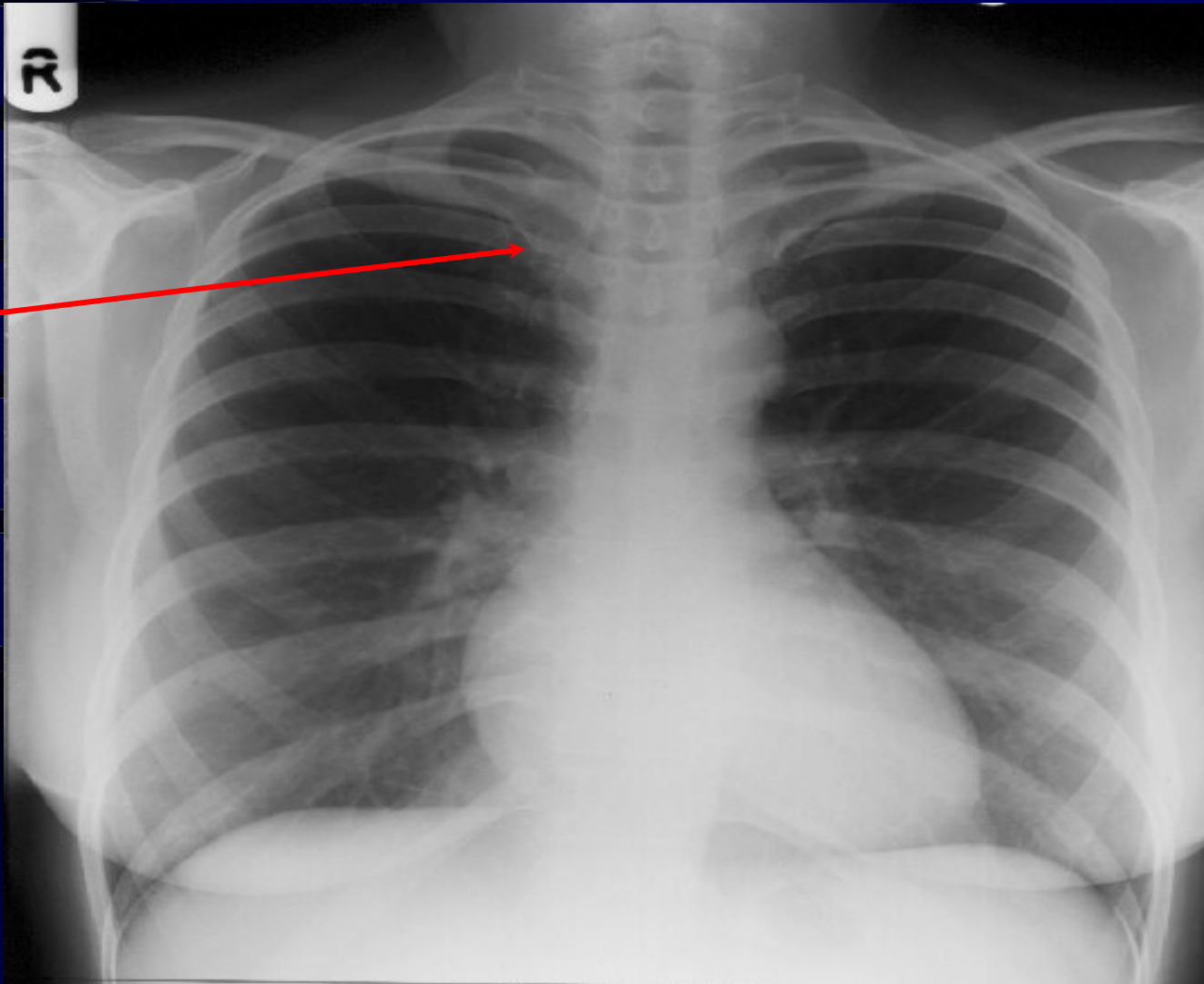
2. Scapular lines:

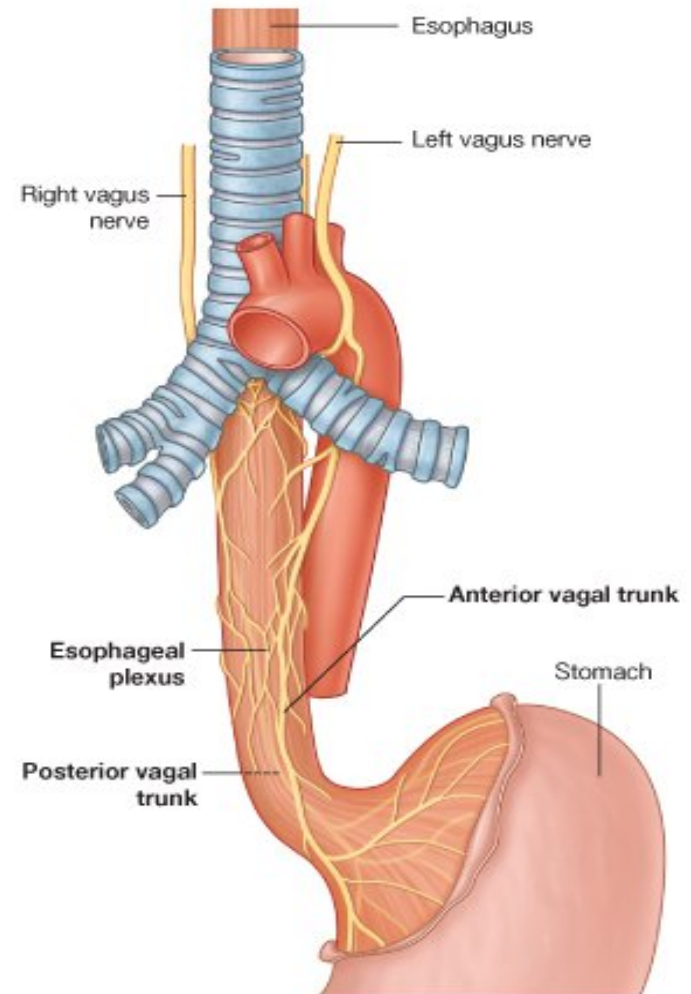
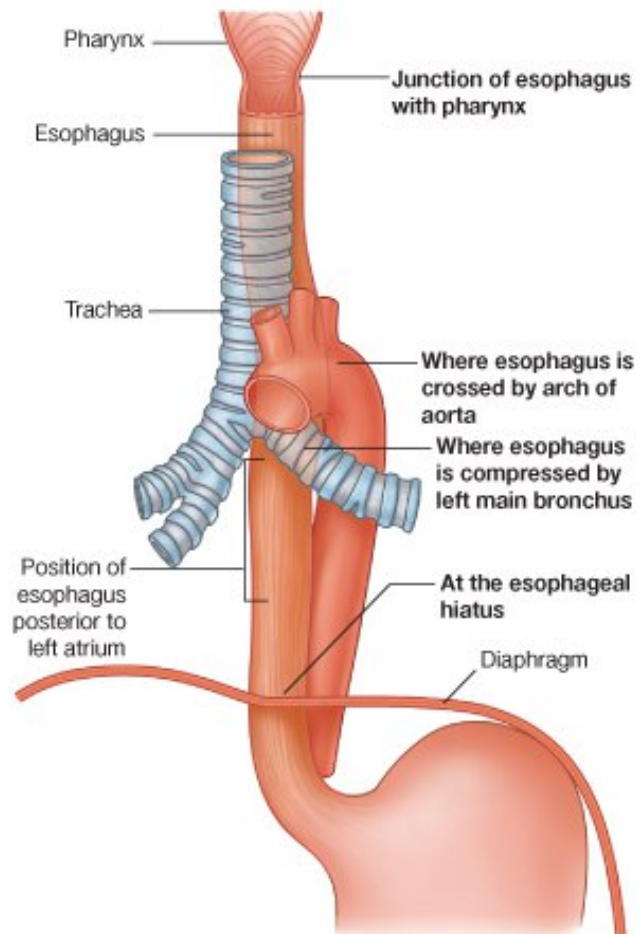
Through sup. & inf. angles of the scapula when arms at anatomical position



posteroanterior chest x-ray

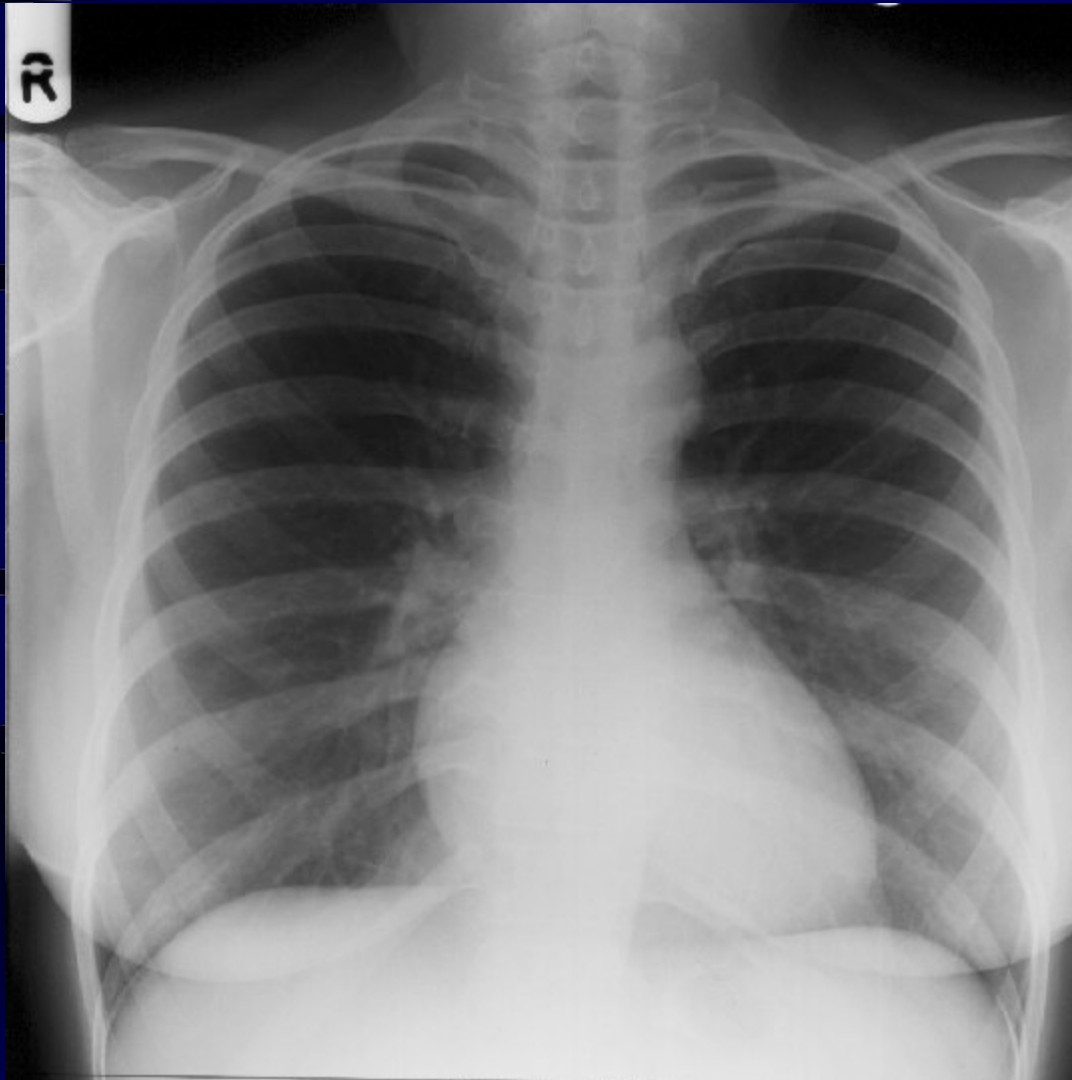
SVC





posteroanterior chest x-ray

**Aorta:
Ascending
& arch**



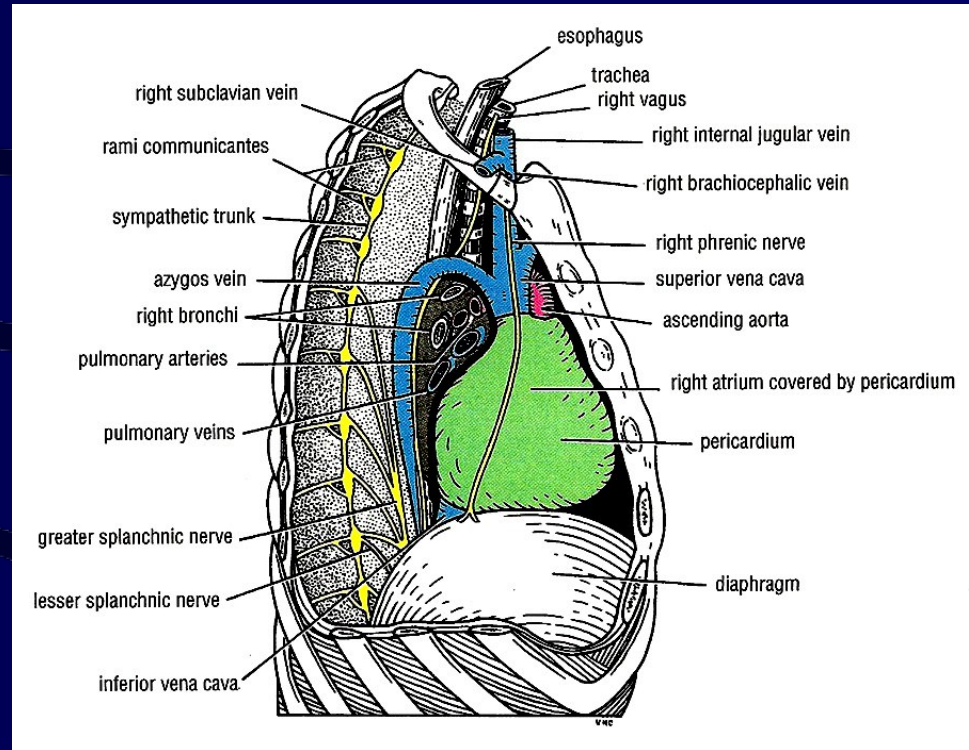
Nerves in Mediastinum: Vagus & Phrenic

Vagus Nerve

- Cranial nerve **X** (parasympathetic)

Rt. Vagus:

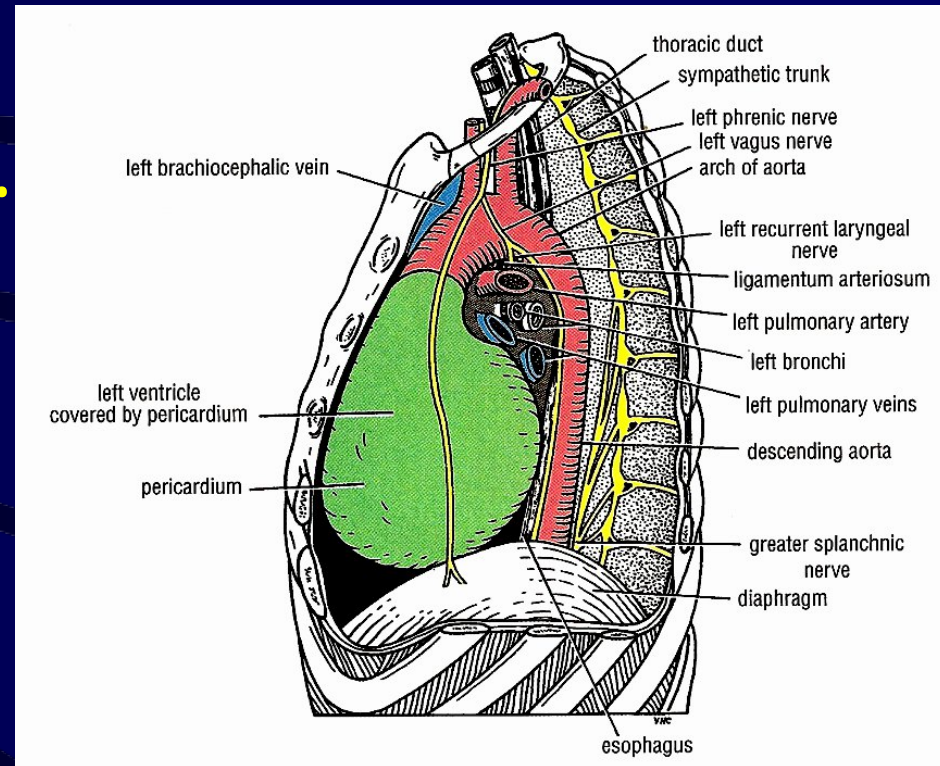
- - Lat. to the trachea
- - Medial to azygos
- - Post. to root of the Rt. lung
- - Join esophagus:
- Esophageal opening (Post.)



Gives Rt. Recurrent laryngeal n. that loops around subclavian a.

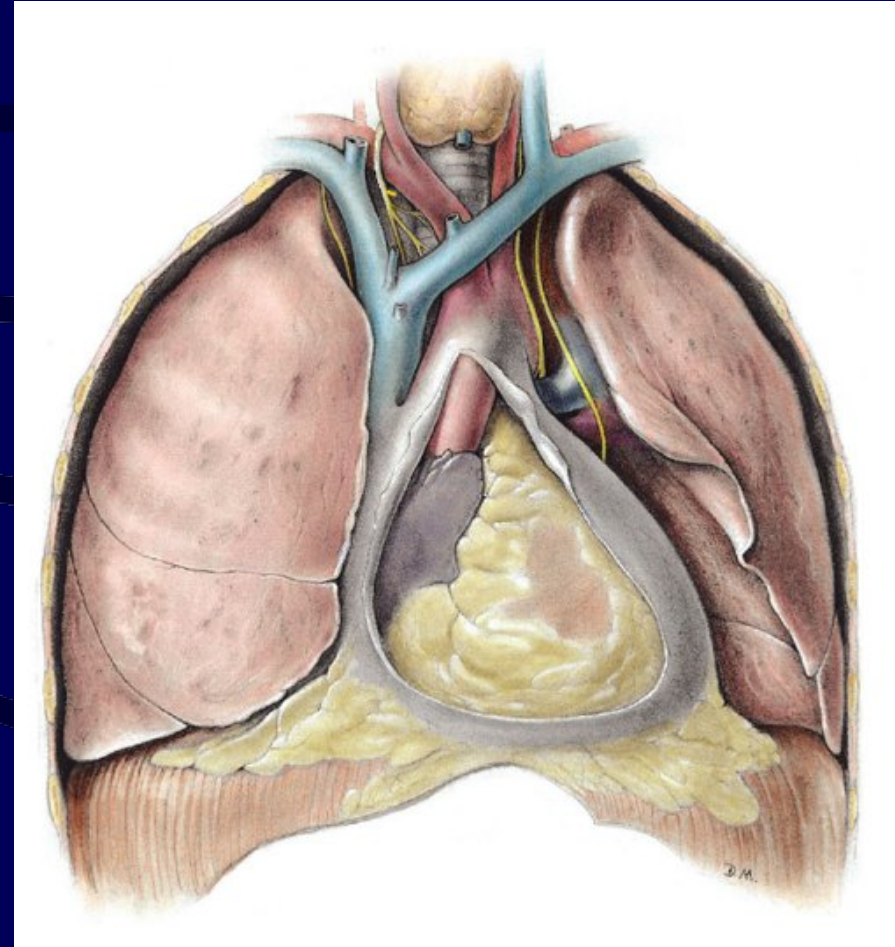
Left Vagus

- - Descends between lf. CC & lf. Subc.
- - Ant. & Lf. to aortic arch
- ⇒ **Lf. Recurrent laryngeal n.**
- - **Post. to lung root**
- - Join esophagus:
- esophageal opening(**ant.**)



Phrenic Nerve

- C3, 4, 5
- Motor:
 - Sole motor to diaphragm.
- Sensory:
 - Sensory to central part of diaphragm.
 - Pericardium
 - Parietal pleura (mediastinal)
 - Peritoneum (diaphragmatic)



Rt. Phrenic

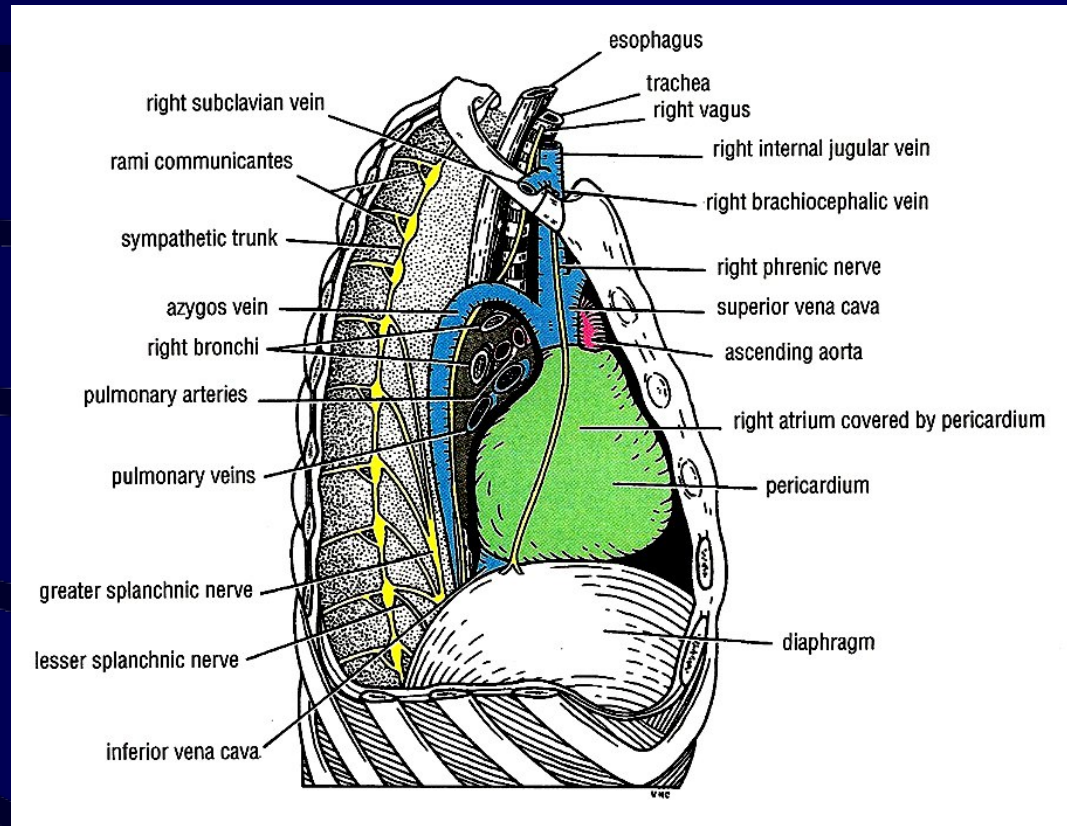
Descends lat. to
brachiocephalic & SVC

Ant. to root of Rt. Lung

Rt. Side of pericardium

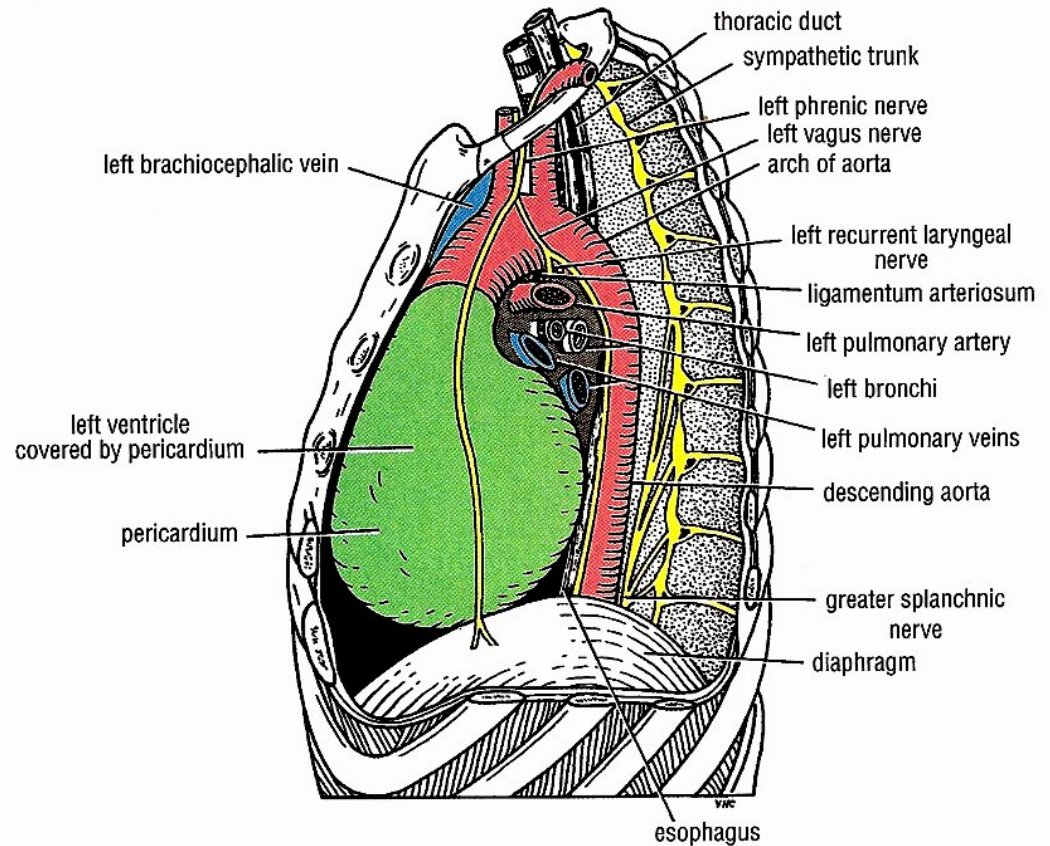
Rt. to IVC:

Caval opening



Left Phrenic

Enters lf. To subclavian a.
Lat. To vagus n (X)



Trachea

Fibro cartilaginous tube.

(C6-sternal angle)

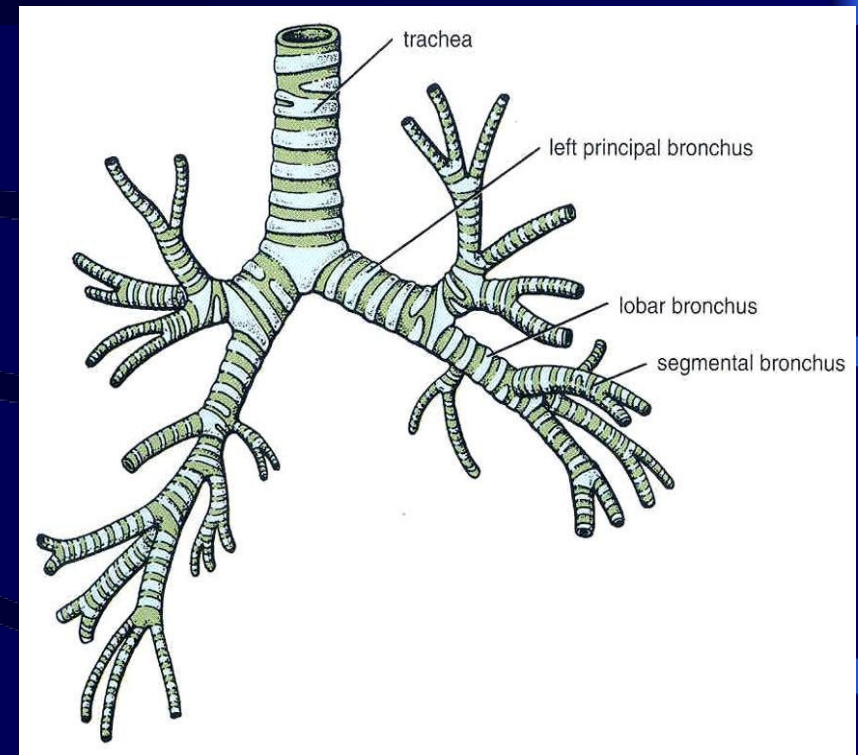
U-shaped bars of **hyaline cartilage**
& **smooth muscle (trachialis)**

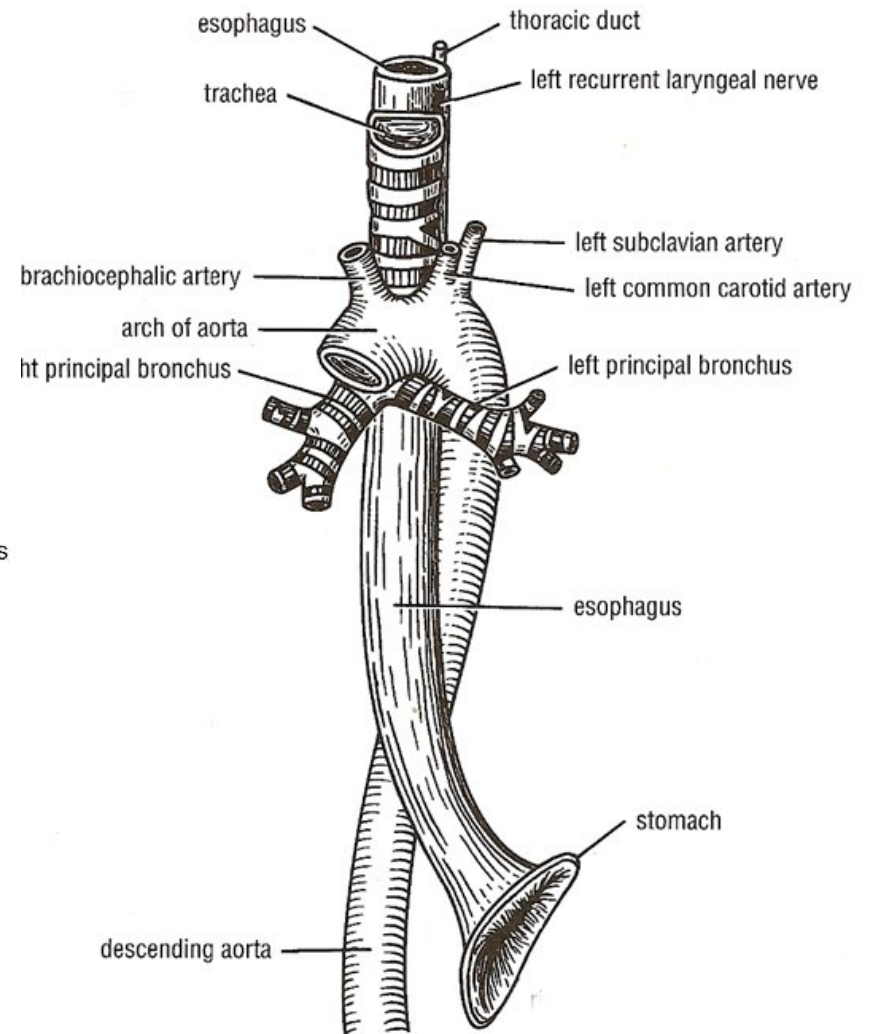
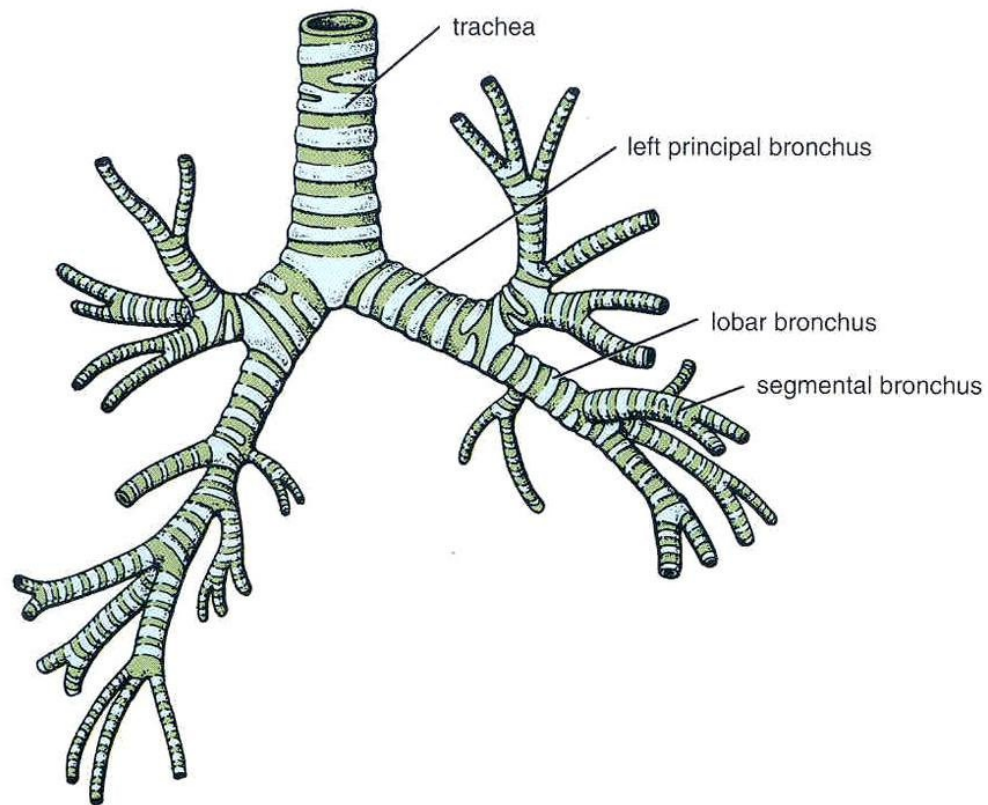
Rt. bronchus:

Wider, shorter & more vertical

Lf. Bronchus:

Narrower, longer & more horizontal





Tracheal Relations

Anterior:

Lf. Brachiocephalic v. & manubrium

Posterior:

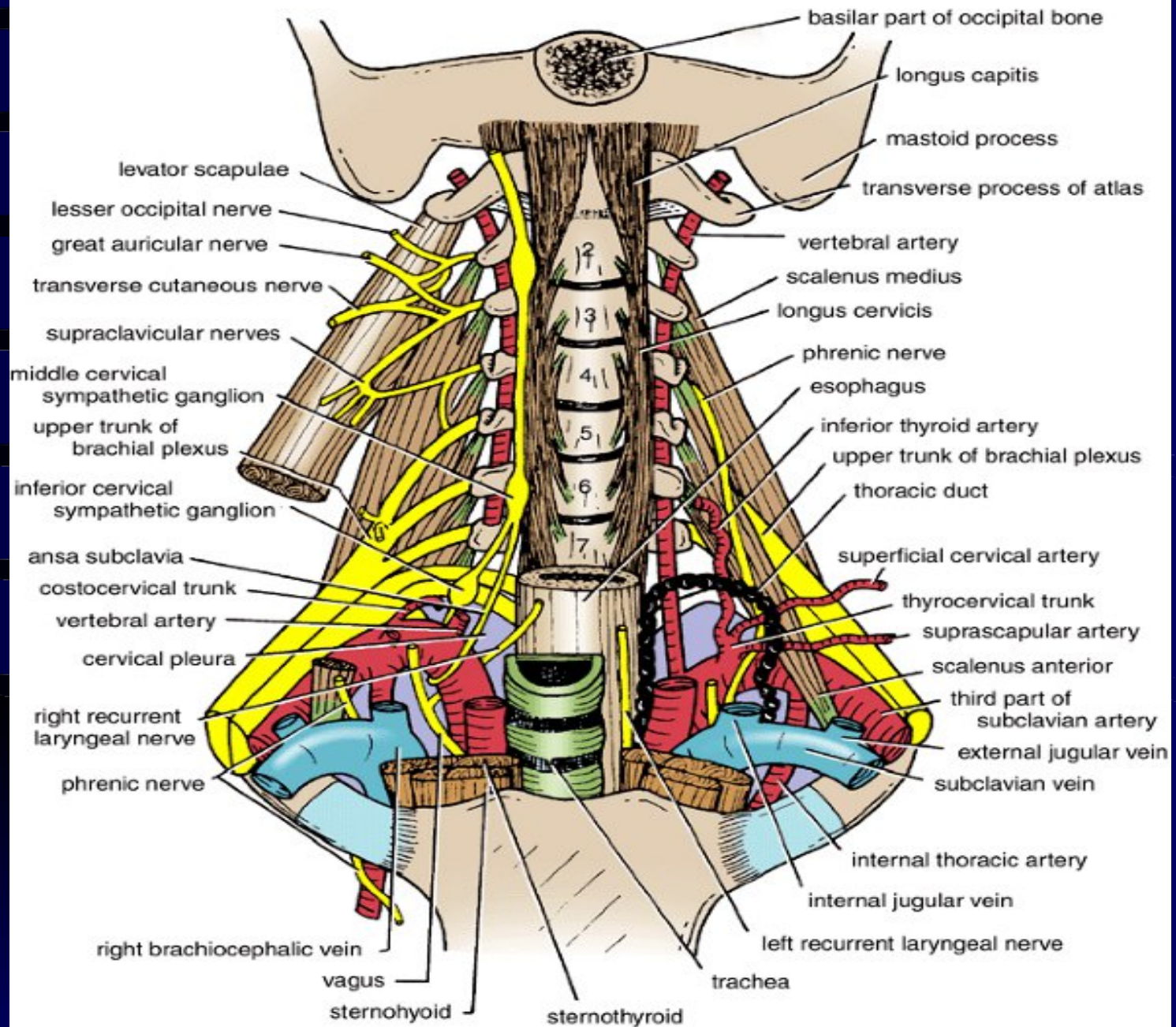
Esophagus & recurrent laryngeal n.

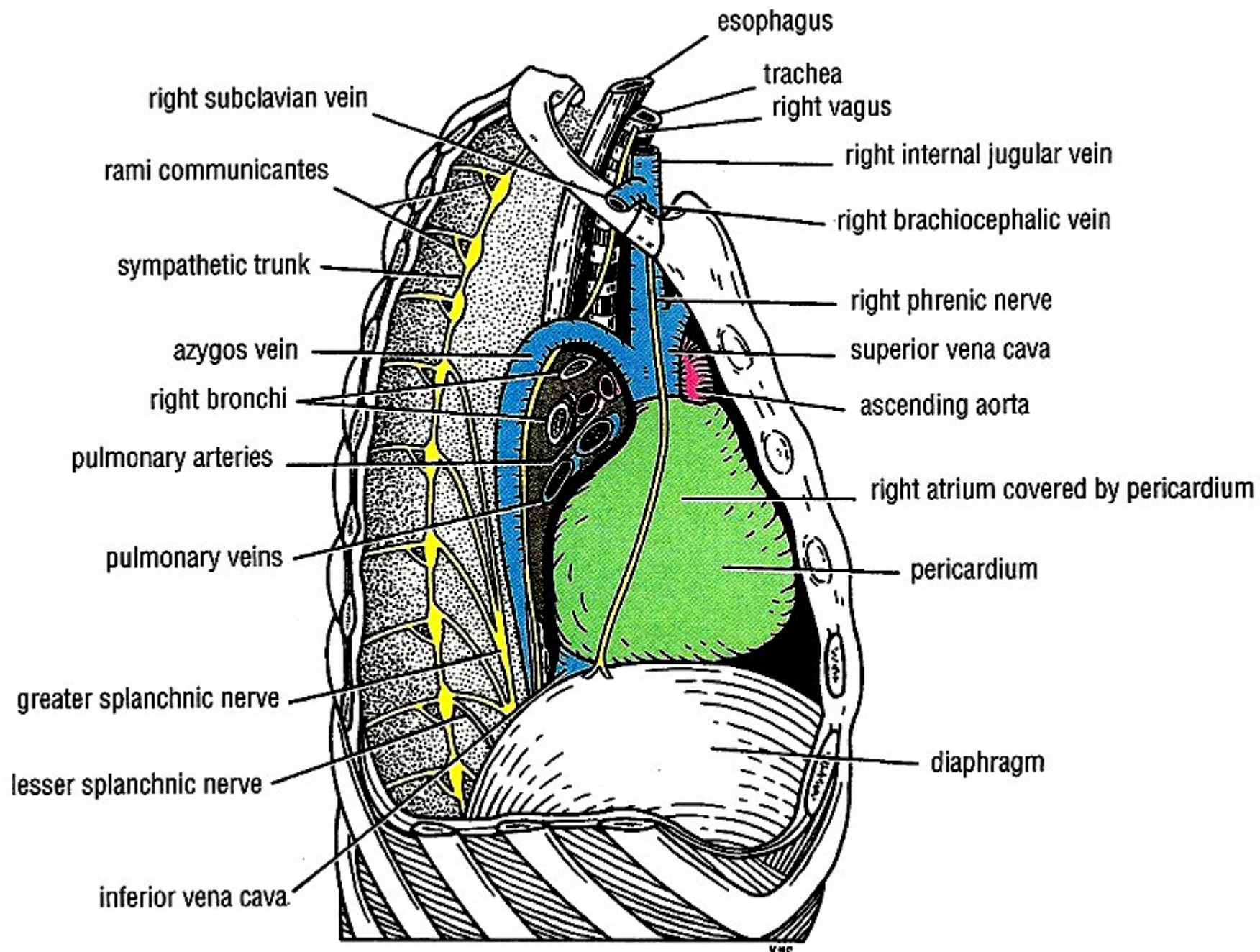
Right:

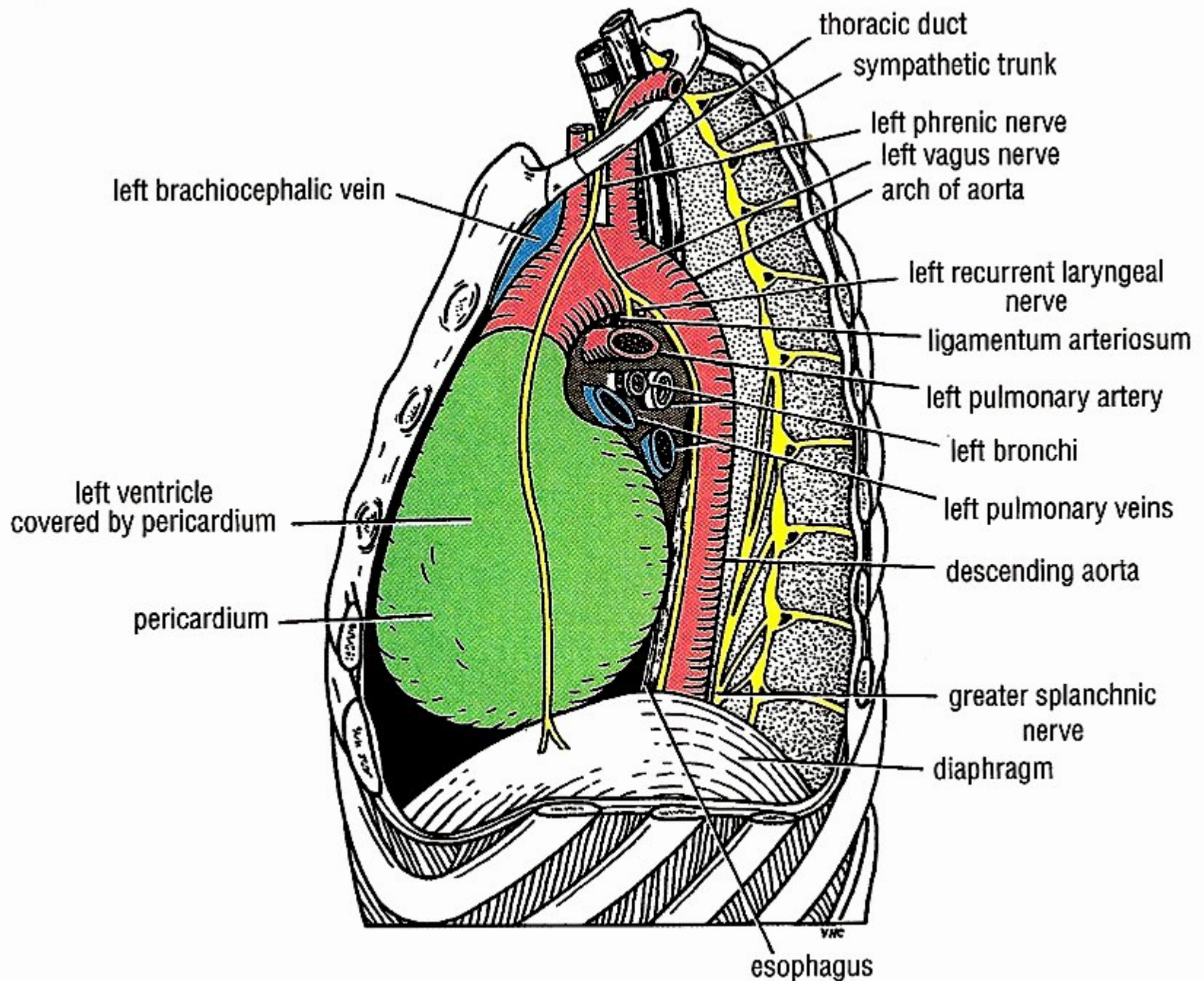
Rt. Vagus n. & Azygos v. (just inf.)

Left:

Aortic arch, Lf. CC & Subclav. A & Lf. Vagus n.







Right:

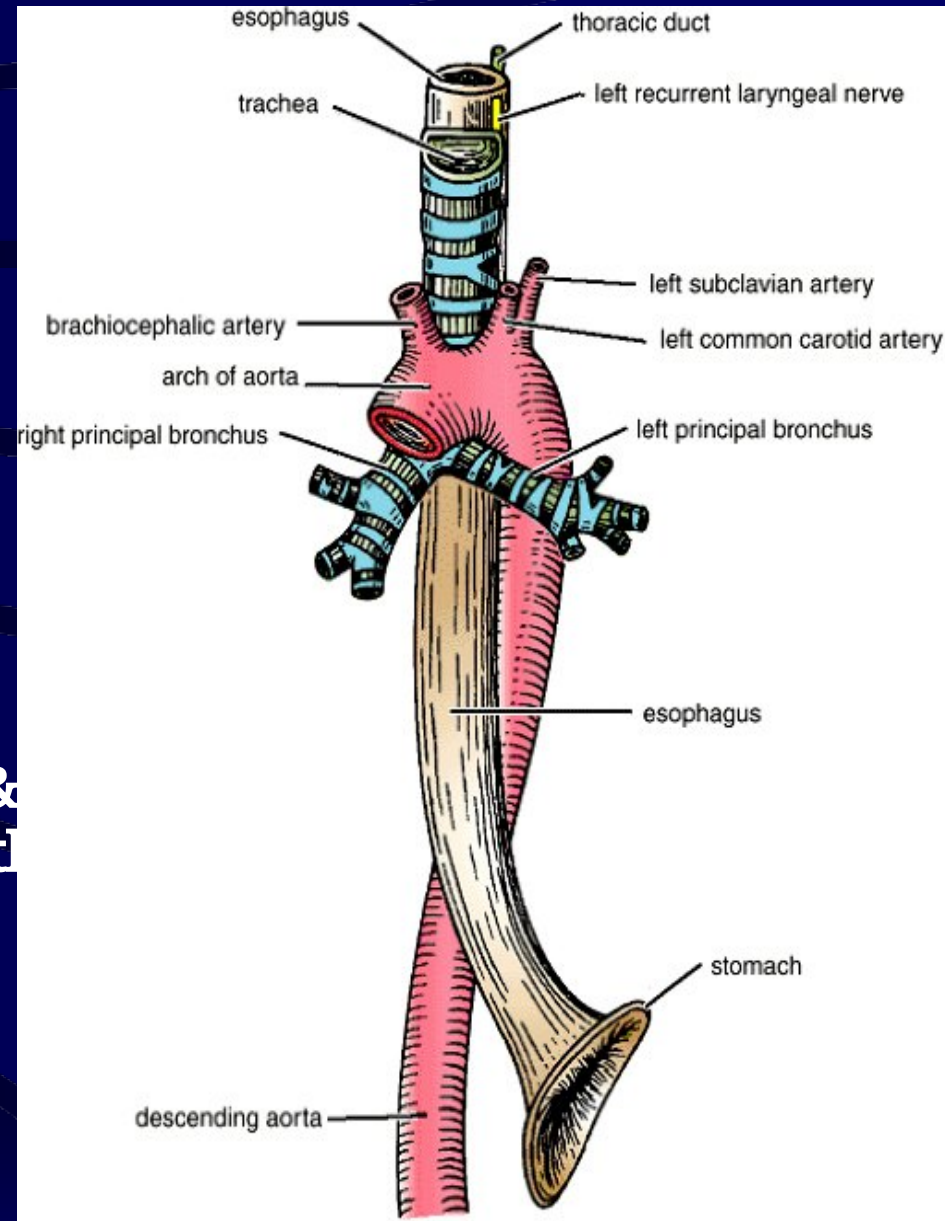
**Mediastinal pleura &
azygos vein (as it arches)**

Left:

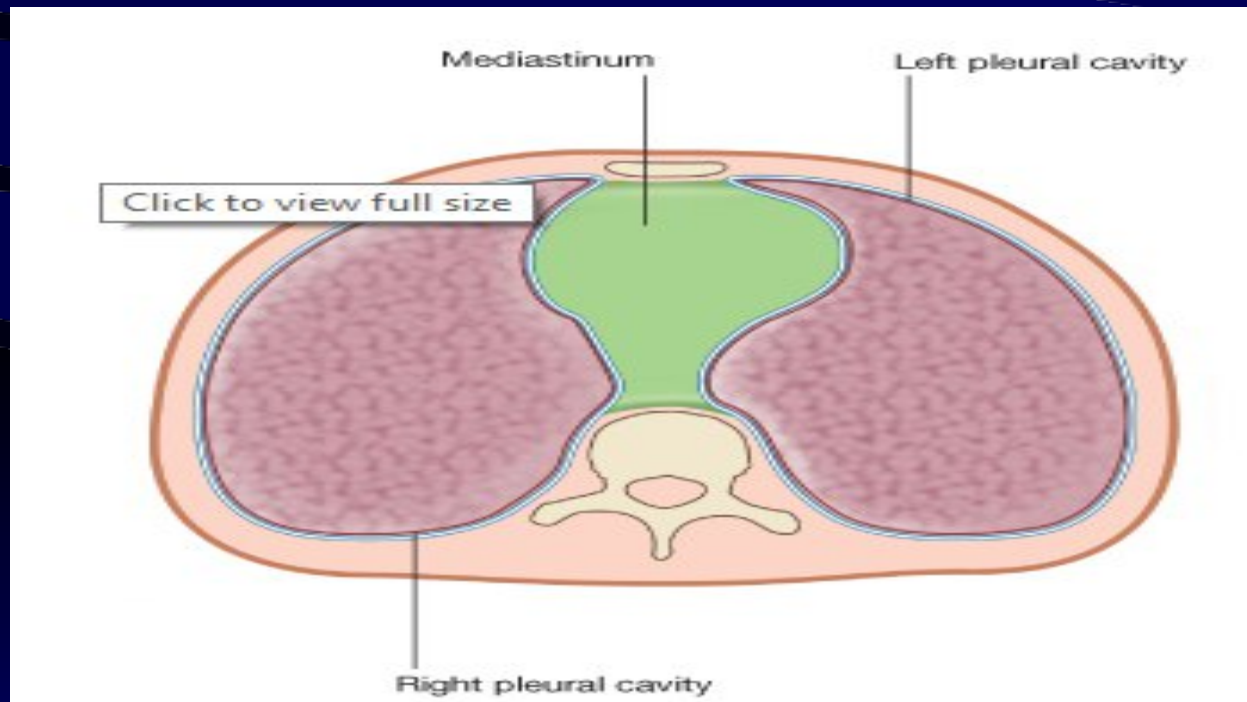
**Aortic arch & Lf. subclavian a
Superior part of thoracic duct**

**Vagus nerves join the esophagus &
rotate around as it passes through the
diaphragm:**

Rt. Vagus = posterior
Lf. Vagus = anterior



Thoracic Cavity: Pleurae & Lungs

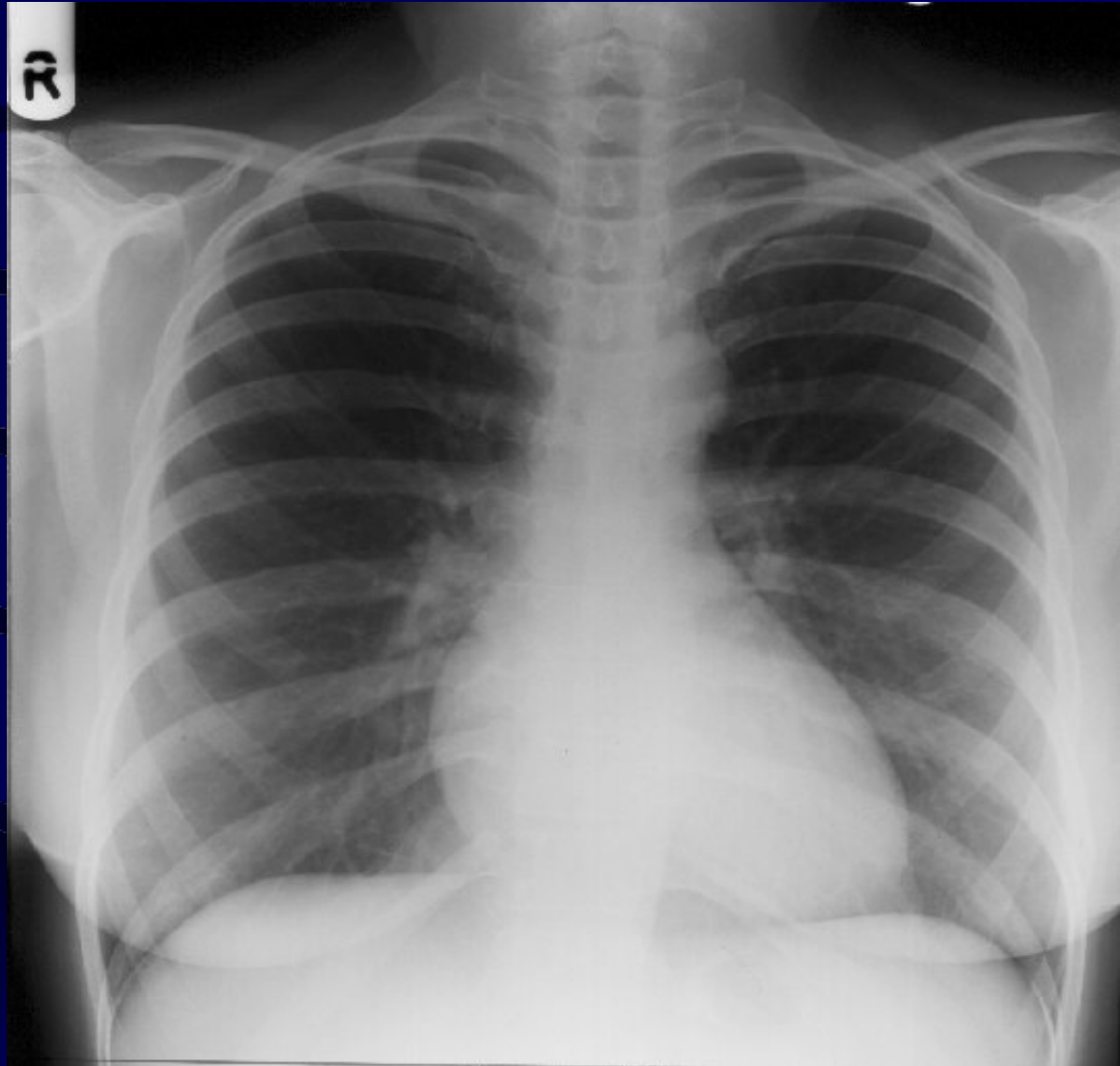


Thoracic Cavity

3 Parts

- 2 pulmonary(lat.)
- lungs & pleurae .

Mediastinum:
(central) Heart &
other big vessels .

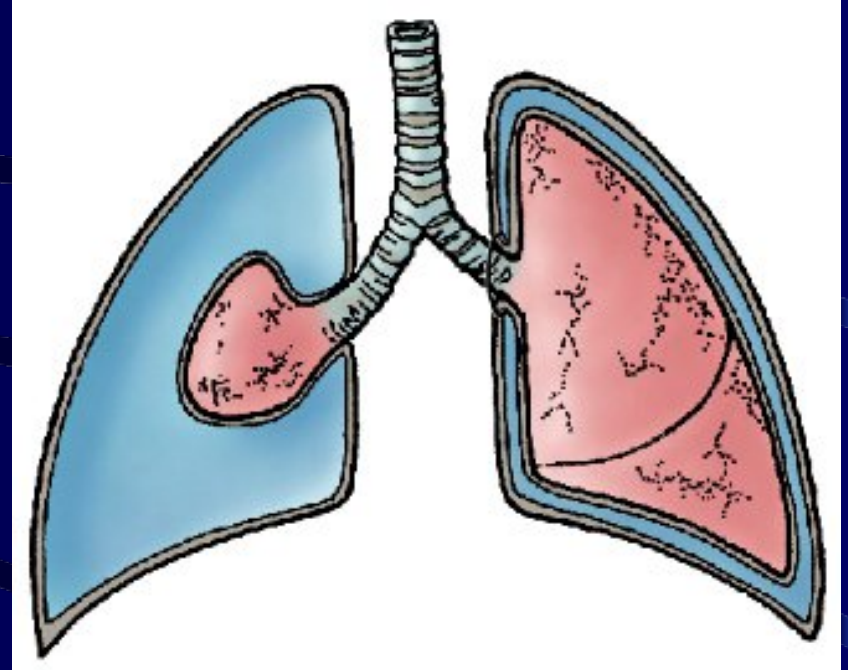


Pleura

- Fluid filled sac that surrounds the lung

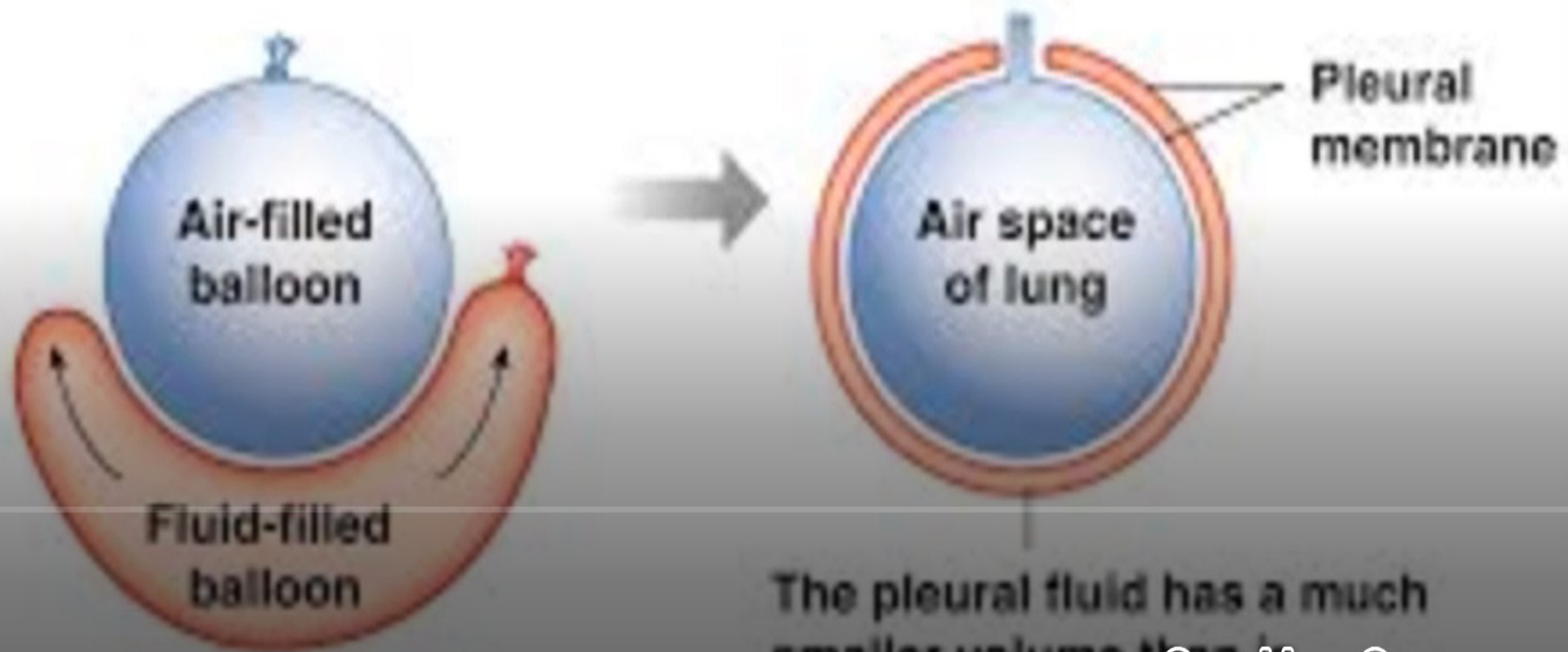
Fxn.:

☒ Friction between
Parietal and visceral
layers



THE PLEURAL SAC

The pleural sac forms a double membrane surrounding the lung, similar to a fluid-filled balloon surrounding an air-filled balloon.



The pleural fluid has a much smaller volume than is suggested by this illustration.

10

00

30



Compartments of Pleura

2 continuous memb. & a cavity in between

- **Visceral Pleura:**

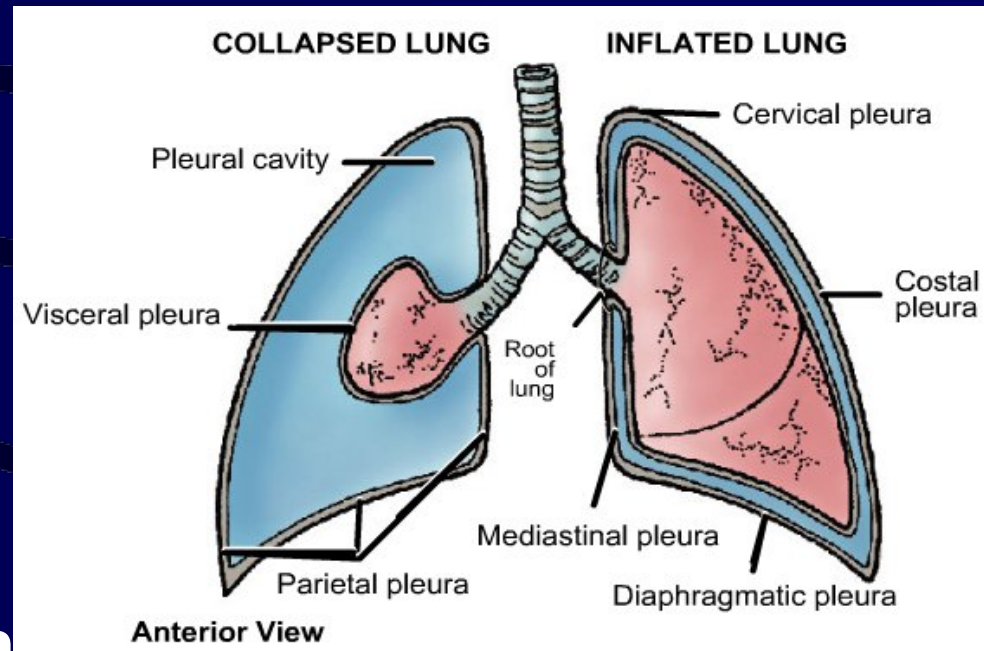
Covers the lungs & follow its curves .

- - **Parietal Pleura:**

lines thoracic wall, mediastinum.

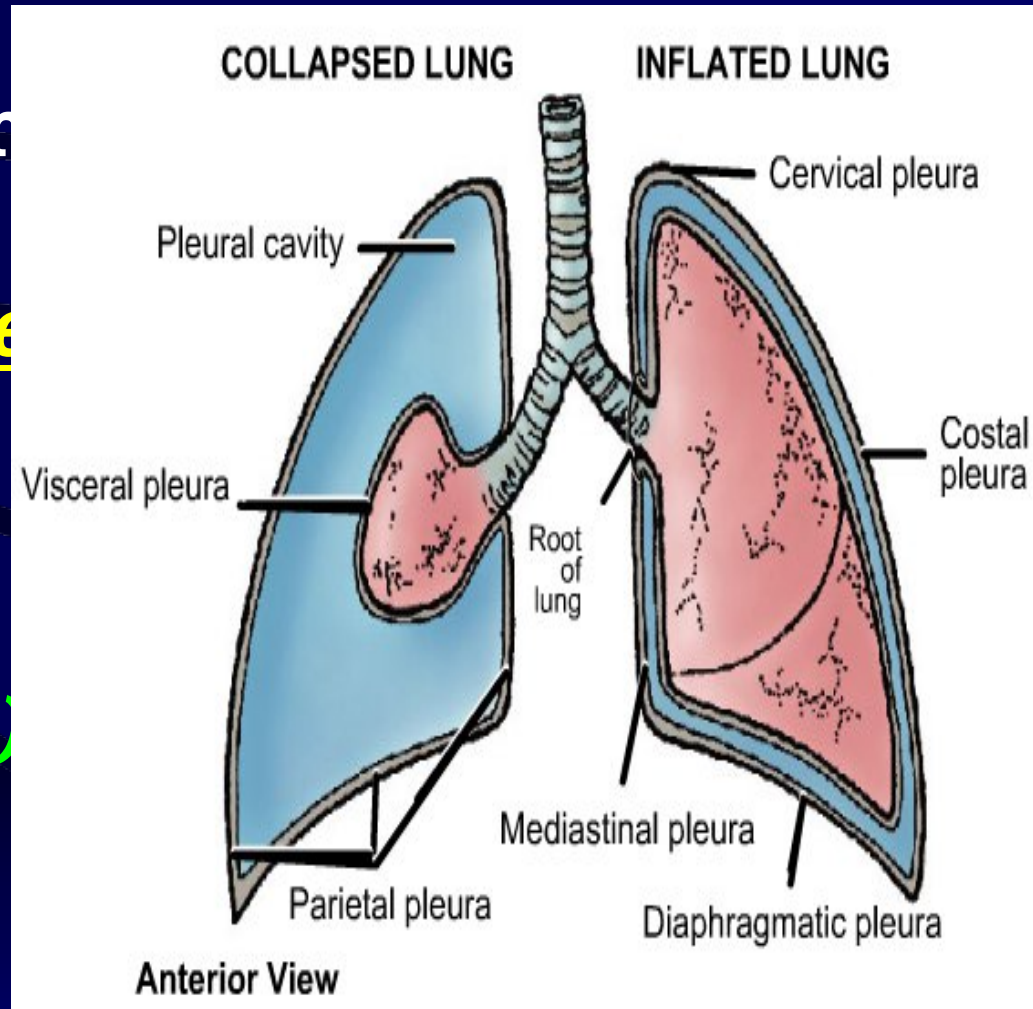
- - **Pleural Cavity:**

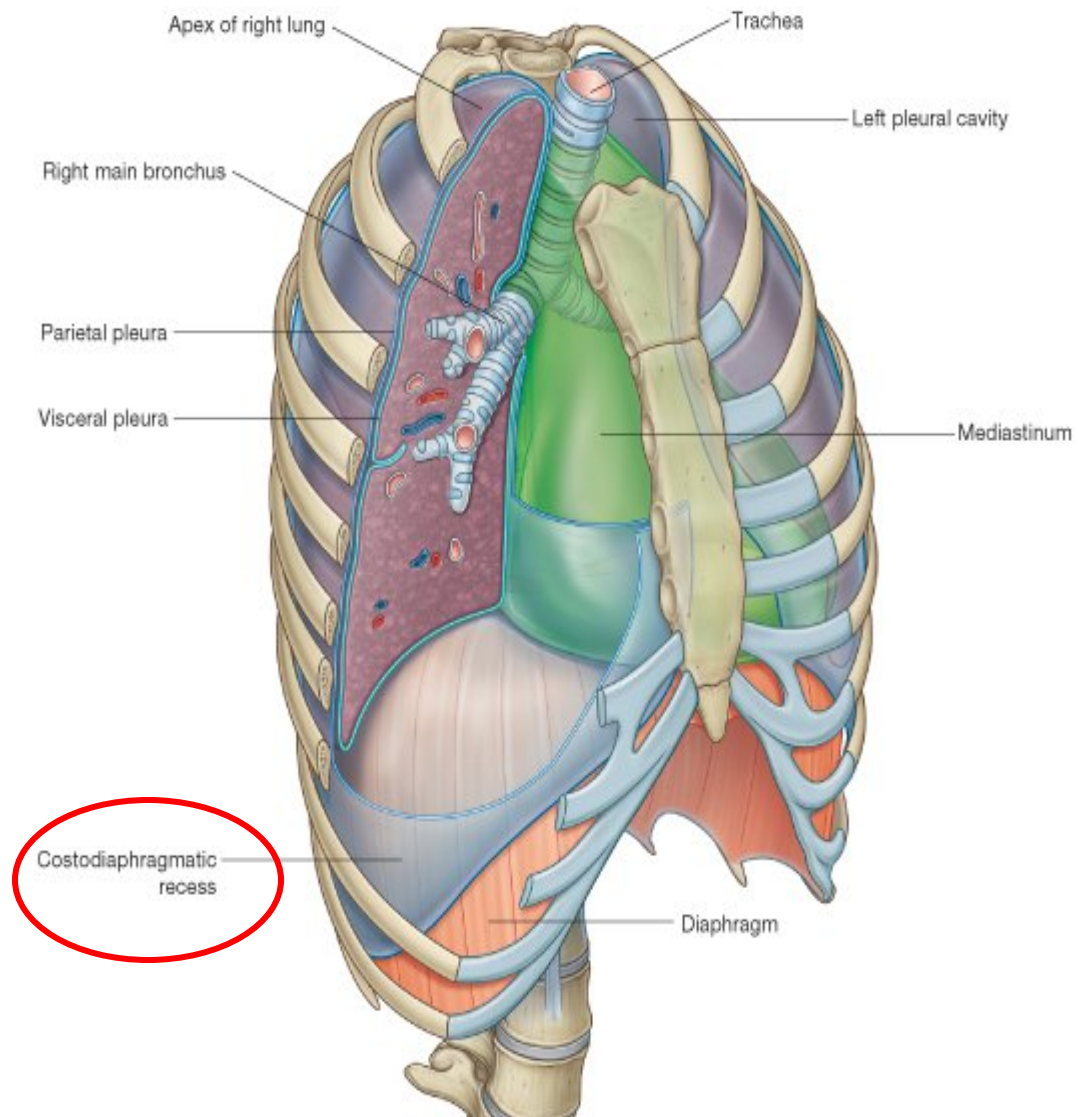
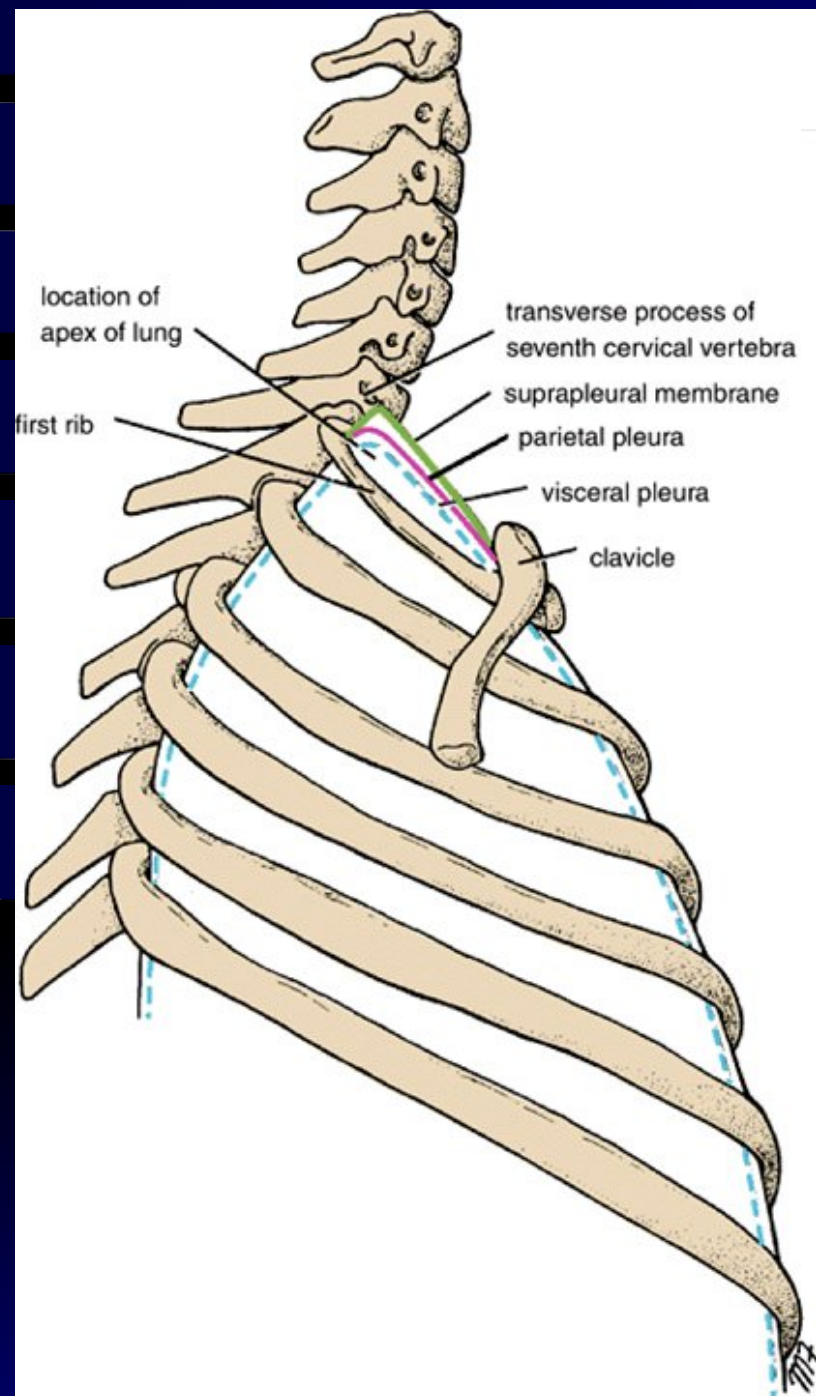
Space between visceral, and parietal layers contains fluid to decrease friction



Pleural Surfaces

- **Costal Surface**: Opposite to ribs & intercostal m.
- **Mediastinal Surface**
Opposite to mediastinum (med.)
- **Diaphragmatic Surface**
Opposite to cupula.
- **Cervical Pleura**
- Extends into the neck
- (2-3 cm above clavicle)





Pleural Reflections

- **Curvatures between pleural surfaces**

Sternal Ref.

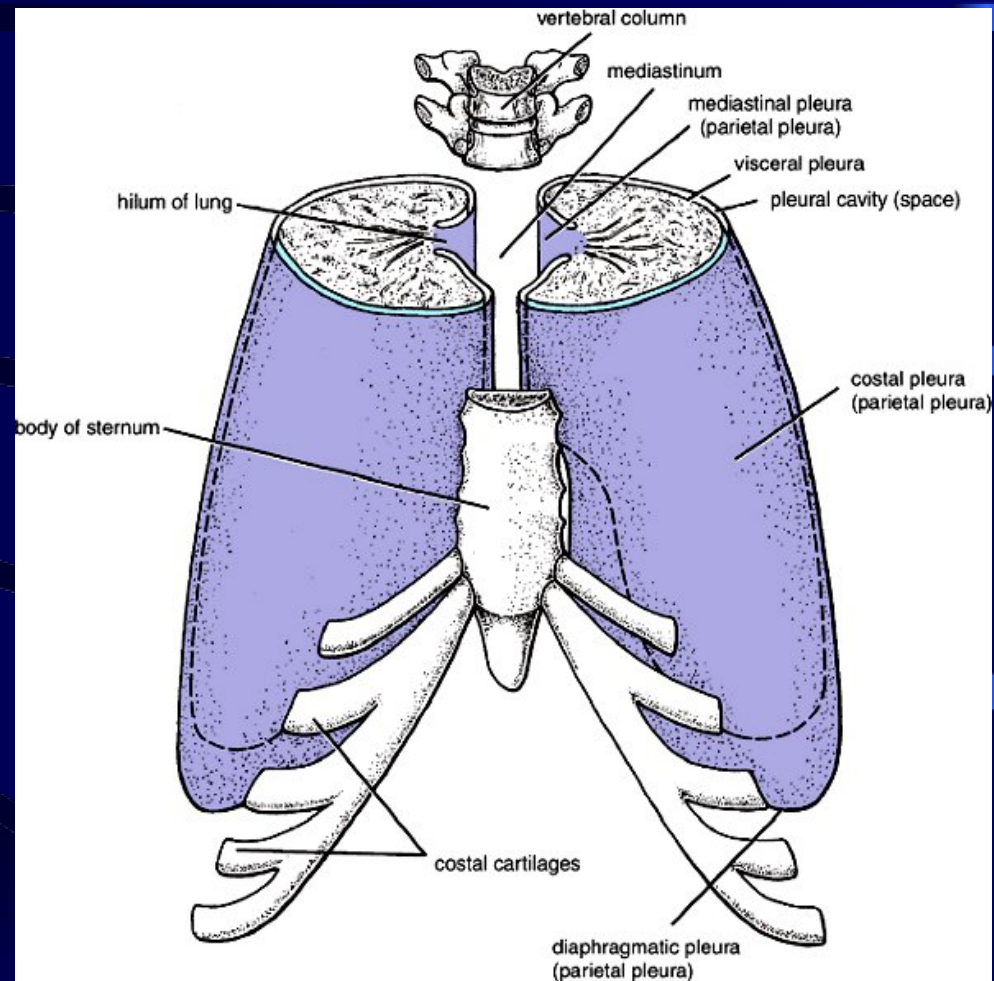
Sharp, ant. between

- Costal Ref.

Sharp, inf. between

- Vertebral

rounded, post. between



Pleural Recesses

- ***Recess:*** Deep space created by pleural reflections

- ***i.e*** ***Part of pleural sac not filled by lung***

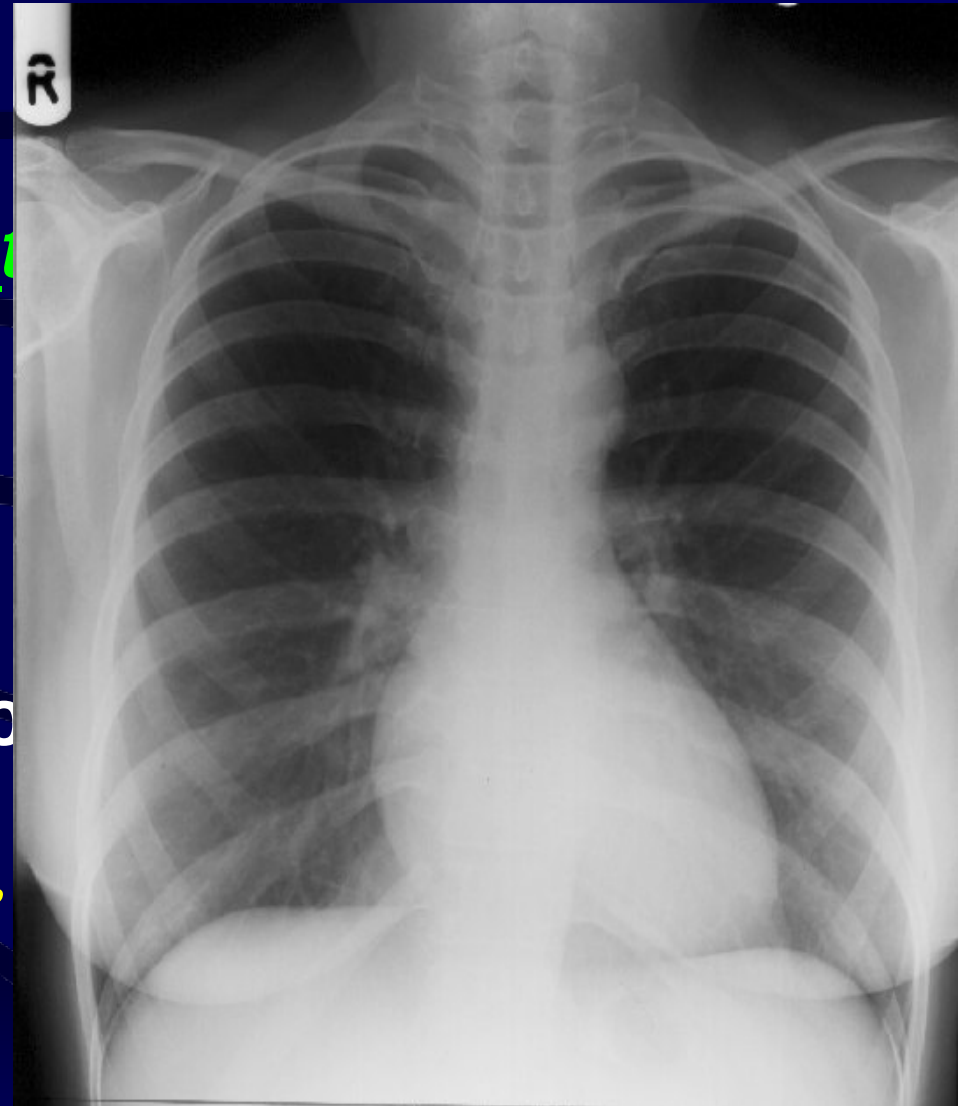
- ***Costodiaphragmatic Recess:***

- Space between costal & diaphragmatic surfaces of the pleura

- ***Costomediastinal Recess:***

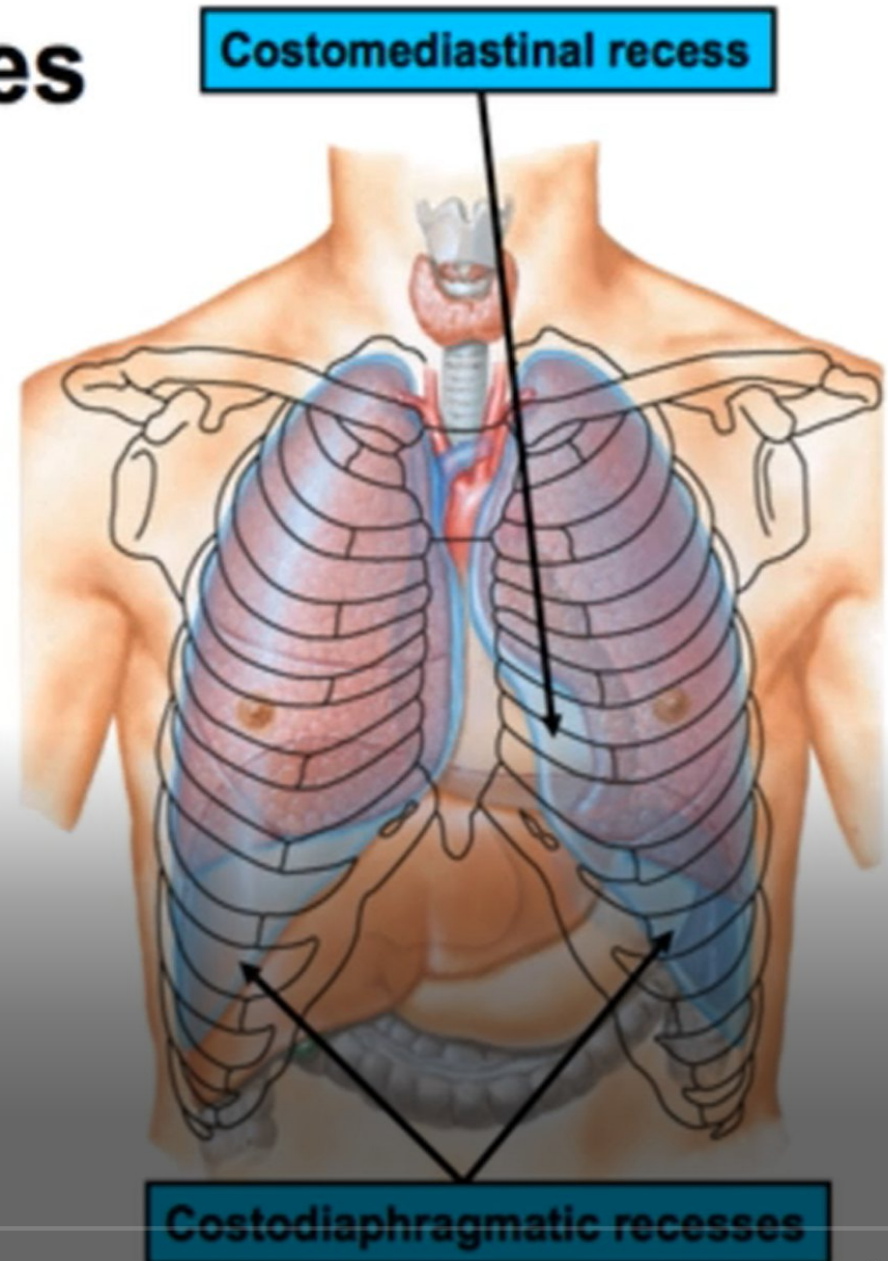
- Space between costal & mediastinal surfaces.

- * larger in lf side



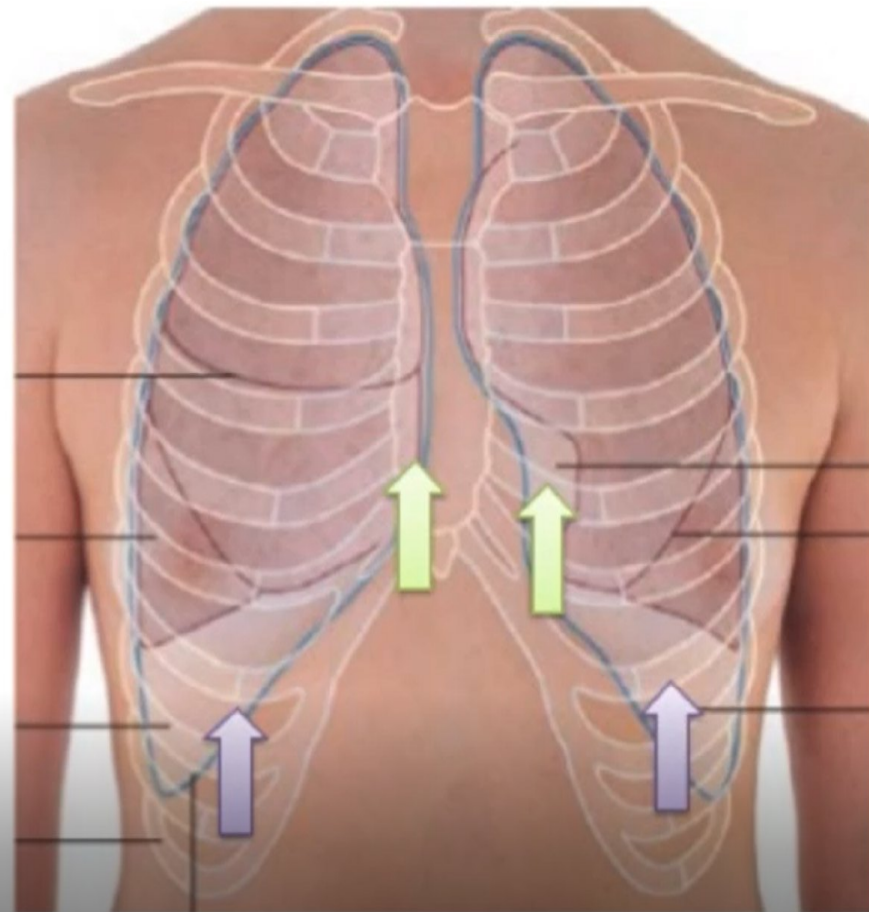
Pleural Recesses

- The lungs do not completely fill all regions of the pleural cavity.
- This results in **recesses** where 2 layers of parietal pleura become opposed.
- Expansion of the lungs into these regions occurs only during forced inspiration.



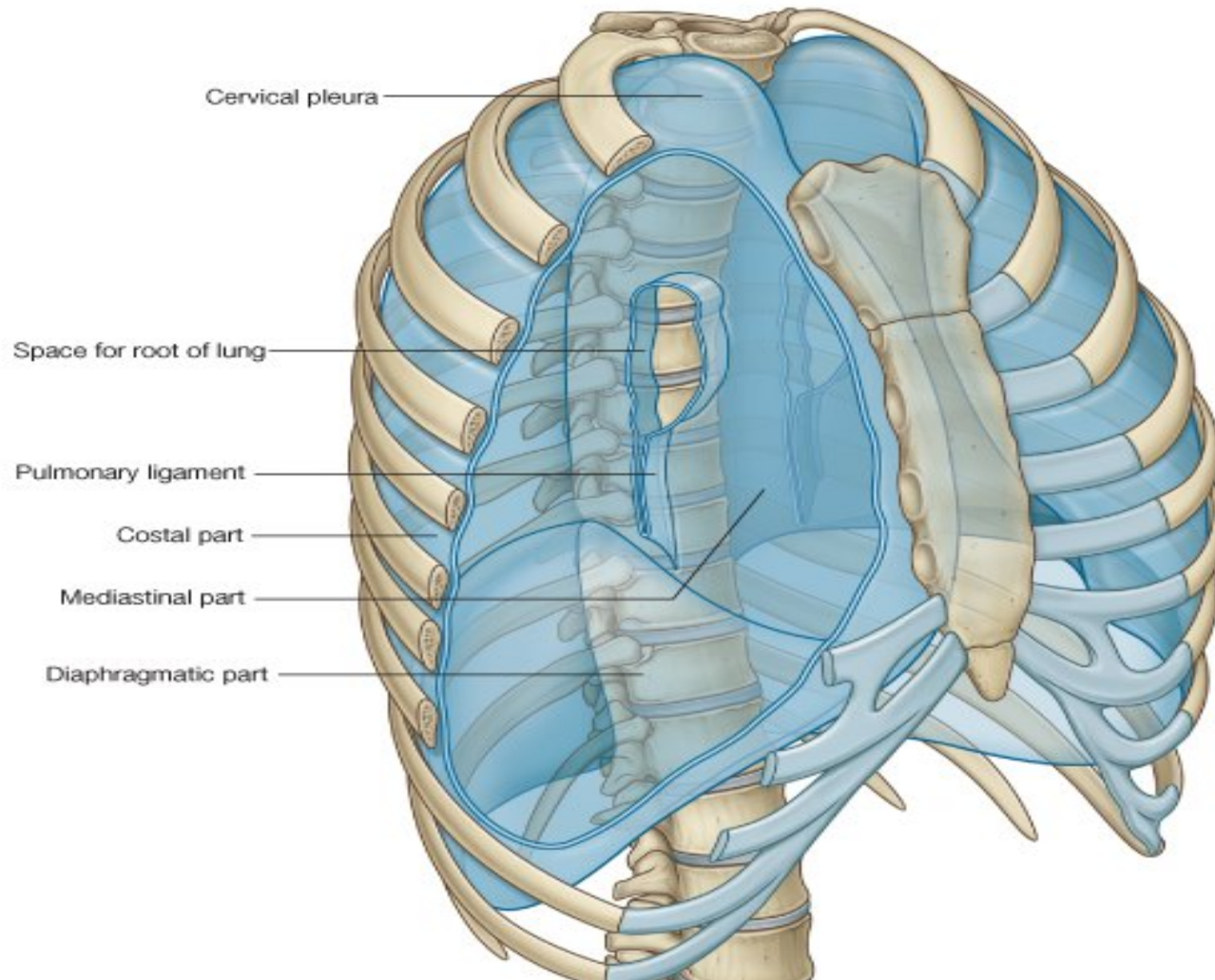
Pleural recess

- The lungs **do not** completely fill the anterior or posterior inferior regions of the pleural cavities
- This results in recesses in which **two layers of parietal pleura become opposed.**
- Expansion of the lungs into these spaces **usually occurs only during forced inspiration**
- The recesses also provide potential spaces in which **fluids can collect and from which fluids can be aspirated.**



- 2. • 1- costomediastineal recess
- 2- costodiphramatic recess

Parietal pleura

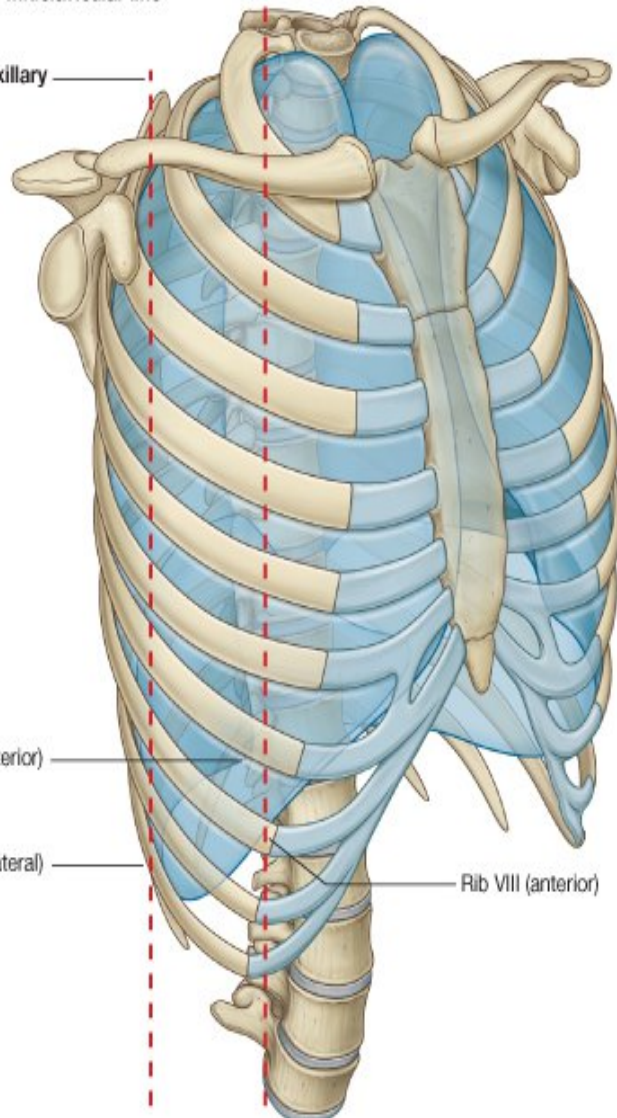


Neurovascular Supply to The Pleura

- Parietal: (very sensitive)
- Follows thoracic wall $\Rightarrow$ Intercostal **VAN**
- Diaphragmatic:
 - Musculophrenic a.
 - Phrenic n.
- Visceral:
 - Follows the lung $\Rightarrow$ Bronchial **A** & **V**.
 - * No innervation $\Rightarrow$ insensitive

Midclavicular line

Midaxillary



Costodiaphragmatic recesses

Midclavicular line

Midaxillary

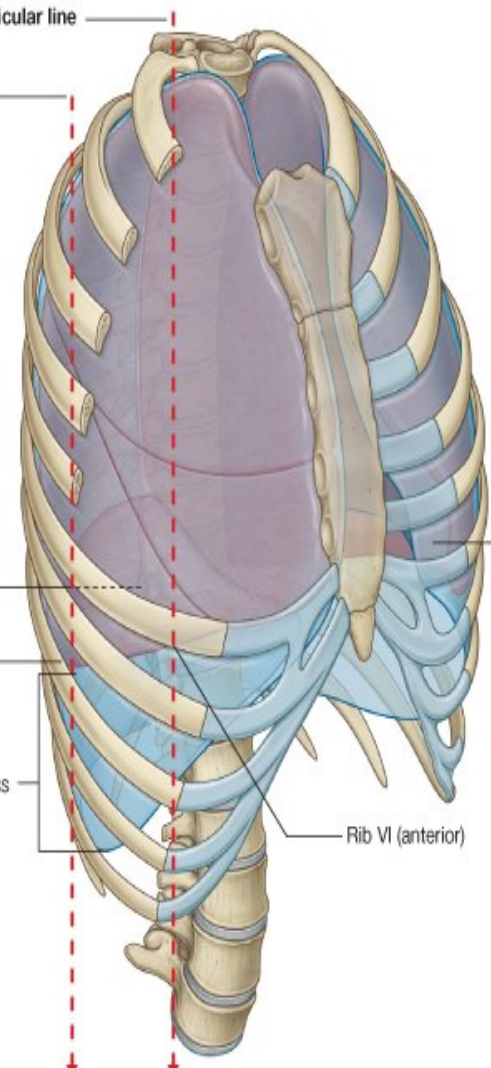
Vertebra TX (posterior)

Rib VIII (lateral)

Costodiaphragmatic recess

Costomediastinal recess

Rib VI (anterior)



Abnormalities in Pleural Cavity

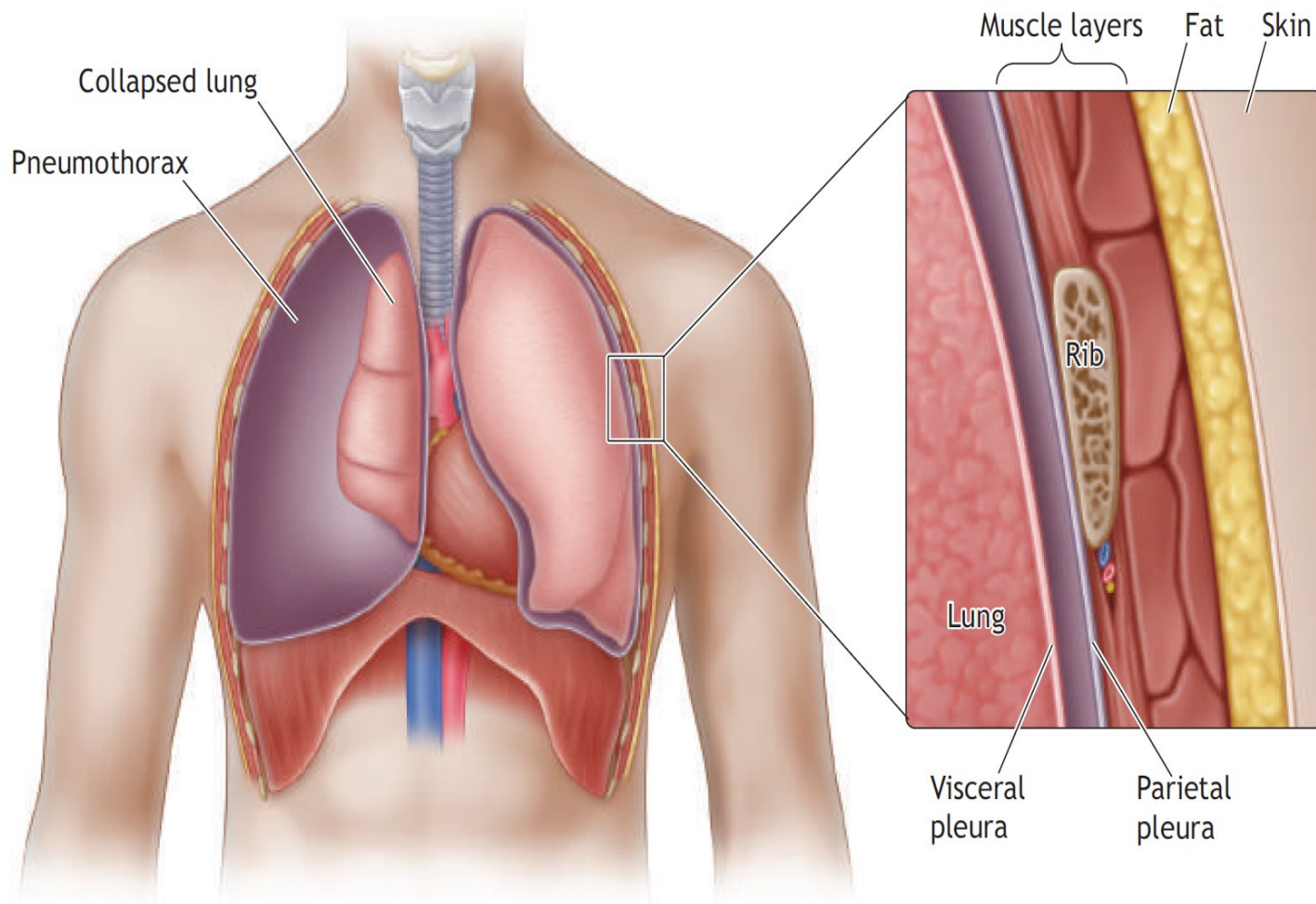
- **Pneumothorax**: Air in pleural cavity.
- From: penetrating wounds (fractured rib).
- **Hemothorax**: Blood in pleural cavity
- From: injury to intercostal vessel
- **Chylothorax**: Lymph in pleural cavity
- From: injury to thoracic duct
- **Pyothrax**: Pus in pleural cavity
- From: complication of pneumonia $\Rightarrow$ partial lung collapse & impaired respiration
 - Rx.: **Thoracocentesis**

Simple pneumothorax

- Open in lung Tissue that leaks air in to Pleural Cavity.
- Blunt thoracic trauma is usual cause.
- May be spontaneous .

Usually self correcting.

S/S: Chest pain ,Dyspnea , Tachypnea, Decrease breath sounds in the affected side.



Simple Pneumothorax. Pneumothorax results from air entering the potential space between the visceral and parietal pleura.

Treatment of simple(closed) pneumothorax

Any pneumothorax is **Best Treated with a Chest Tube** placed in the fifth intercostal space **just anterior to the midaxillary line** .

Observation and aspiration of a small, asymptomatic pneumothorax may be appropriate decision.

After inserting a chest tube and connecting it to an underwater seal apparatus with or without suction, **chest x-ray examination is done to confirm appropriate placement and re-expansion of the lung.**

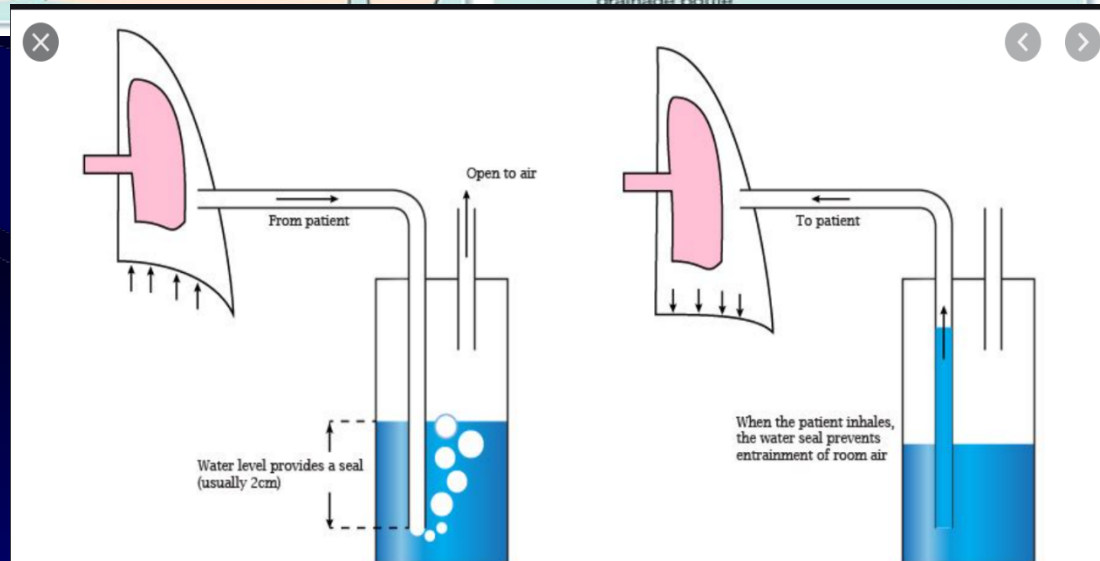
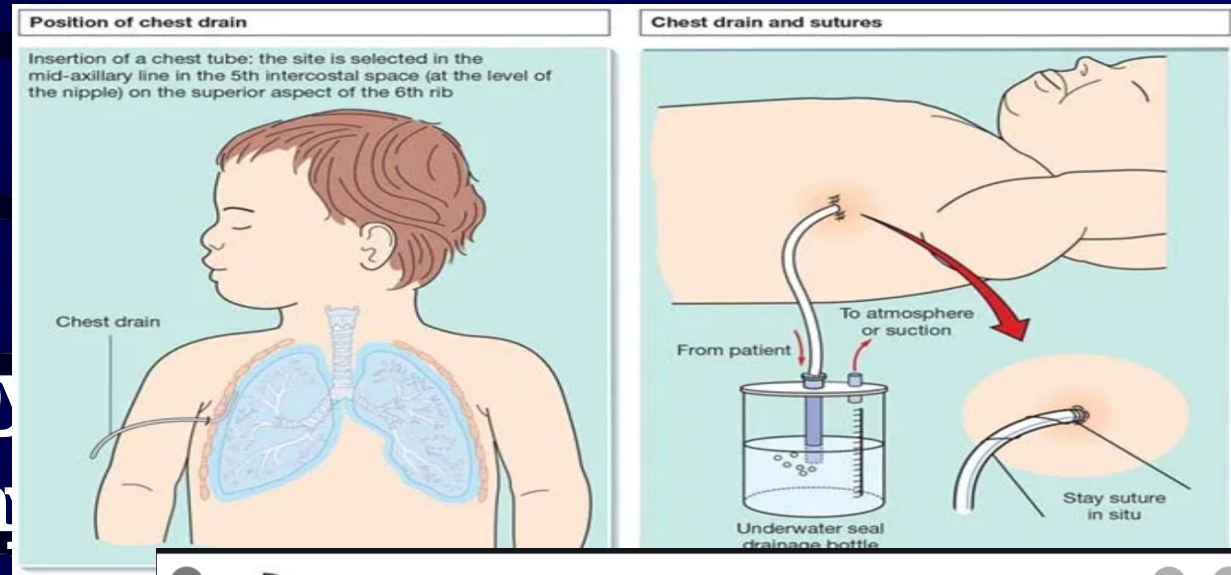
Chest Tube Indication for Insertion

Traumatic
pneumothorax.

Traumatic
Hemothorax.

Drainage of empyema

Post thoracotomy

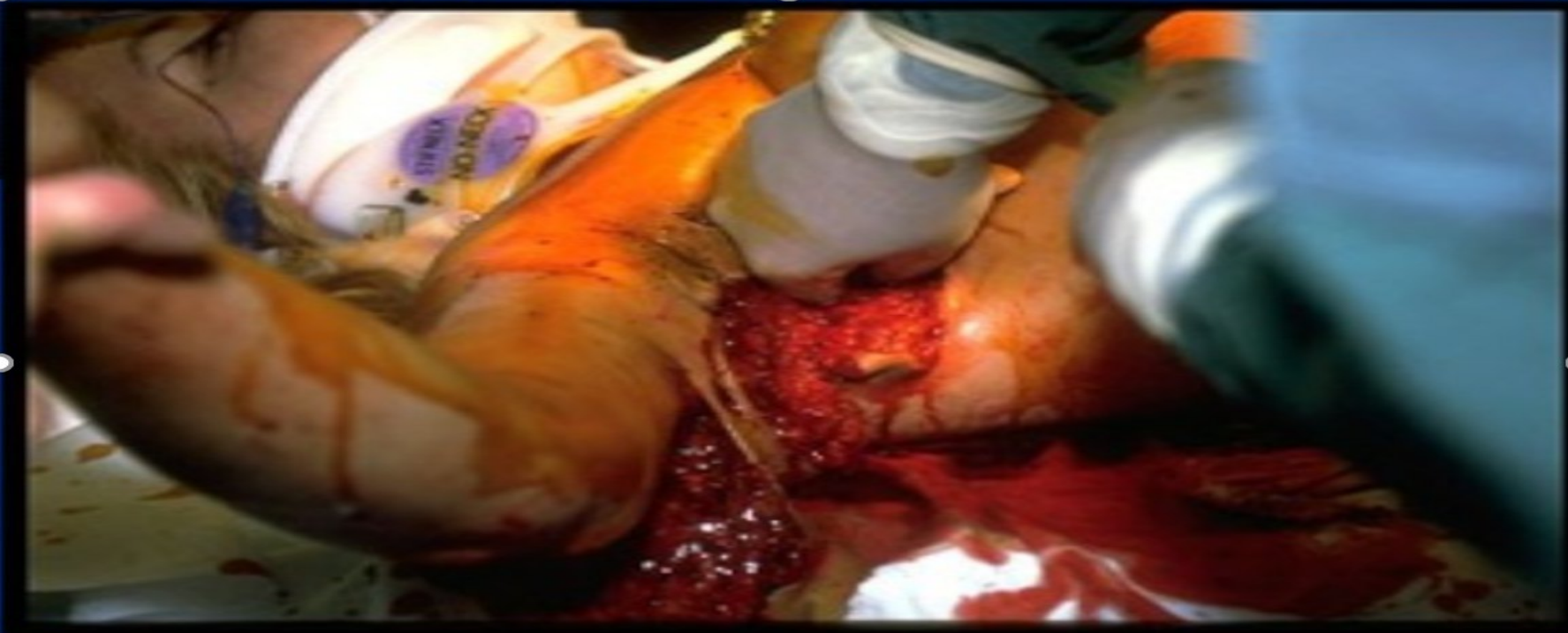


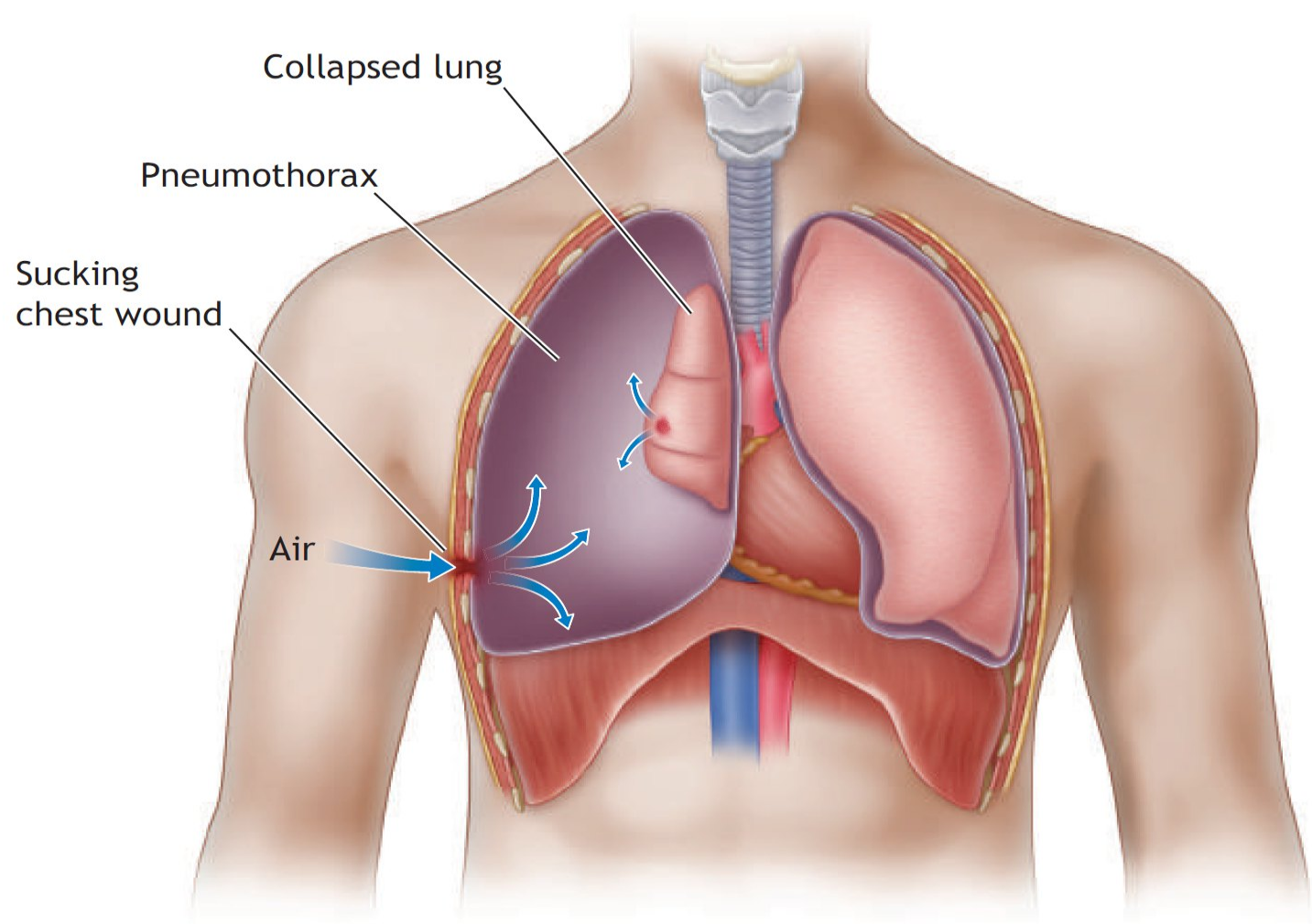
Open Pneumothorax

Opening in the chest wall that allow air into pleural cavity.

Causes lung to collapse due to increase pressure in pleural cavity.

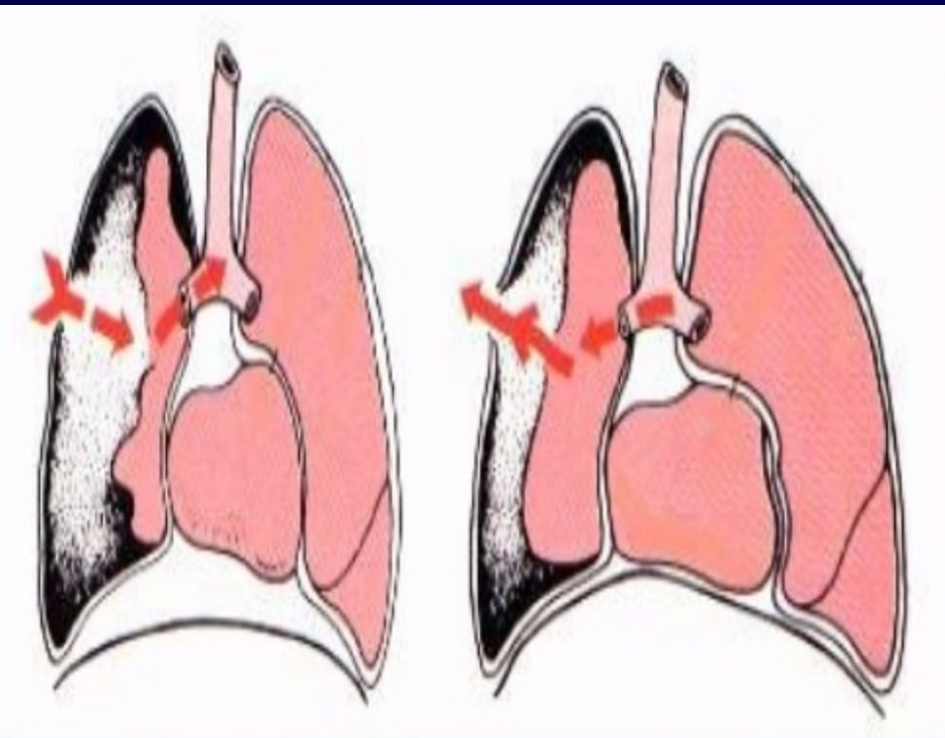
Equilibration between ITP and Atmospheric pressure is Immediate





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che

Open Pneumothorax



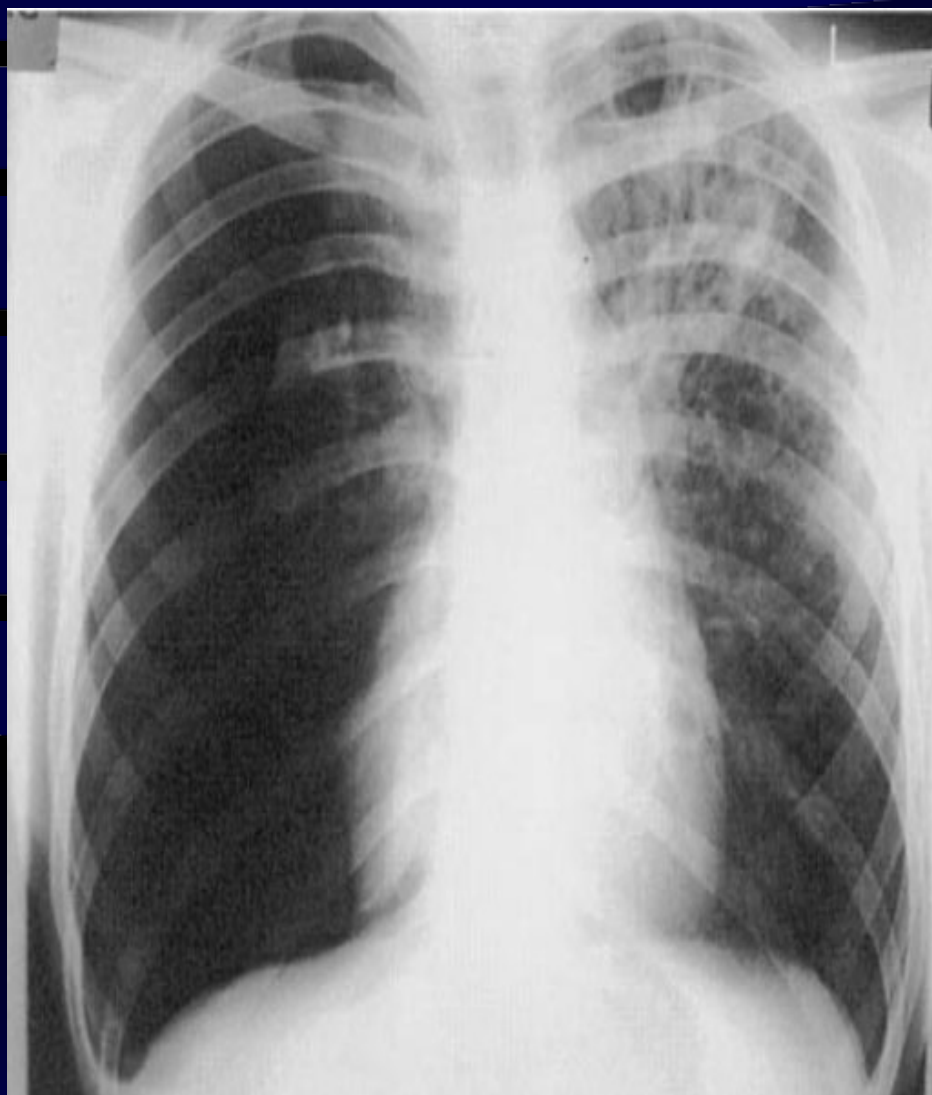
Sucking chest wound

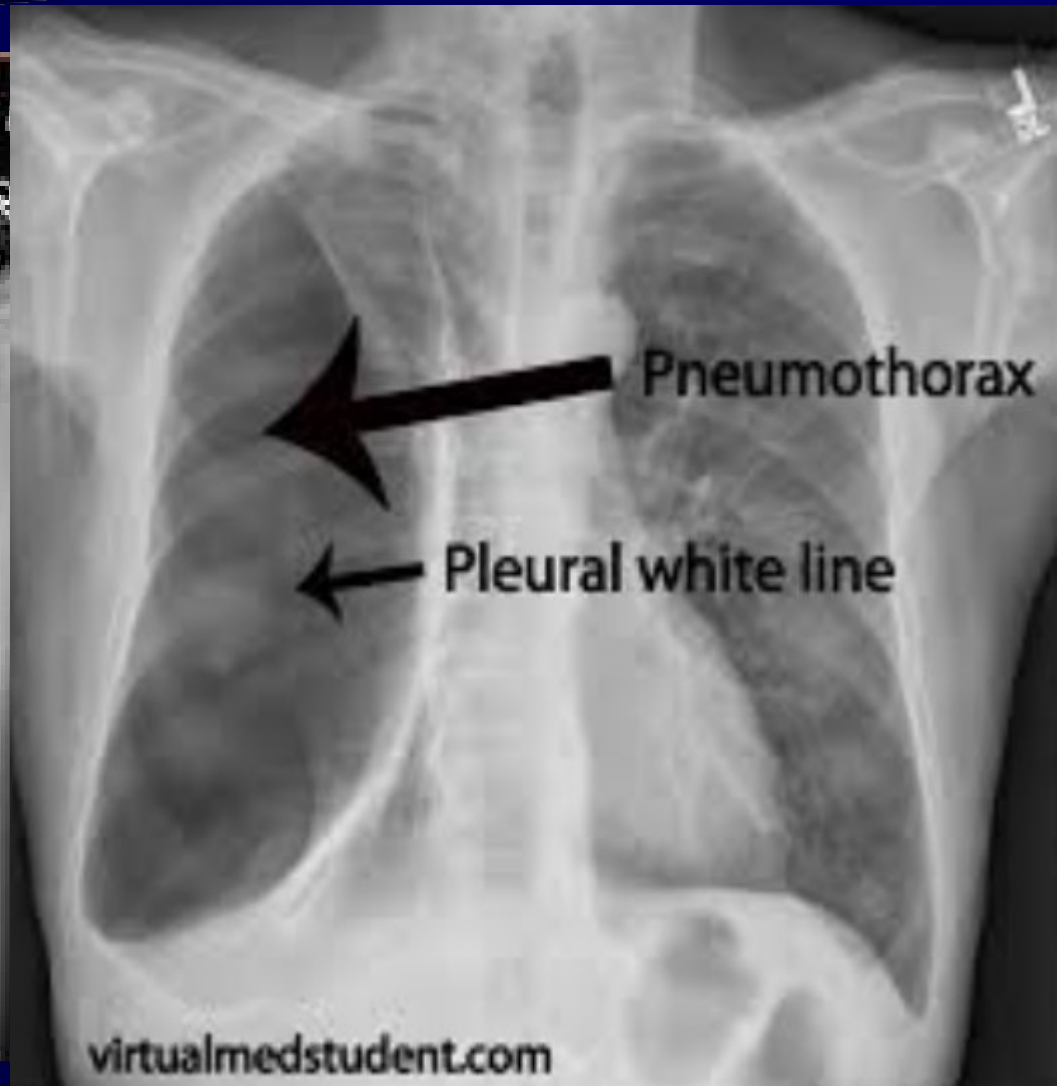




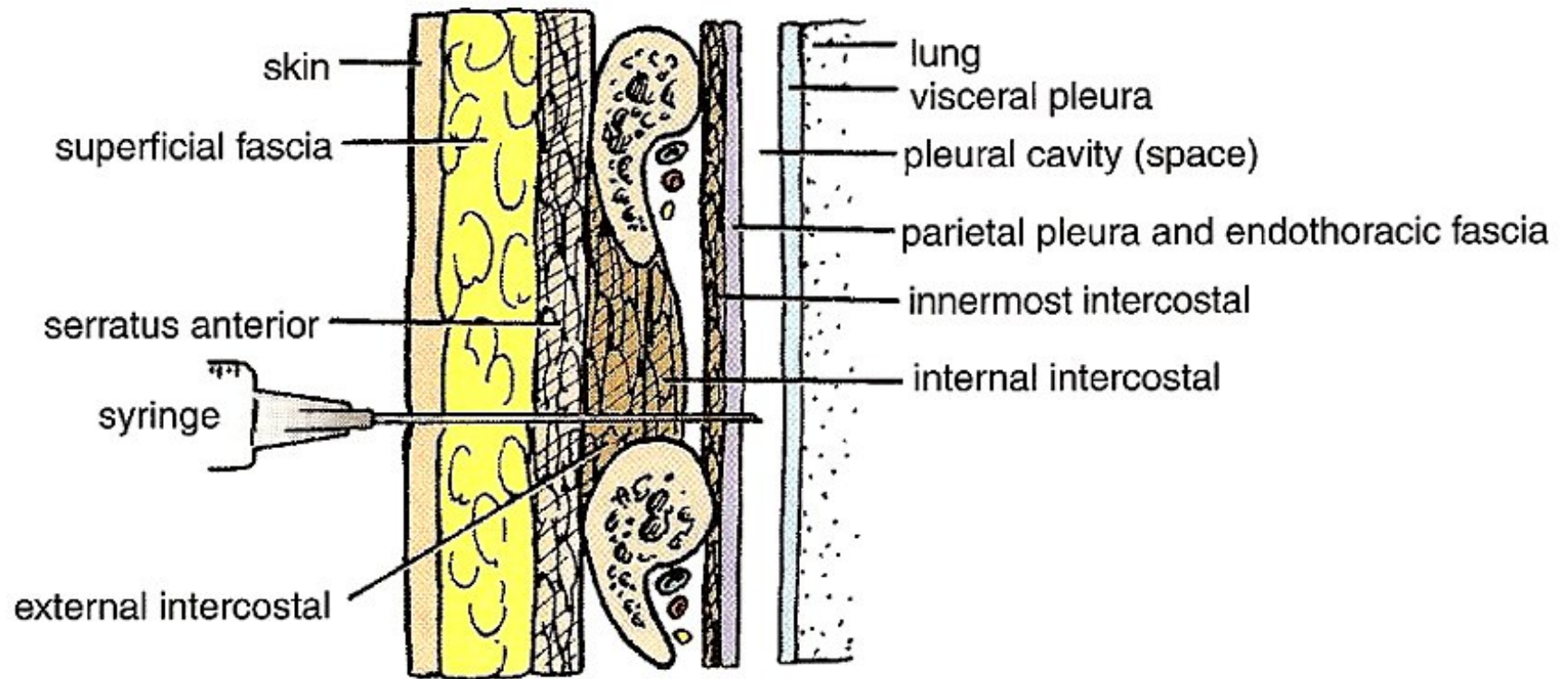
■ **FIGURE 4-4 Dressing for Treatment of Open Pneumothorax.**

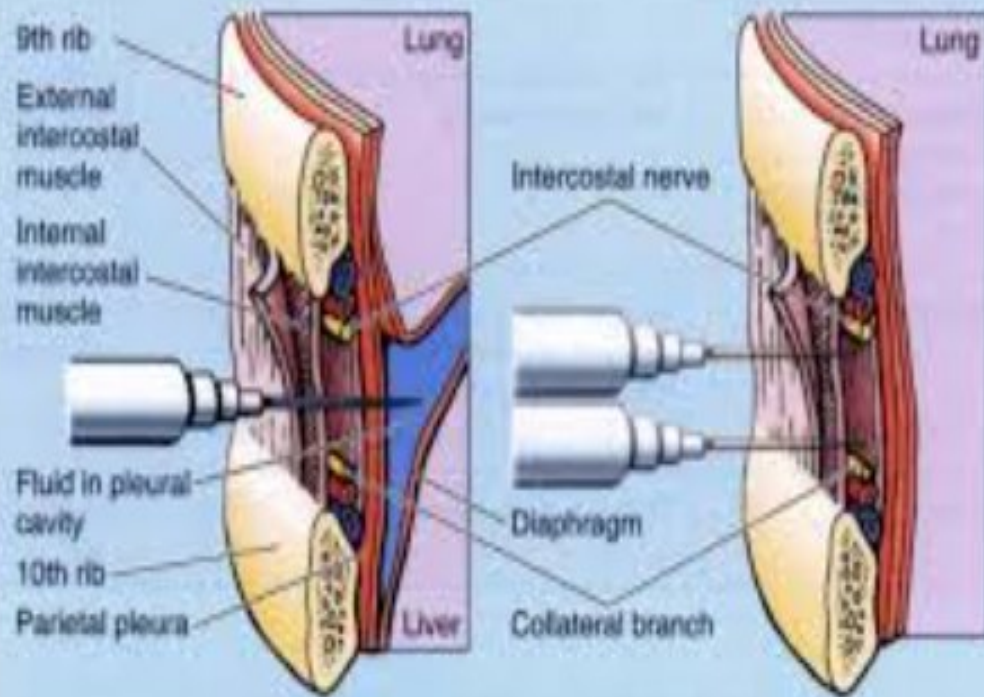
Promptly close the defect with a sterile occlusive dressing that is large enough to overlap the wound's edges. Tape it securely on three sides to provide a flutter-valve effect.



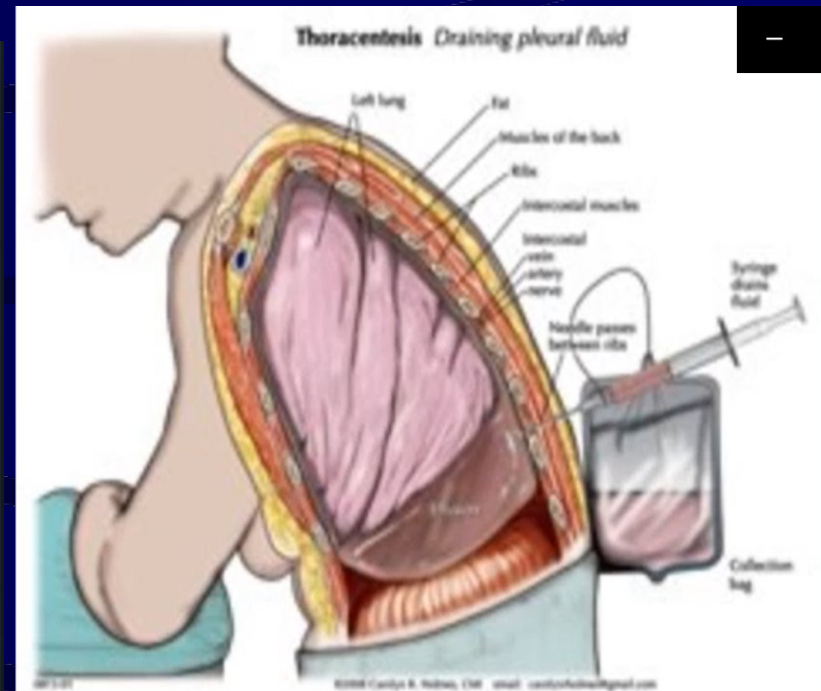


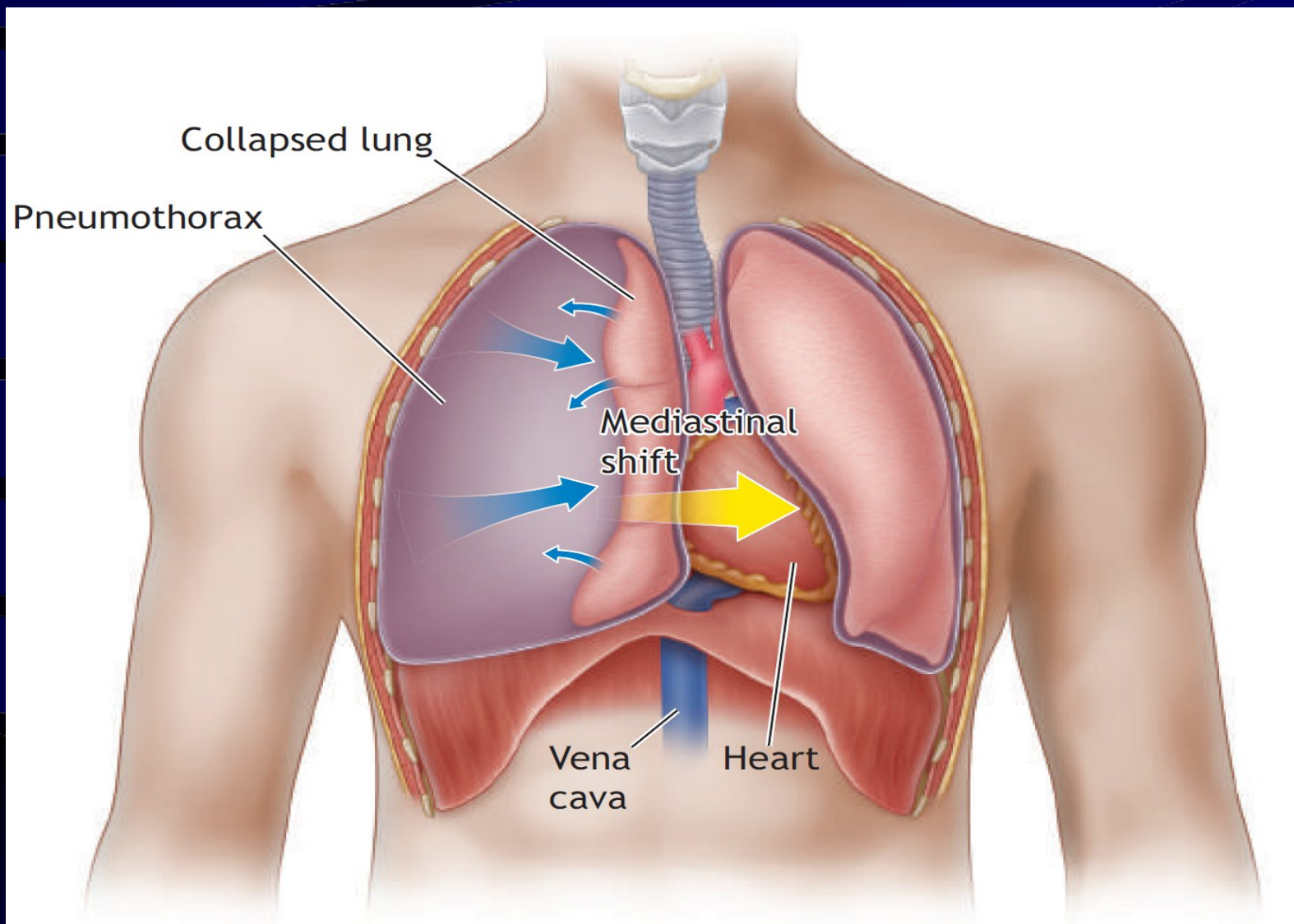
Thoracocentesis





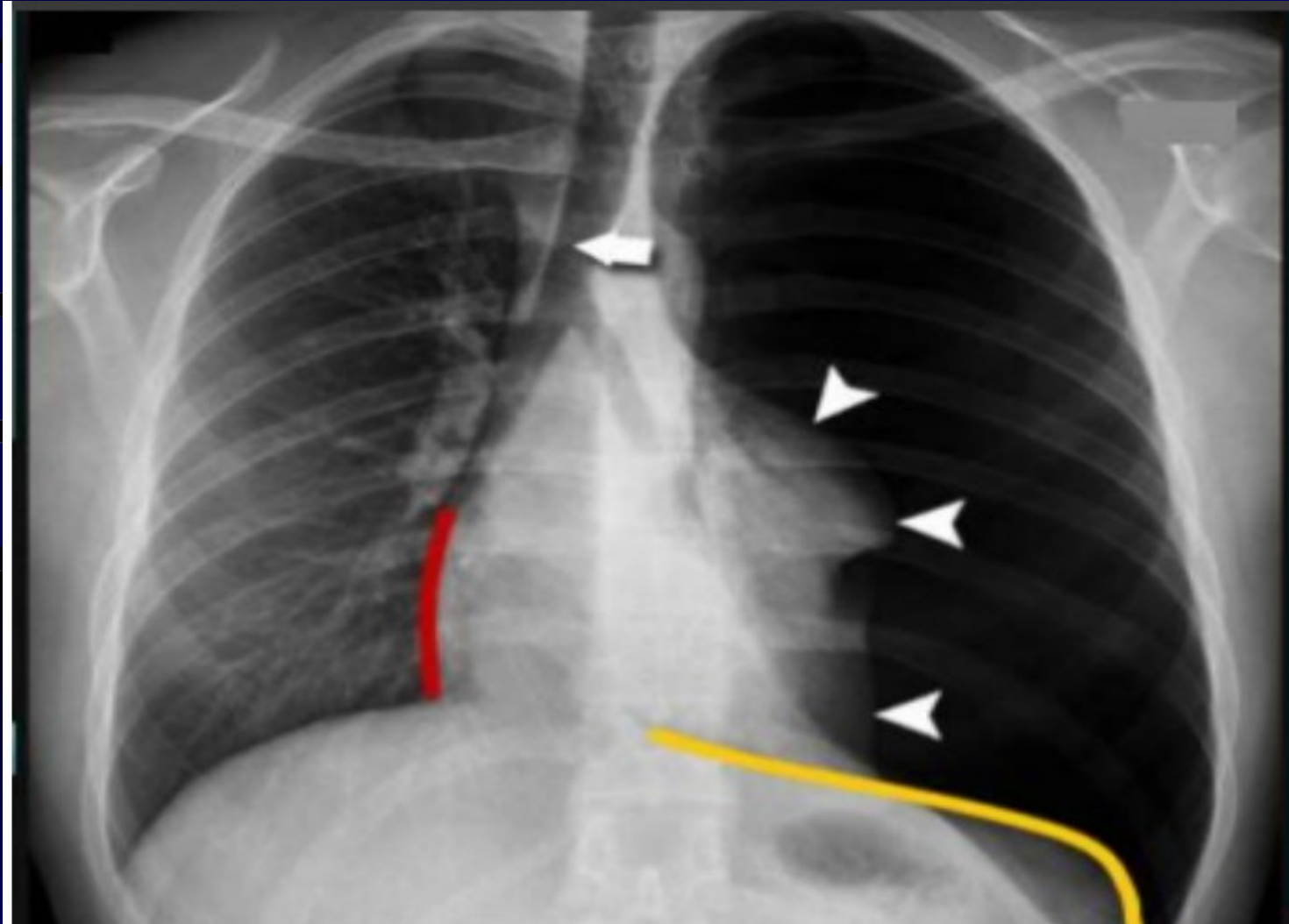
(A) Technique for thoracocentesis (in midaxillary line) (B) Intercostal nerve block

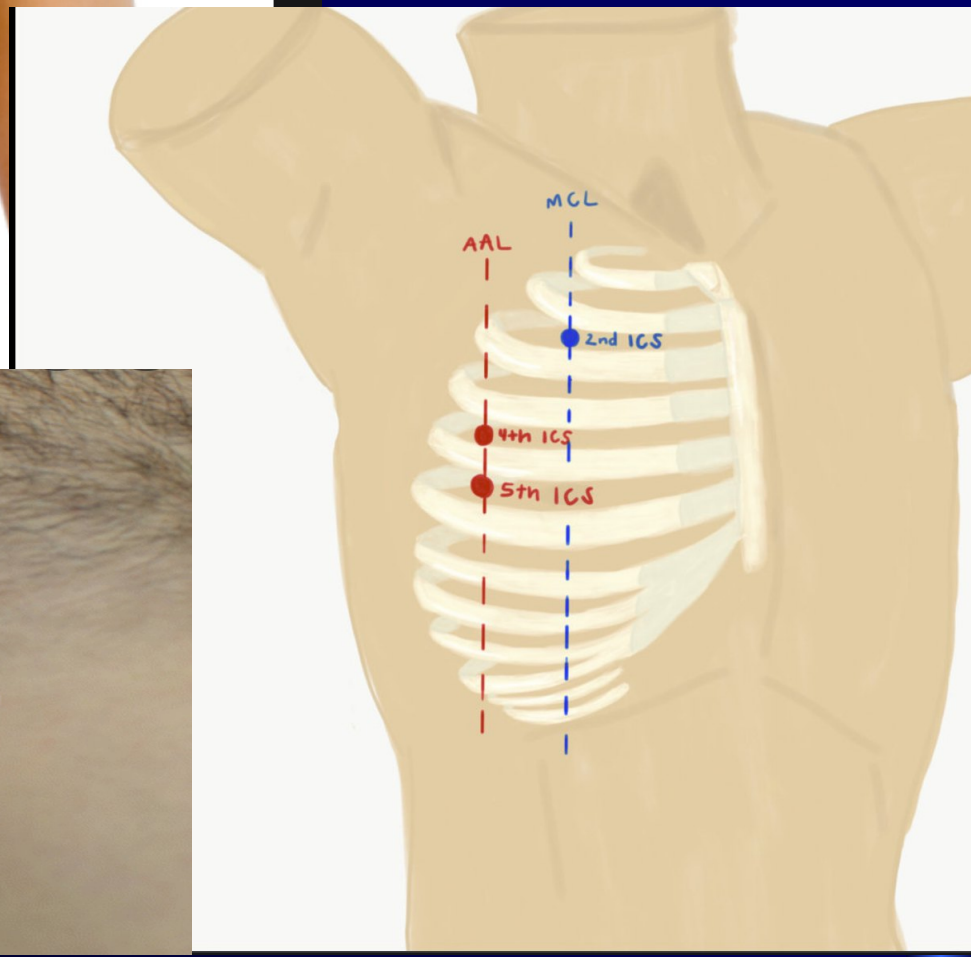
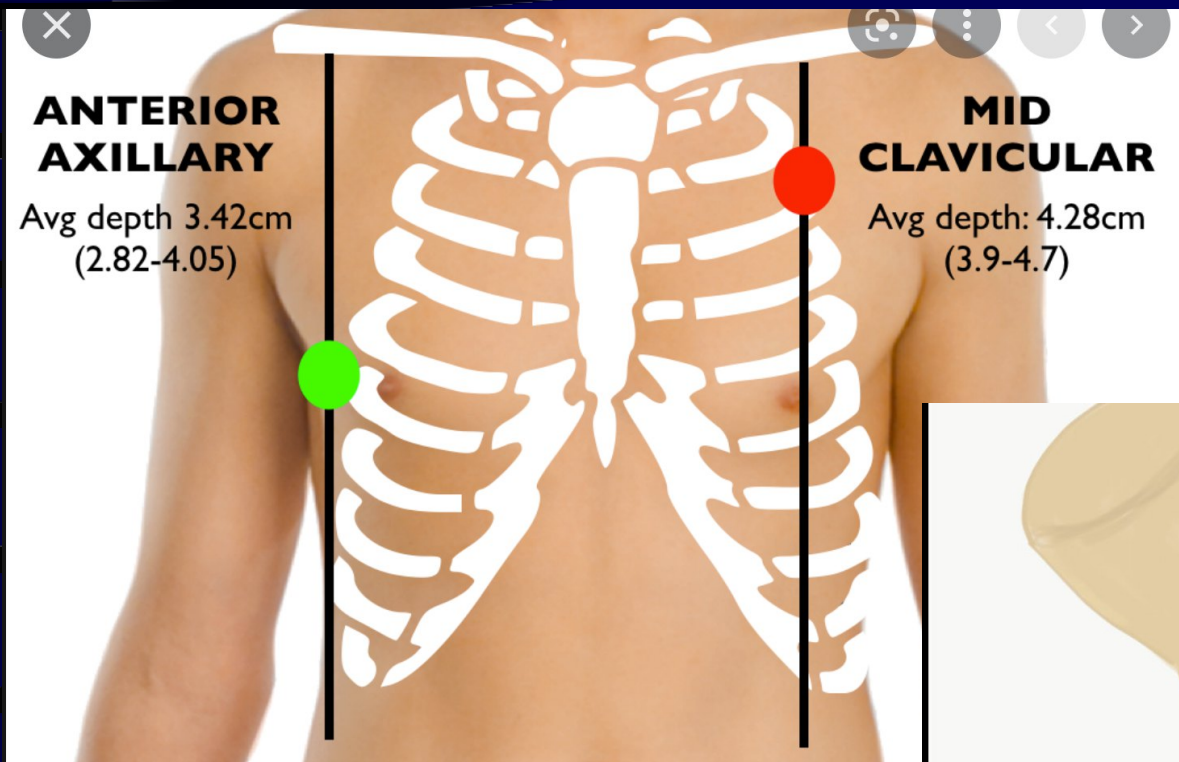




■ **FIGURE 4-1** Tension Pneumothorax. A “one-way valve” air leak occurs from the lung or through the chest wall, and air is forced into the thoracic cavity, eventually collapsing the affected lung.

Tension Pneumothorax

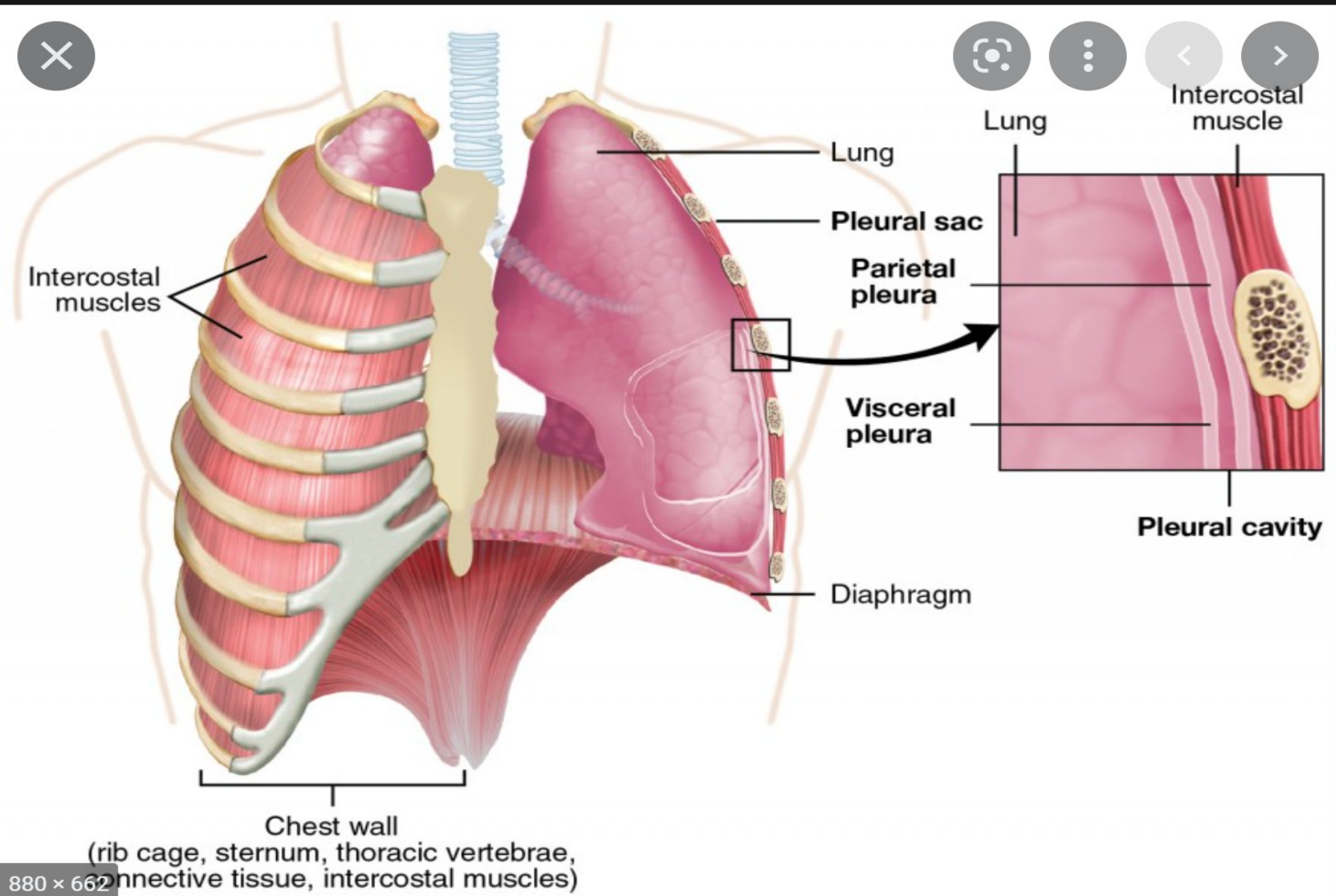


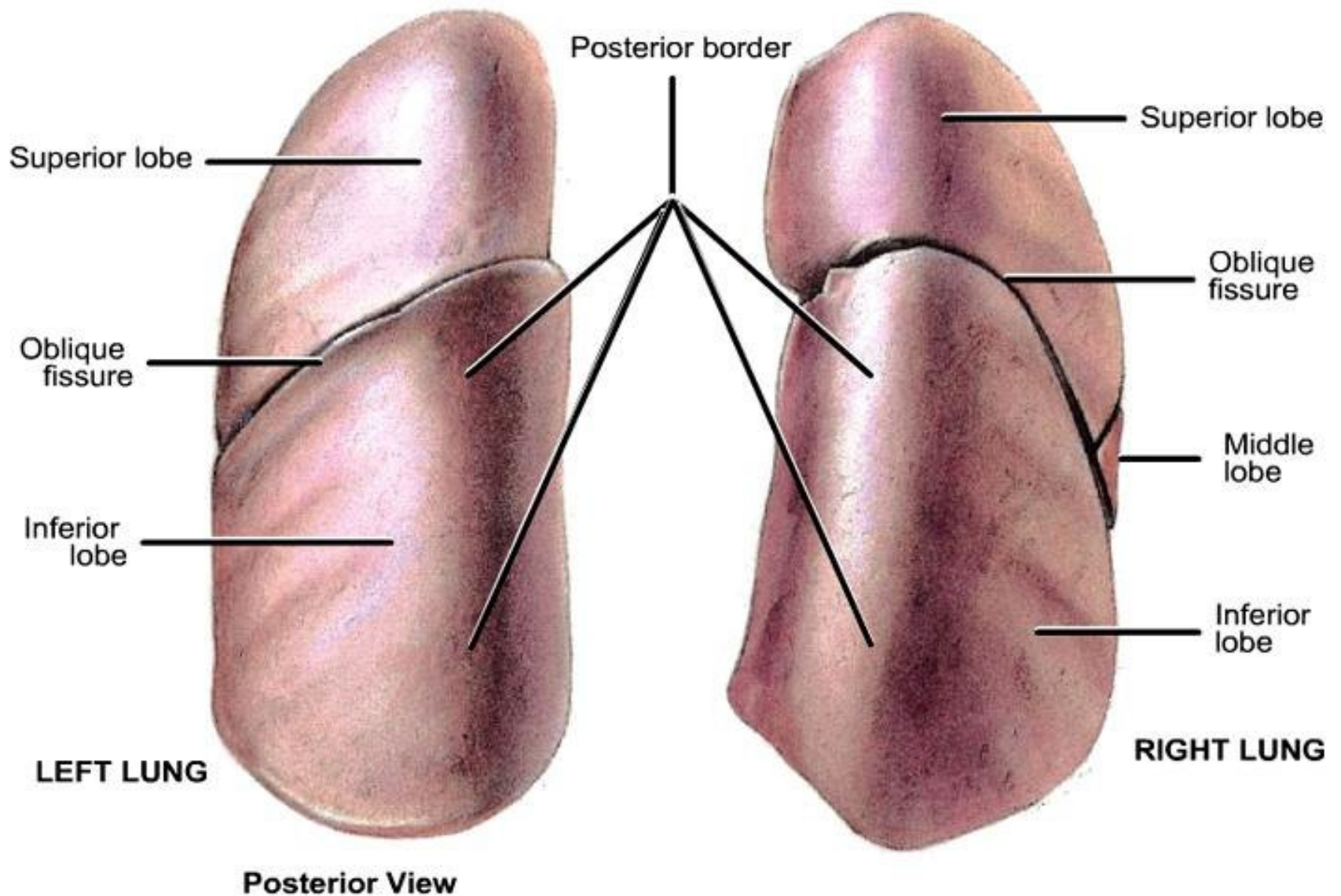


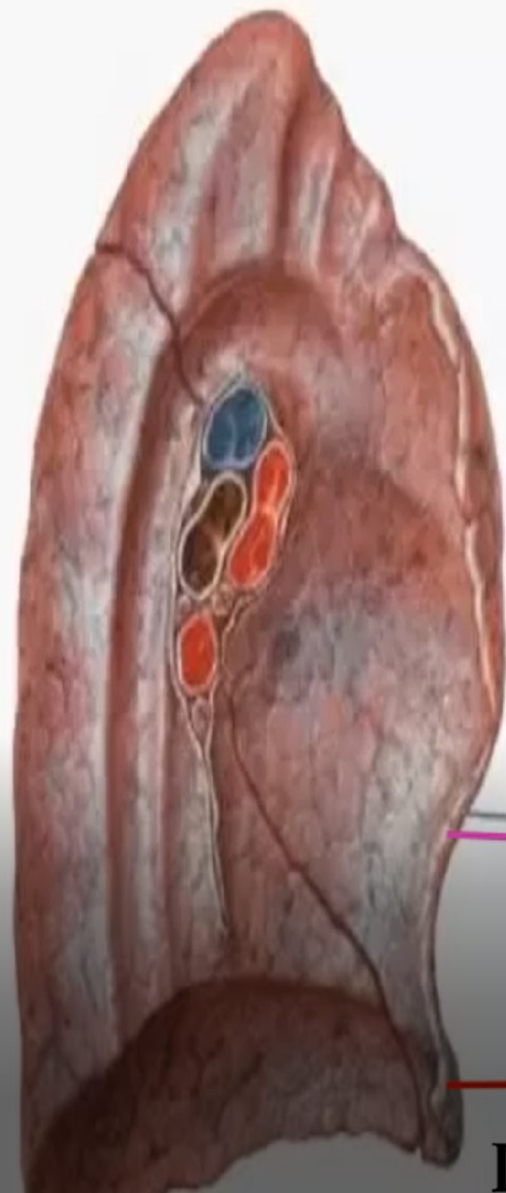
The Lungs

- The vital organ of respiration
- Each lung have:
- Apex: Reach neck of rib posterior, one inch above mid 1/3 of clavicle anterior
- Is covered by cervical pleura and supra pleural membrane.
- Base: Concave lie over cupula of diaphragm.
- 3 surfaces:
- Costal, Mediastinal, Diaphragm.
- 3 borders:
- Sharp ant. round Post. Inf.



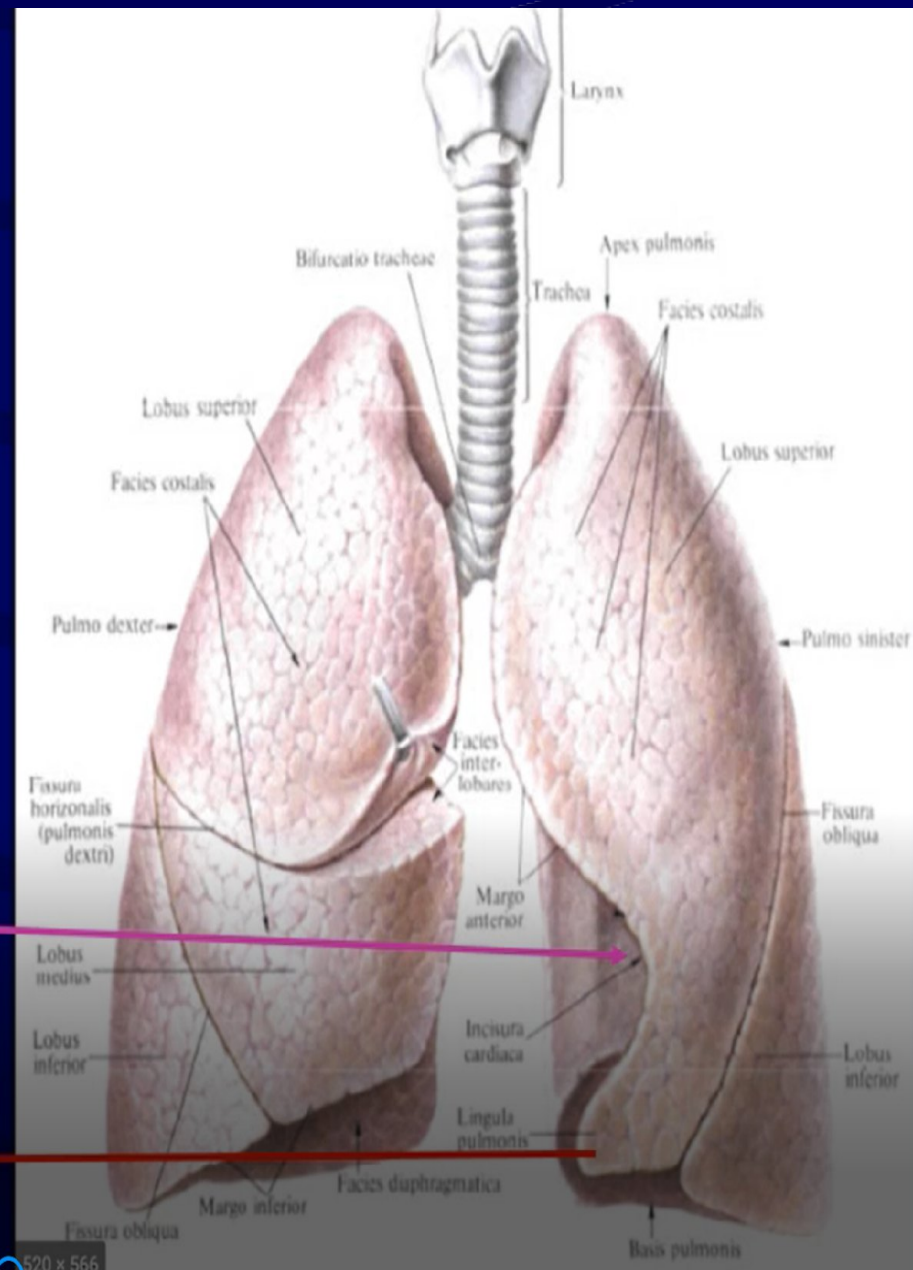






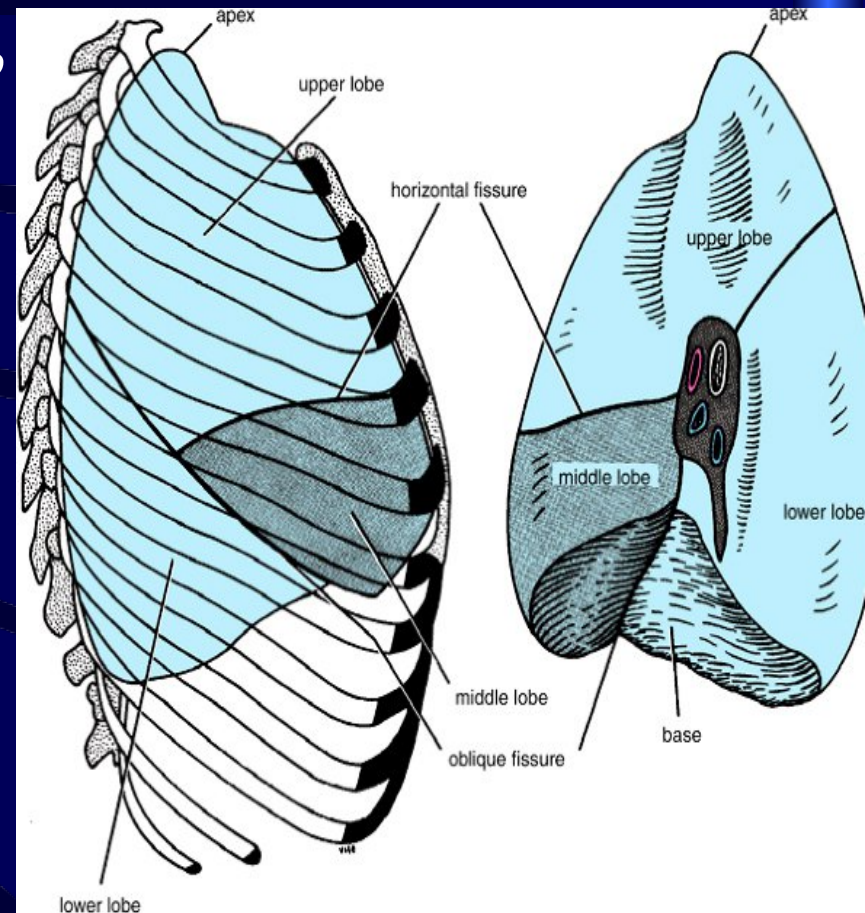
Cardiac notch

Lingula



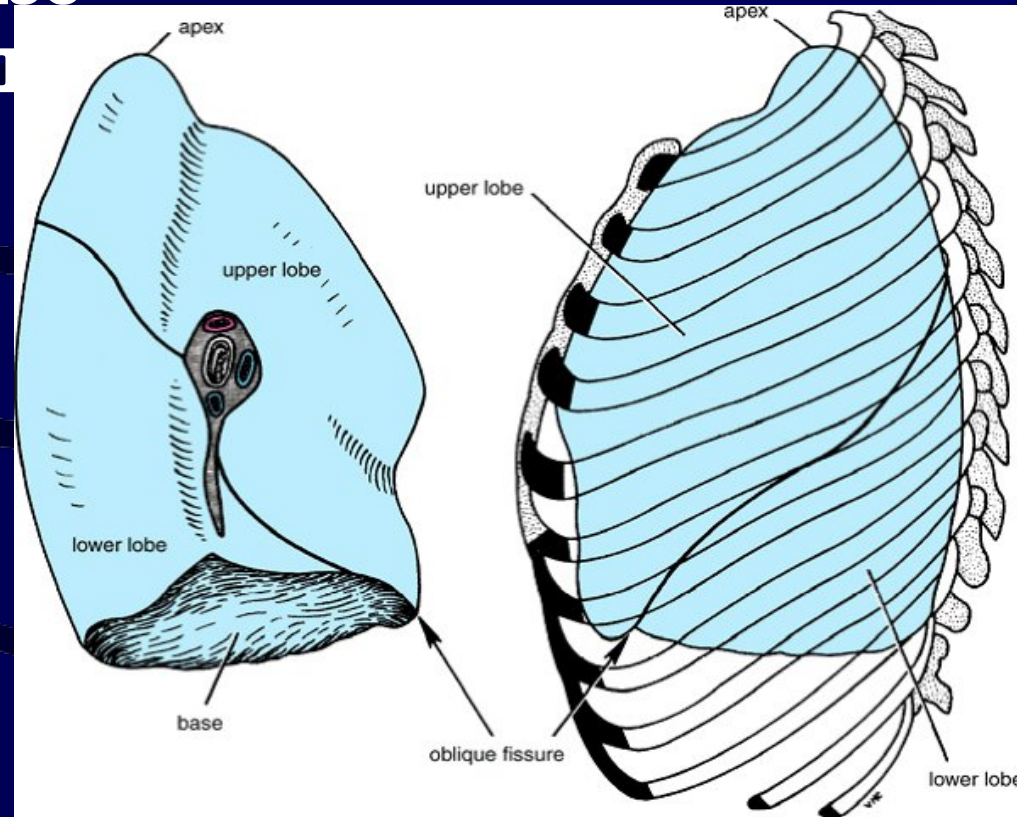
Right Lung

- Larger, shorter, thicker than left lung.
- Divides into 3 lobes: Upper, Middle, Lower
- In between lobes 2 fissures:
- Oblique fissure begins at pos border of lung 6cm below apex, at level of 3rd TS Ends at 6th cc junction.
- Crosses 6th rib in midaxillary
- Horizontal fissure:
- 4th CC (ant.) oblique fissure mid axillary line



Left Lung

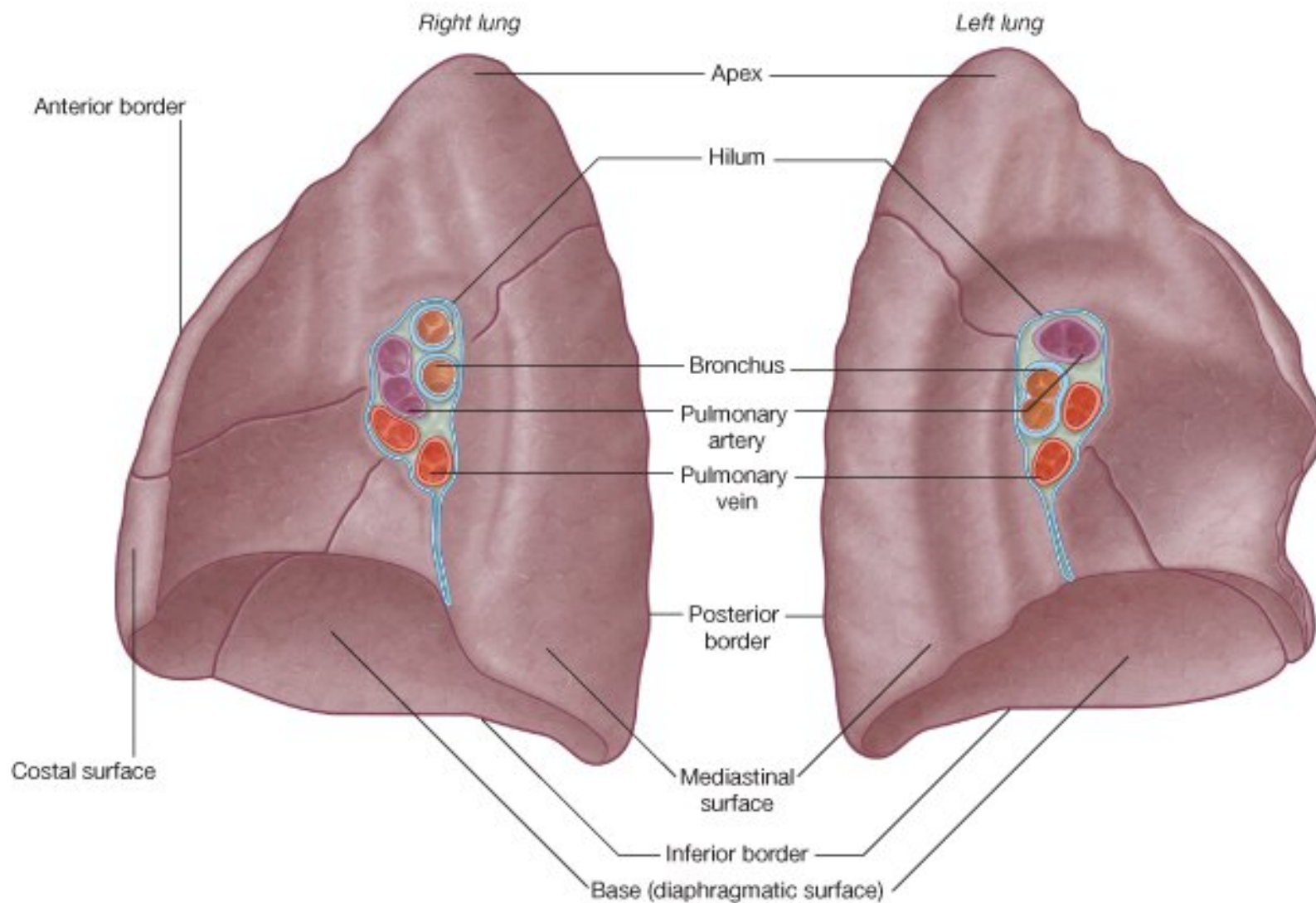
- Smaller than Rt. Because of heart, taller, narrower
- 2 lobes: upper, lower
- 1 fissure:
 - Oblique fissure
- Ant. Border:
- Cardiac Notch deviate from 4th, 6th cc.
- Lingula(beneath the notch)

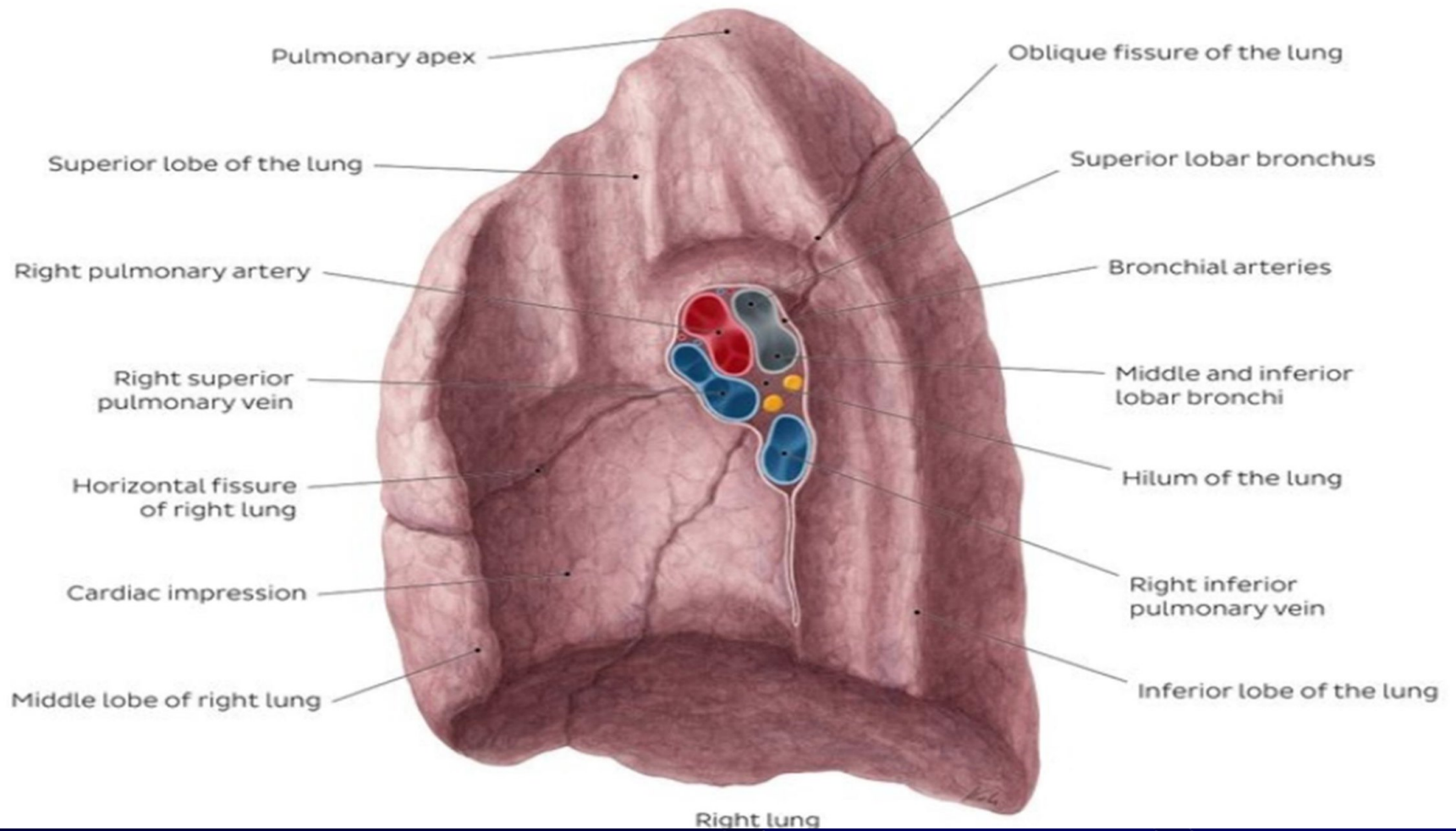


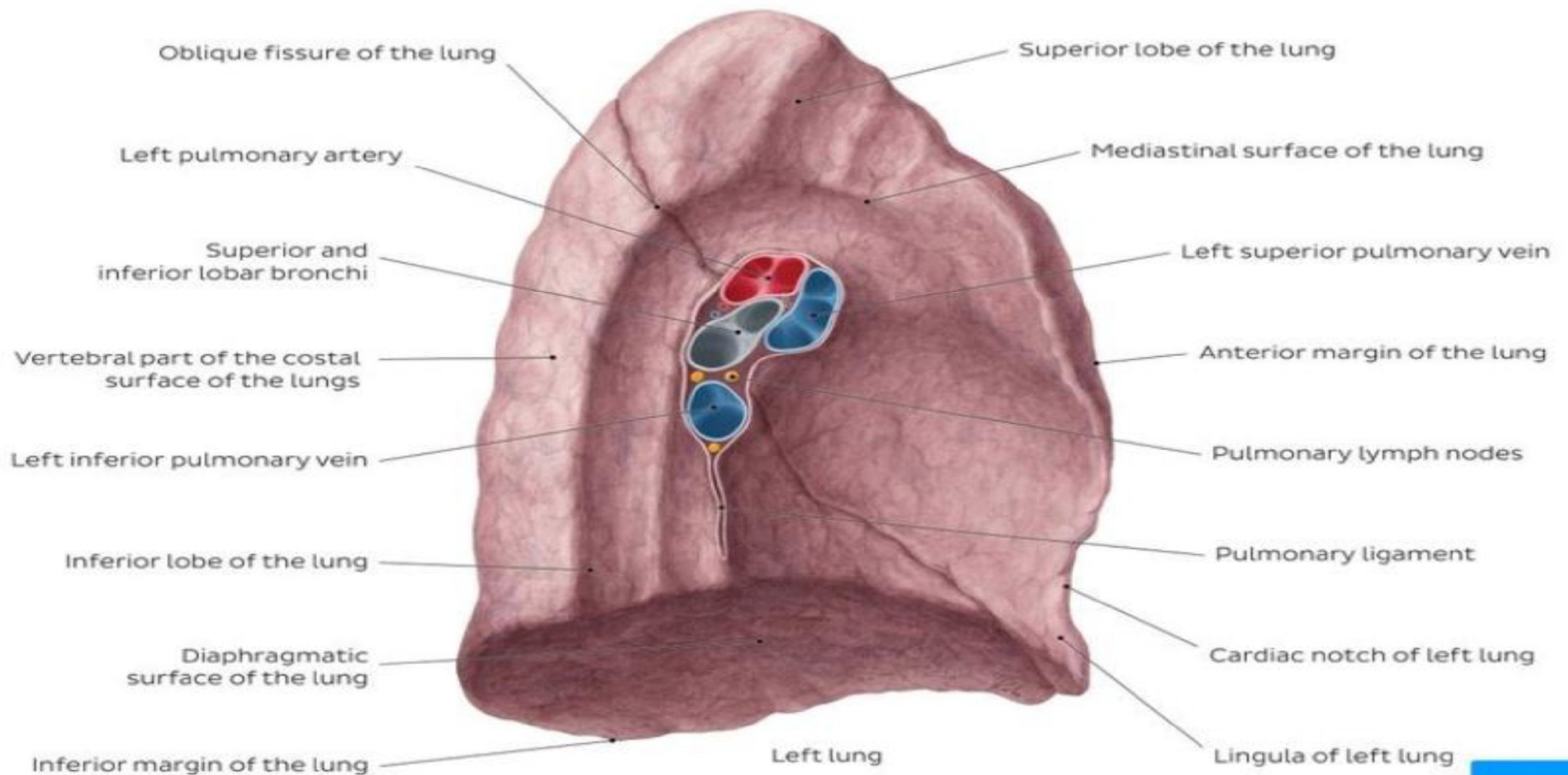
Root & Hilum of The Lung

On Medial Surface

- Root:
- Str. that enter from Mediastinum to Hilum of lung or leave the lung, connect lung with Heart ,and Trachea.
- (Pulmonary a. & v. & Bronchi)
- Enclosed in tube of pleura
- Opposite to 5th, 7th thoracic vertebra
- Hilum:
- Is Aperture through which structures from root enter or leave lung
- Lie in pos part of medias surface.
- Midway between apex and base of lung .



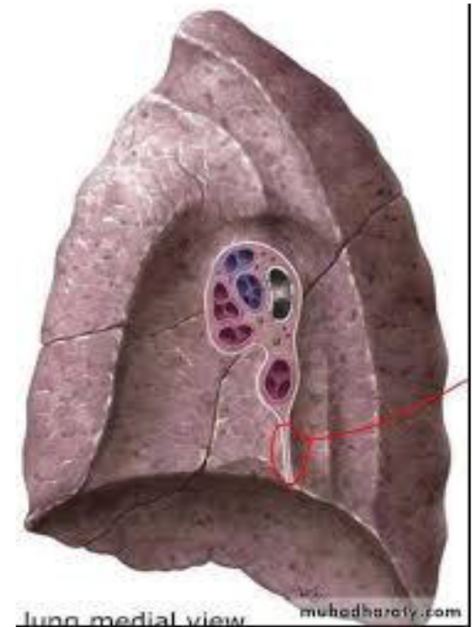






Pulmonary ligament

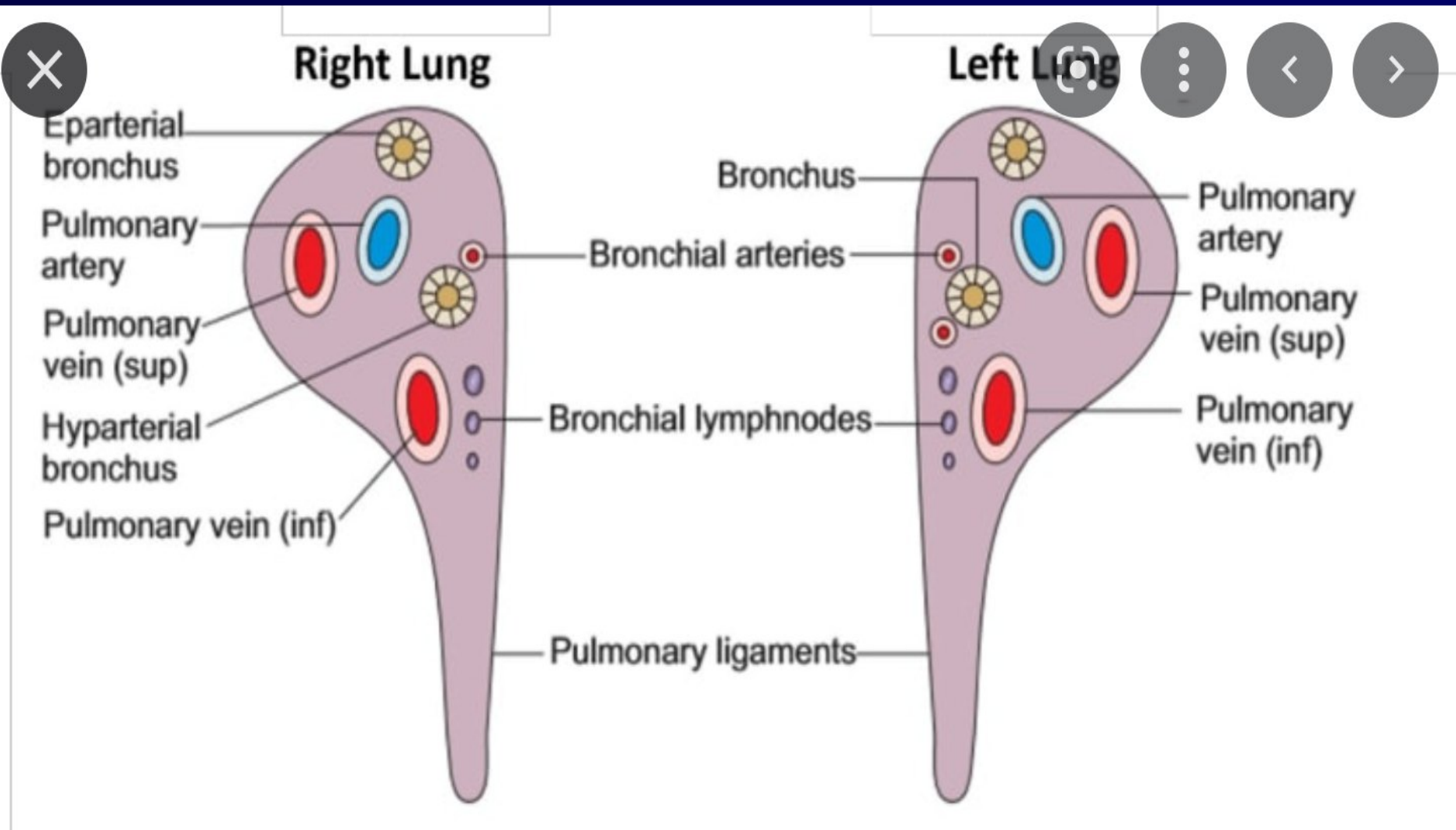
- ✓ **Two** layered fold of **mediastinal** pleura
- ✓ **Surrounds** lung **hilum**
- ✓ Extends **downward** and **ends** at the lung base

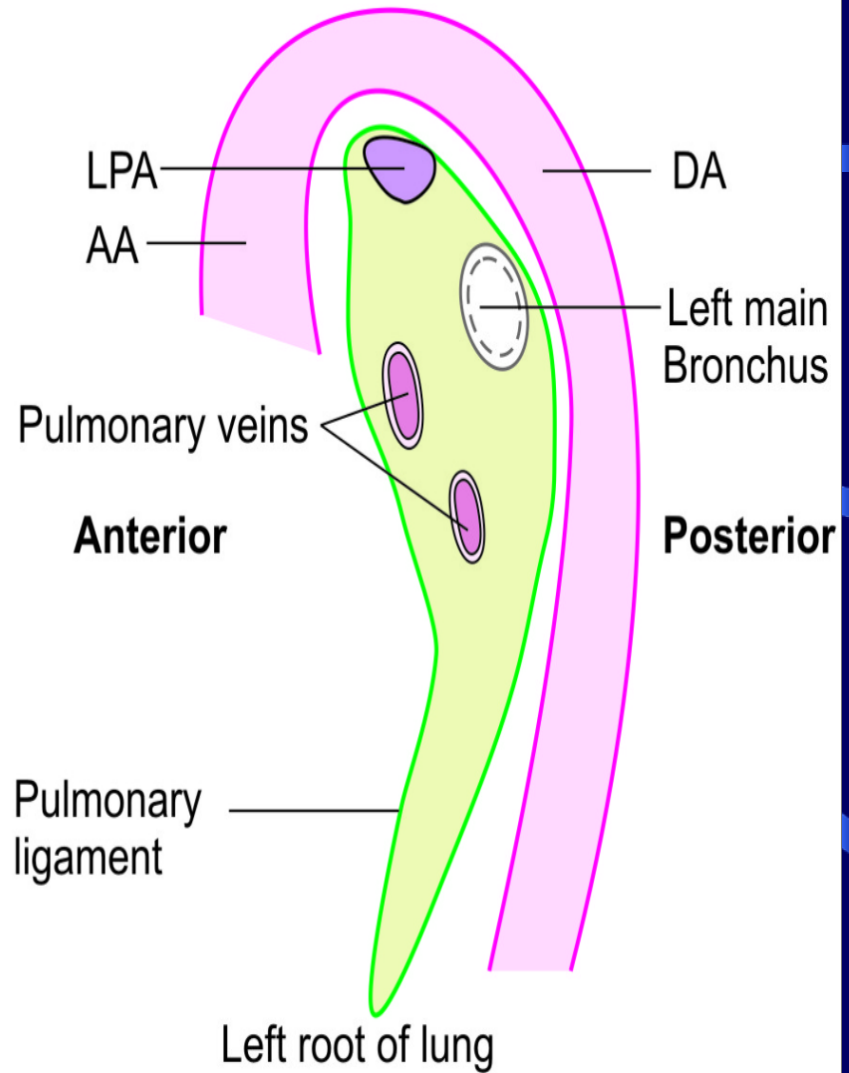
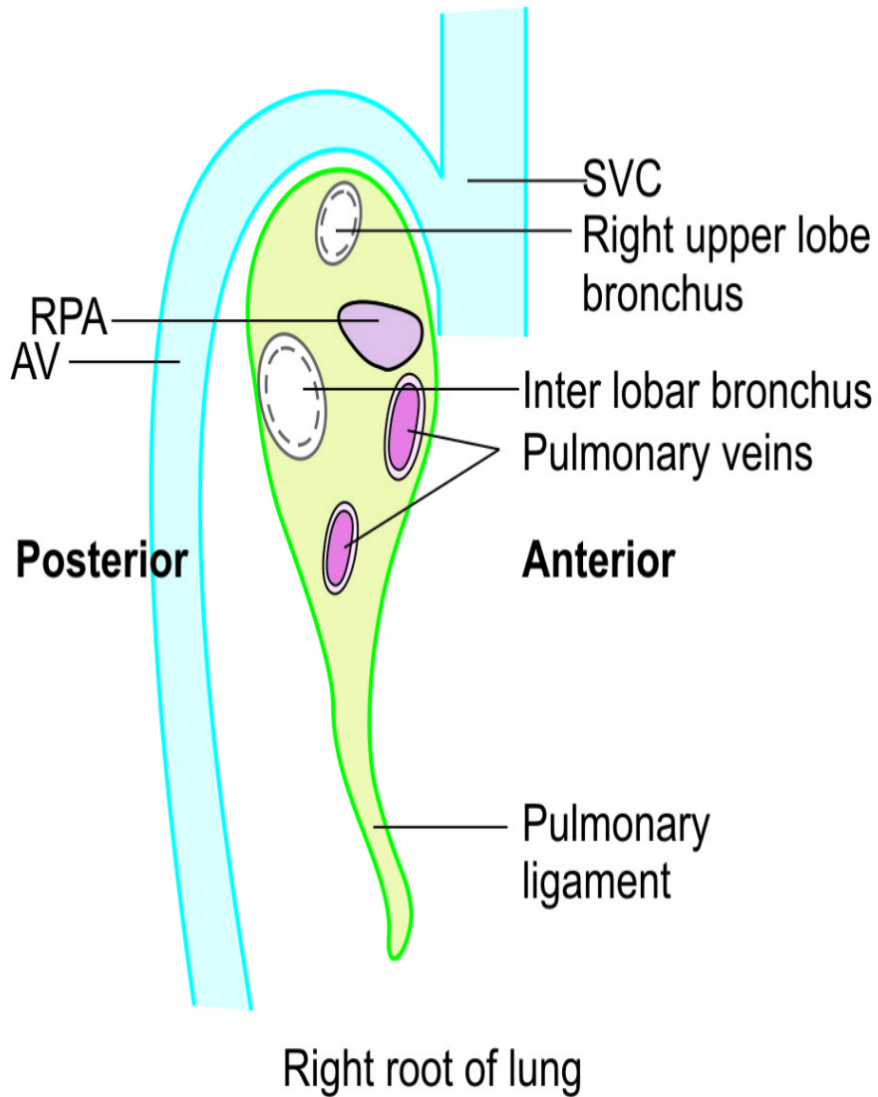


Arrangement of structures in root of lung

- Upper pulmonary vein is, most Anterior structure.
- Principle bronchus , most Posterior structure.
- Lower pulmonary vein is most Inferior structure.
- On Rt side there is a smaller bronchus called Eparterial bronchus, above main bronchus.
- Pulmonary artery lie between principle bronchus ,and SPV Rt lung.
- PA Lt side above and infront of main bronchus.
- Root of Lt lung contain One Bronchus only.
- ROL contain one or more bronchial A , Broncho-pulmonary LN, pulmonary plexus of nerves .

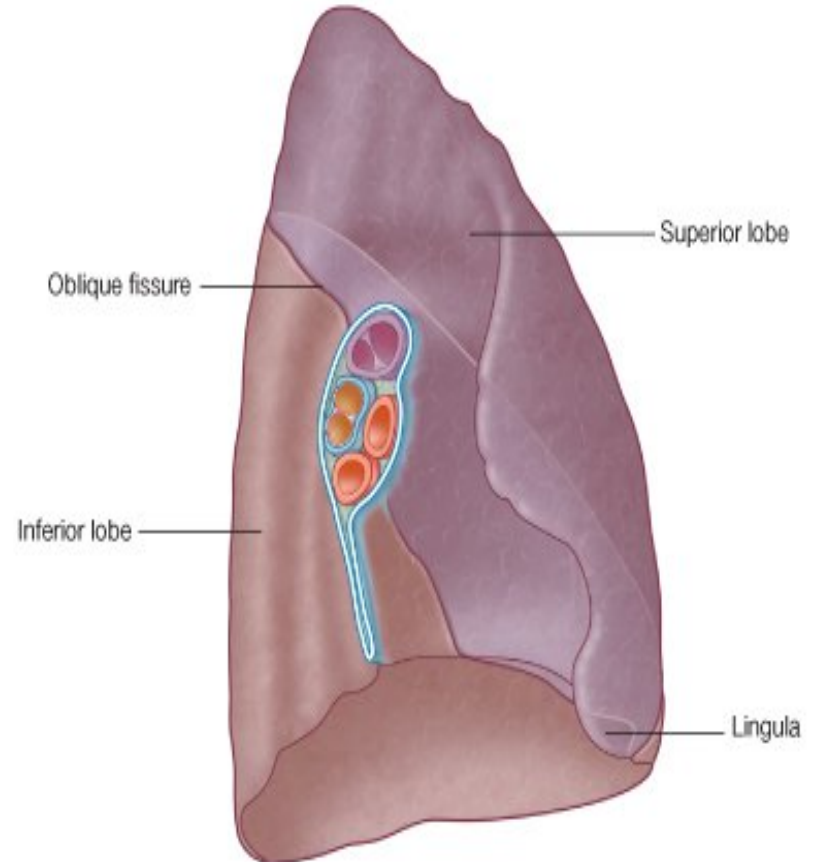
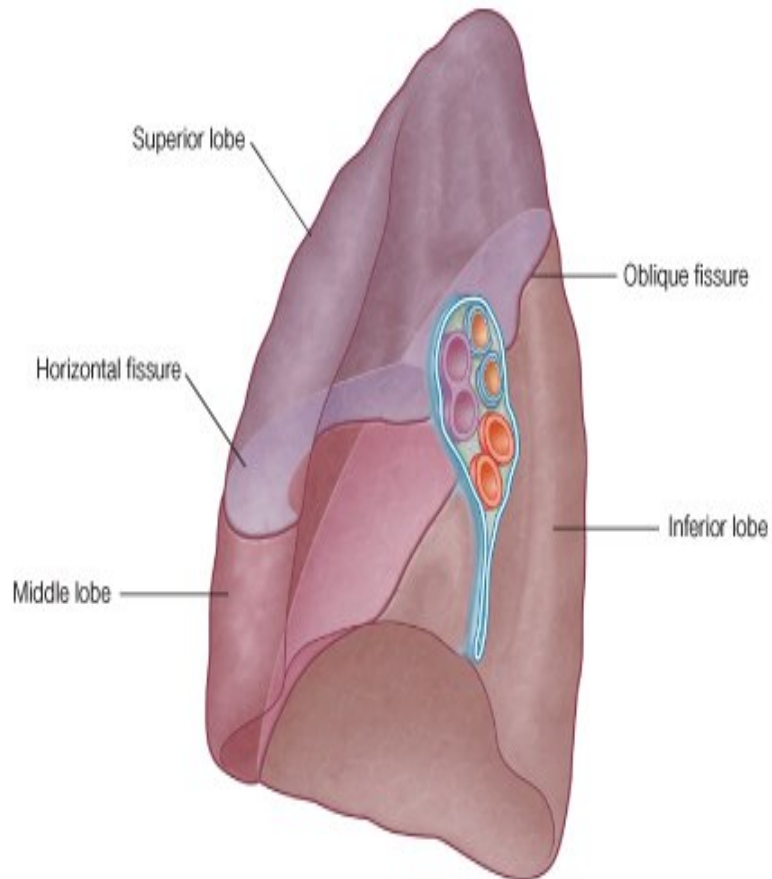
Arrangement of Structures In Lung Hilum

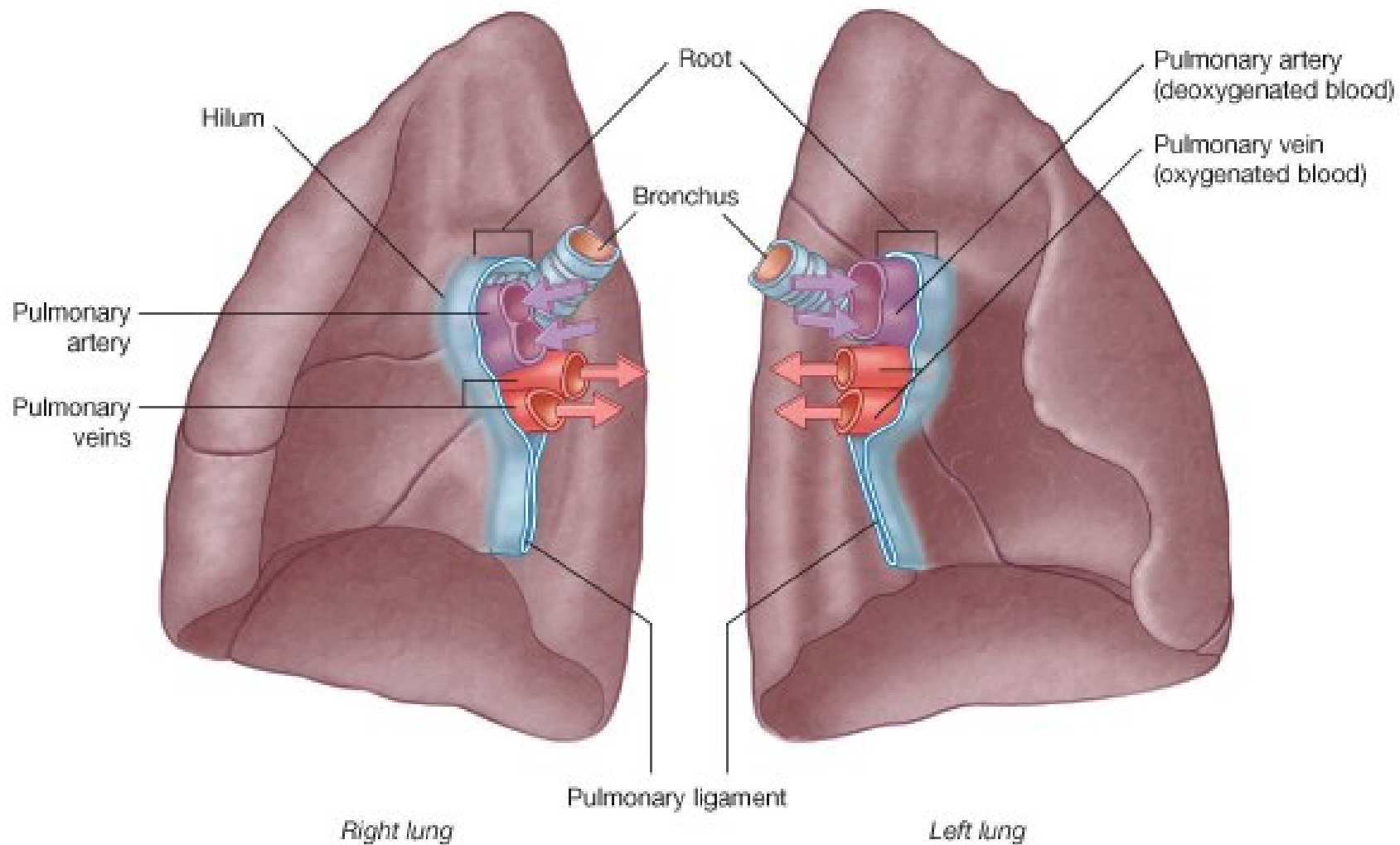




Rt,Lt lung fissures

A

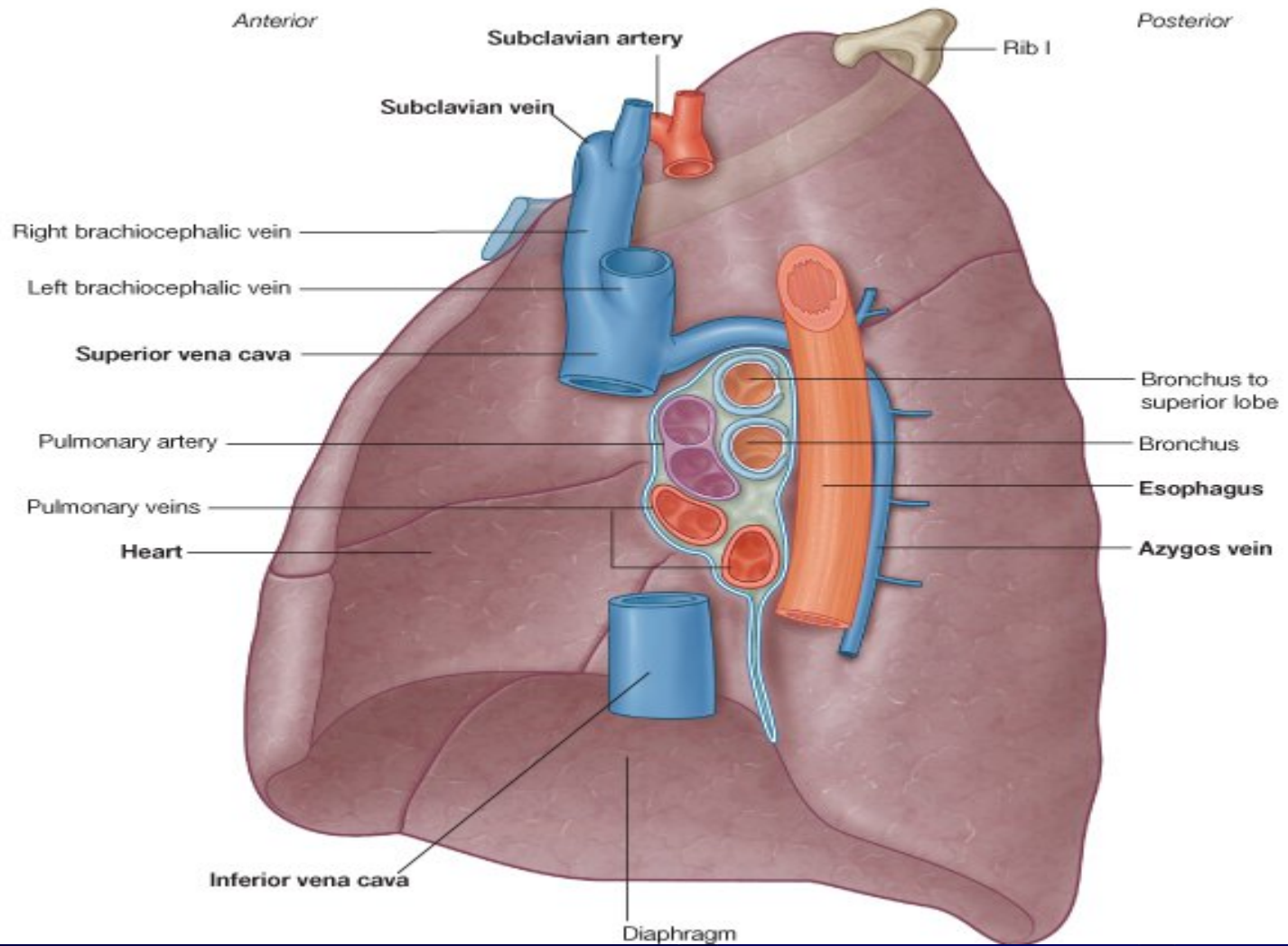




Mediastinal surface of Rt lung

- Most important is hilum of lung ,and line of attachment pulmonary lig.
- *In front and below of hilum*
- Wide concave impression for Rt atrium
- 2 Vertical grooves for SVC , IVC,above and below hilum
- *Behind of hilum*
- Groove for azygos vein ,and esophagus.
- *Immediately above hilum*
- Curved groove for arch of azygos vein.
- *Above level of arch of Azygos 3 grooves*
- Esophagus , Trachea, SVC.

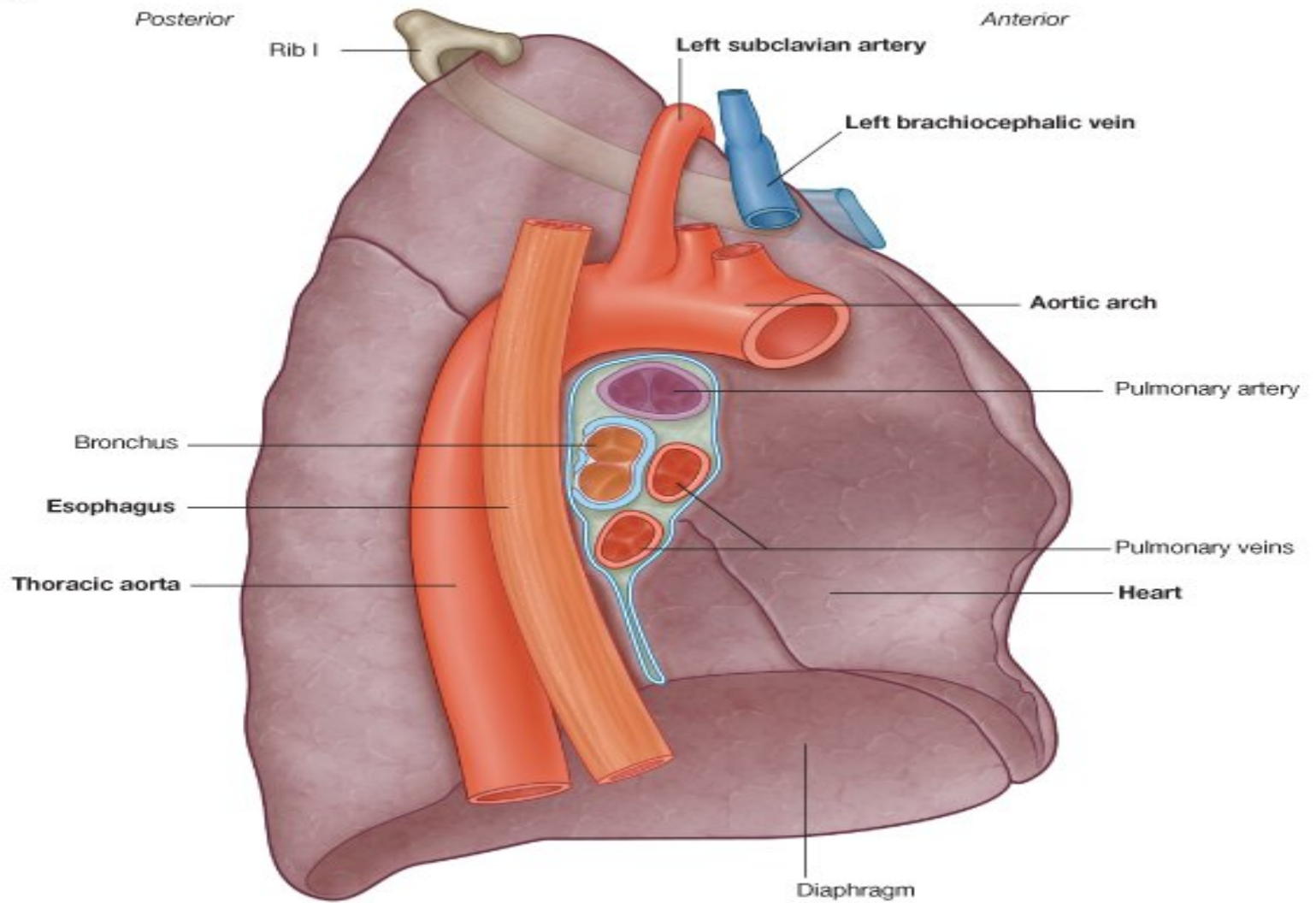
B



Mediastinal surface of Lt lung

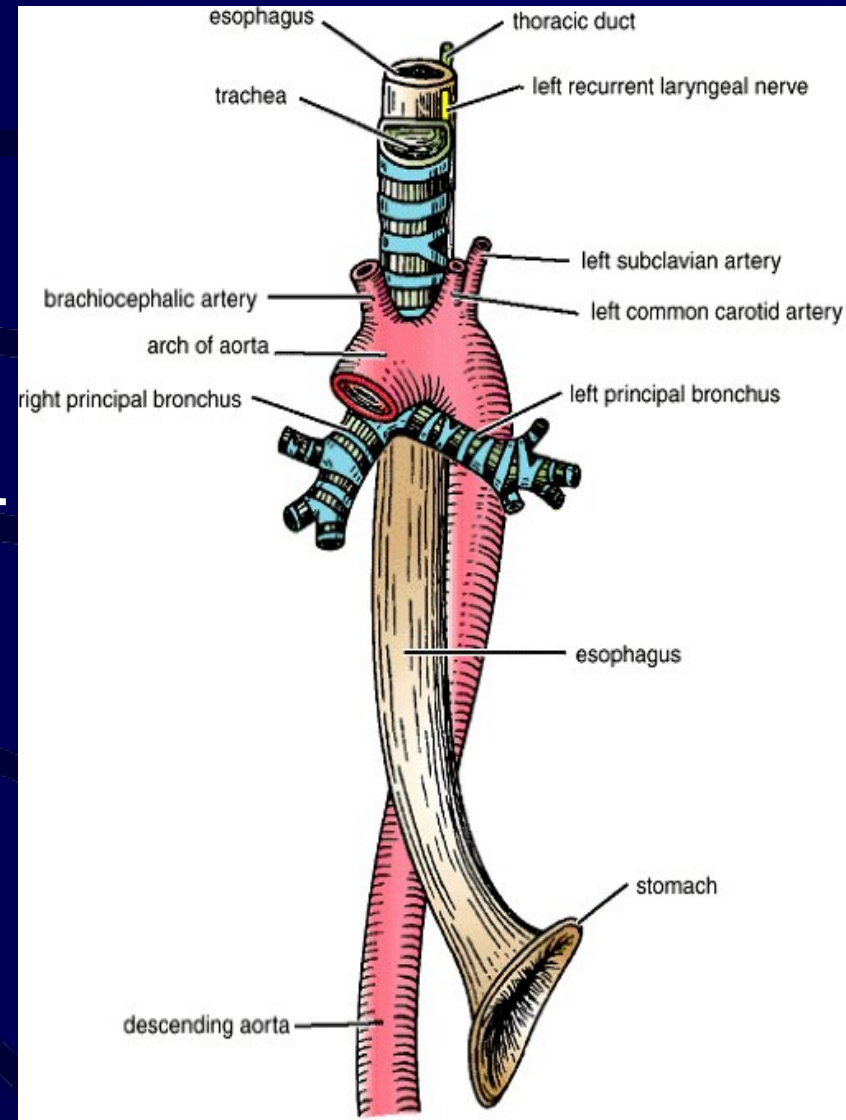
- Most important is hilum of lung ,and line of attachment of pulmonary lig.
- *In front and below hilum*
- Wide deep concave area for Lt ventricle.
- *Behind of hilum*
- Longitudinal groove for descending aorta.
- *Immediately above hilum*
- Broad groove for arch of aorta.
- *Above level of aortic arch*
- 2 grooves for Lt subclavian,lt CCA.
- Phrenic nerve descend 1 cm in front of ROL
- Vagus nerve form pos pul plexus on pos aspect of root

B



Bronchi

- 1. Main bronchi (1):
- One on each side
- Extend from angle of Lewis
To hilum of lung.
- Rt. bronchus:
- Wider, shorter & more vertical
- Lt. Bronchus:
- Narrower, longer &
• more horizontal



Difference between Rt,Lt bronchi

Lt bronchus

Longer and narrower

Less in line with trachea

1st branch arise two inch from bifurcation

Lt PA cross in front of stem Lt bronchus
Before origin of 1st branch

Arch of aorta crosses above Lt bronchus
from in front backward

Rt bronchus

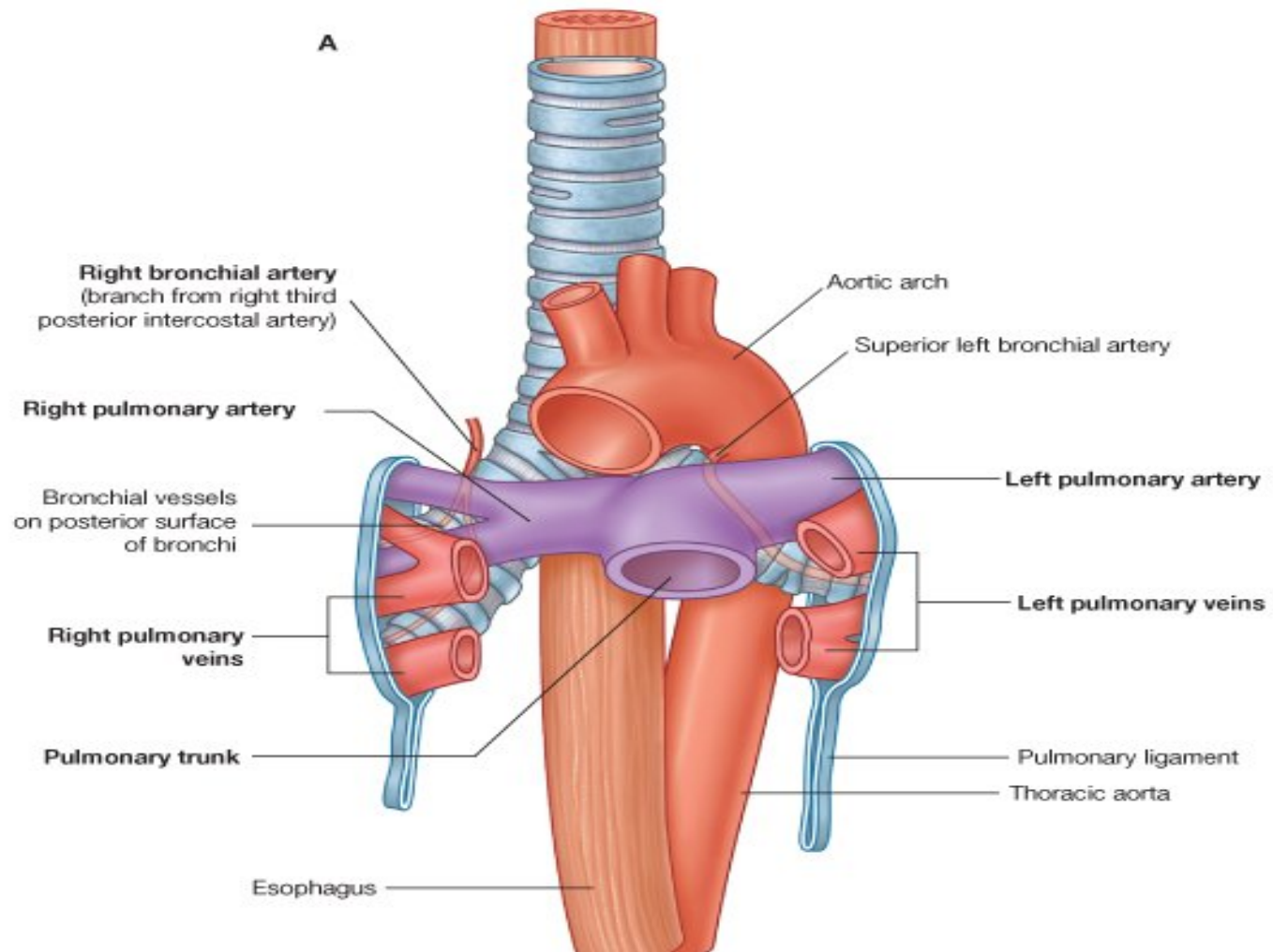
Shorter wider

More in line with trachea

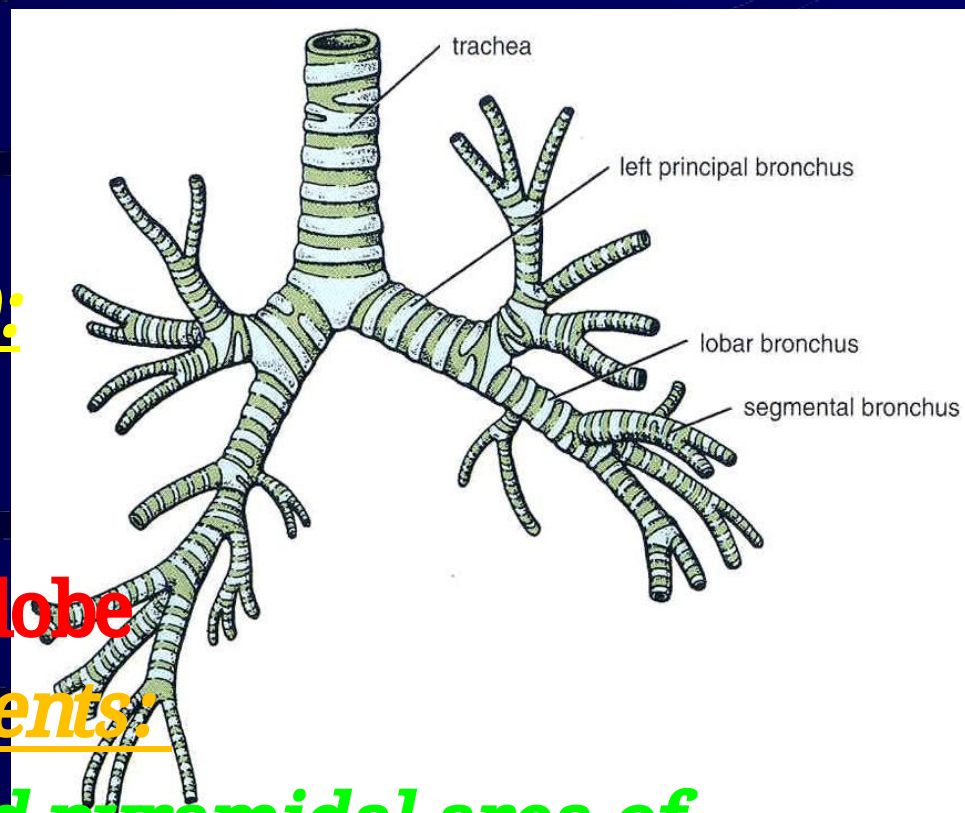
1st branch arise one inch from bifurcation

Rt PA cross in front of stem Rt bronchus
after origin of 1st branch

Arch of azygos vein crosses above Rt
bronchus, from behind forward

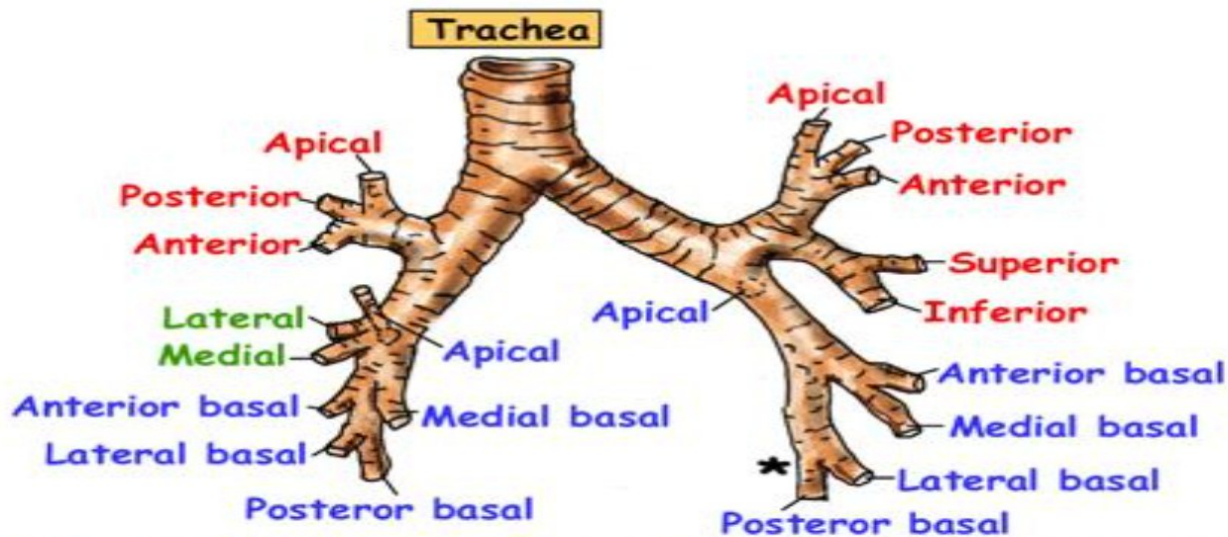


- 2. Lobar bronchi (2):
- 2 Lt. & 3 Rt.
- 3. Segmental bronchi (3):
- 10 Rt **3** upper lobe,
2 mid lobe **5** lower lobe
- 8 Lt **4** upper lobe **4** lower lobe
- Bronchopulmonary segments:



Segmental bronchus and pyramidal area of lung it supply with apex at hilum, base at surface of lung, and accompanying PA branch.

BRONCHOPULMONARY SEGMENTS



★ Late branching due to cardiac pressure

Mnemonic: Starting on right at upper lobe, working down right lobe then down left lobe the segments are as follows:

APALM APALM APAIS APAL

BRONCHI

Blood supply: Bronchial arteries from aorta (2 on left, 1 on right)

Venous drainage: On right - azygos, left - hemiazygos. Also a little via bronchial veins and pulmonary veins

Nerve Supply: Pulmonary plexus at hilum - vagus and sympathetics

SYMPATHETIC

Vasoconstriction

Bronchodilatation (beta 2)

Suppress glandular secretion (alpha)

PARASYMPATHETIC

Vasodilatation

Bronchoconstriction

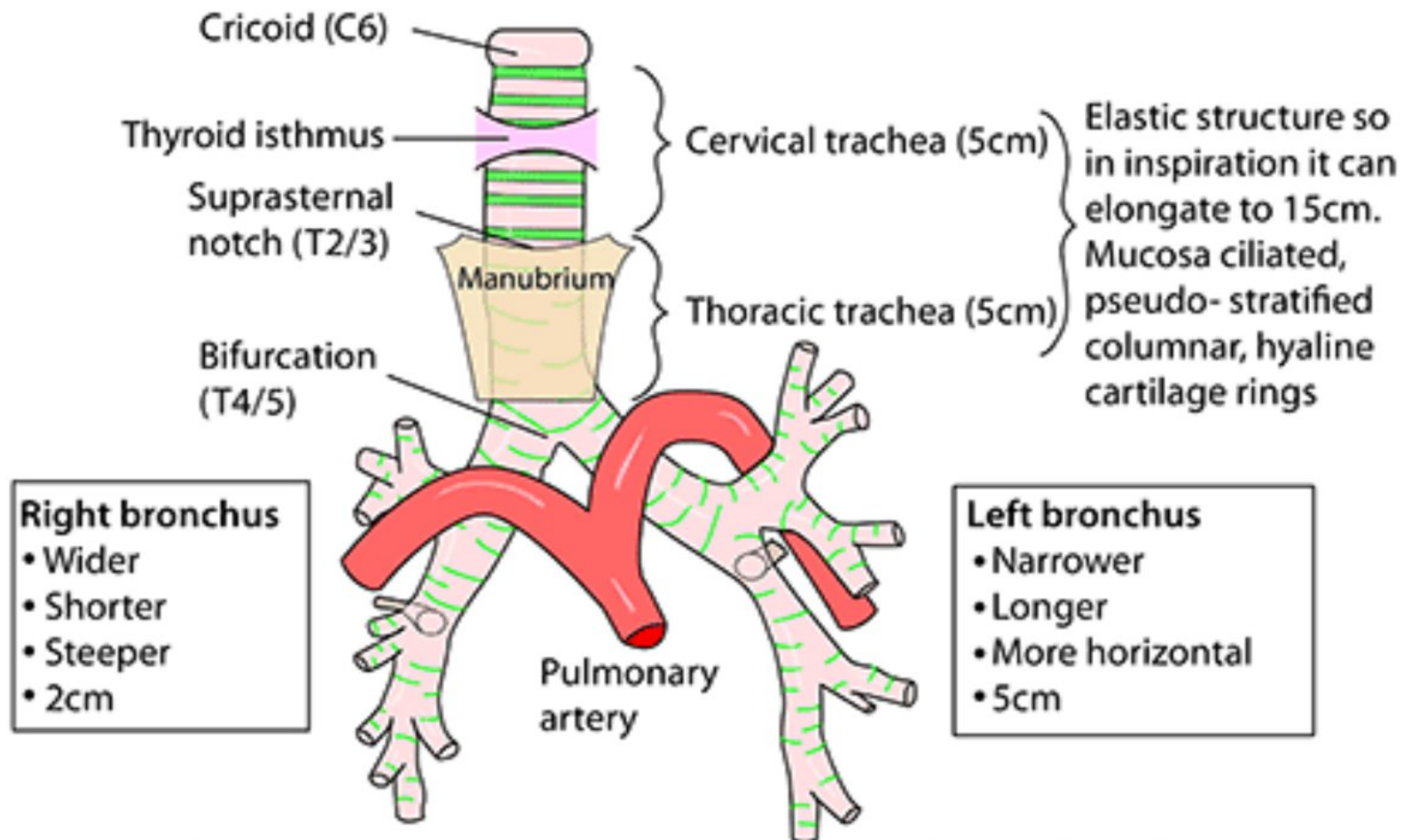
Increase glandular secretions

Sensation

Bronchopulmonary Segments

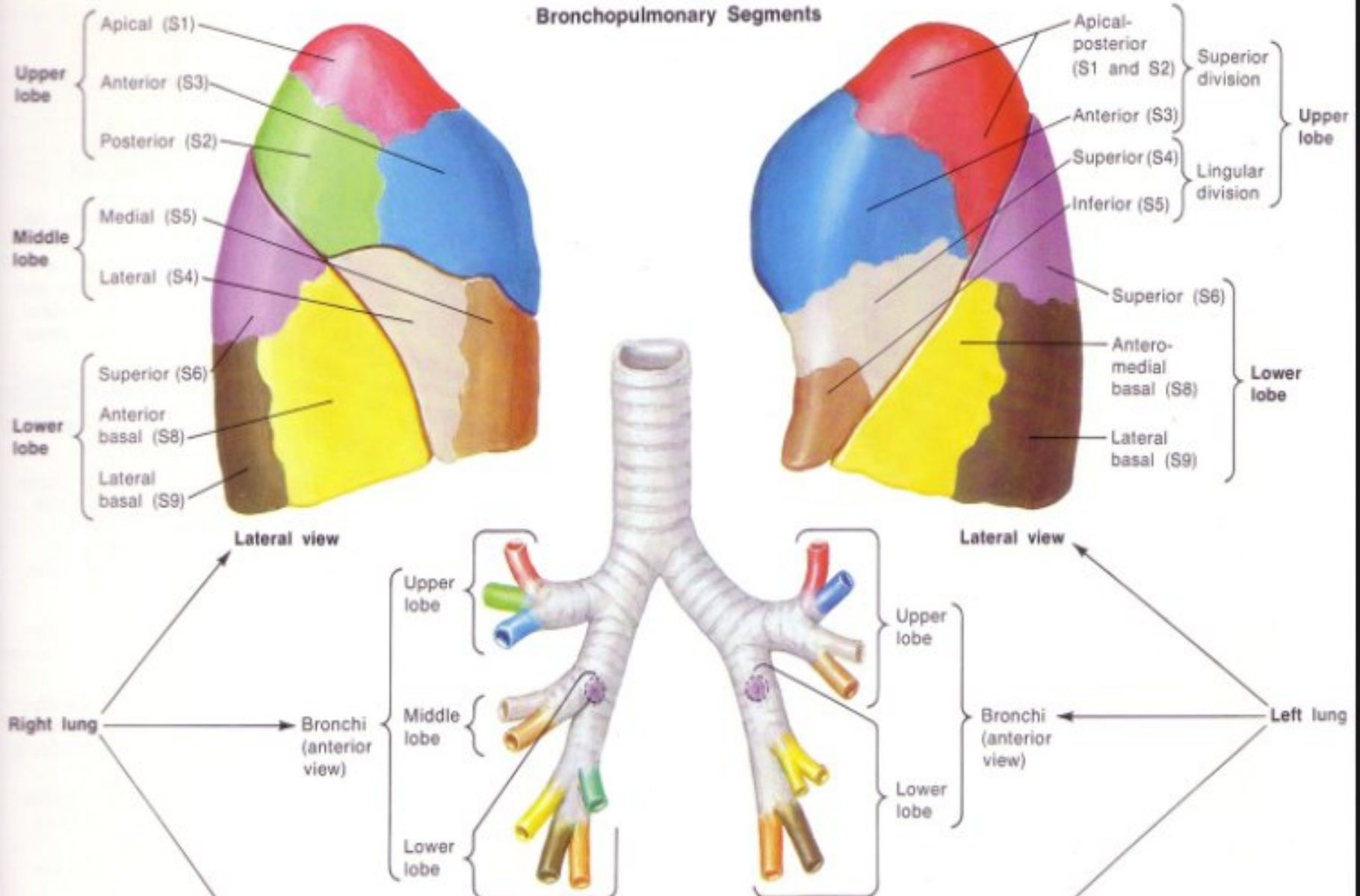
- Anatomical, Functional, & Surgical units of the lung .
 - Pyramidal in shape like a wedge:
 - Apex: Root, Base: pleural surfaces
 - Each segment has its own bld. Supply & innervation
 - Separated by C.T.
- Subdivisions of lung lobes.
10 in Rt lung ,8-10 Lt lung.
- Diseased segment can be removed surgically
(because it is a structural unit)

RELATIONS OF TRACHEA & BRONCHI



Inhaled foreign bodies are more likely to enter the right main bronchus and then pass into the apical bronchus of the right lower lobe - the first one that points posteriorly

Bronchopulmonary Segments





RIGHT

Upper Lobe

Apical

Posterior

Anterior

Middle Lobe

Lateral

Medial

Lower Lobe

Superior

Medial

Anterior

Lateral

Posterior

LEFT

Upper Lobe

Apicoposterior

Anterior

Superior lingular

Inferior lingular

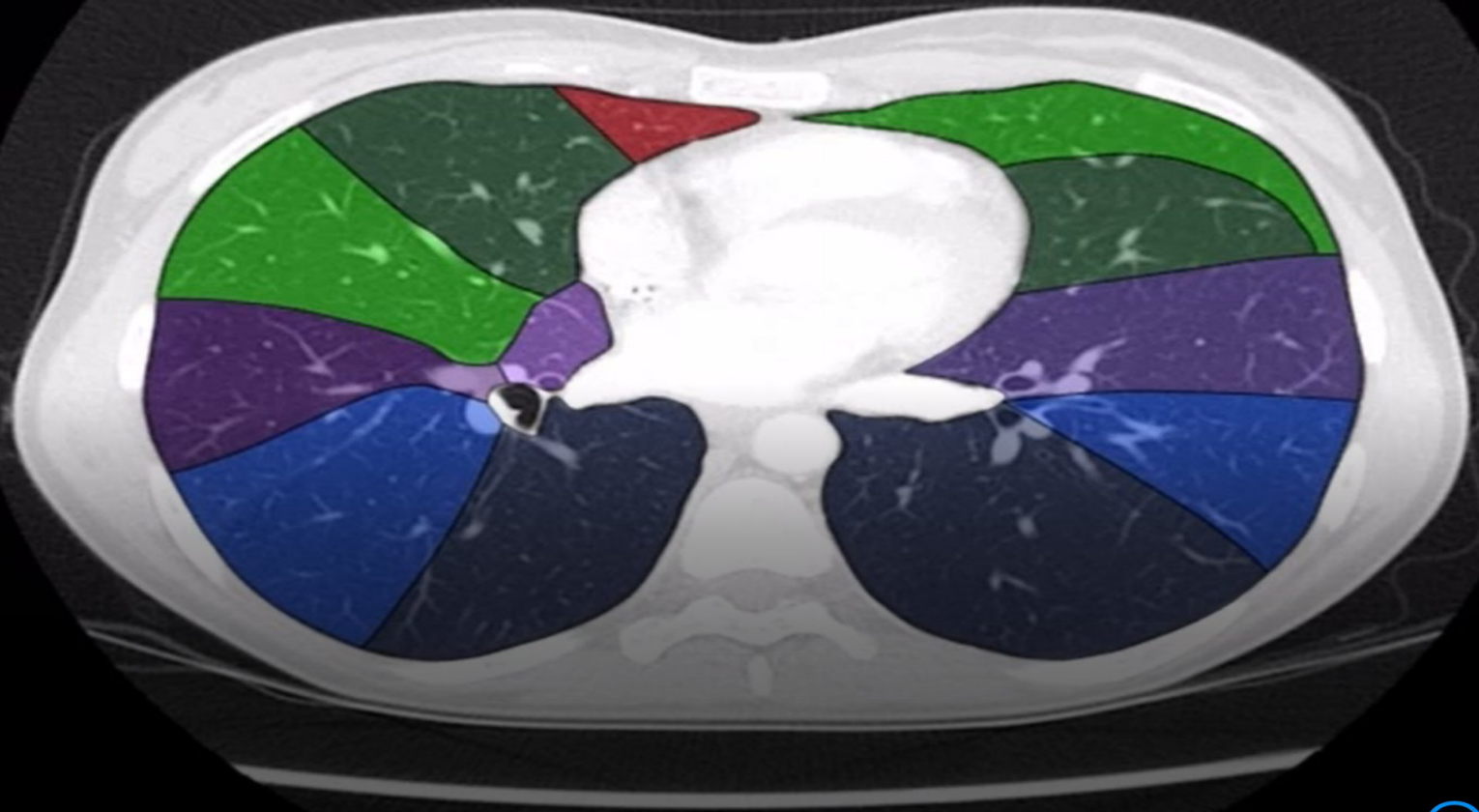
Lower Lobe

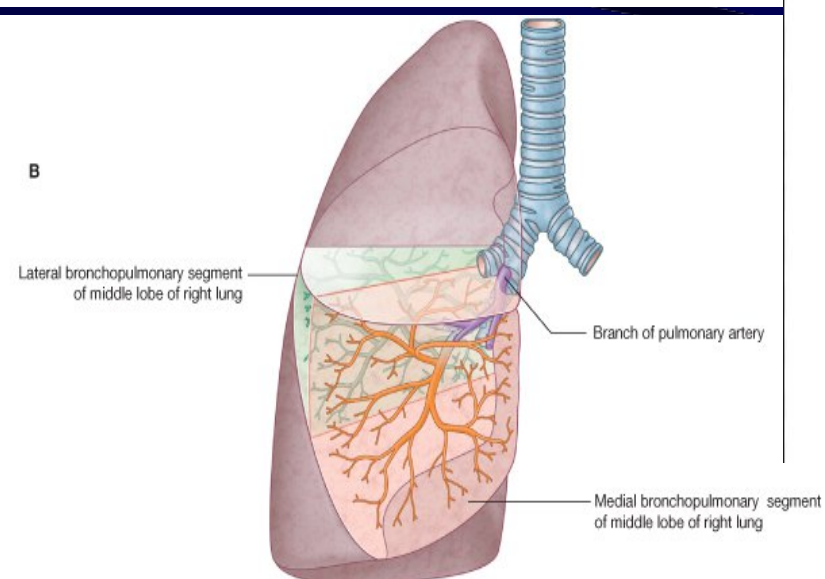
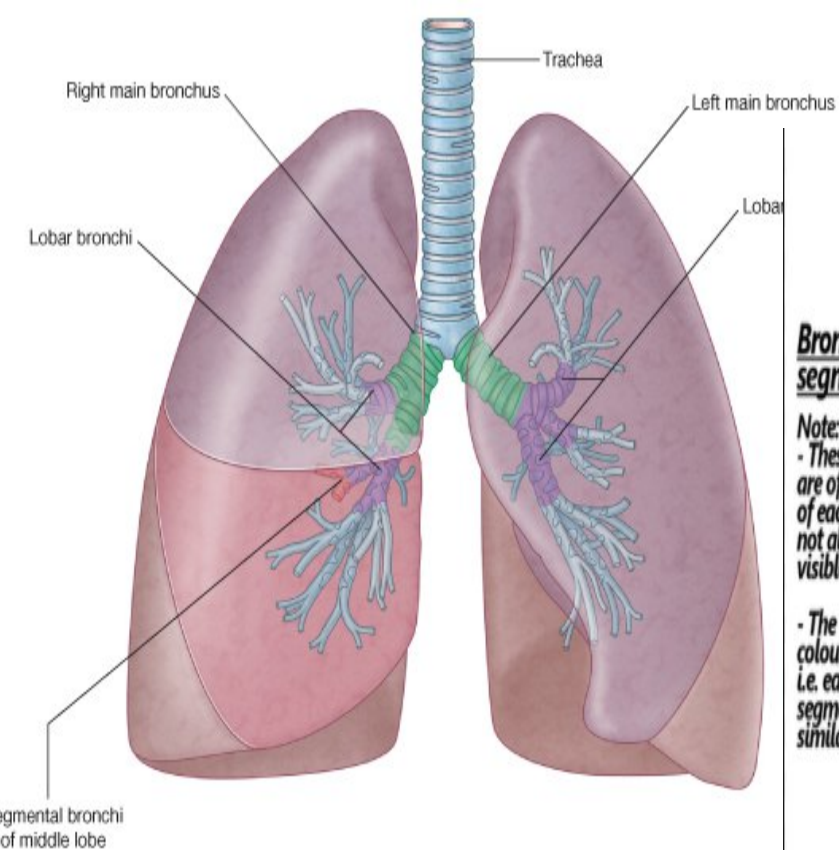
Superior

Anteromedial

Lateral

Posterior



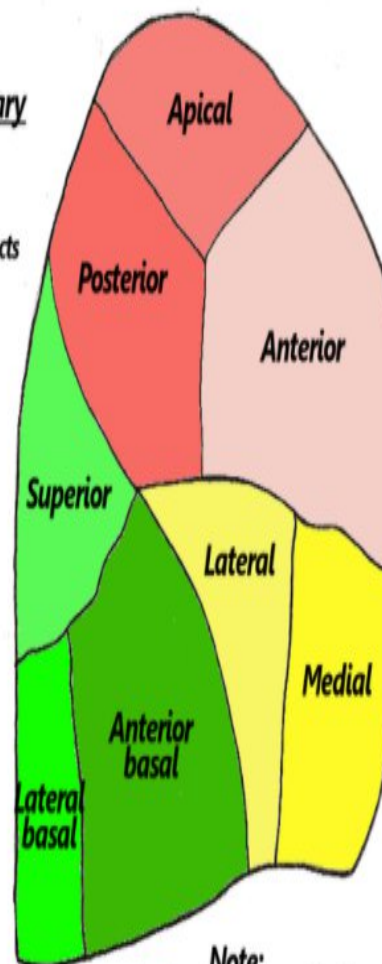


Bronchopulmonary segments

Note:
- These views are of the lateral aspects of each lung. As such, not all segments are visible.

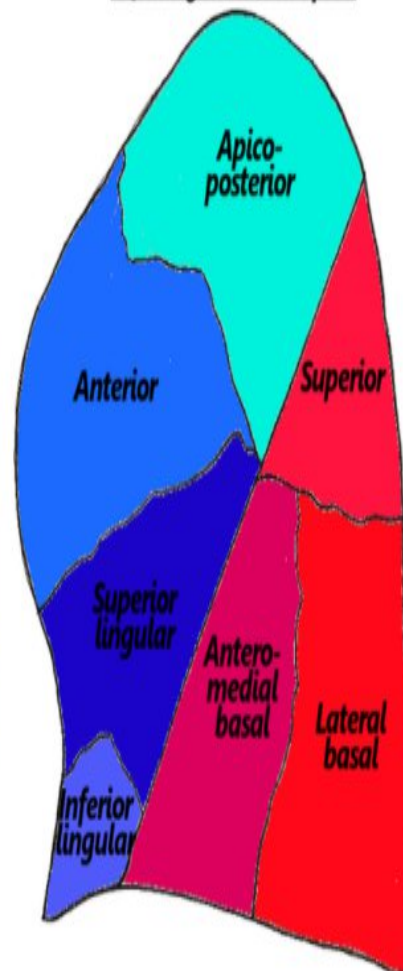
- The diagram is colour-coordinated, i.e. each lobe has segments of a similar colour

Right lung - lateral aspect

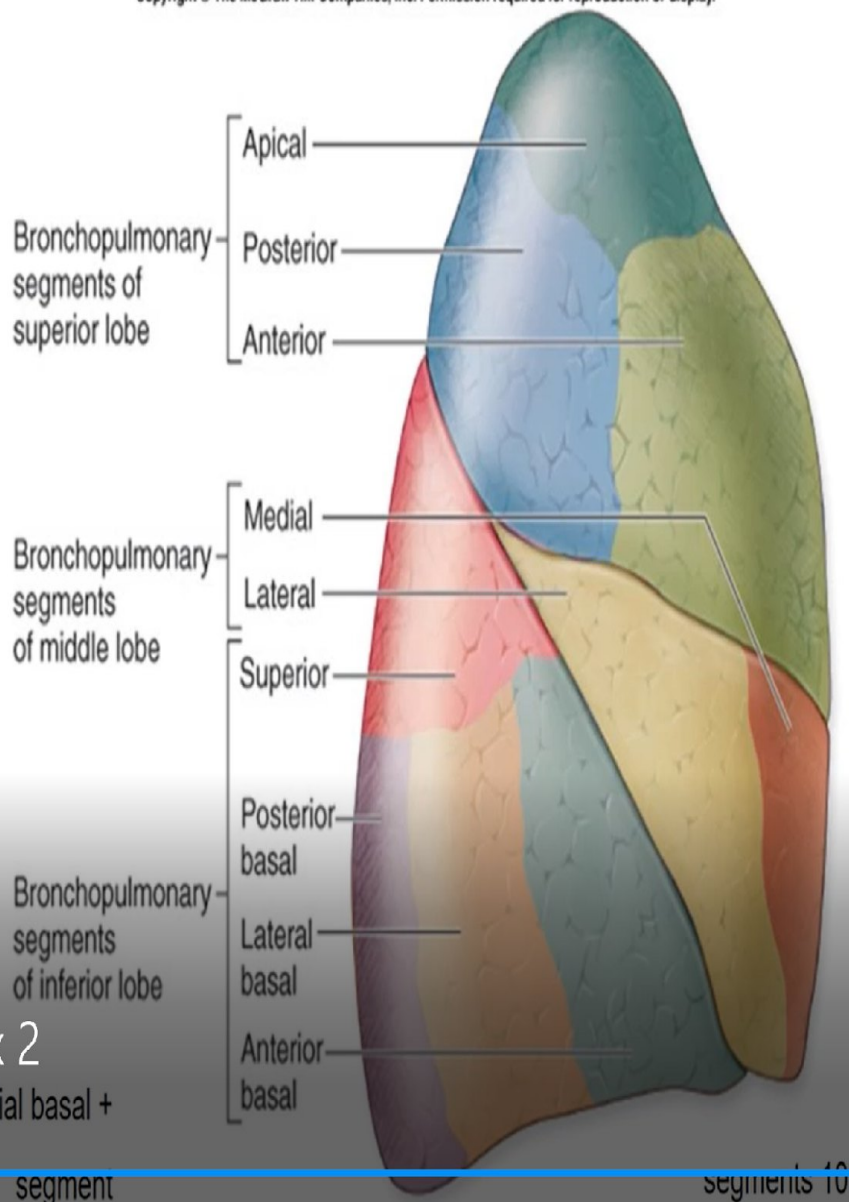


Note:
Posterior basal and medial basal segments are obscured from view

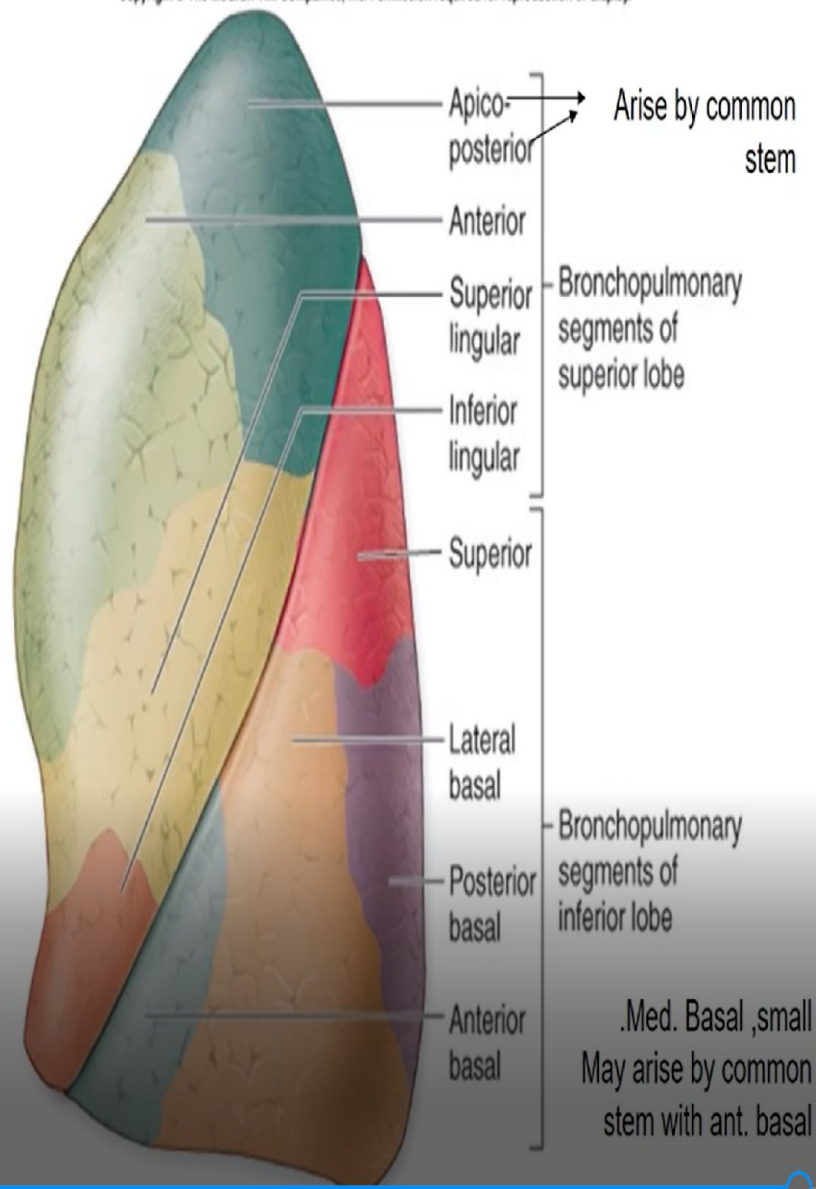
Left lung - lateral aspect



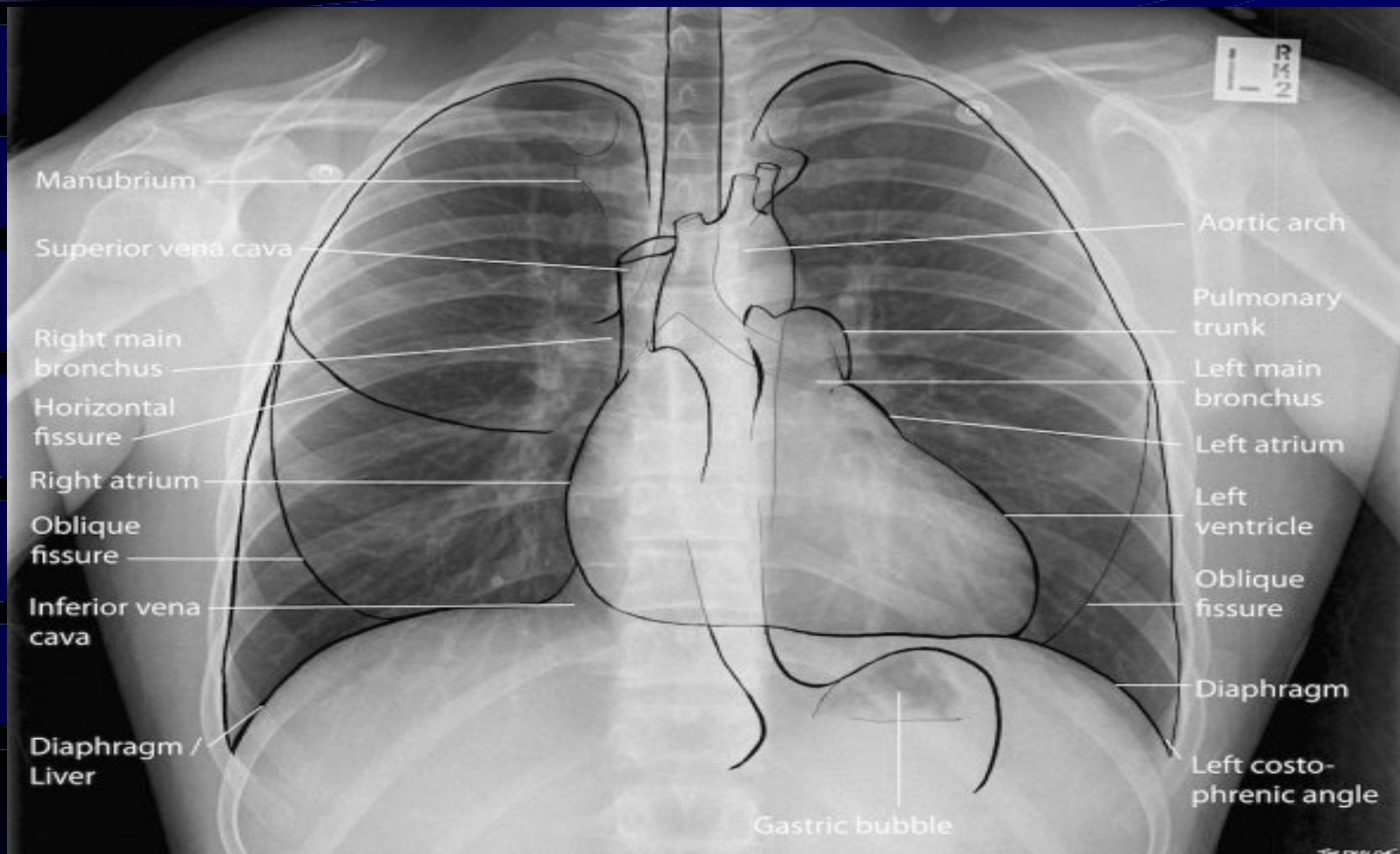
Note:
Posterior basal segment is obscured from view



Right lung, lateral view



Left lung, lateral view

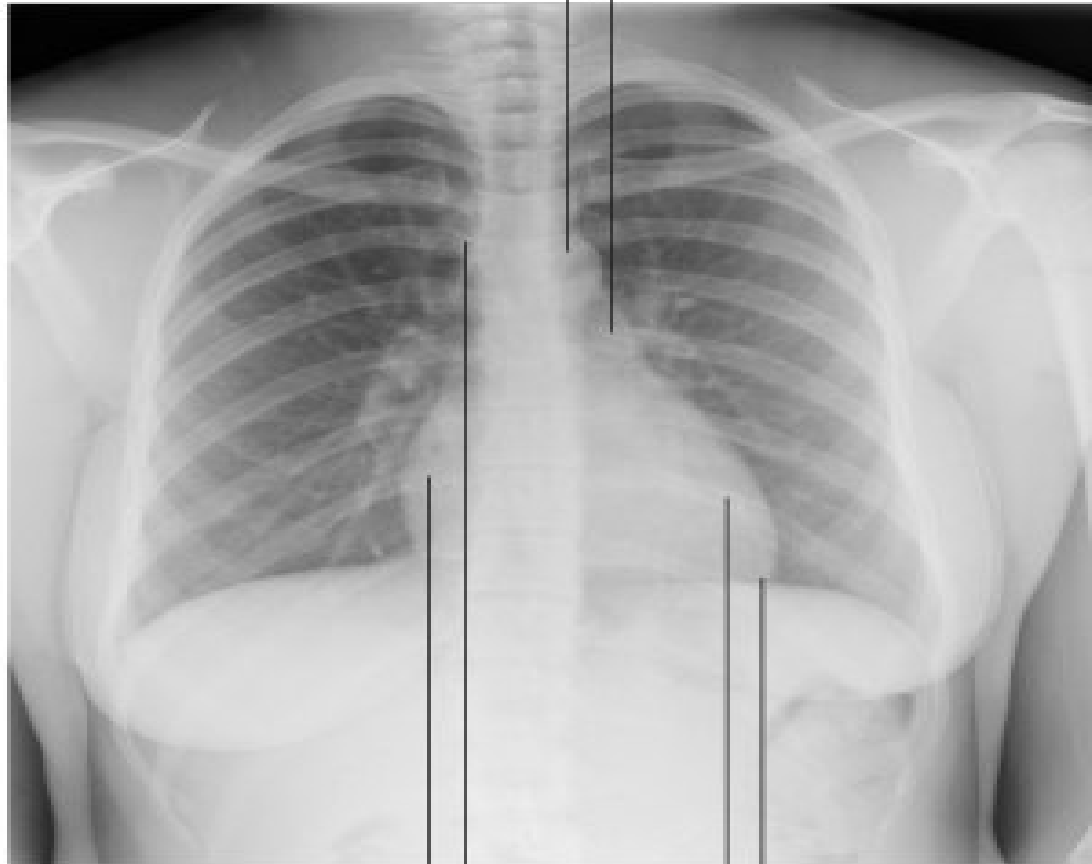


1/3 of heart size is to Rt , 2/3 to Lt of medial plane

A

Arch of aorta

Pulmonary trunk



Right atrium

Superior vena cava

Apex of heart

Left ventricle