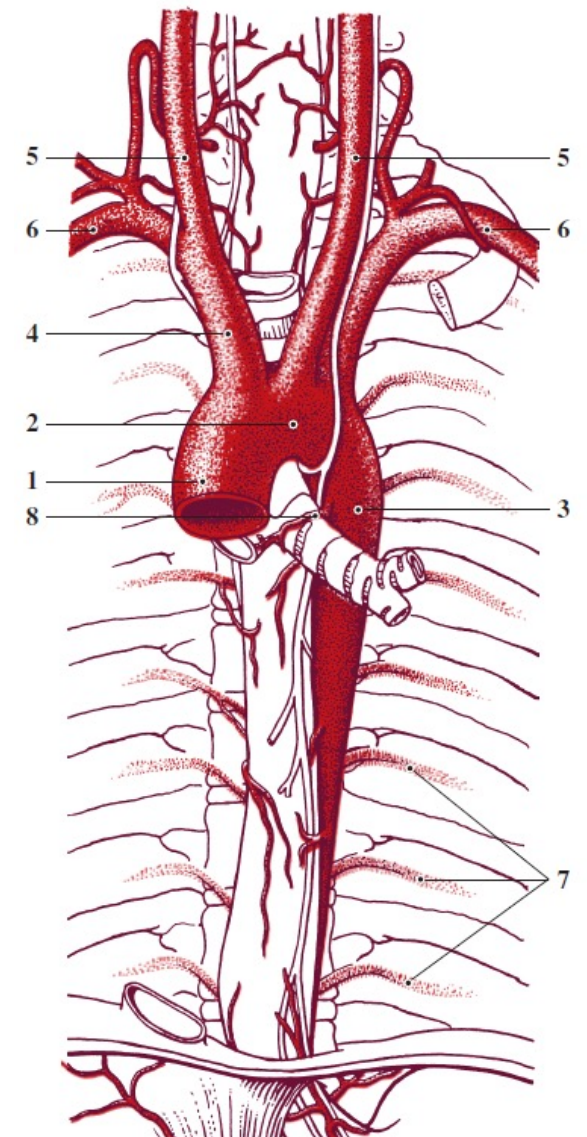


Thorax – aorta thoracica, venae thoracis

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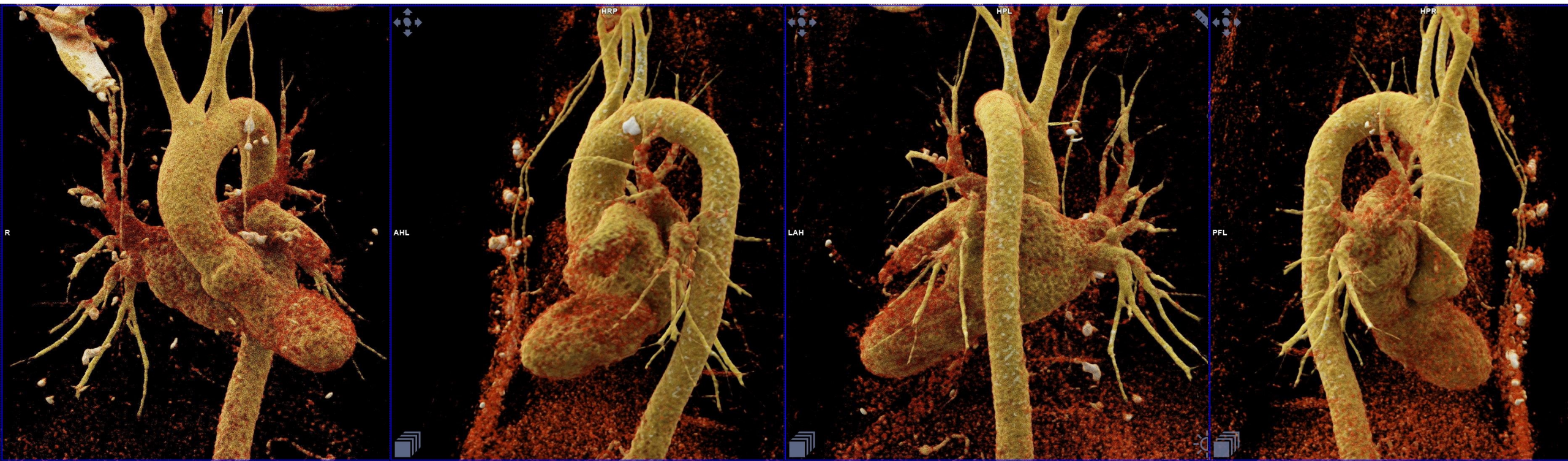


- **Bulbus aortae**
- **Aorta ascendens**
- **Arcus aortae**
- **Aorta descendens**
- **Hiatus aorticus**
 - **Th12**



AORTA THORACICA

AORTA



- ♦ **Aa. Coronariae**
- ♦ **Truncus brachiocephalicus**
 - ♦ **A. subclavia dextra**
 - ♦ **A. carotis communis dextra**
- ♦ *A. thyroidea ima*
- ♦ **A. carotis communis sinistra**
- ♦ *A. vertebralis sinistra*
- ♦ **A. subclavia sinistra**
- ♦ **Aa. intercostales post.**
- ♦ **Aa. bronchiales**
- ♦ *Rr. mediastinales, oesophageales, pericardiaci*



ARCUS AORTAE



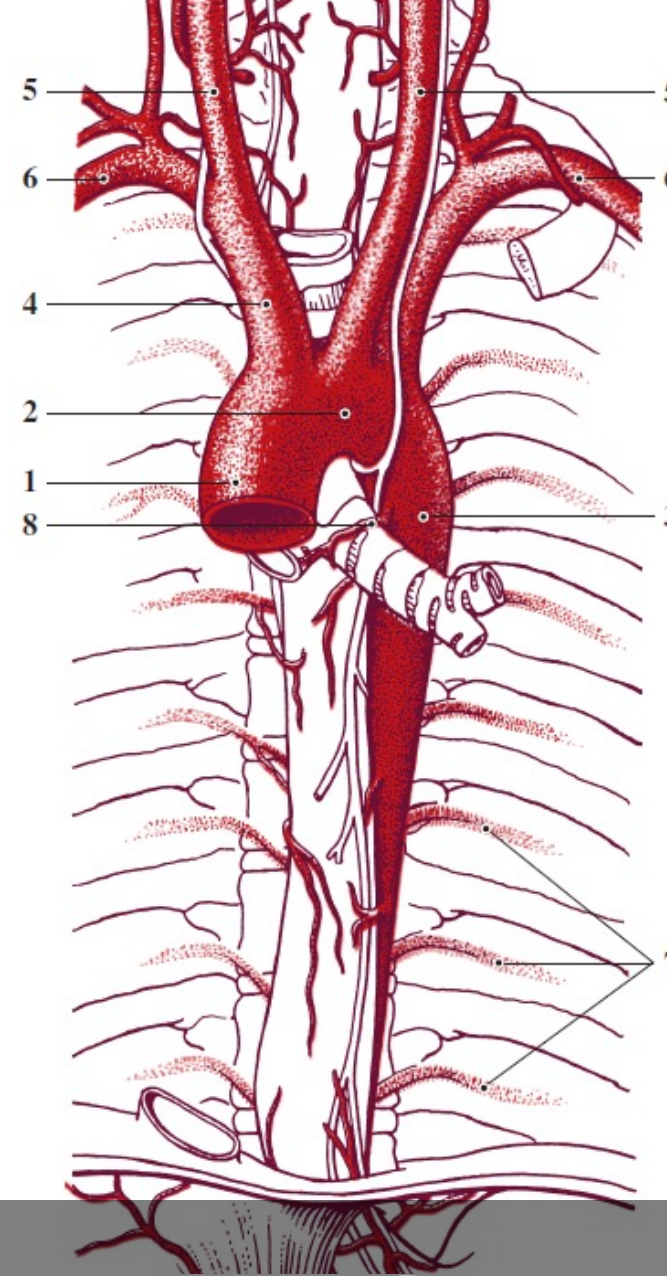
- 🔴 Ligamentum arteriosum
- 🔴 Injuries
- 🔴 Dissection
- 🔴 Orientation point



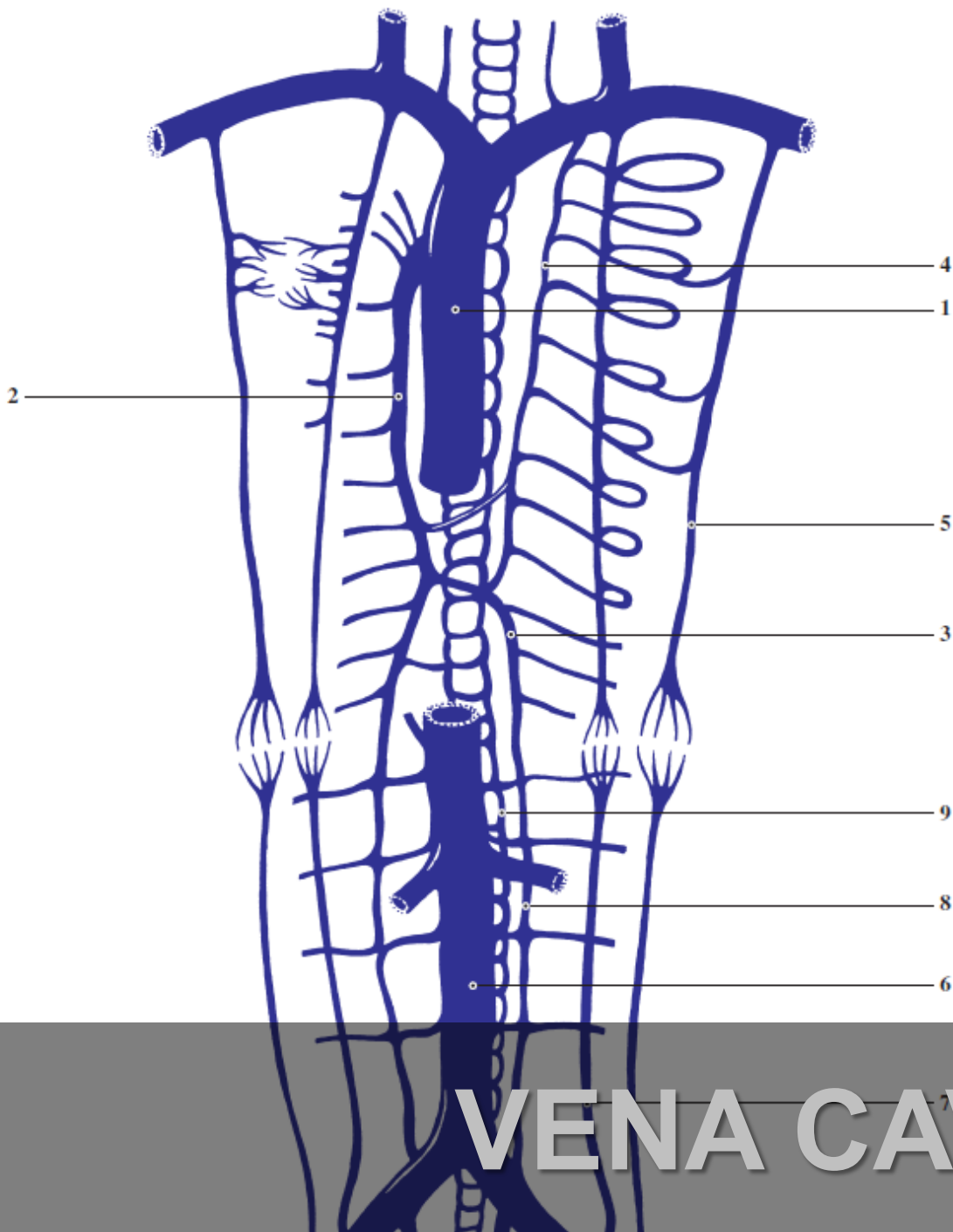
ISTHMUS AORTAE



- 🔥 Aa. intercostales posteriores
- 🔥 Aa. subcostales
- 🔥 aa. phrenicae superiores
- 🔥 Rami mediastinales
- 🔥 Rami oesophageales
- 🔥 Rami pericardiales
- 🔥 Aa. bronchiales (sin.)

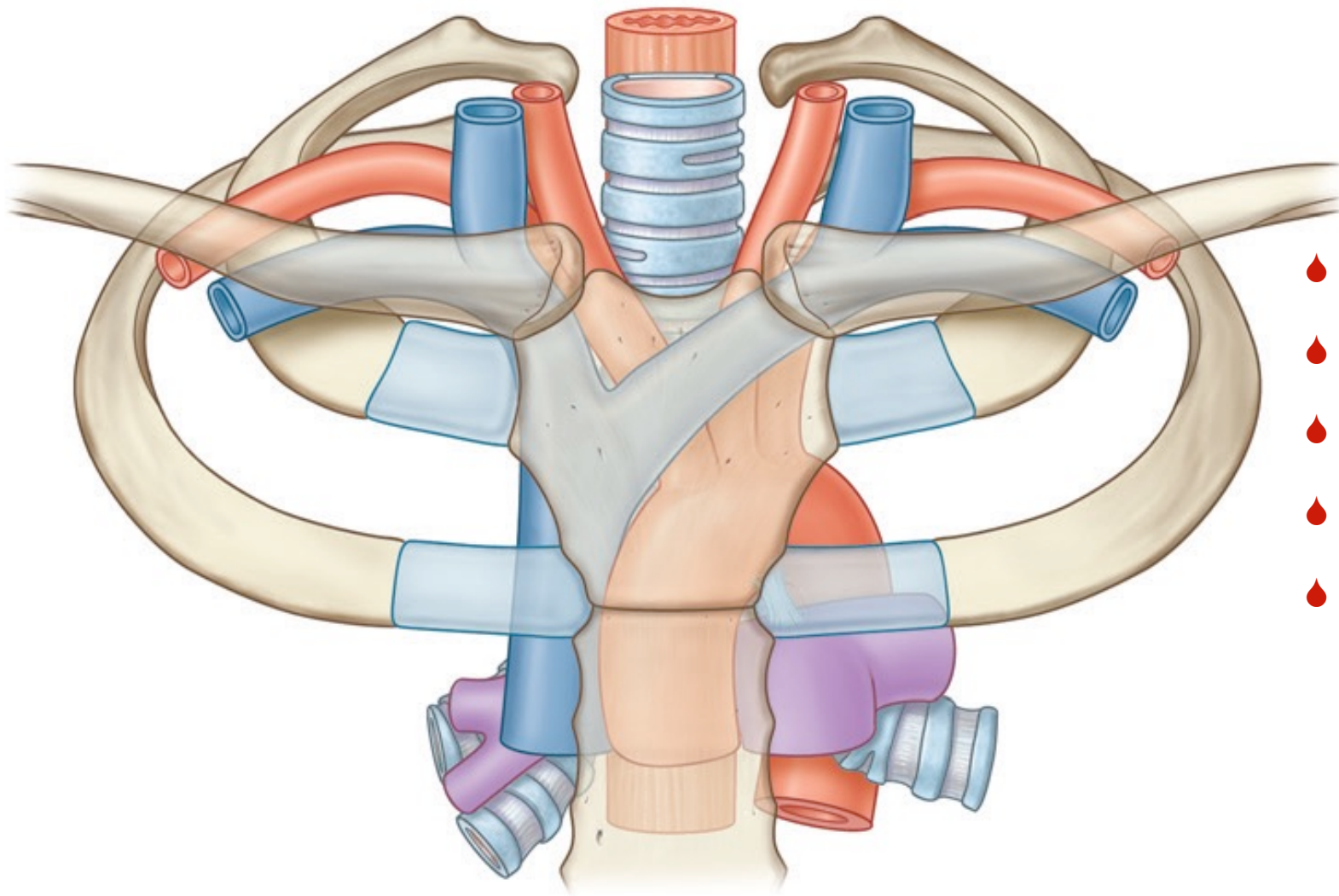


RAMI VISCERALE ET PARIETALES



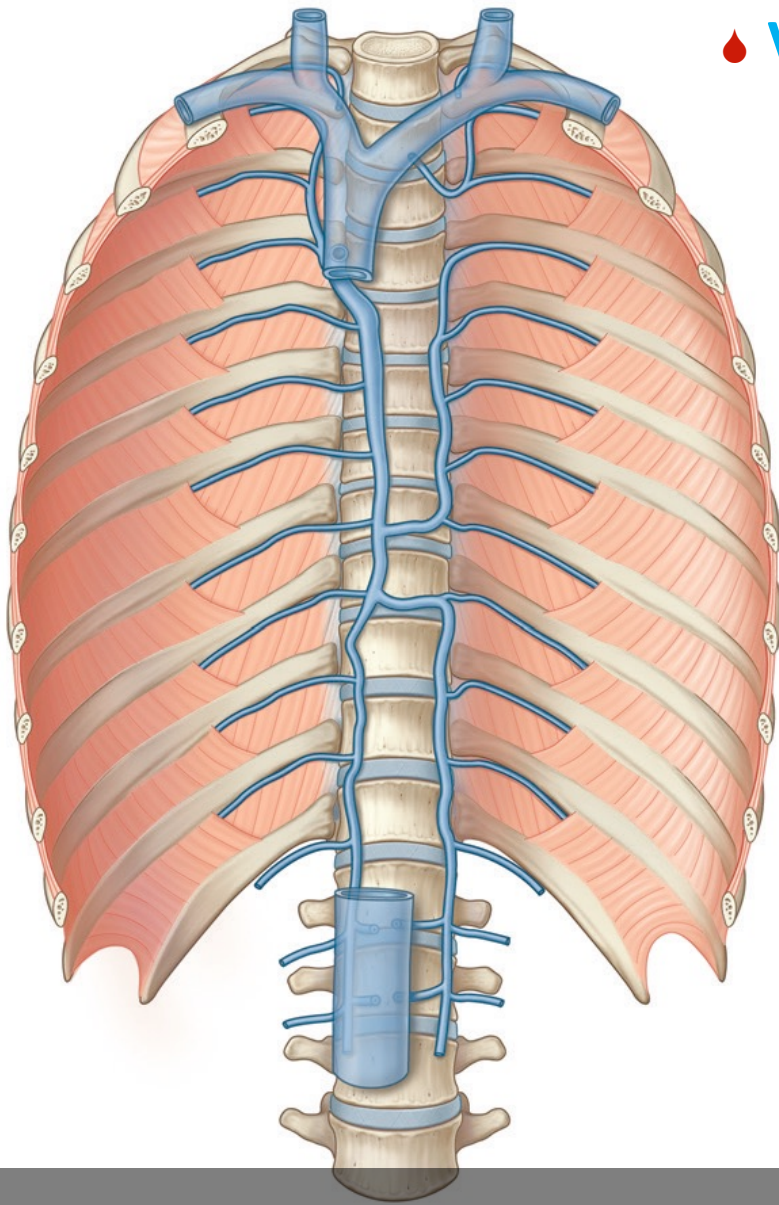
- 🔴 Vena cava superior
- 🔴 V. brachiocephalica sinistra
- 🔴 V. brachiocephalica dextra
- 🔴 v. azygos

VENA CAVA SUPERIOR



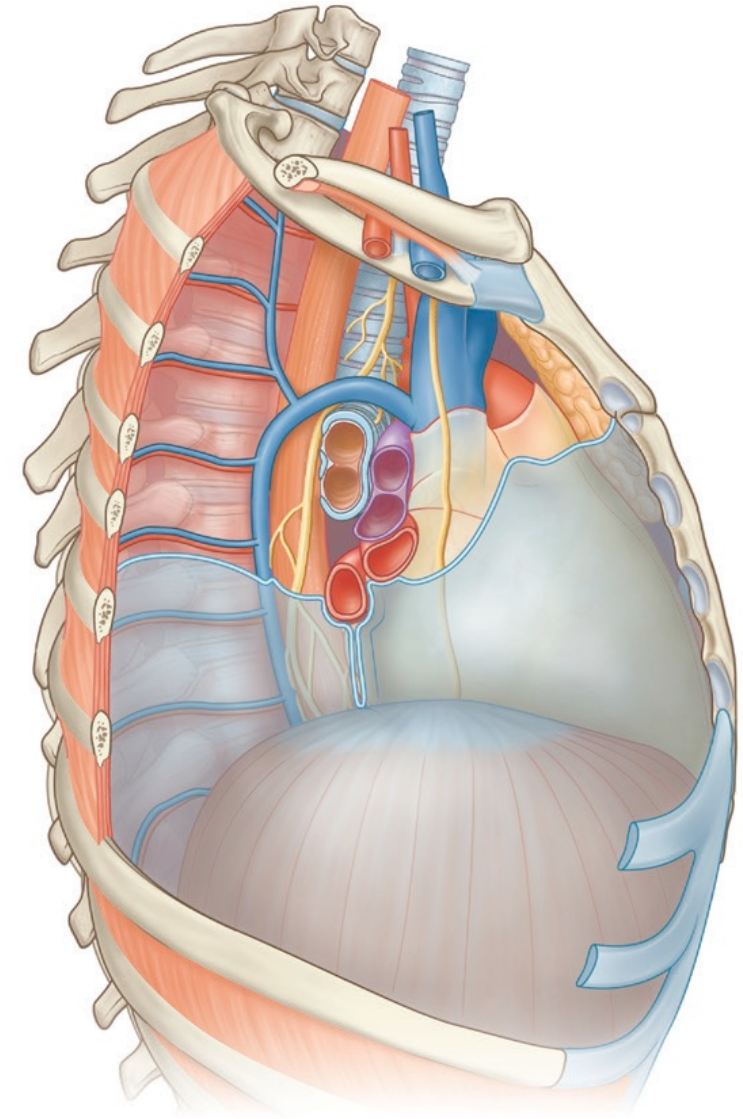
- ♦ V. brachiocephalica dextra
- ♦ V. brachiocephalica sinistra
- ♦ V. thoracica interna
- ♦ V. intercostalis superior (suprema)
- ♦ V. thyroidea inferior (ima)

VENAE MEDIASTINI

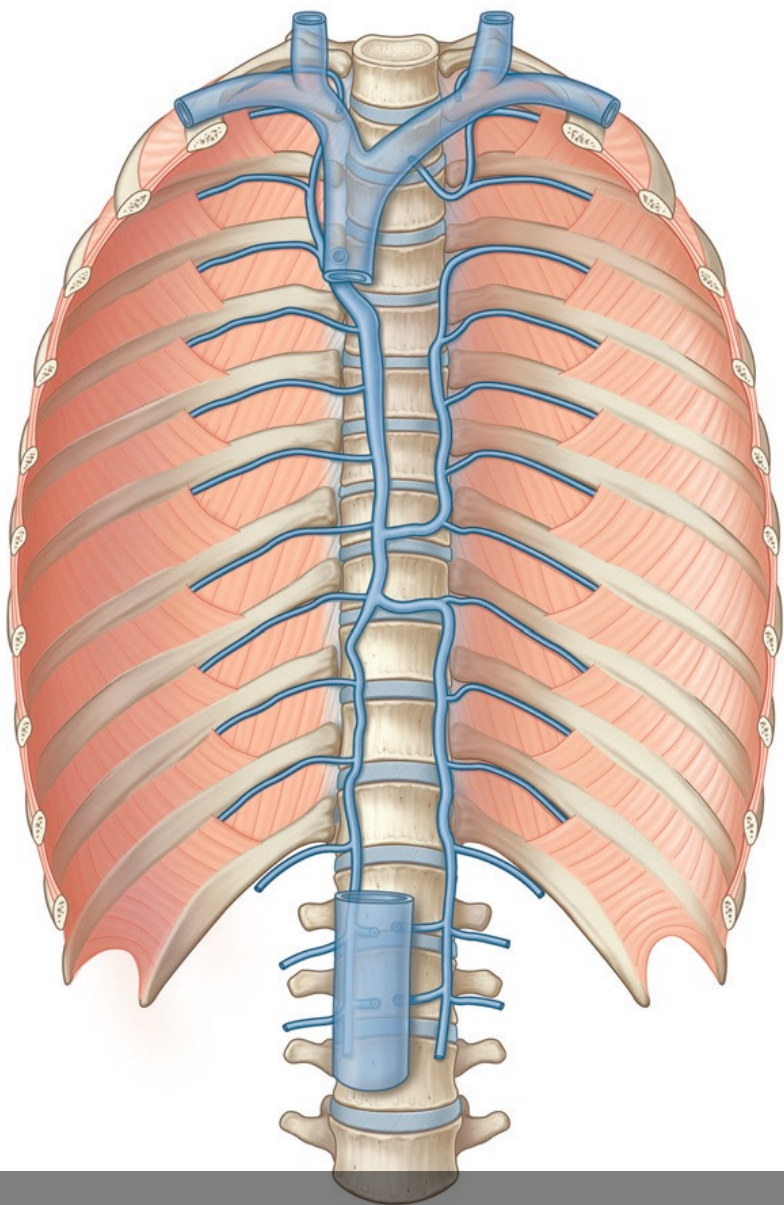


♦ V. azygos

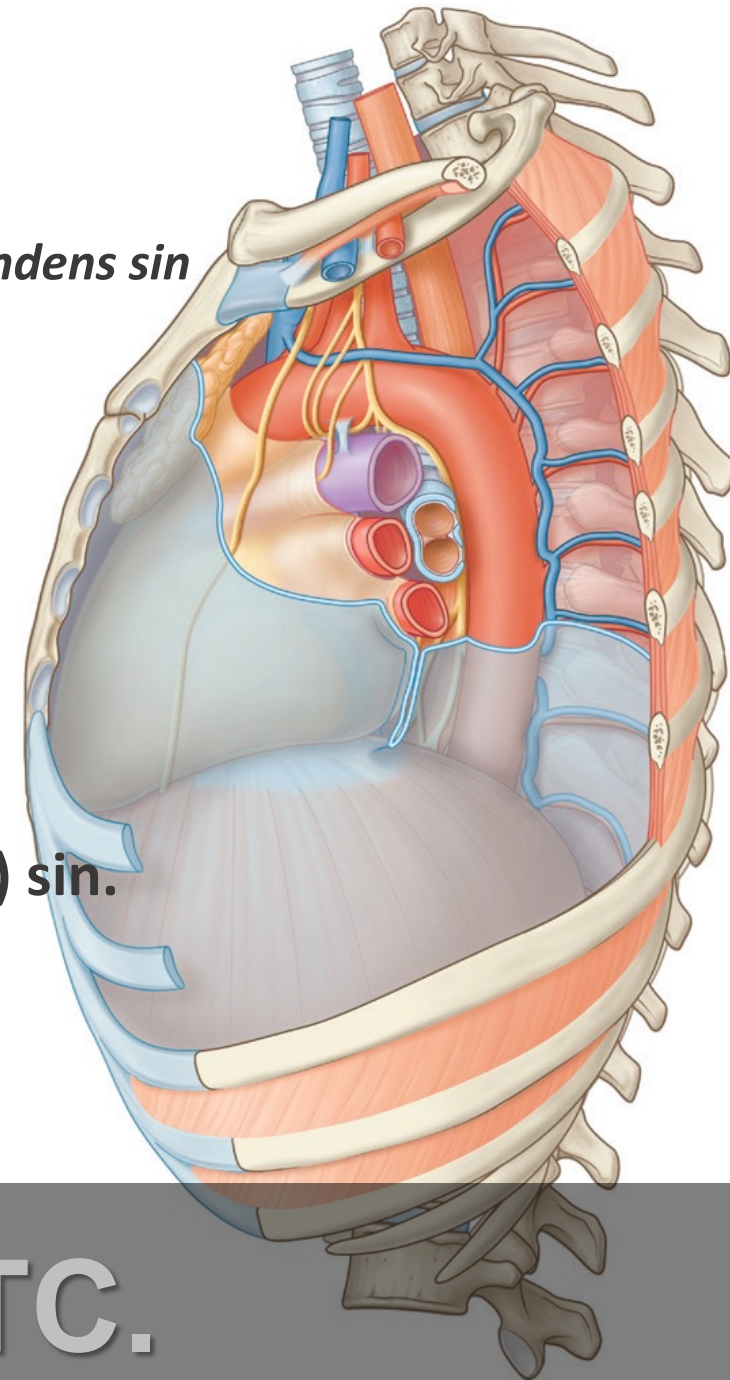
- ♦ Prevertebral right
- ♦ Created by
- ♦ *v. subcostalis dx.*
- ♦ *v. lumbalis ascendens dx.*
- ♦ Inflow to v. cava superior - Th4
 - ♦ Over hilum and pericardial sac
- ♦ inflows
- ♦ *Vv. intercostales dx (5. - 11.)*
- ♦ *V. intercostalis superior*
- ♦ *V. hemiazygos*
- ♦ *V. hemiazygos accesoria*
- ♦ *Vv. oesophageales, mediastinales, pericardiales, bronchiales (dx)*



V. AZYGOS

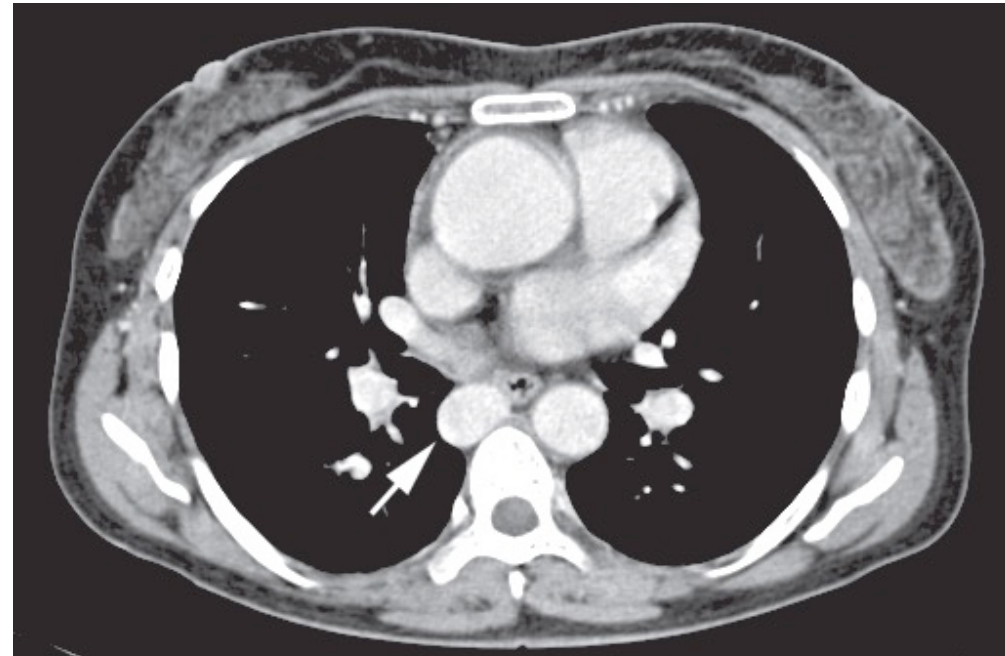
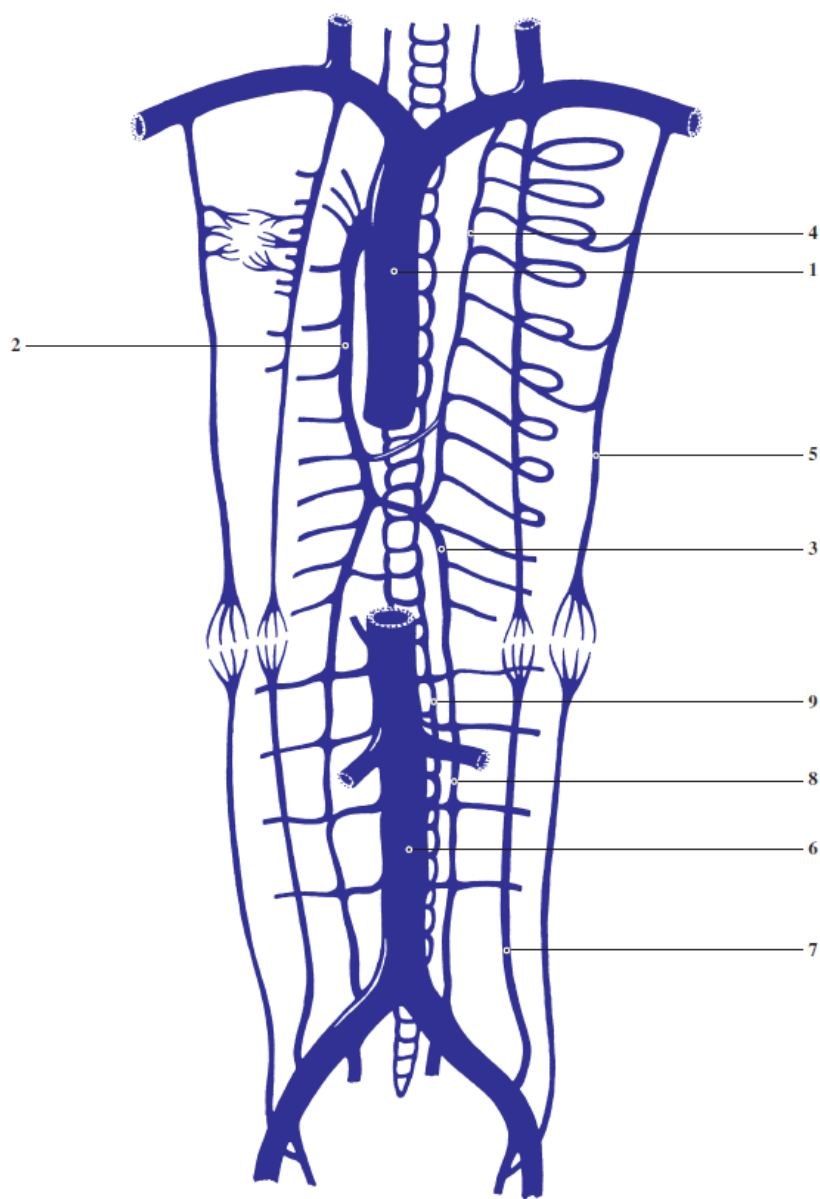


- ♦ **V. hemiazygos**
 - ♦ Left prevertebral
 - ♦ Created by
 - ♦ *v. subcostalis sin. a v. lumbalis ascendens sin*
 - ♦ Inflows into v. azygos
 - ♦ Level Th9 crosses to right
- ♦ **V. hemiazygos accesoria**
 - ♦ Left prevertebral
 - ♦ Inflows – intercostal veins
 - ♦ Inflows to hemiazygos
 - ♦ Th7/8 towards right
- ♦ **V. intercostalis superior (suprema) sin.**
 - ♦ variable
 - ♦ V. hemiazygos
 - ♦ V. brachiocephalica sin.

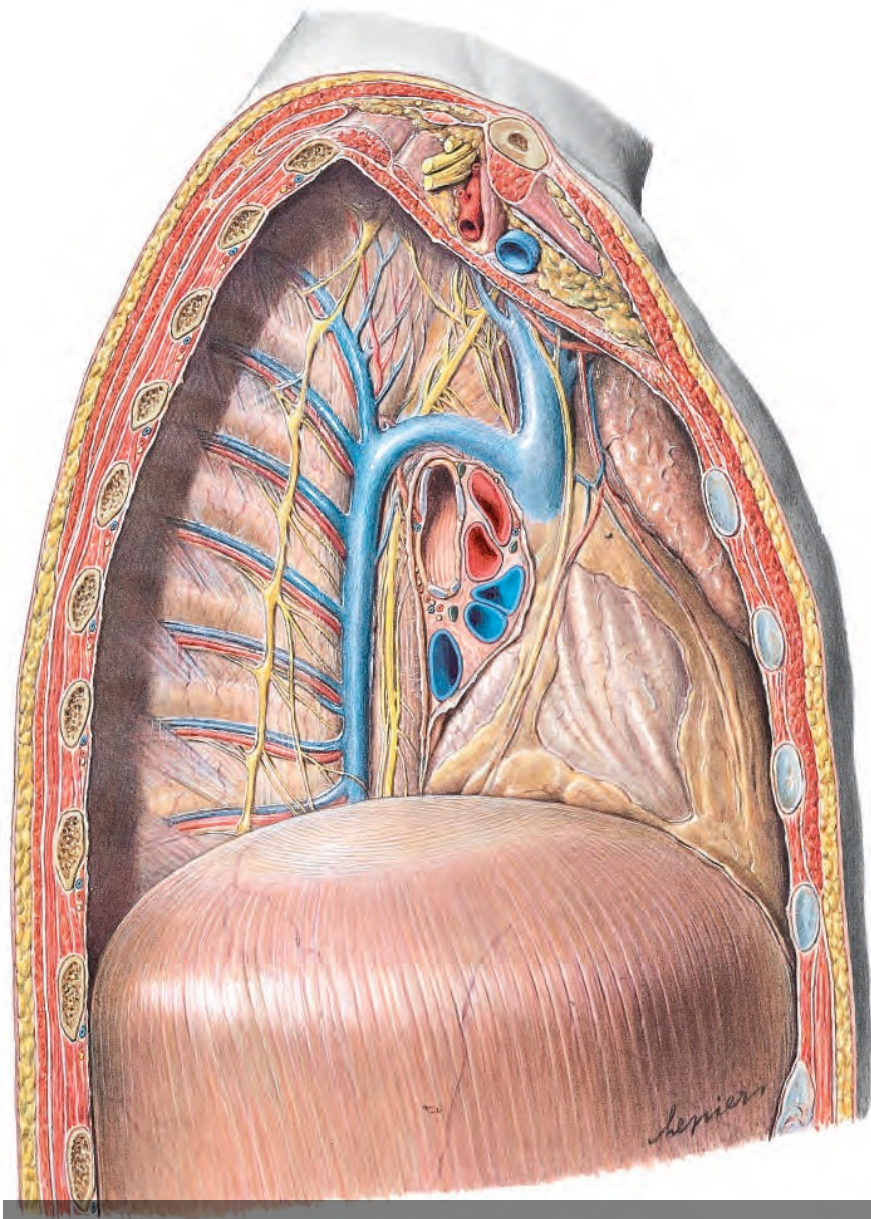


V. HEMIAZYGOS ETC.

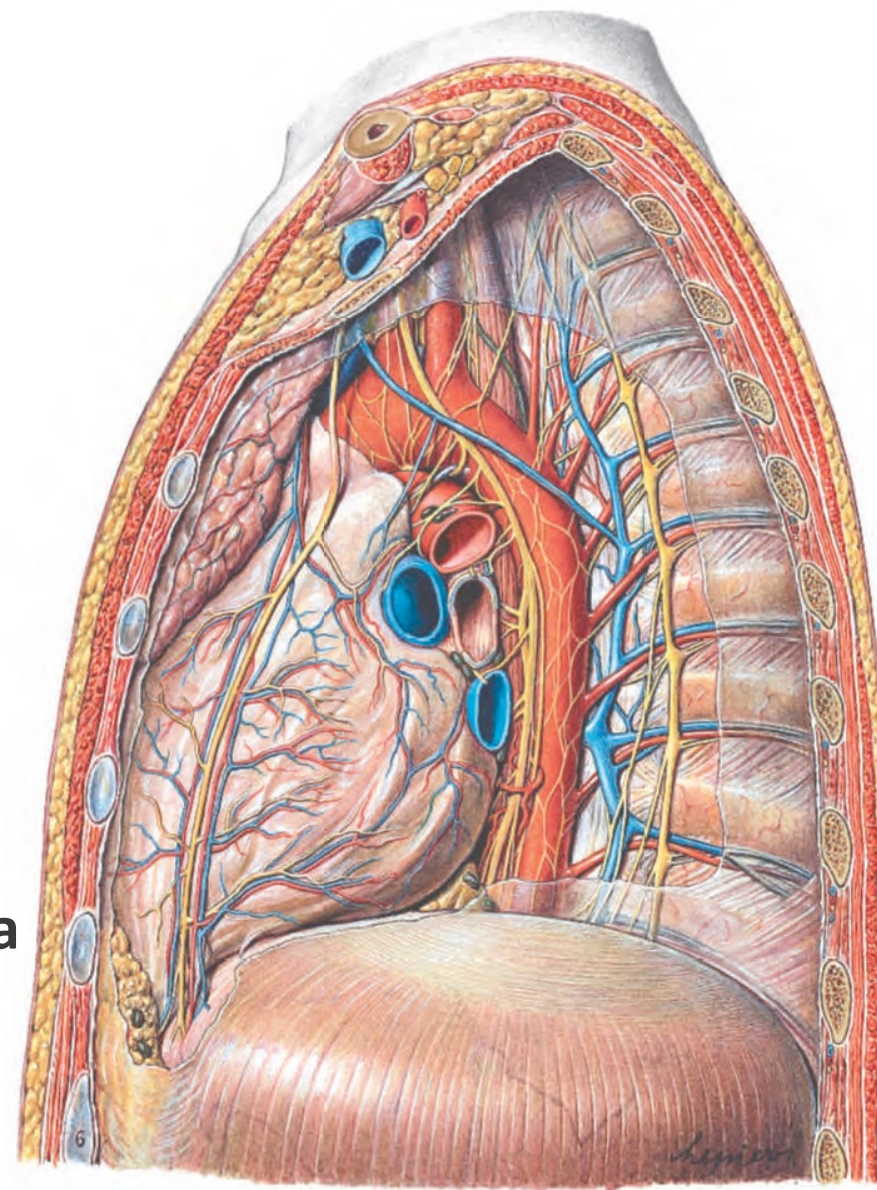
🔴 V. lumbalis ascendens



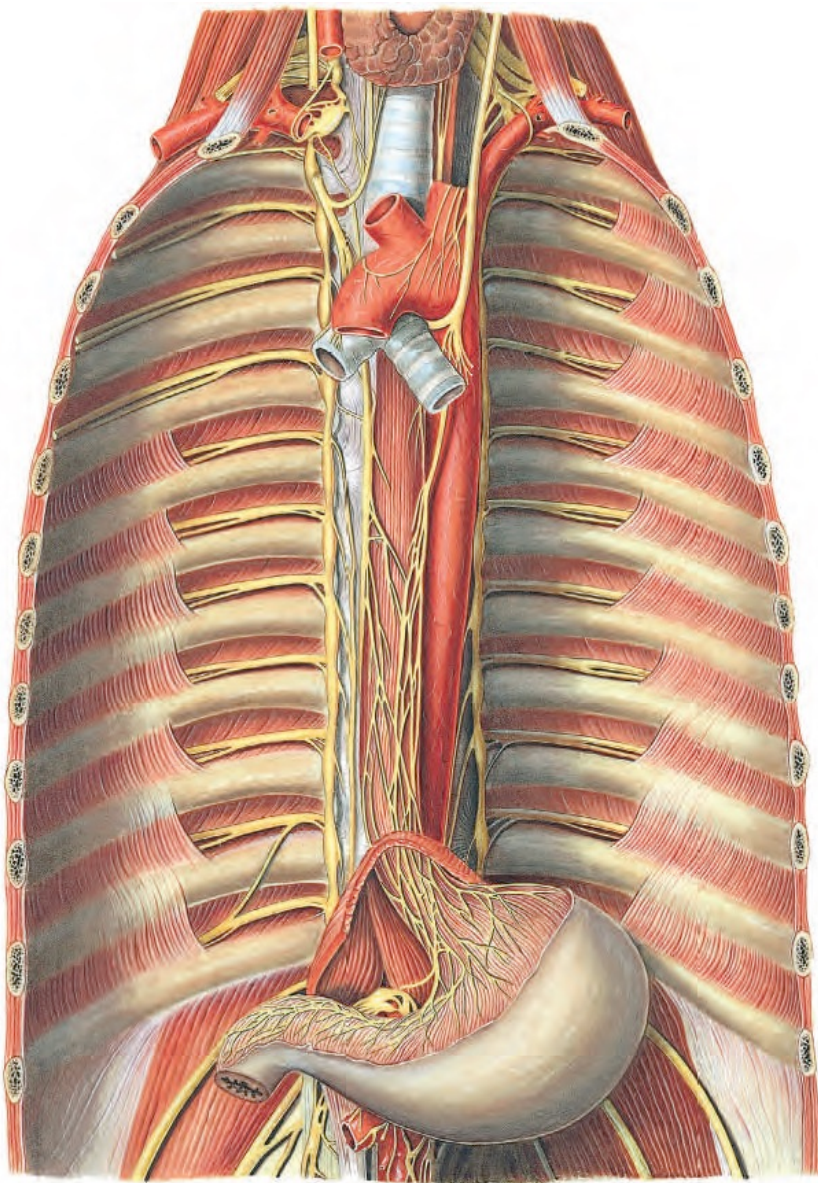
THORAX/ABDOMEN – VENOUS CONNECTION



- ♦ Truncus sympathicus
- ♦ Nervus vagus (n. X)
- ♦ Nervus phrenicus
- ♦ Nn. intercostales
- ♦ Aorta
- ♦ Vena cava superior
- ♦ Vena brachiocephalica
- ♦ V. azygos
- ♦ V. hemiazygos
- ♦ V. intercostalis suprema
- ♦ Vasa intercostalia
- ♦ Vasa thoracica interna



ARTERIES, VEINS AND NERVES



♦ Truncus sympathicus

♦ Ganglia sympathica

- ♦ Oesophagus, bronchi, lungs (heart)

♦ Nervus splanchnicus major (5. - 9. event. 10. sympat. ganglion)

- ♦ *Greater splanchnic nerve (engl.)* – ganglia coeliaca

♦ Nervus splanchnicus minor (9. - 11. sympat. ganglion)

- ♦ *Lesser splanchnic nerve (engl.)* – ganglia aorticorenalia

♦ Nervus splanchnicus minimus (12. sympat. ganglion)

- ♦ *Least splanchnic nerve (engl.)* – plexus renalis

♦ Nervi cardiaci

♦ Nervus vagus (n. X)

- ♦ bronchi and lungs

- ♦ heart

- ♦ Plexus oesophagealis

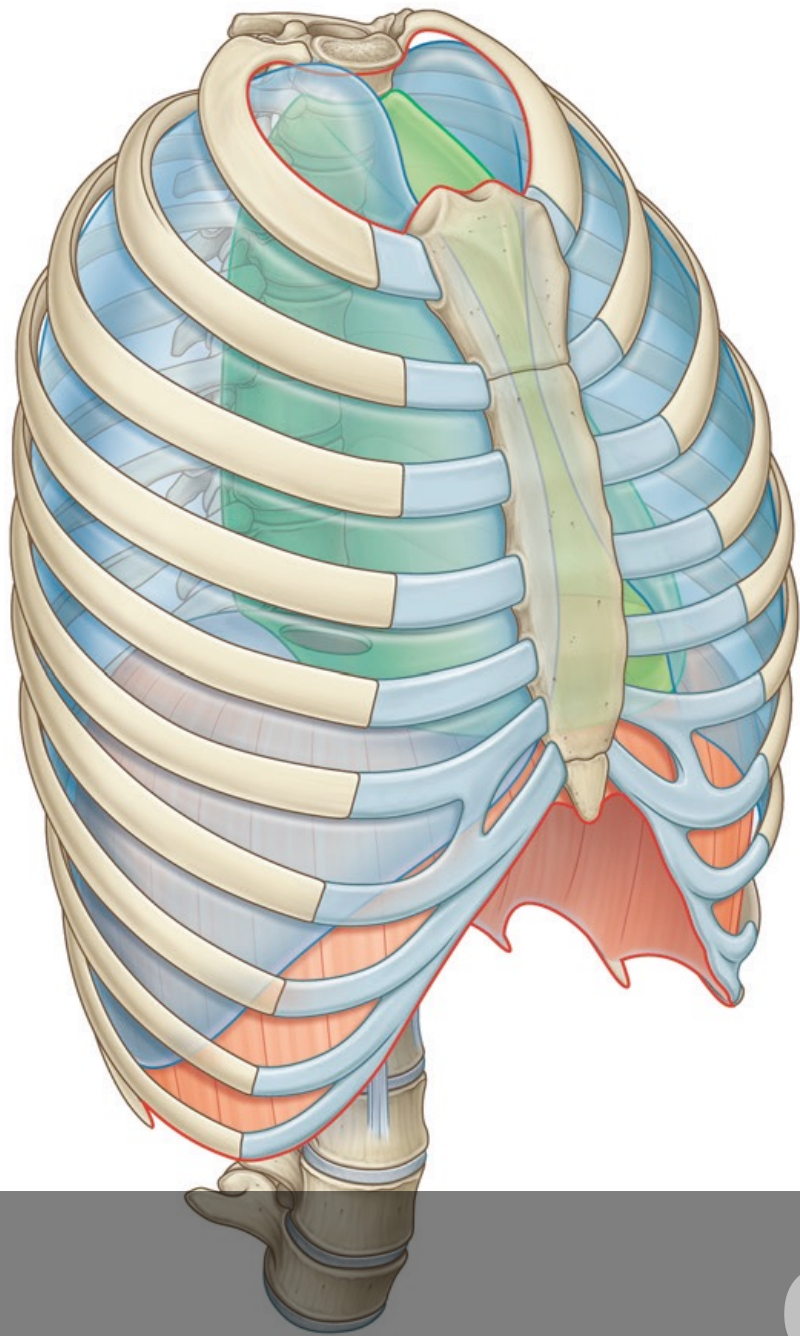
- ♦ Truncus vagalis anterior (n. vagus sinister)

- ♦ Truncus vagalis superior (n. vagus dexter)

AUTONOMOUS NERVES

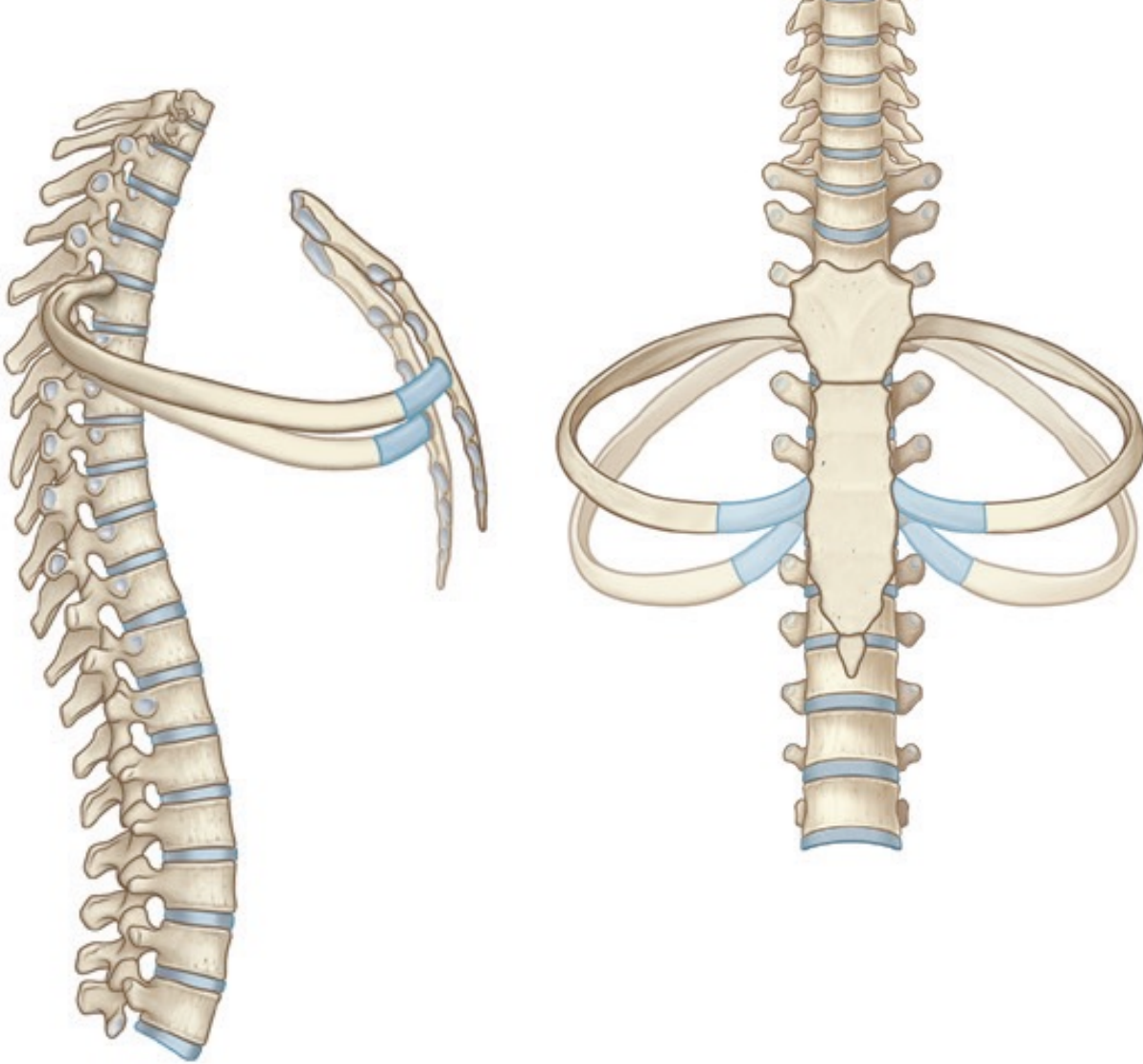
Thorax – chest wall, mediastinum, pleural cavity

Prof. MUDr. Jiří Ferda, Ph.D.



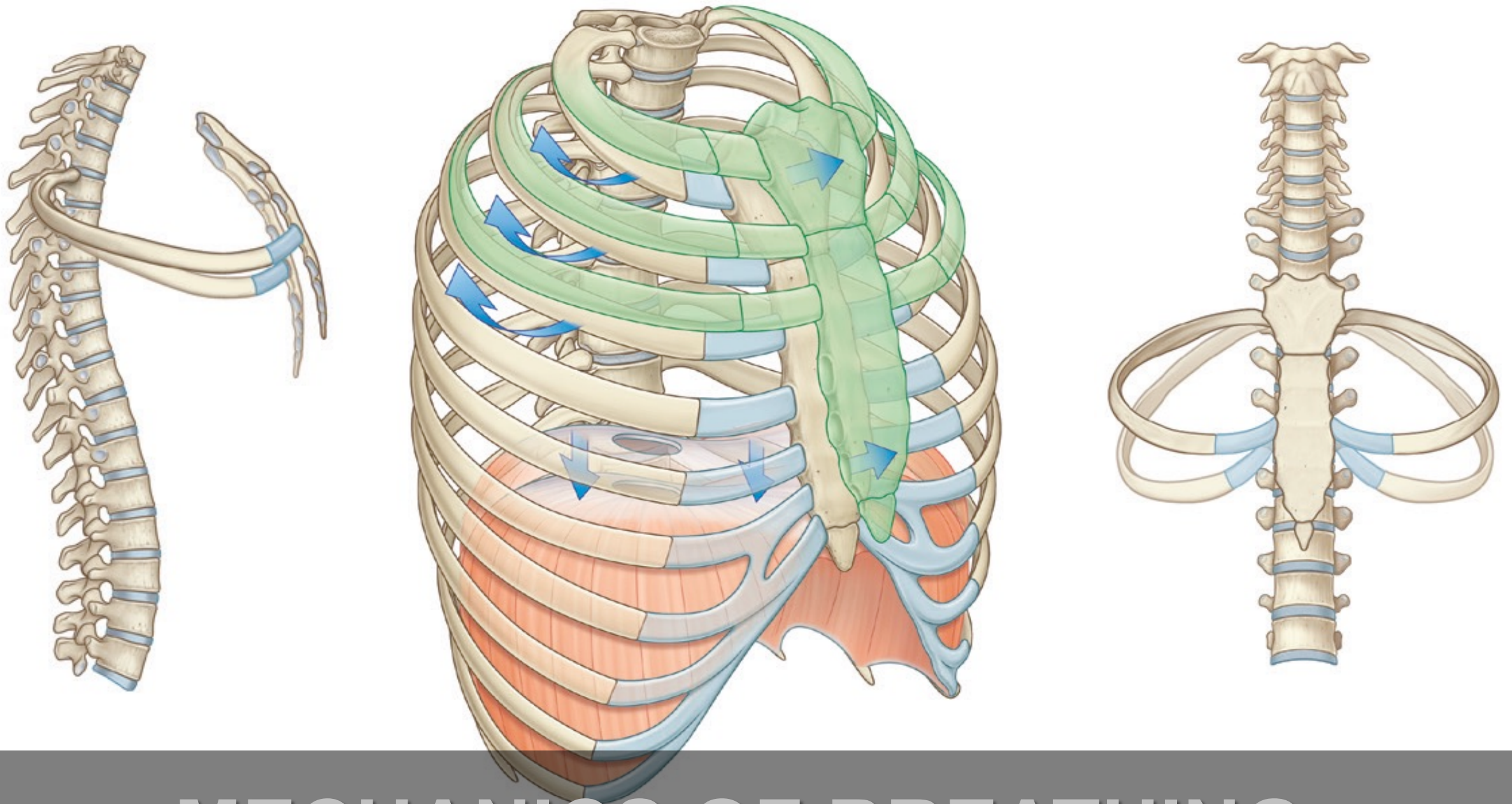
-
- **Upper margin Th1 - 1. rib - manubrium st.**
 - Apertura thoracica superior
 - Continuation to neck
- **Lower margin - diaphragm**
 - Apertura thoracica inferior
 - Hiatus – continuation to abdomen
- **Outer margins**
 - Muskuloskeletal wall
 - Verterbal column, sternum, ribs
 - Flexible and movable

CHEST



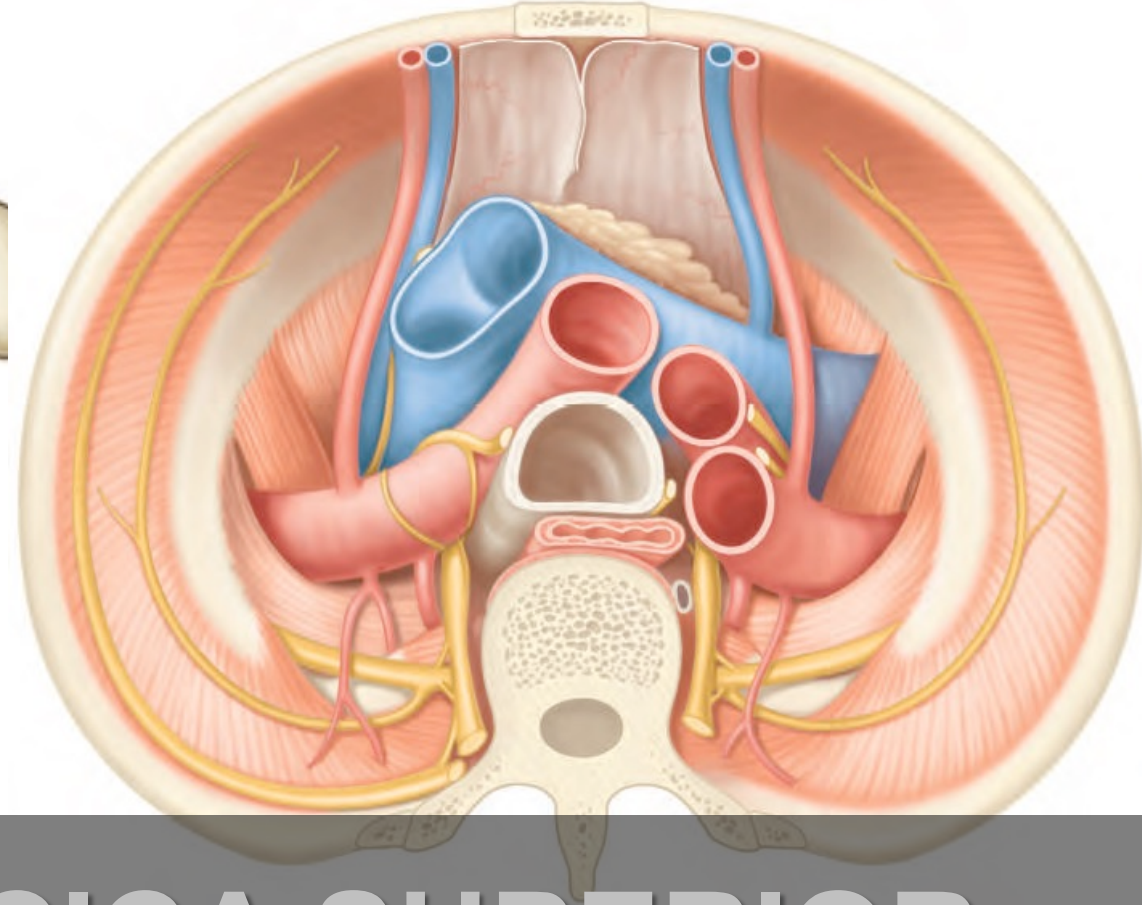
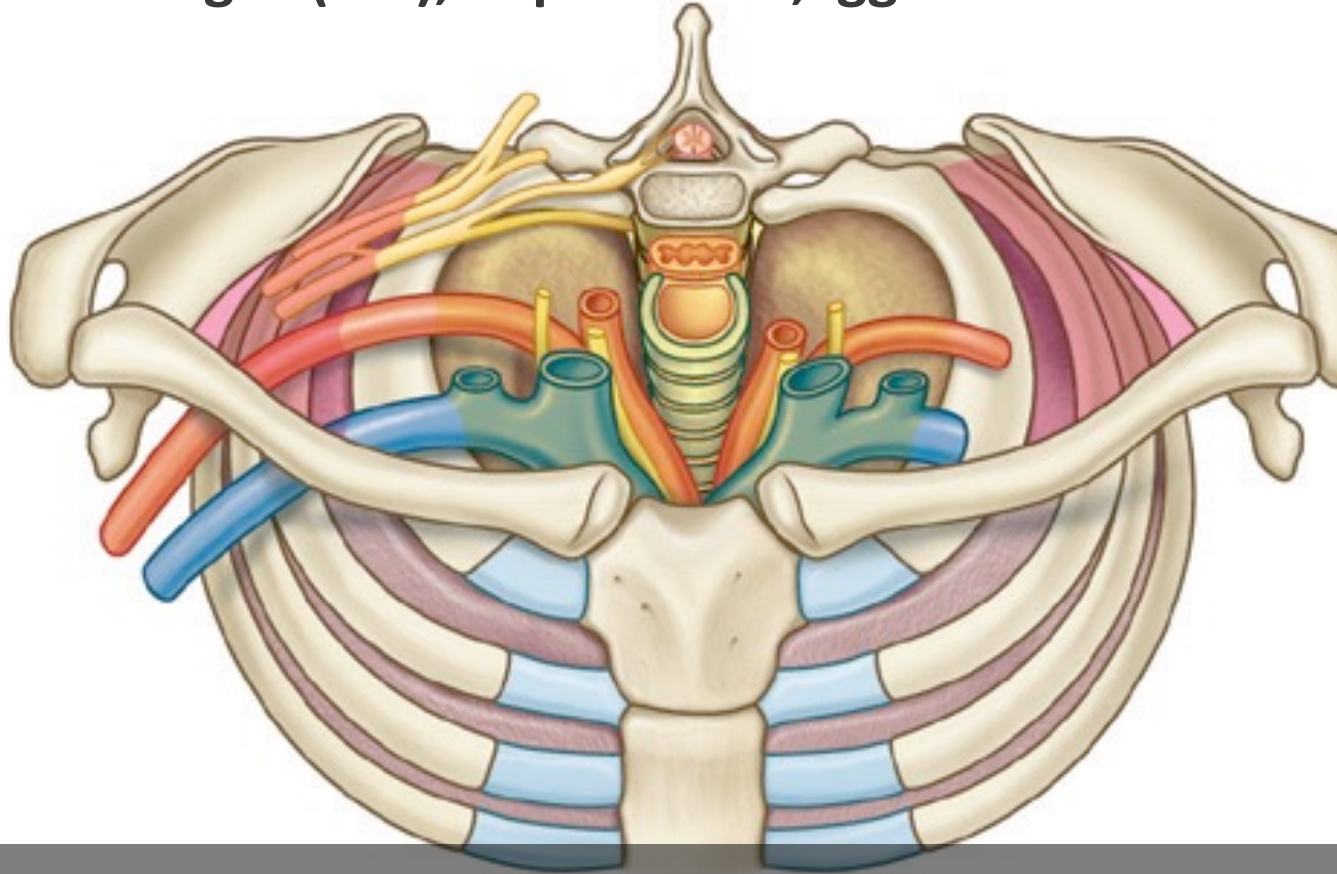
- **breathing**
- **Mechanics of breathing**
 - Changes in shape and pressure
 - Mechanics of lever
- **Protection of inner organs**
 -
- **continuation**

CHEST FUNCTION

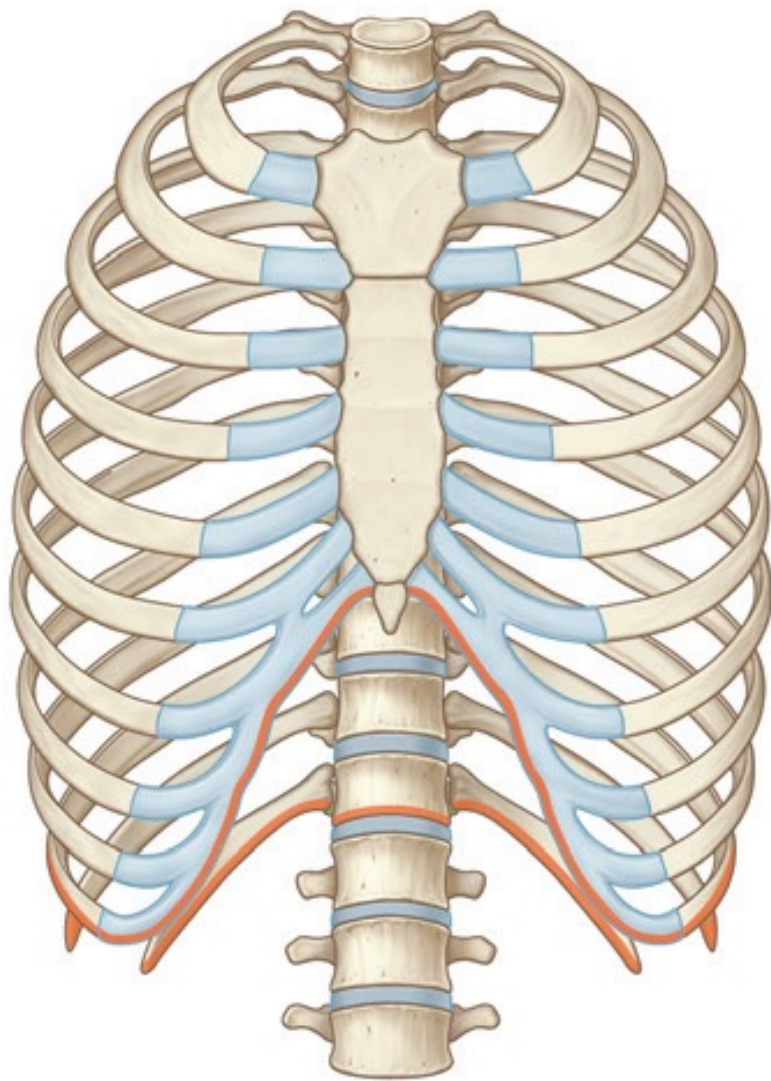


MECHANICS OF BREATHING

- ♦ Th1, 1. rib, manubrium sterni (intervertebral disc level Th2/3)
- ♦ a. carotis communis, a. subclavia
- ♦ v. jugularis interna, v. jugularis externa, v. subclavia
- ♦ n. vagus (n.X), n. phrenicus, ggl. cervicale inferius, truncus sympathicus, plexus brachialis



APERTURA THORACICA SUPERIOR



♦ diaphragma

- ♦ *Dorsal insertion*
- ♦ *Th12*
- ♦ *Lateral insertion*
- ♦ *costa XII, costa XI (apex)*
- ♦ *Ventral insertion*
- ♦ *costa X, synchondróna c. VII-X*

♦ Copula dextra, copula sinistra

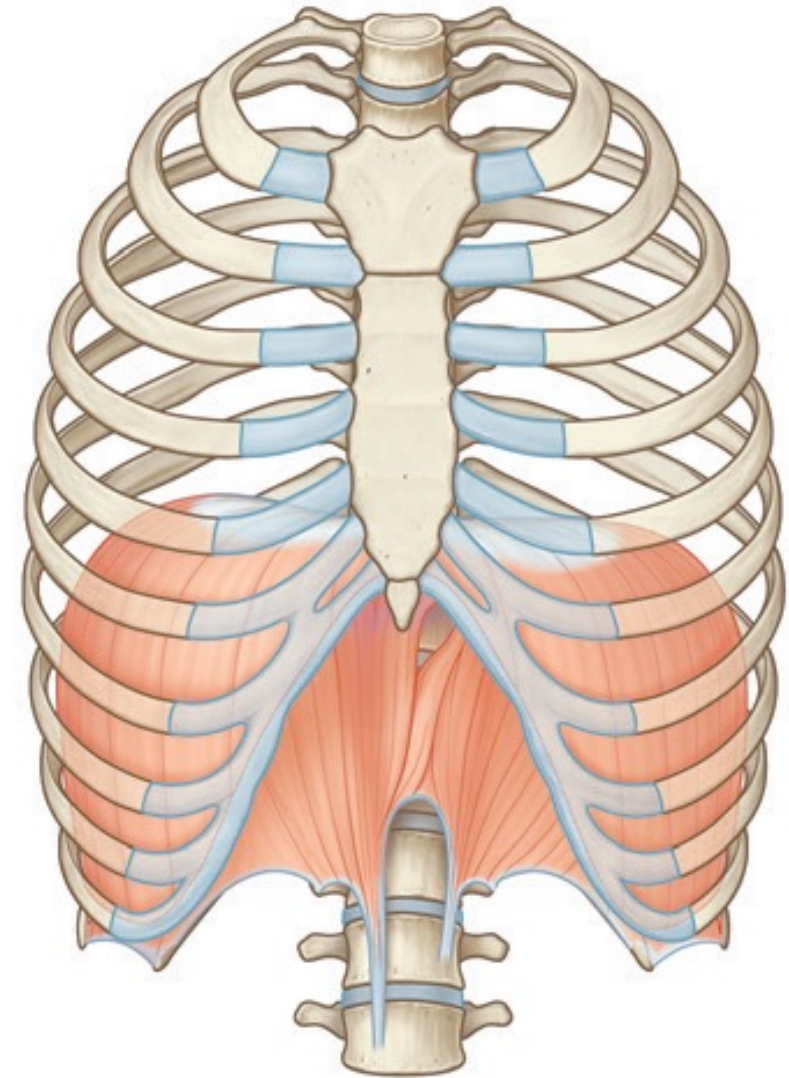
♦ Crus diaphragmatis

♦ Hiatus diaphragmaticus

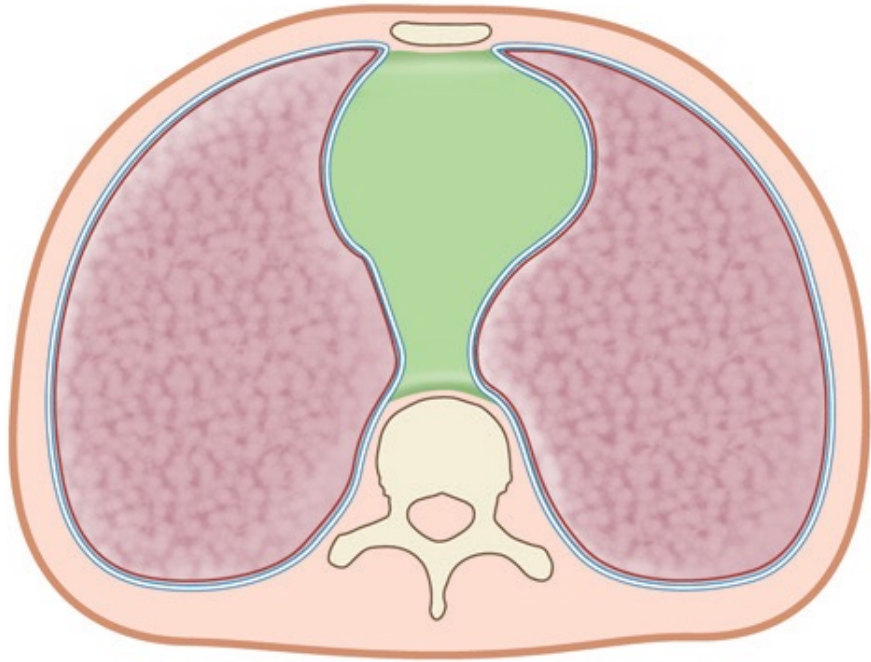
♦ aorticus

♦ oesophagealis

♦ vena cavae



APERTURA THORACICA INFERIOR



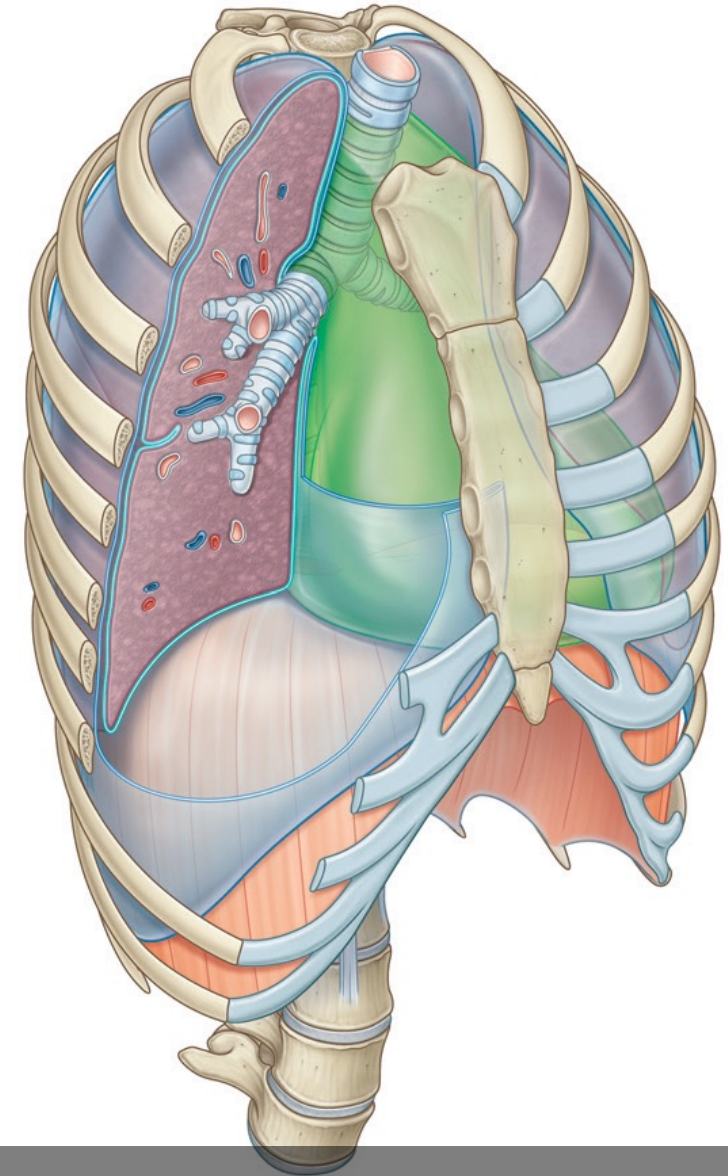
• **Mediastinum**



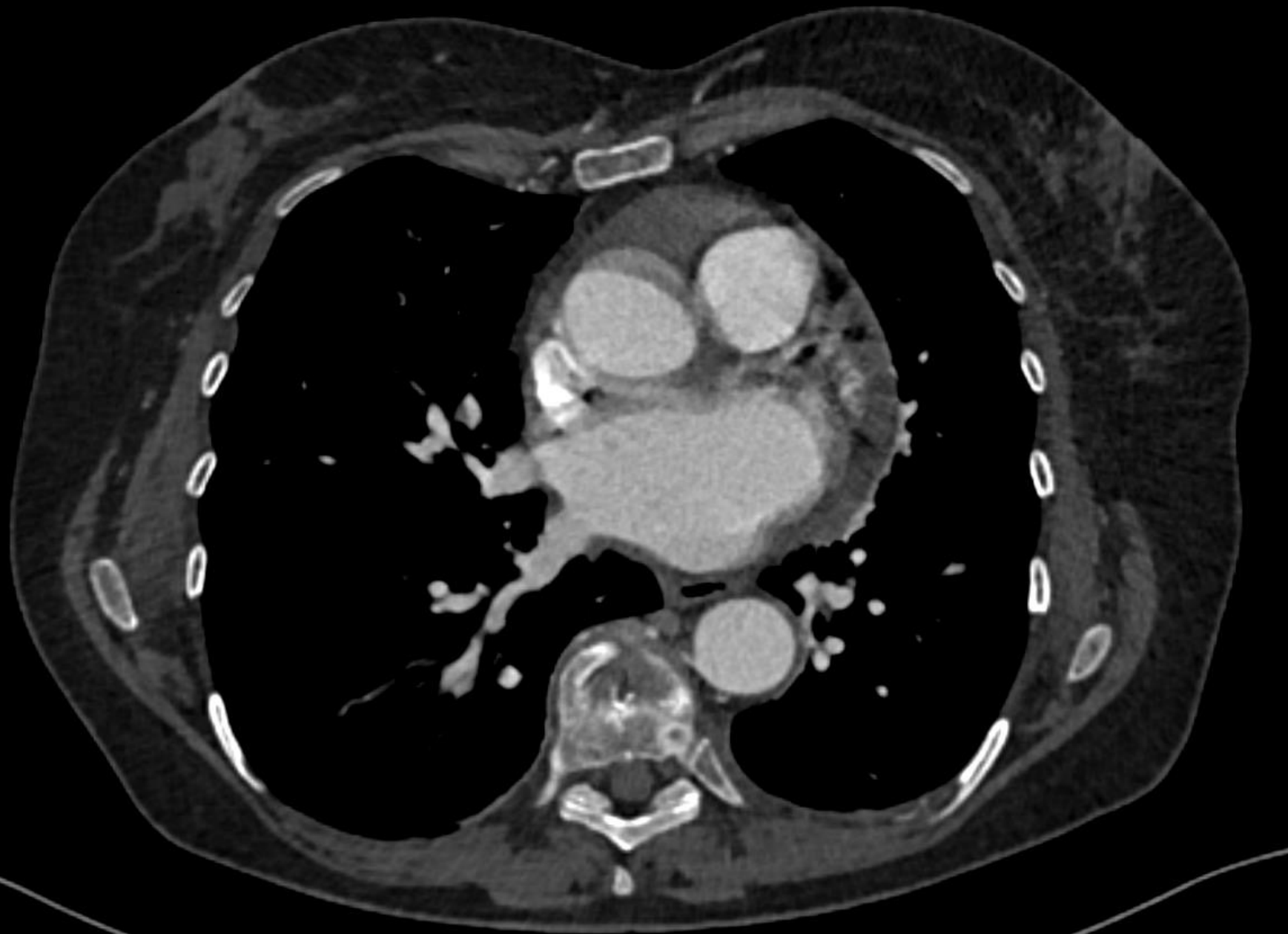
• **Cavitas pleuralis dextra**

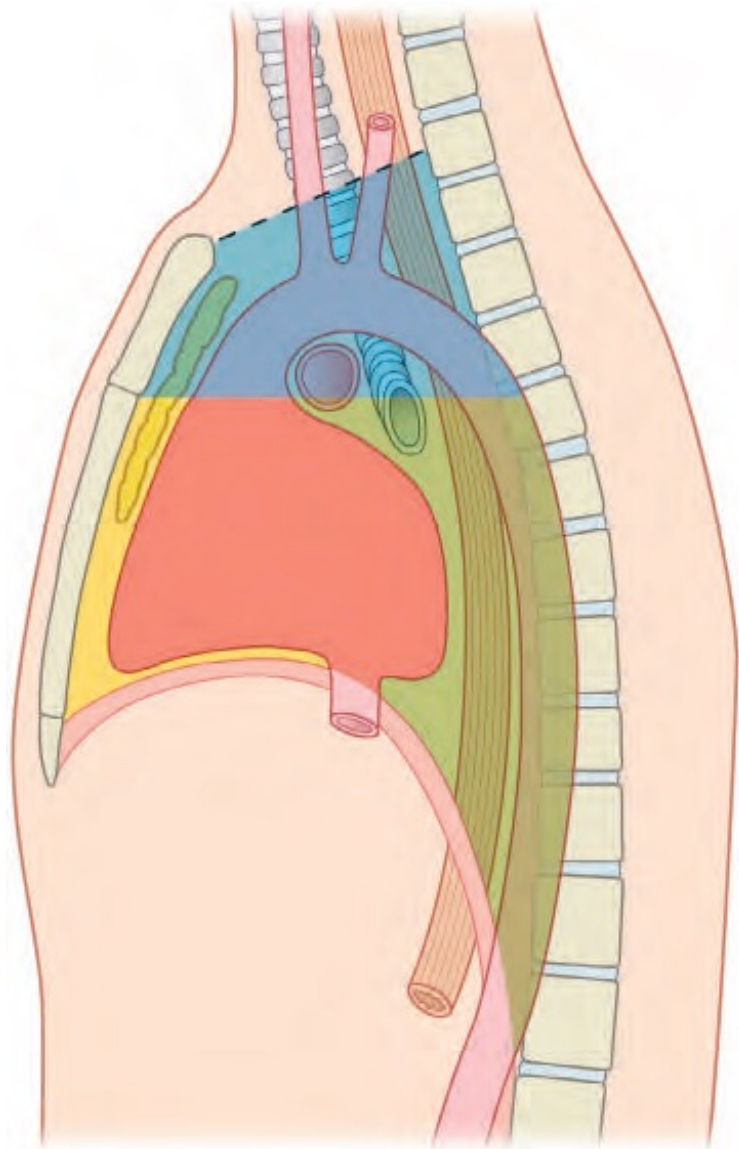
• **Cavitas pleuralis sinistra**

• ***Chest wall***



CHEST COMPARTMENTS





♦ Mediastinum superius

- ♦ Aorta ascendens Arcus aortae
- ♦ Venae brachiocephalicae
- ♦ Trachea
- ♦ Oesophagus

♦ Mediastinum anterius

- ♦ Thymus
- ♦ A. et v. thoracica interna

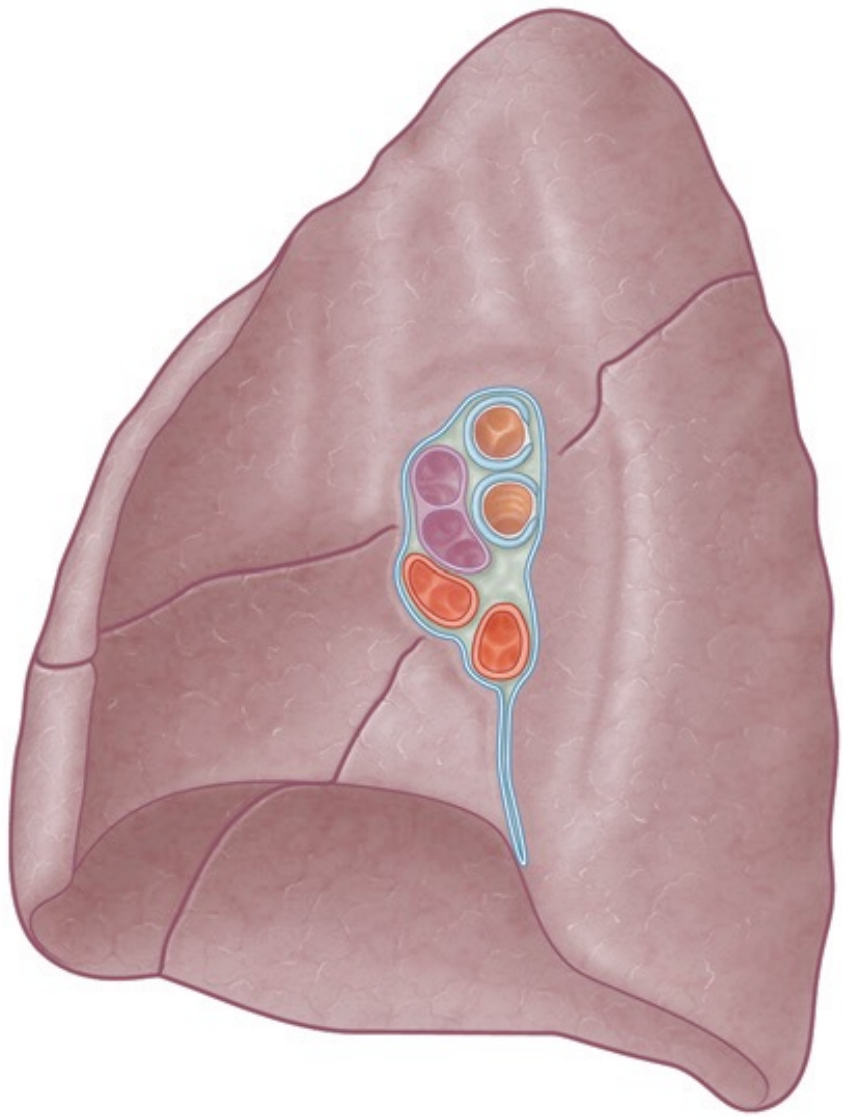
♦ Mediastinum medius

- ♦ cor

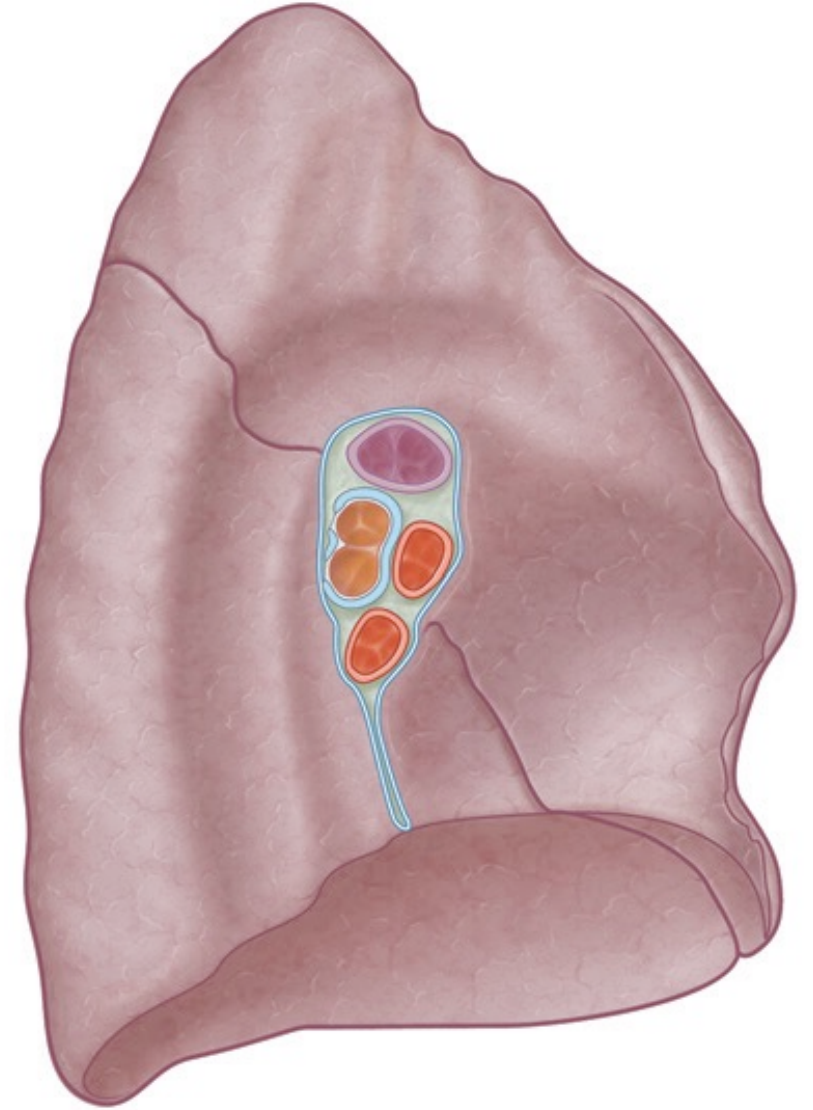
♦ Mediastinum posterius

- ♦ Oesophagus
- ♦ Bronchi
- ♦ Aorta descendens
- ♦ Vena azygos et hemiazygos
- ♦ Ductus thoracicus

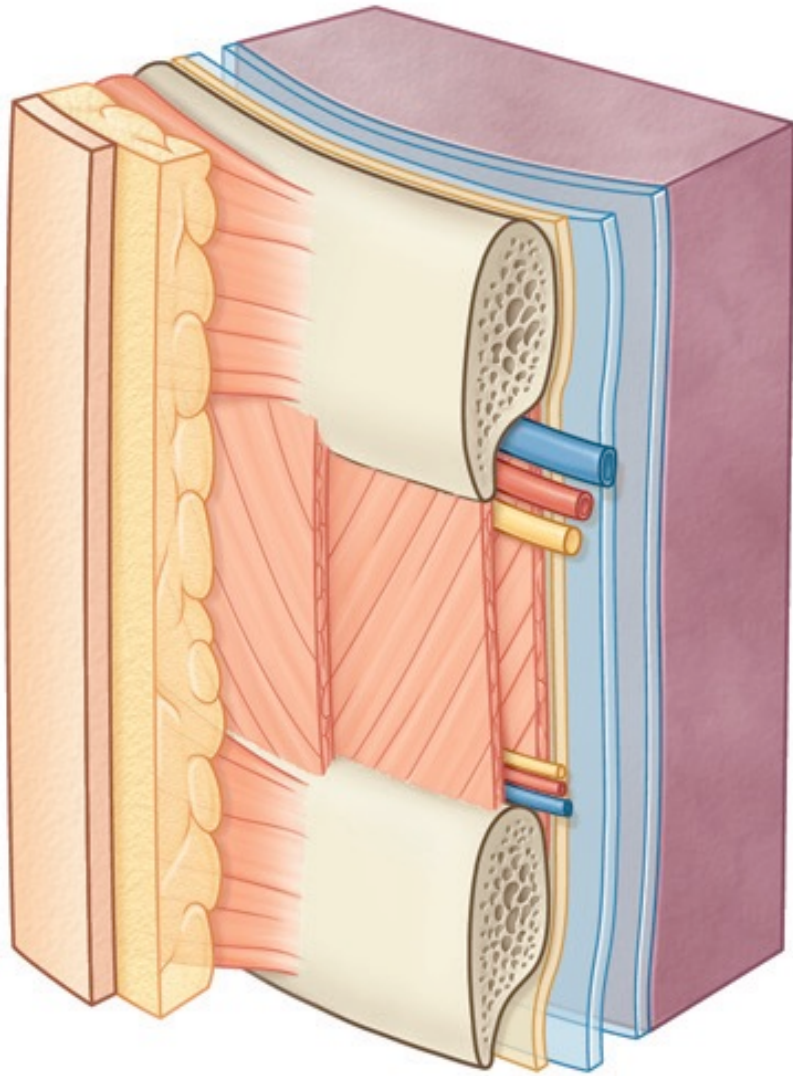
MEDIASTINUM



- Hilus pulmonis
- Bronchus
- A. pulmonalis
- V. pulmonalis
- A. bronchialis
- Lig. pulmonalis

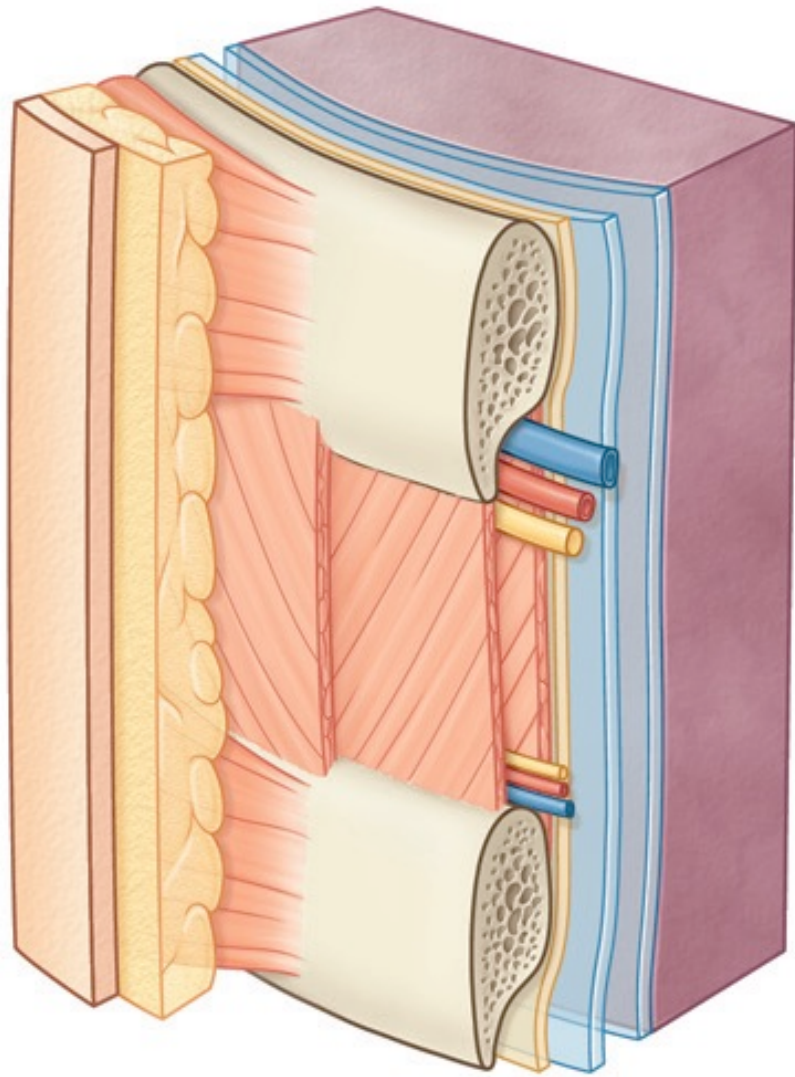


CONNECTION OF LUNG AND MEDIASTINUM

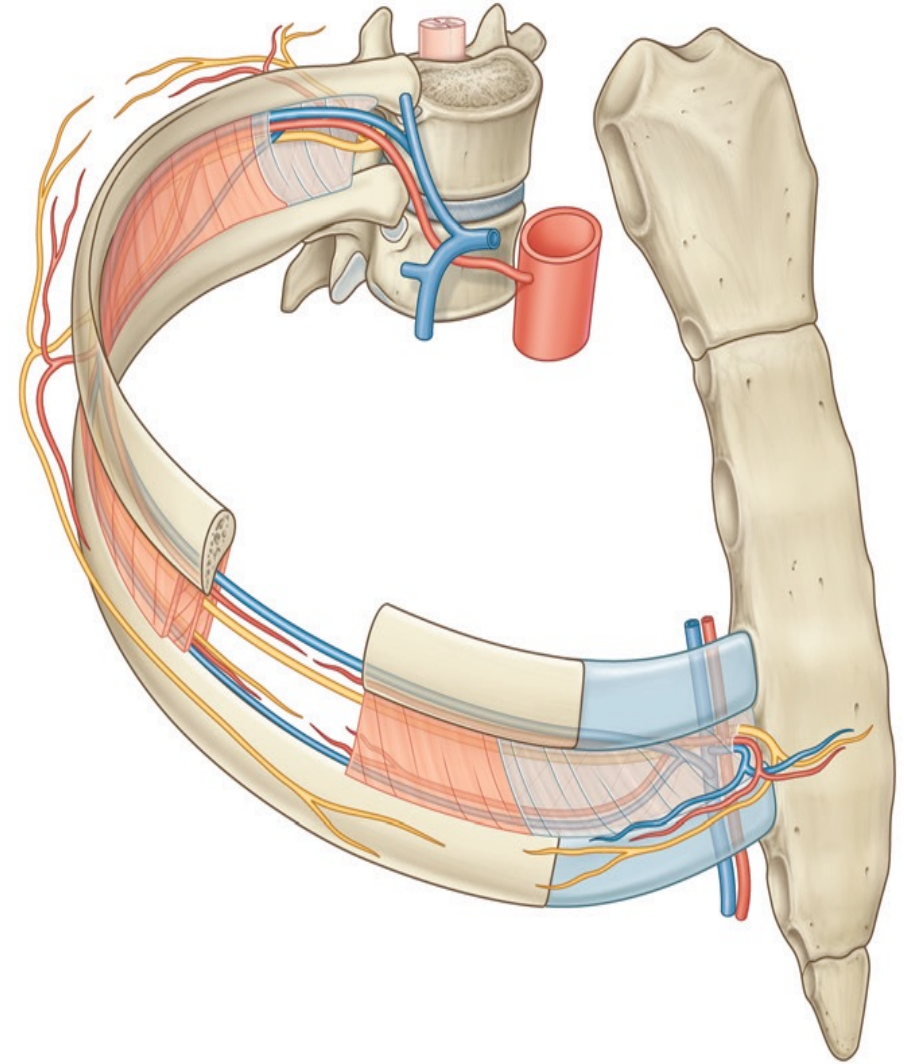


- skin
- Subcutaneous tissue
- Chest muscles
- Skeleton
- Intercostal muscles
- Fascia endothoracica
- Pleura parietalis
- Pleura visceralis
- Parenchyma pulmonis
- Glandula mammae

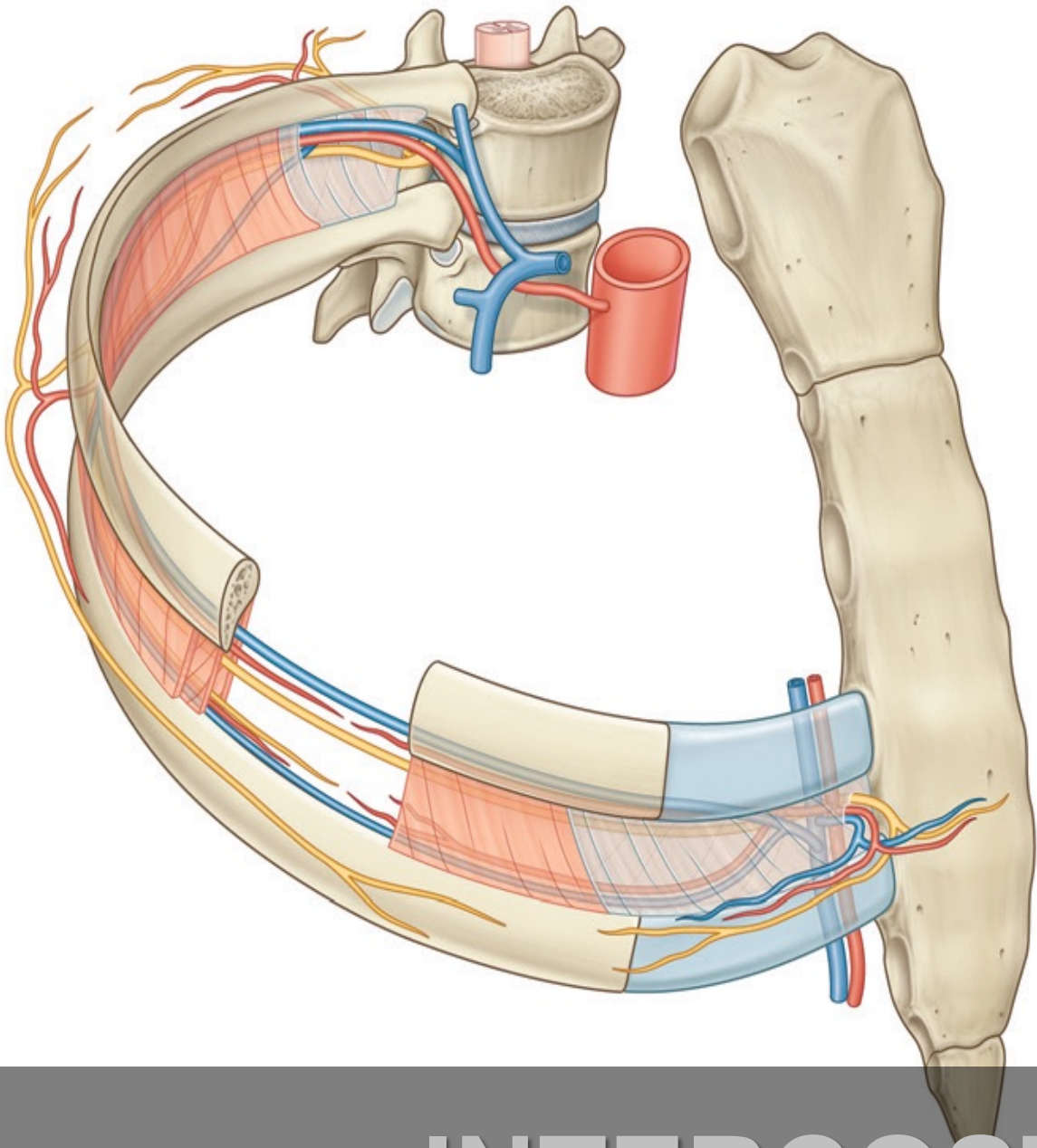
CHEST WALL



- ♦ Kůže + podkoží
- ♦ M. serratus anterior
- ♦ M. intercostalis externus
- ♦ M. intercostalis internus
- ♦ Vasa et n. intercostales
 - ♦ *Vasa intercostales post, ant*
 - ♦ *Rami collaterales*
 - ♦ *Rami cutanei laterales*
- ♦ M. intercostalis intimus
- ♦ Fascia endothoracica
- ♦ Pleura parietalis
- ♦ Pleura visceralis
- ♦ Parenchyma pulmonis



INTERCOSTAL SPACE



• **Mm. intercostales externi**



• **Membrana intercostalis externa**



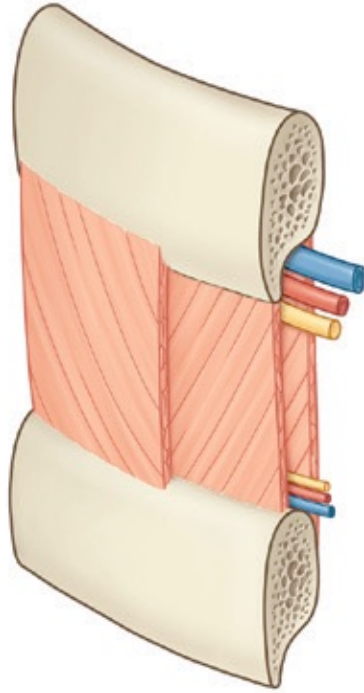
• **Mm. intercostales interni**



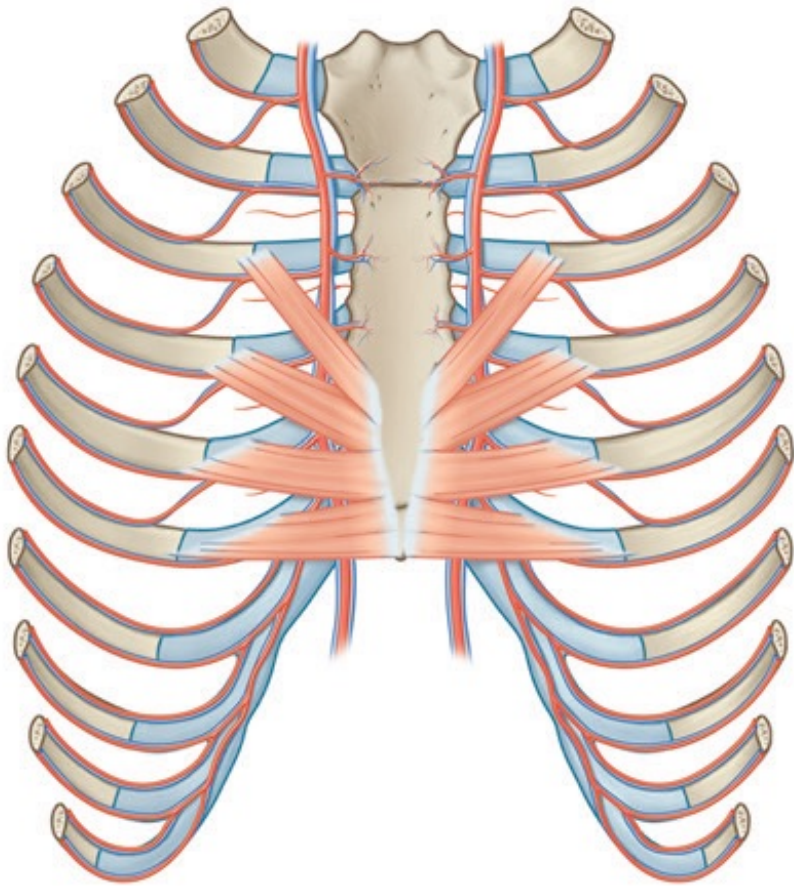
• **Membrana intercostalis interna**



• **Mm. intercostales intimi**

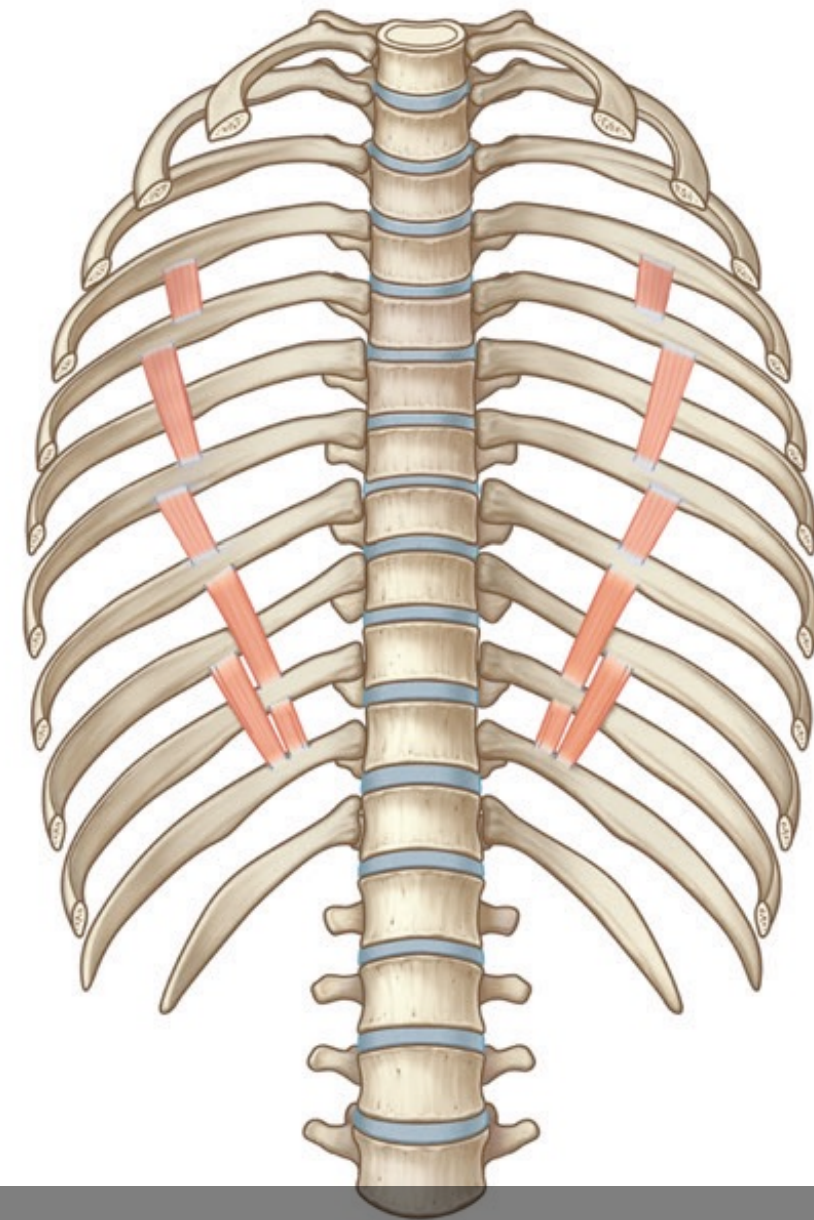


INTERCOSTAL MUSCLES

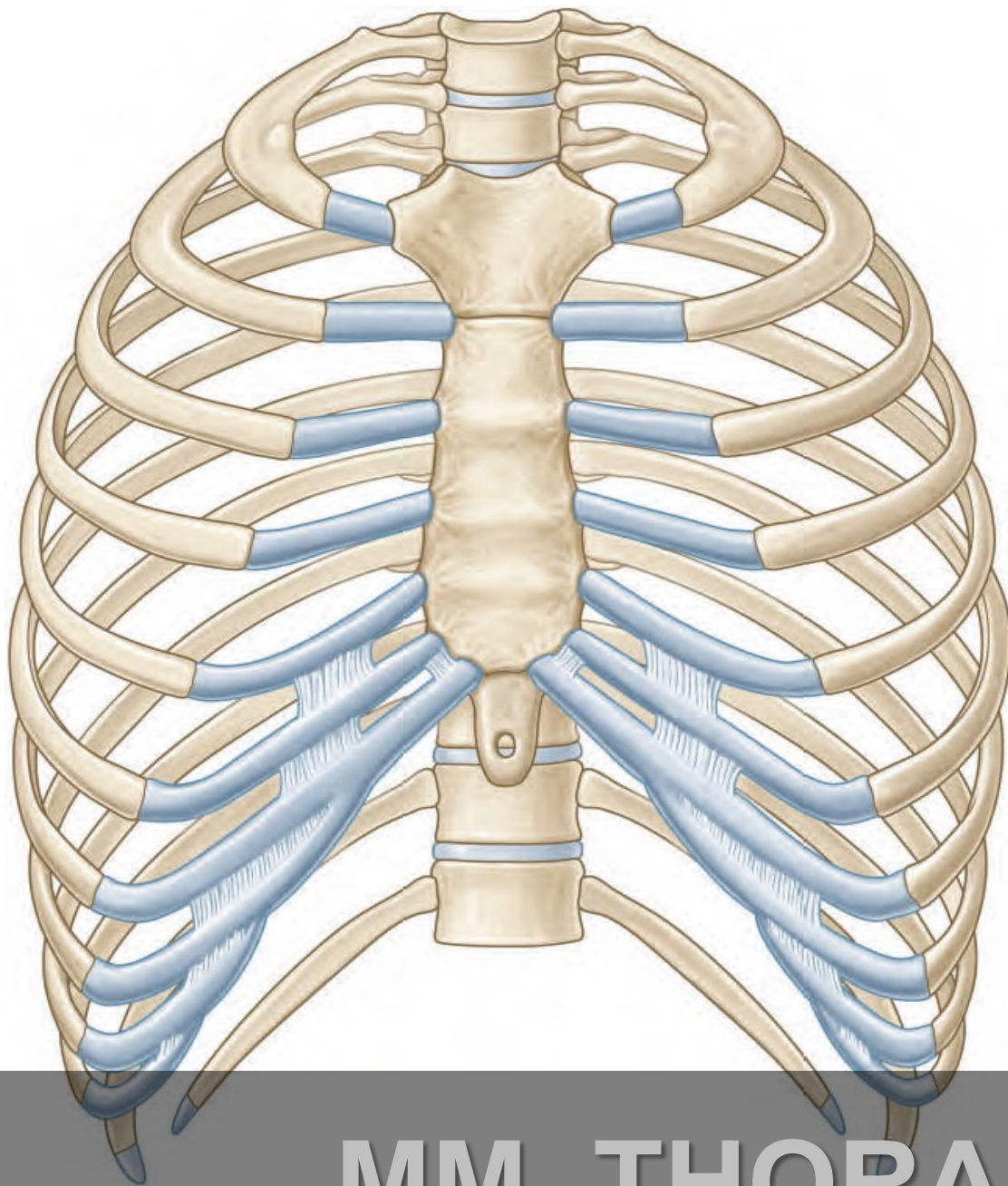


- ♦ **inspiratory muscles**
- ♦ Mm. intercostales externi

- ♦ **expiratory muscles**
- ♦ Mm. intercostales interni
- ♦ Mm. intercostales intimi
- ♦ Mm. subcostales
 - ♦ Costa IV - costa XI
- ♦ M. transversus thoracis
 - ♦ Sternum - costa III - VI



MM. THORACIS INTERNI



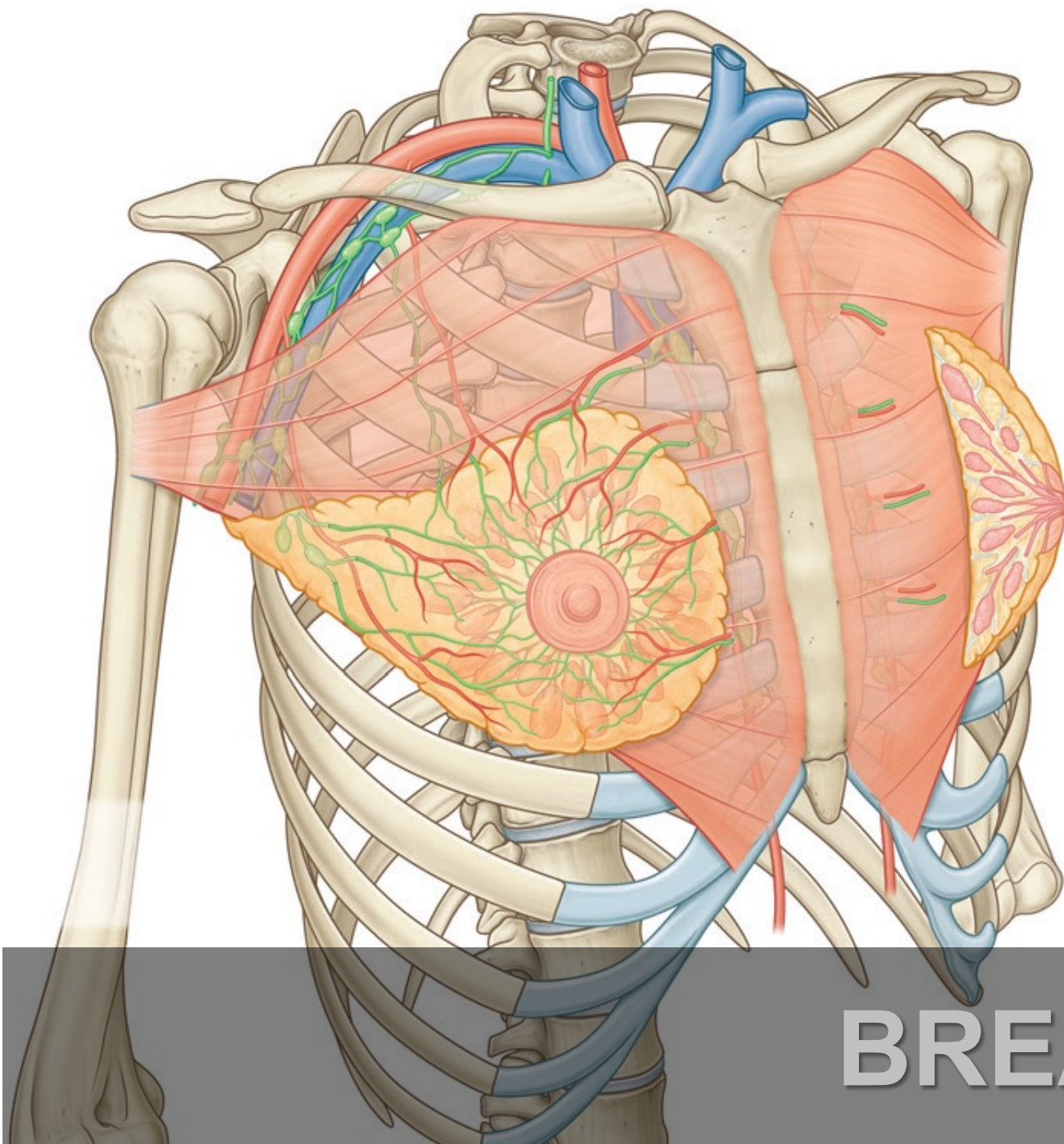
♦ Auxiliary inspiratory muscles

- ♦ M. sternocleidomastoideus - sternum
- ♦ M. subclavius - costa I
- ♦ M. scalenus anterior - costa I
- ♦ M. scalenus medius - costa I
- ♦ M. scalenus posterior - costa II
- ♦ Thorakohumerální svaly
- ♦ *M. serratus anterior* - costa I - VII
- ♦ *M. pectoralis minor* - costa III - V
- ♦ *M. pectoralis major* - sternum
- ♦ *M. serratus posterior superior*
- ♦ *M. serratus posterior inferior*

♦ Auxiliary expiratory muscles

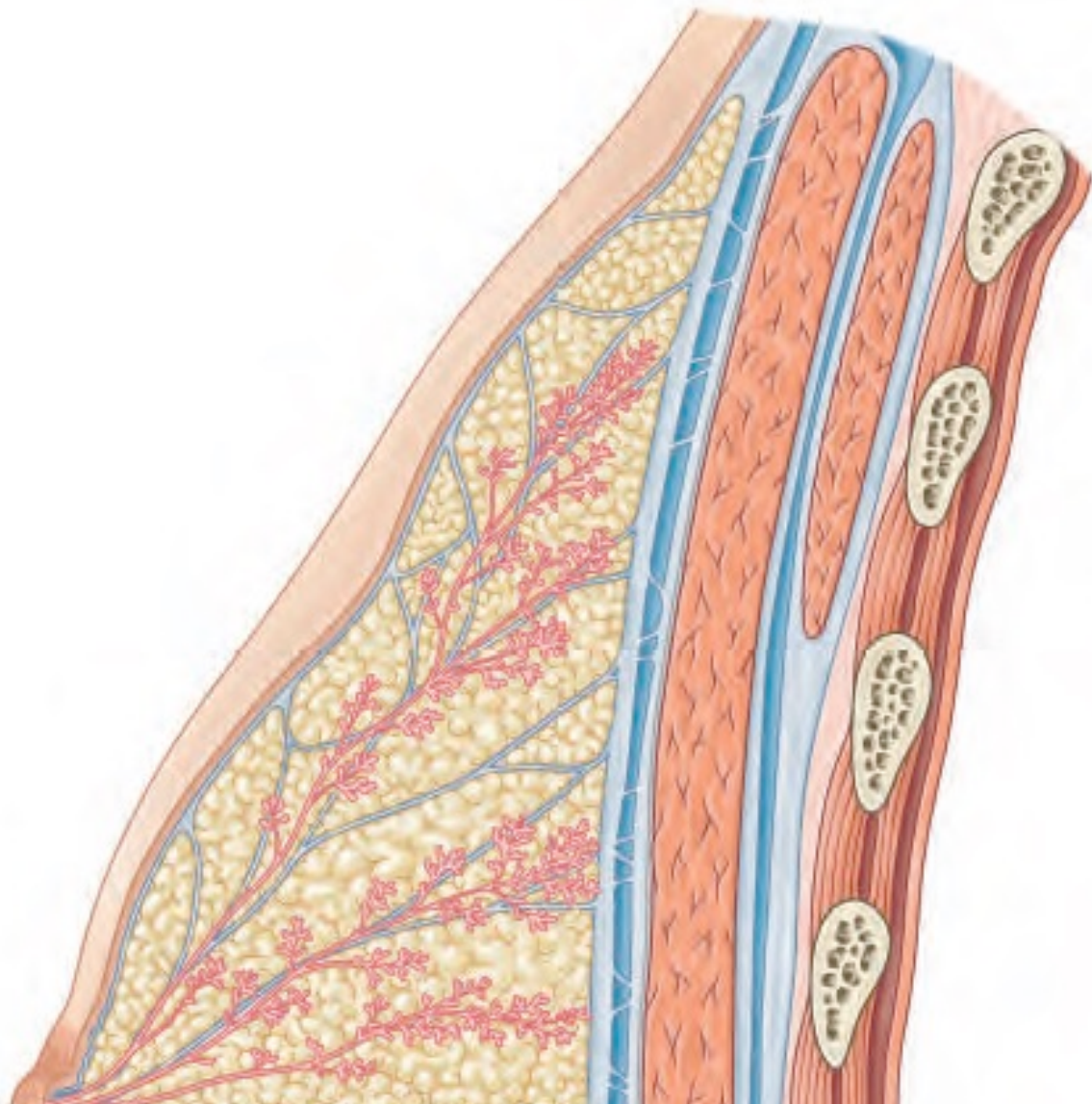
- ♦ M. rectus abdominis - costa VI - VII
- ♦ Mm. dorsi

MM. THORACIS EXTERNI



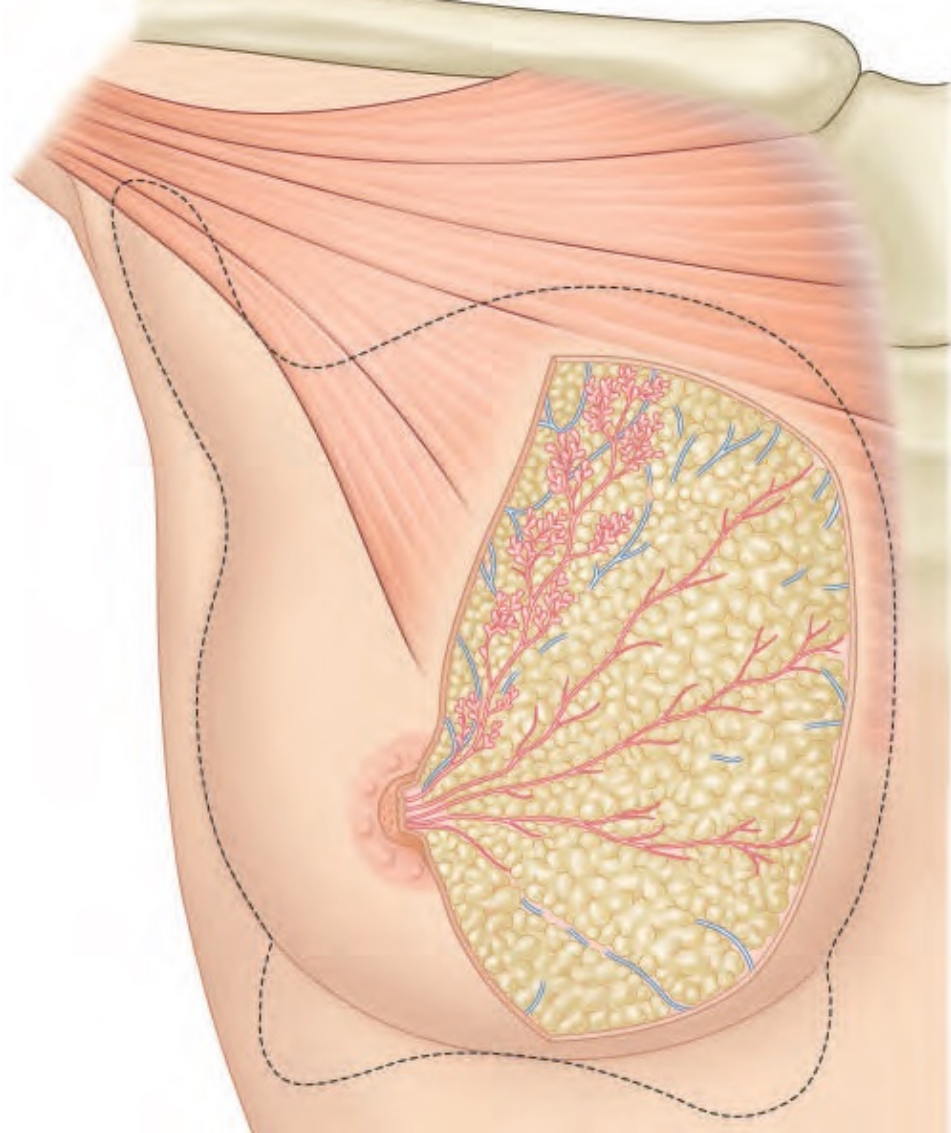
- ♦ **M. pectoralis major**
- ♦ **2. - 3. rib – axillary process**
- ♦ **Lower margin**
- ♦ **5-6. žebro**
- ♦ **Deep fascia**
- ♦ **Submammary space**
- ♦ **Glandular tissue, ductus lactiferi**
- ♦ **Papilla**
 - ♦ 20-23 cm from jugulum and each other
- ♦ **Areola**

BREAST

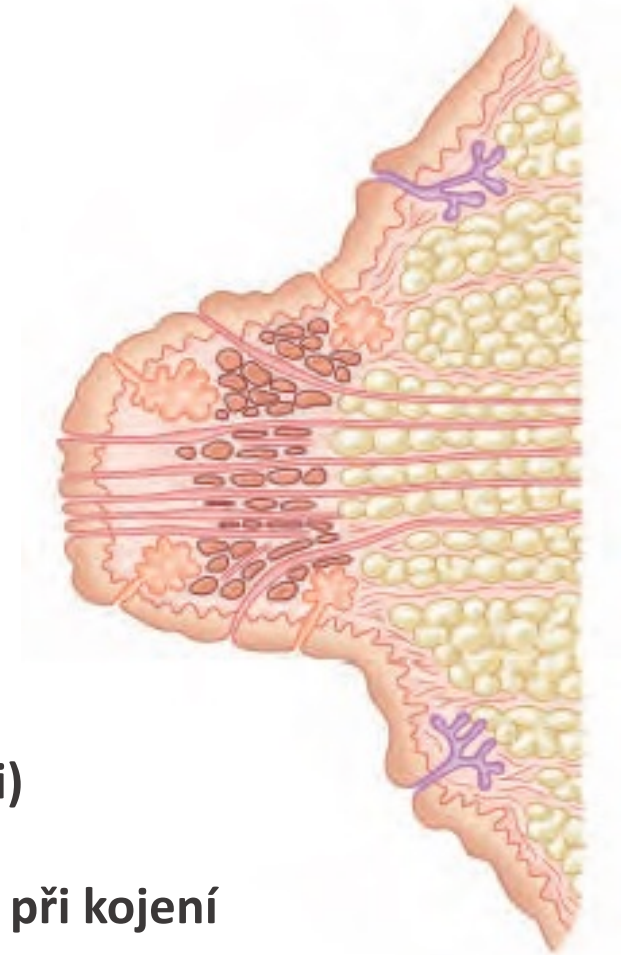


- ♥ Chest wall (costae, mm. intercostales)
- ♥ M. pectoralis minor
- ♥ M. pectoralis major
- ♥ Fascia pectoralis
- ♥ Spatium submamare
- ♥ Fascia profunda
- ♥ Tela adiposa
- ♥ Tela glandularia
- ♥ Ligamenta suspensoria Cooperi
- ♥ Fascia superficialis
- ♥ Skin

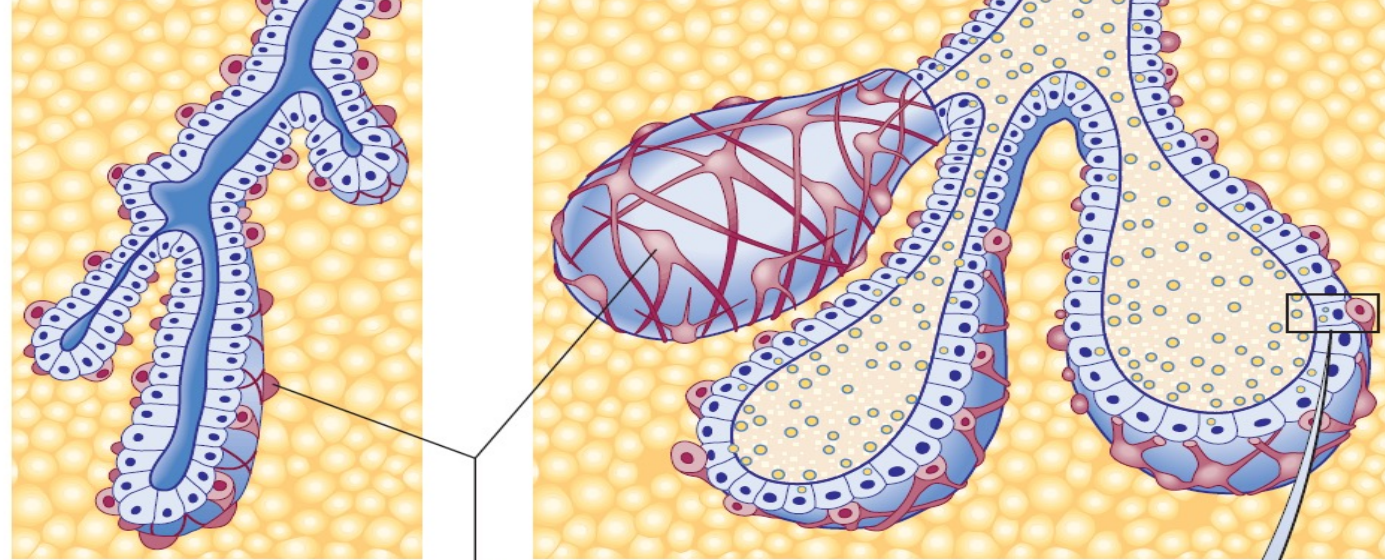
BREAST



- ♦ **Alveolus**
- ♦ **Lobulus**
- ♦ **Ductus lactiferus (10-15)**
 - ♦ Sinus lactiferus
- ♦ **Bradavka**
 - ♦ ústí duktů
- ♦ **Areola**
 - ♦ Výraznější pigmentace
 - ♦ Gll. saebaceae
 - ♦ Gll. areolares (Montgomeri)
 - ♦ Tubercula Montgomeri)
 - ♦ Olejovitý sekret - lubrikant při kojení



GLANDULA MAMMARIA

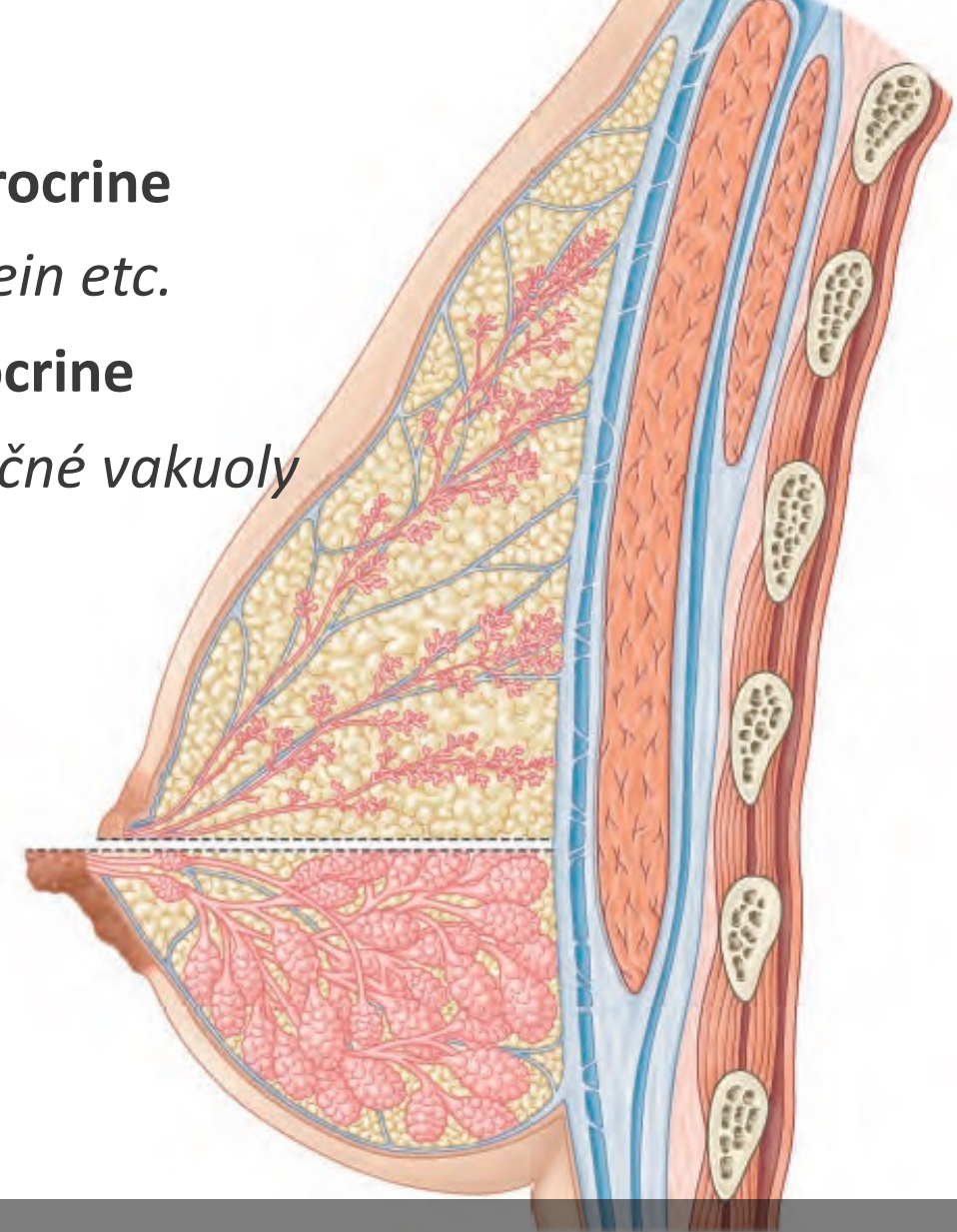
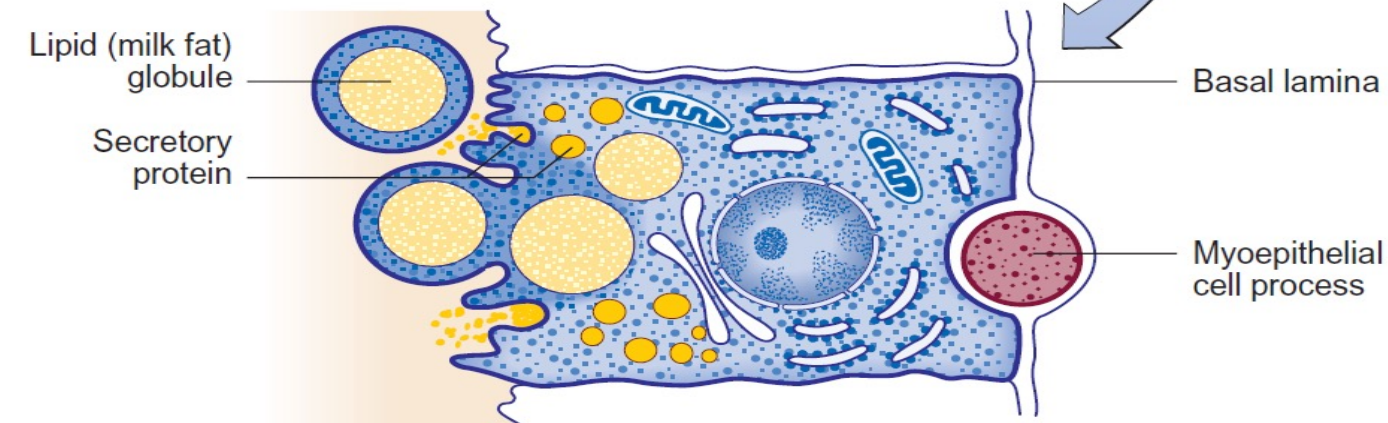


Non-lactating
(nulliparous)

Myoepithelial
cell

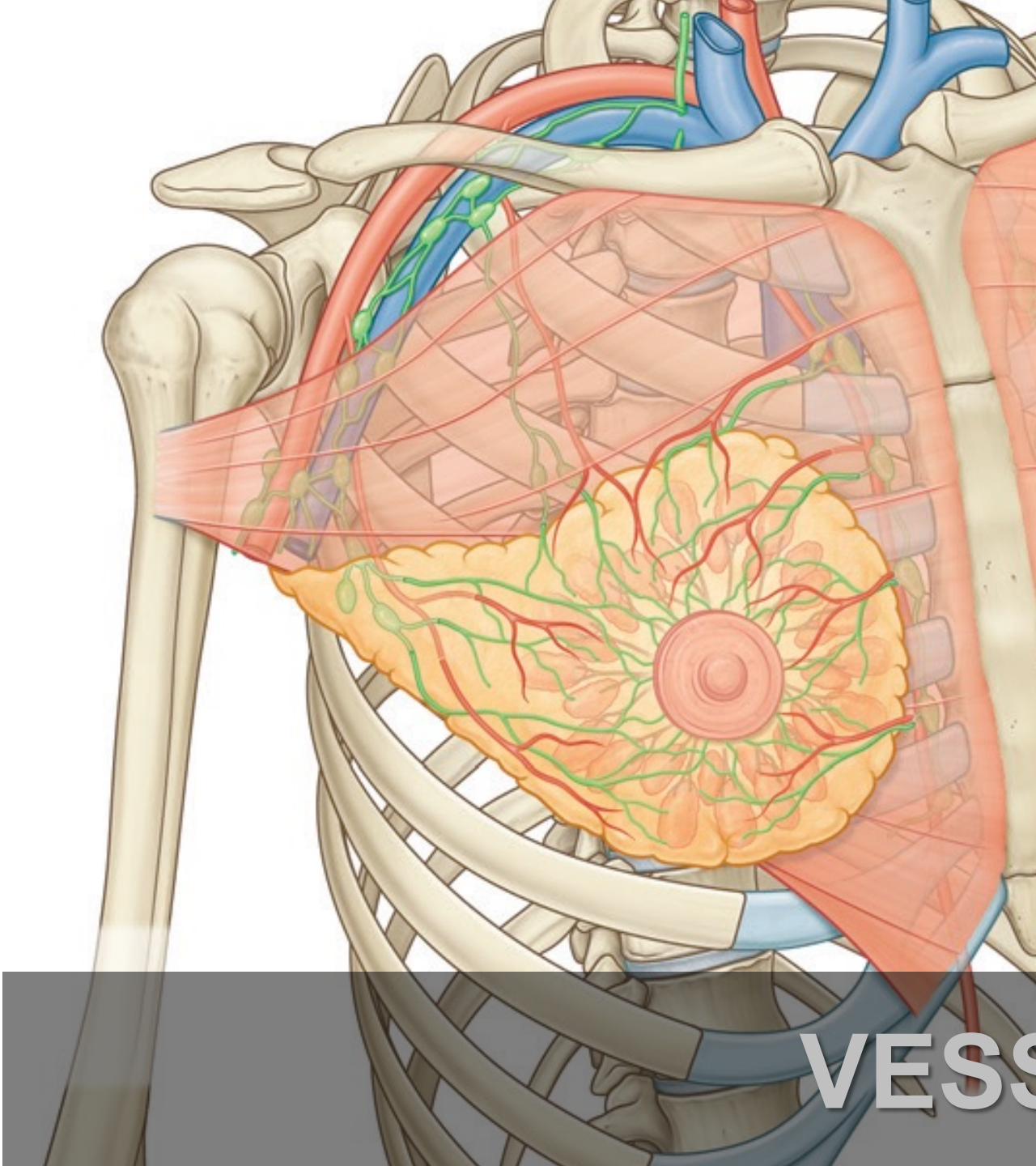
Lactating

- ♦ Merocrine
- ♦ *Casein etc.*
- ♦ Apocrine
- ♦ *Mléčné vakuoly*



LACTATION

- a. thoracica lateralis
- A. thoracoacromialis
- A. thoracica interna
 - Rami mammarii

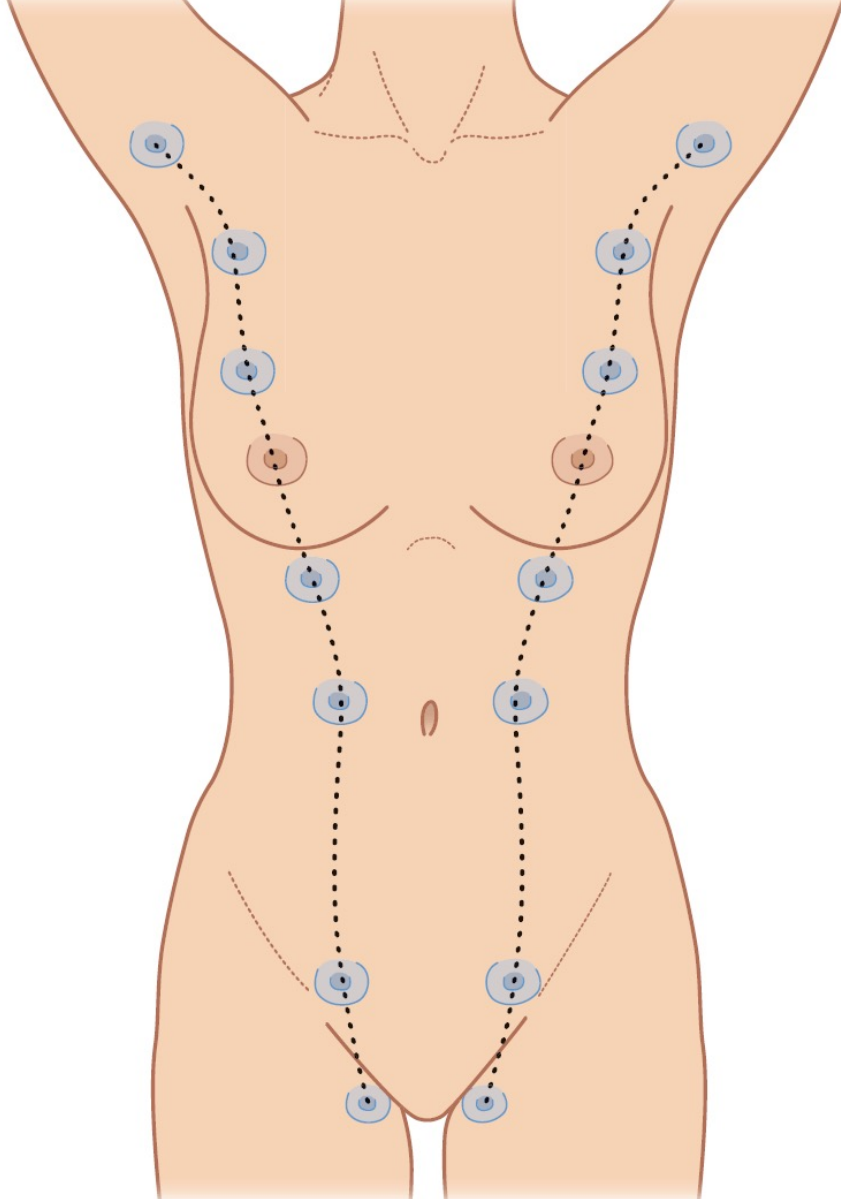


VESSELS



- Intramammary nodes
- Axillary lymph nodes
- I., II., and III. stages
- Supraclavicular nodes
- Intrathoracic nodes
- along vasa thoracica interna

LYMPHATICS

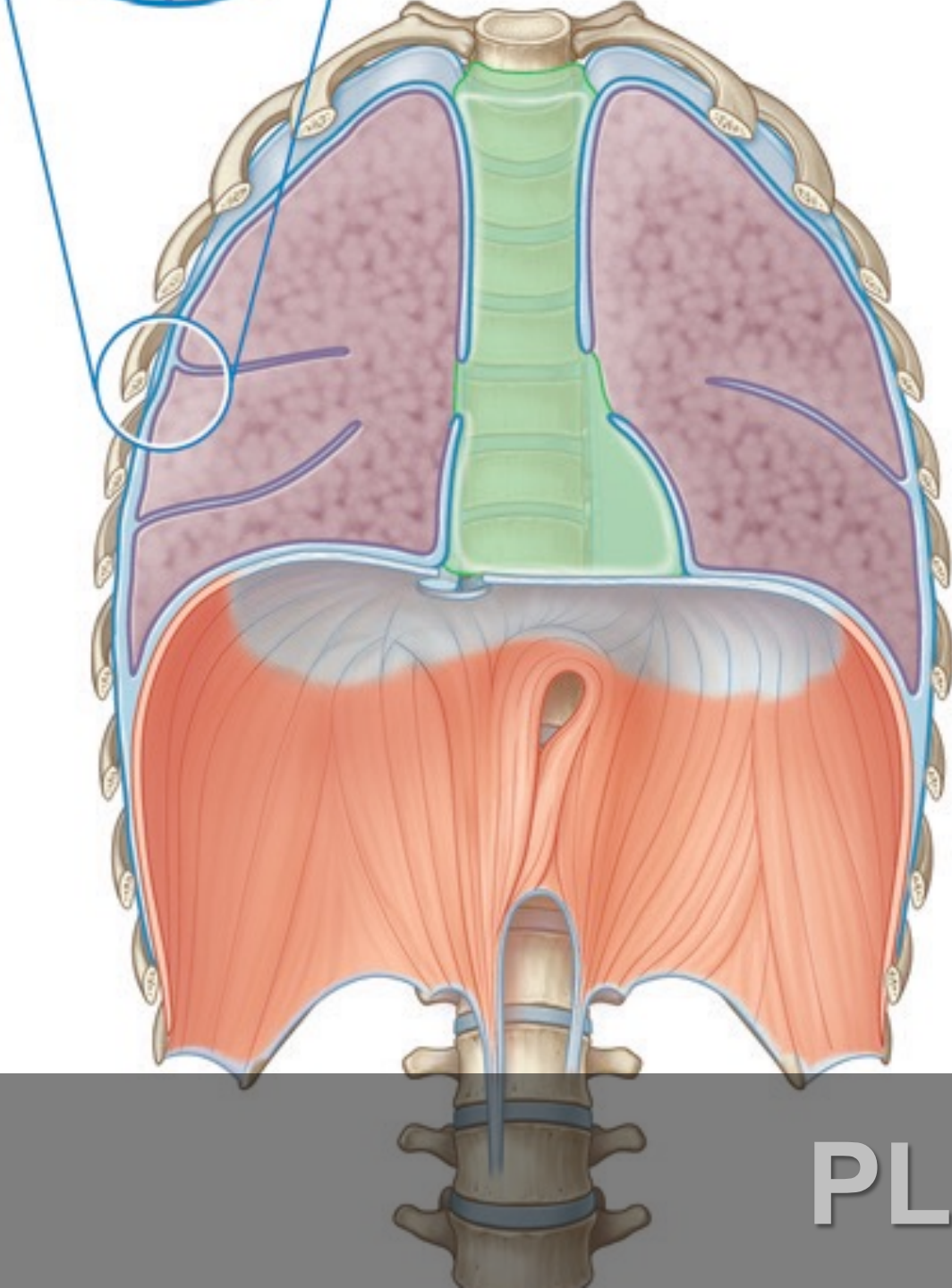


- Accessory and rudimentary
- nipple
- Nipple with areola
- Gland without nipple
- Typically in axillary region
- Risk of carcinoma

LACTIFER CREST

Thorax – pleural cavity nad diaphragm

Prof. MUDr. Jiří Ferda, Ph.D.



- ♦ **Pleura**
 - ♦ Mesothelia
 - ♦ Supporting connective tissue
- ♦ **Pleura parietalis**
 - ♦ Pars costalis
 - ♦ Pars diaphragmatica
 - ♦ Pars cervicalis (cupola)
 - ♦ Pars mediastinalis
- ♦ **Pleura visceralis**
 - ♦ On lung surface
- ♦ **Ligamentum pulmonale**
- ♦ **Cavitas pleuralis**

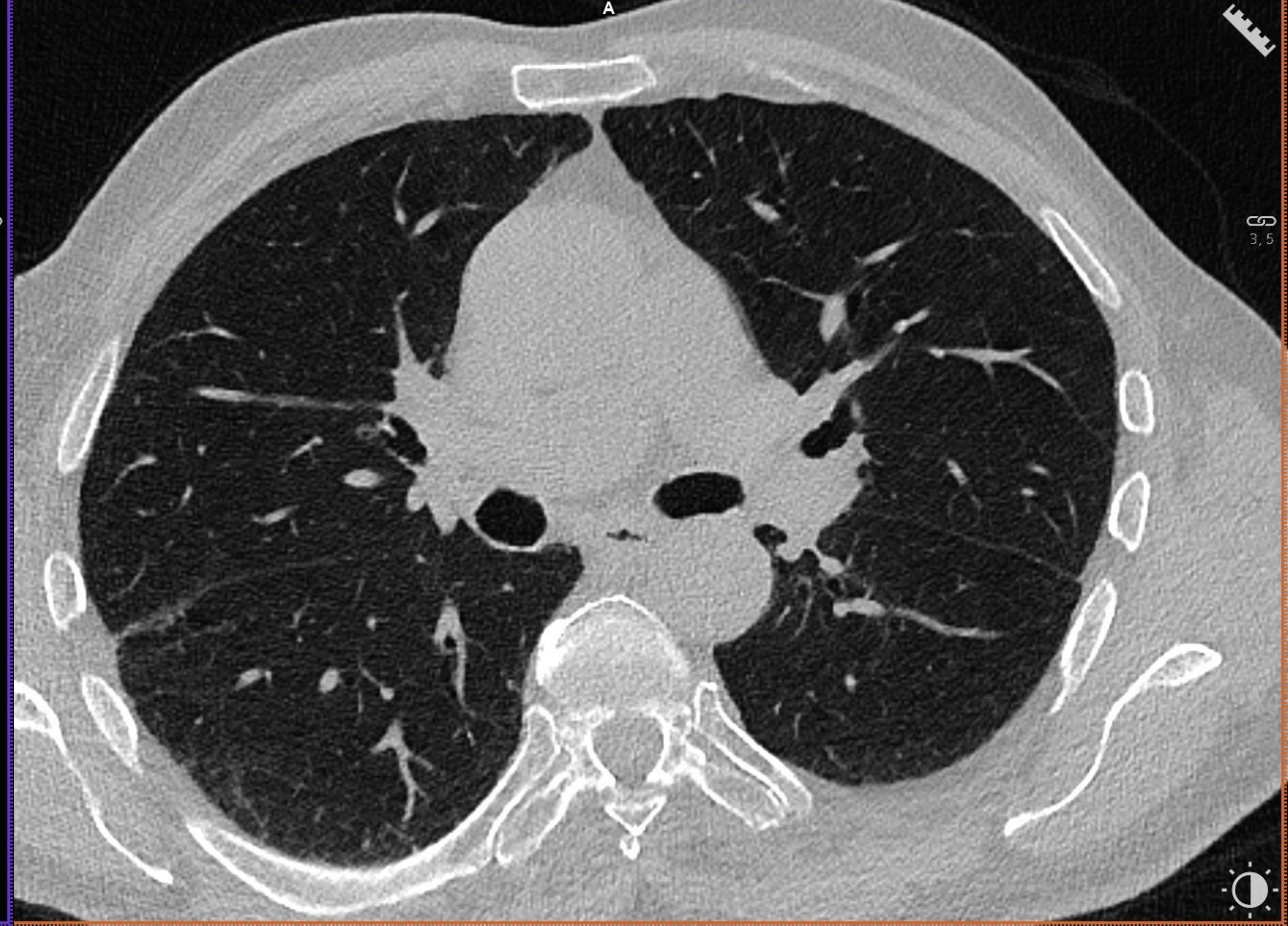
PLEURA



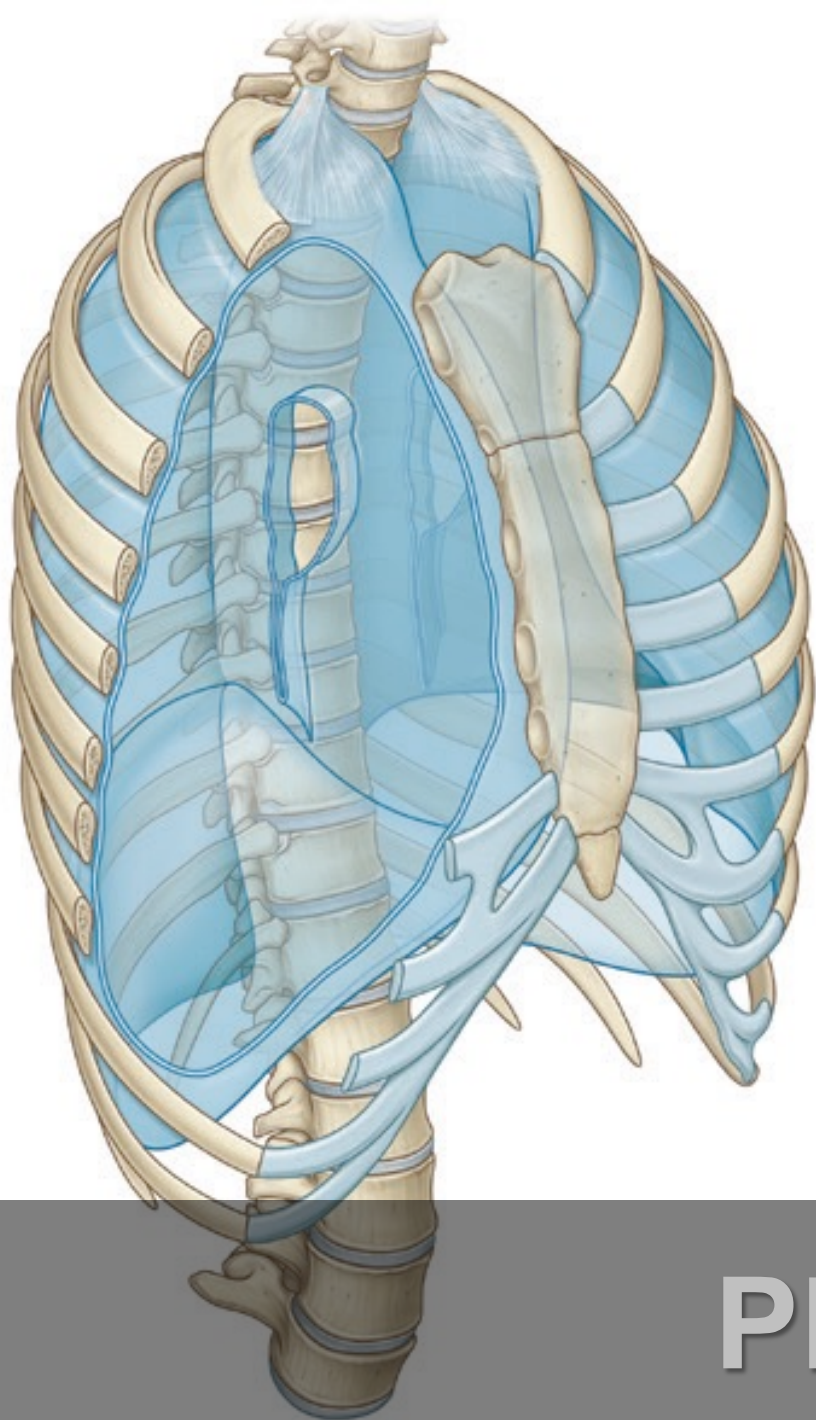
- ♦ **Recessus pleurales**
- ♦ Recessus costodiaphragmaticus
- ♦ Recessus costomediastinalis (dx. ant)
- ♦ Recessus paecardiacus (sin. ant.)
- ♦ Recessus retrooesophageus (dx. post.)



CAVITAS PLEURALIS



RECESSUS PLEURALES



- ◆ **Membrana suprapleuralis**

- ◆ **Parietalis/visceralis**

- ◆ Interface in lung root

- ◆ On hilus continues

- ◆ **Pleura visceralis**

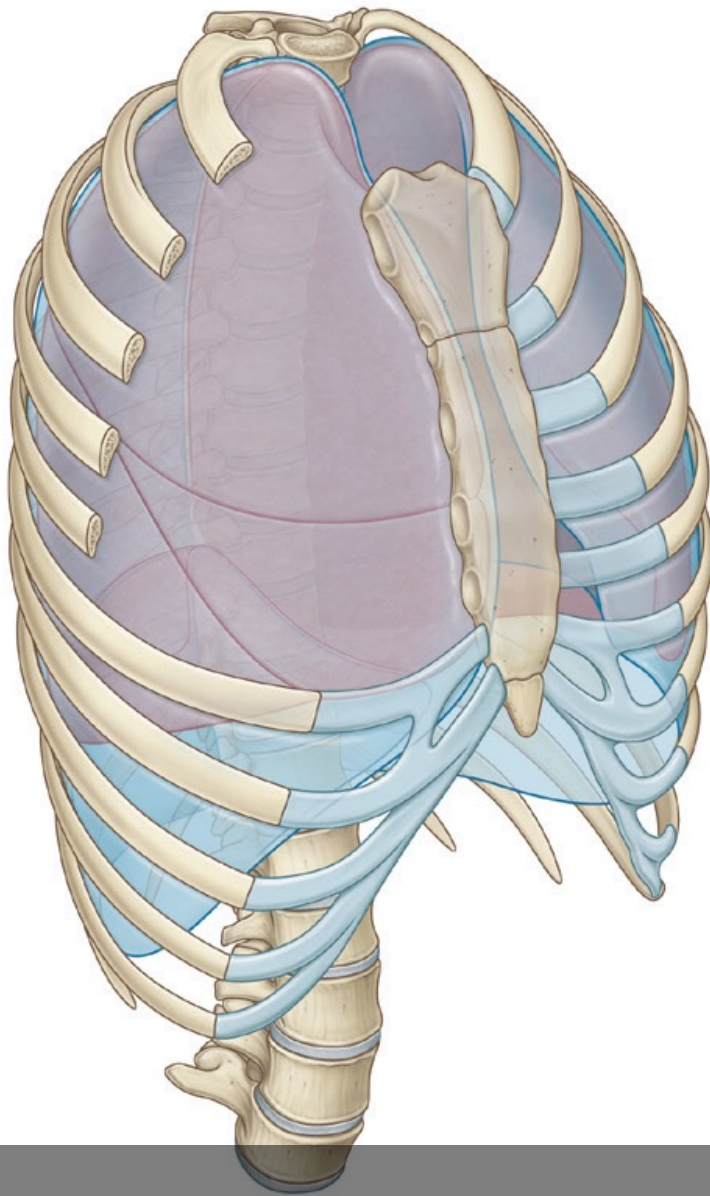
- ◆ **Parietalis/visceralis**

- ◆ **Ligamentum pulmonale**

- ◆ dupplicature

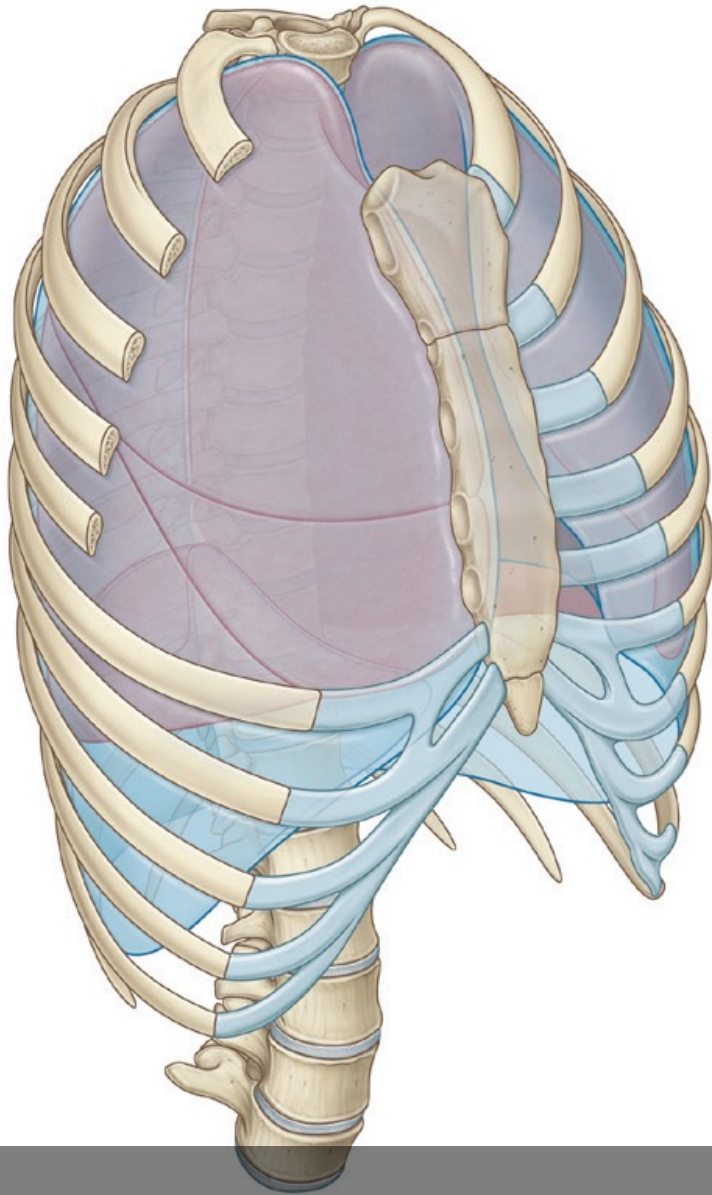
- ◆ Fixing lung to mediastinum

PLEURA



♦ <i>rib level</i>	lung	pleura
♦ Medioclavicular line	VI	VII
♦ Middle axillar line	VIII	IX
♦ Scapular line	X	XI
♦ Paravertebral	XI	XII
♦ Area thymica – cupula -	II	
♦ Anterior interface line	II - IV	
♦ Area perikardiaca	IV - VI	
♦ Recessus oesophageus	Th 4 - Th12	
♦ Left from midline from right side		
♦ pleural divergence	Th 2 - k C7	

PROJECTIONS



♦ **Fissura interlobaris obliqua**

♦ **Processus spinosus Th3**

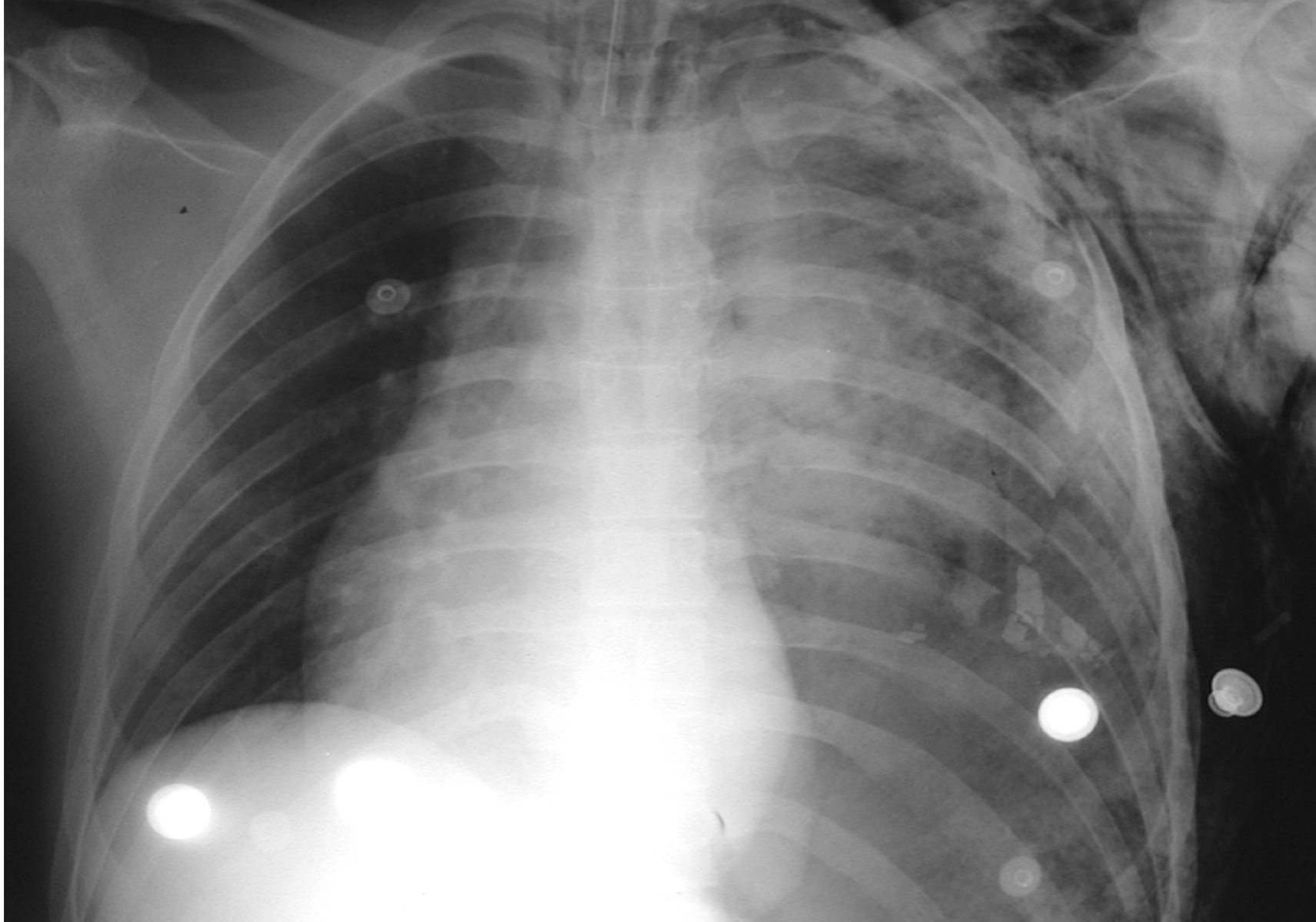
♦ **Cartilago costae VI**

♦ **Fissura interlobaris horizontalis**

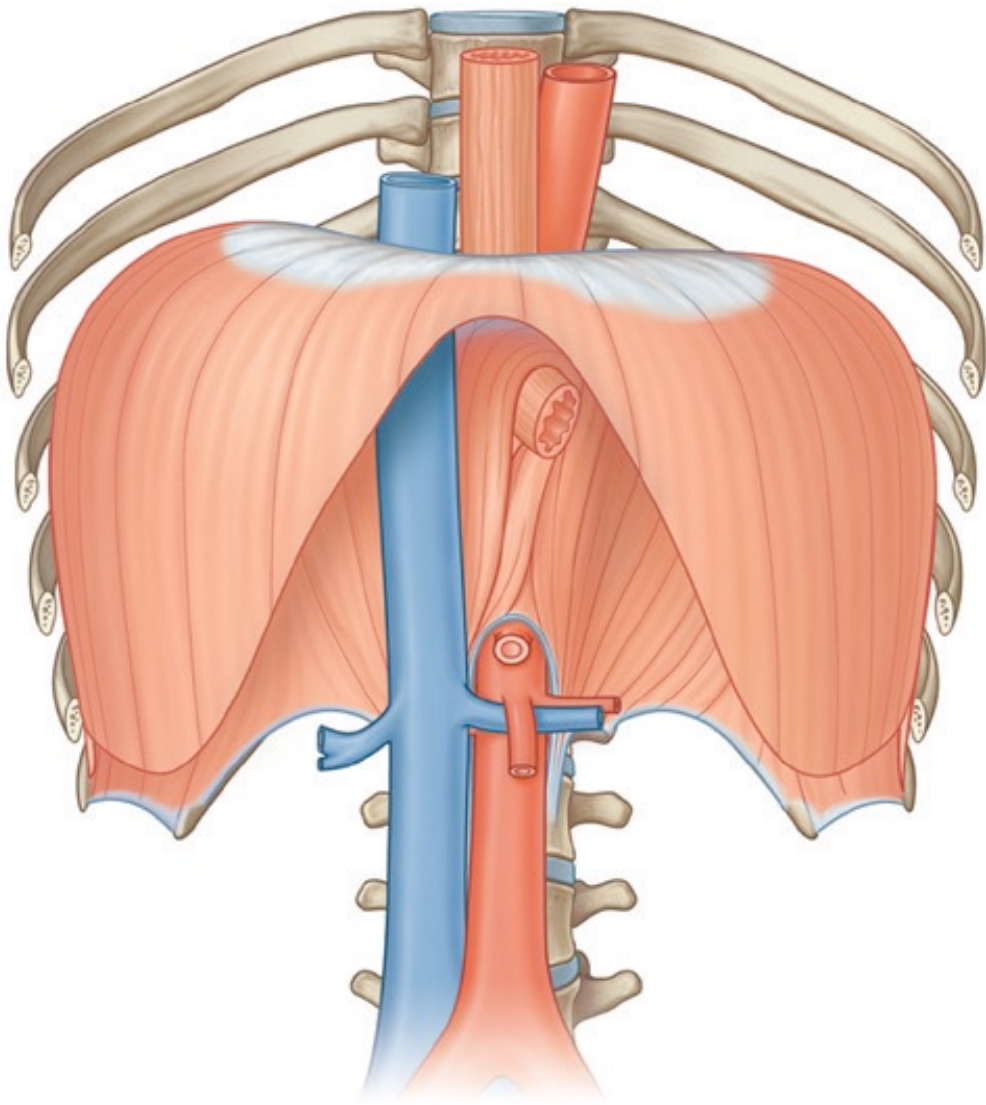
♦ **Oddělení v zadní axilární čáře**

♦ **Podél costa IV**

PLEURAL FISSURES PROJECTIONS

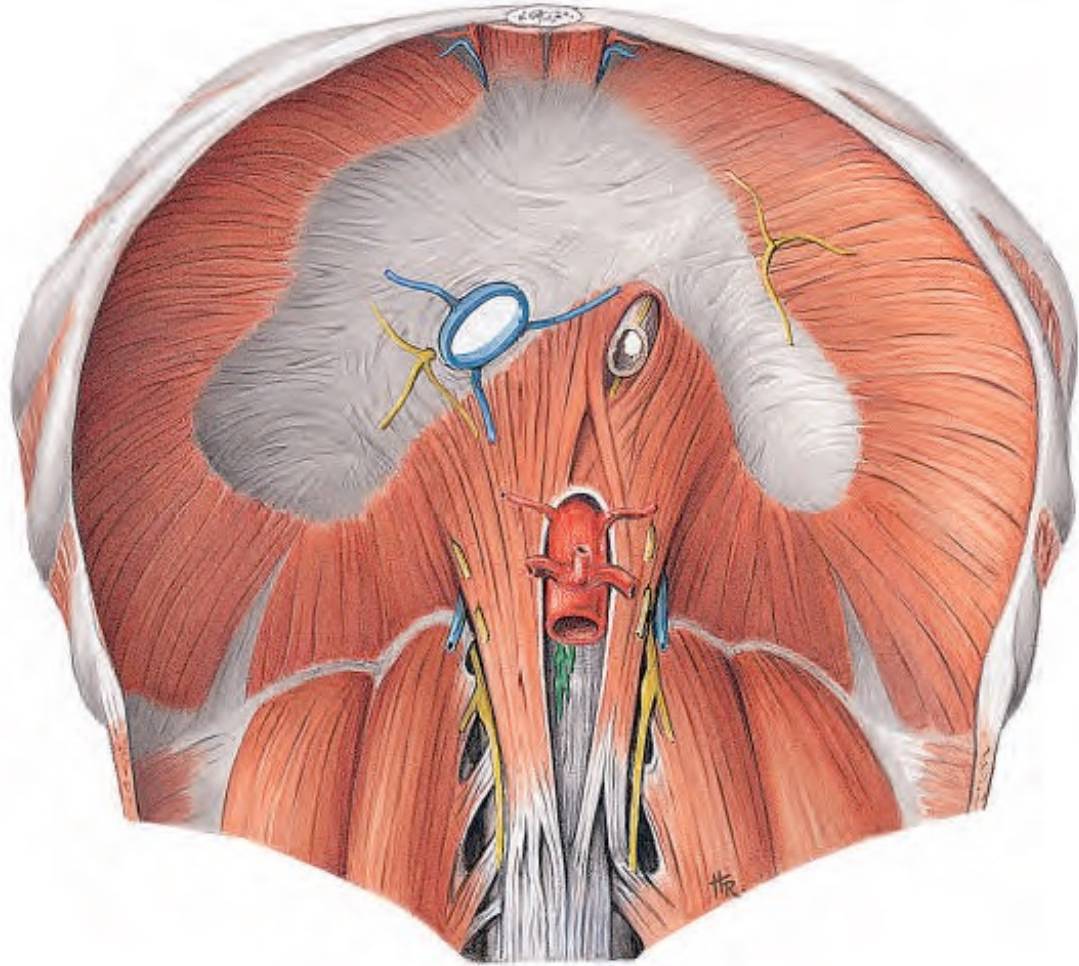


Tension pneumothorax



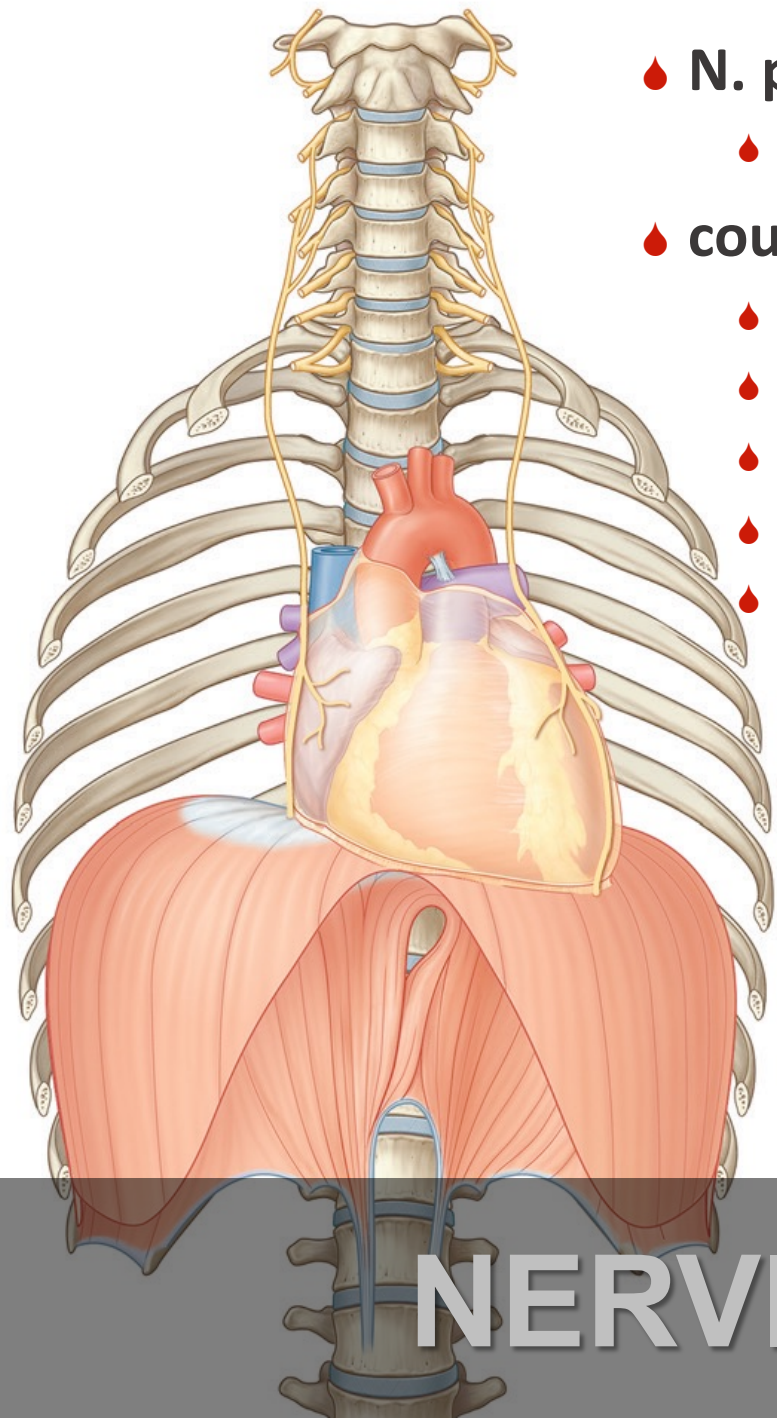
- ♦ **Centrum tendineum**
 - ♦ Foramen venae cavae - Th8
- ♦ **Pars sternalis**
 - ♦ Trigonum sternocostale (Morgagni)
- ♦ **Pars costalis**
 - ♦ Trigonum costolumbale (Bochdaleki)
- ♦ **Pars lumbalis**
 - ♦ Hiatus oesophagealis - Th10
 - ♦ Hiatus aorticus - Th12
- ♦ **Crura diaphragmatis - L3**
 - ♦ Lig. arcuatum, laterale dx., sin., medianum

DIAPHRAGMA

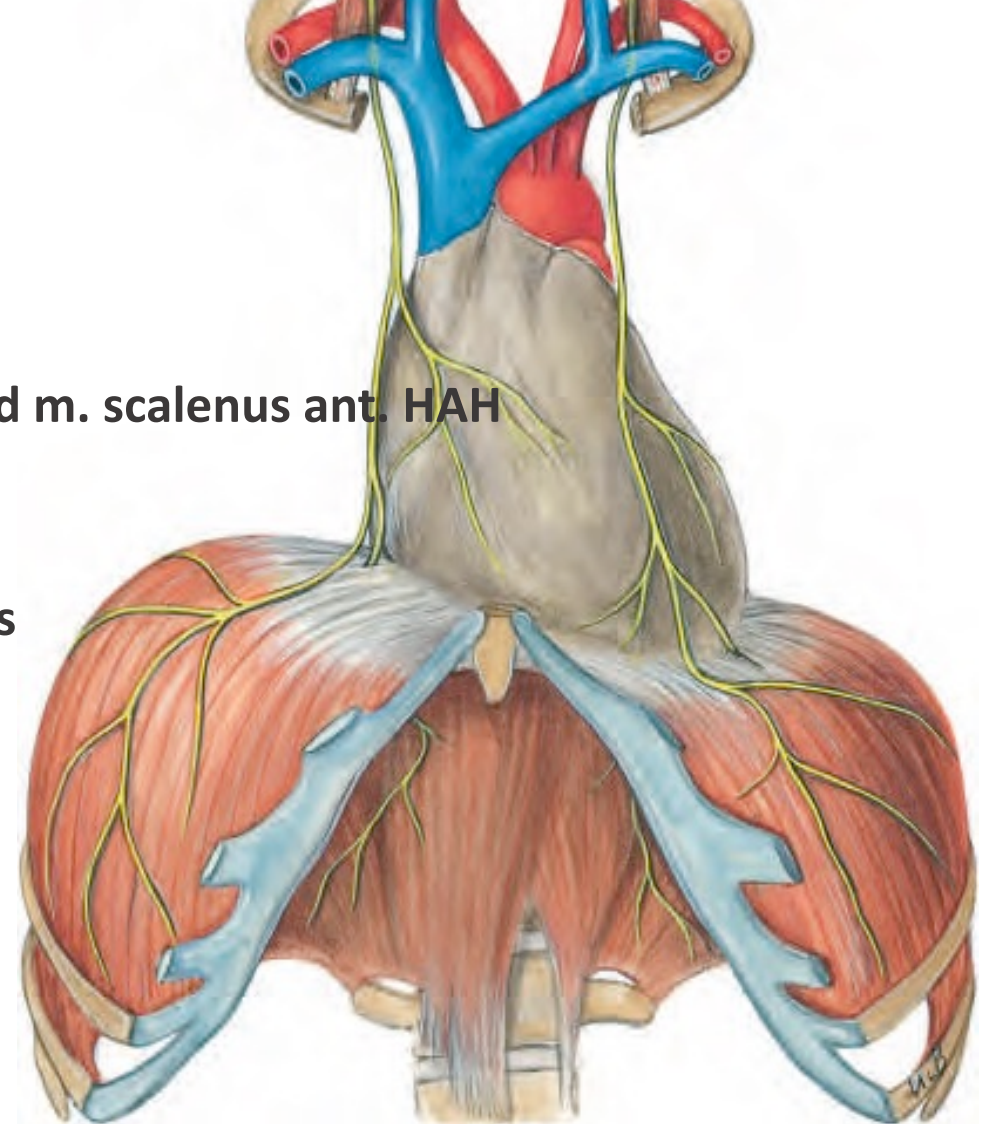


- ♦ **Centrum tendineum**
 - ♦ Foramen venae cavae - Th8
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- ♦ **Pars costalis**
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- ♦ **Crura diaphragmatis - L3**
 - ♦ Lig. arcuatum, laterale dx., sin., medianum

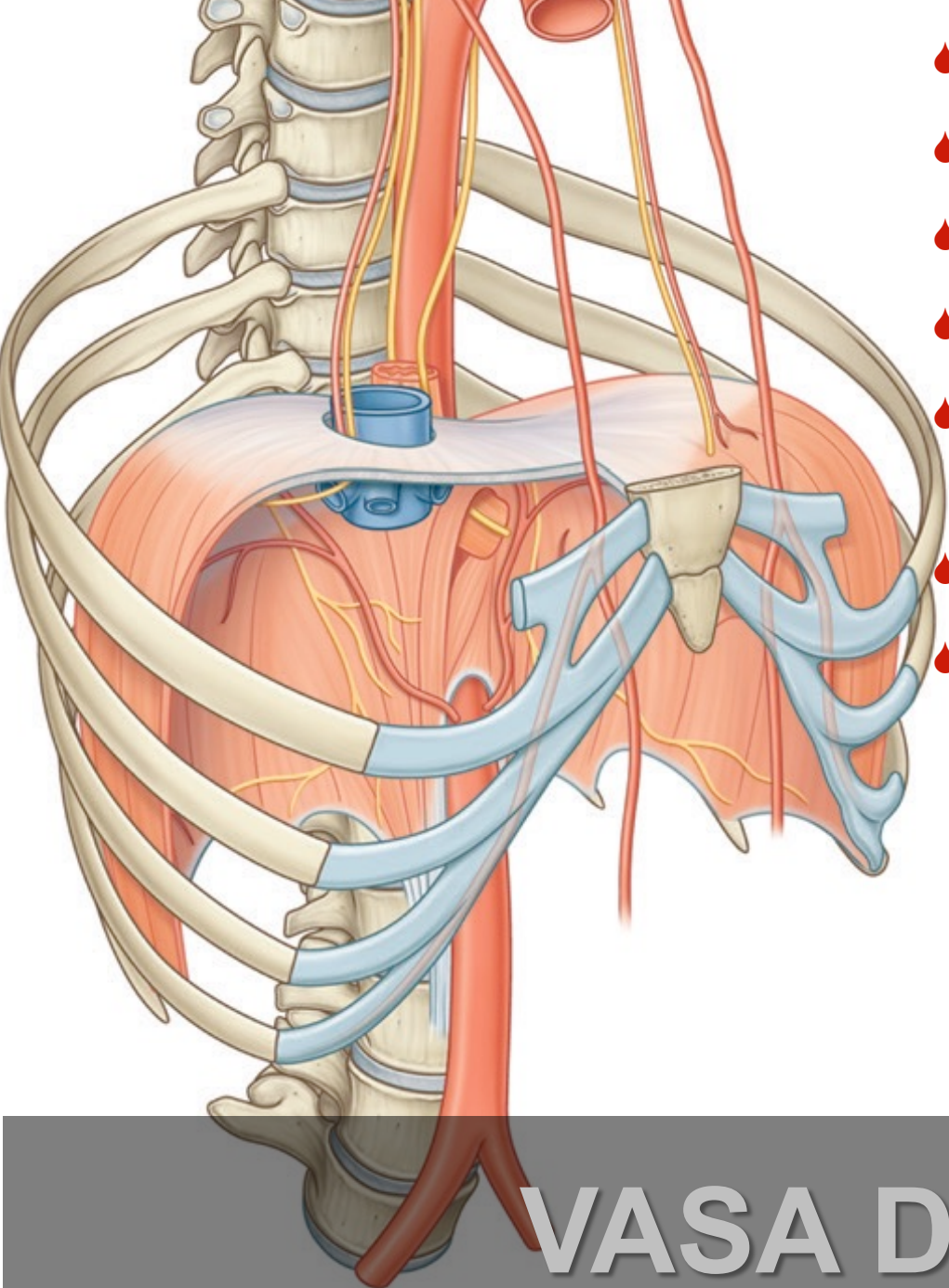
DIAPHRAGMA



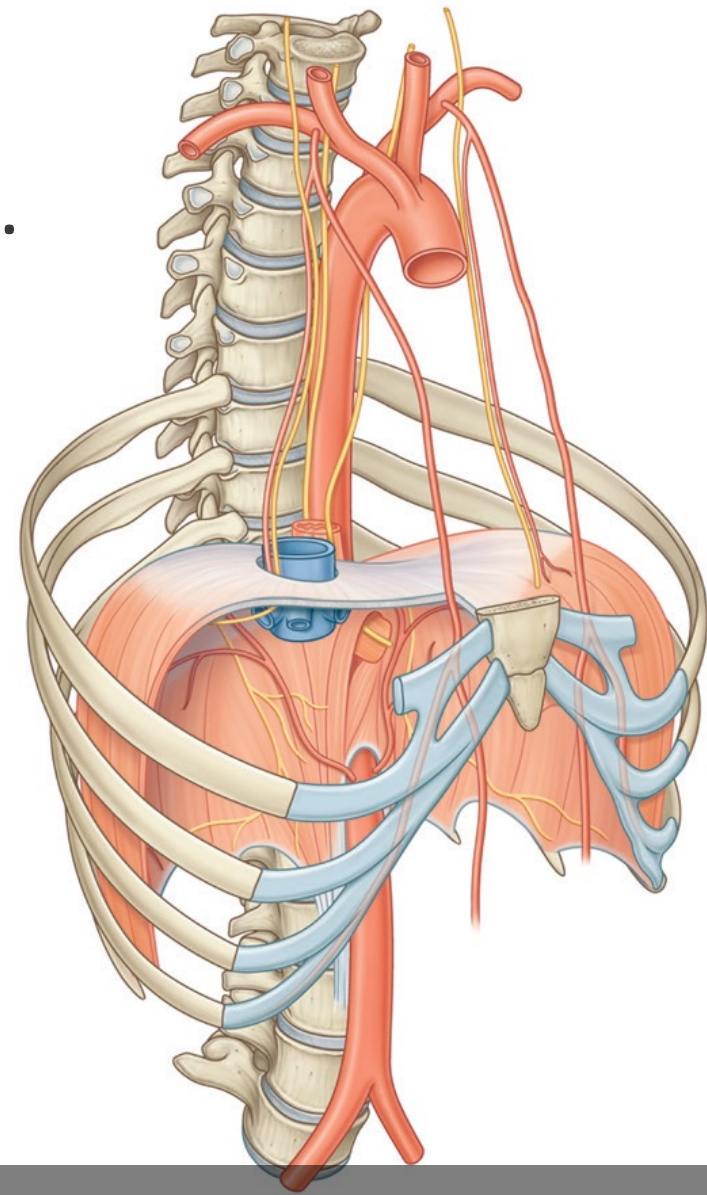
- ♦ **N. phrenicus (C3,C4,C5)**
 - ♦ Plexus cervicalis
- ♦ **course**
 - ♦ Vertical on neck
 - ♦ between v. subclavia and m. scalenus ant. HAH
 - ♦ Anterior to hilus
 - ♦ Rr. pericardiales
 - ♦ Rr. phrenicoabdominales
 - ♦ Dx. - foramen v. cavae
 - ♦ Sin. - pars muscularis



NERVI DIAPHRAGMATIS



- ♦ A. phrenica inferior dx. et sin.
- ♦
- ♦ A. phrenica superior dx. et sin.
- ♦
- ♦ A. thoracica interna dx. et sin.
 - ♦ a. pericardiophrenica
- ♦ Aa. intercostales 5 - 11
- ♦ A. subcostalis (pod 12.ž)



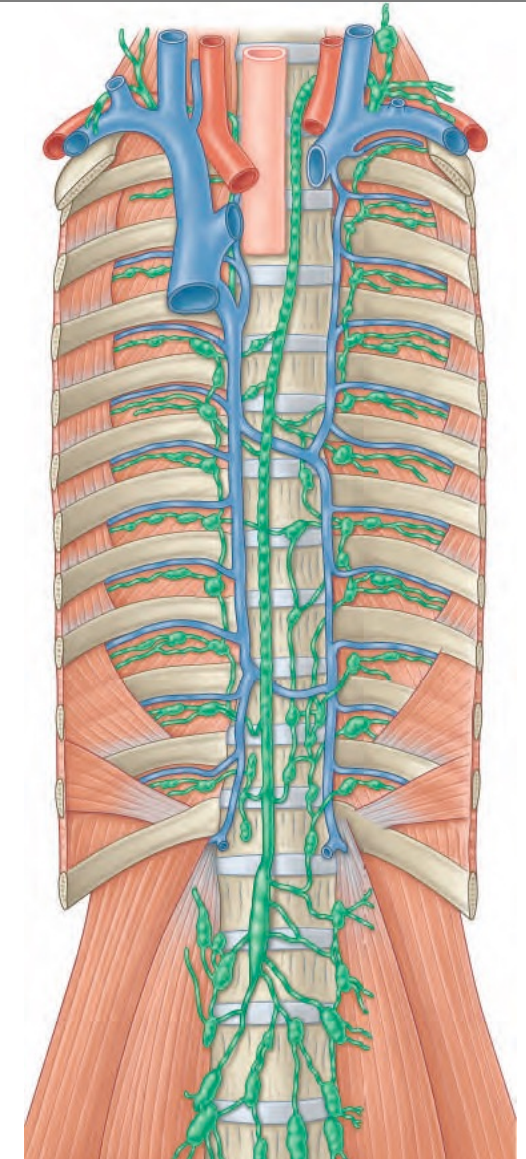
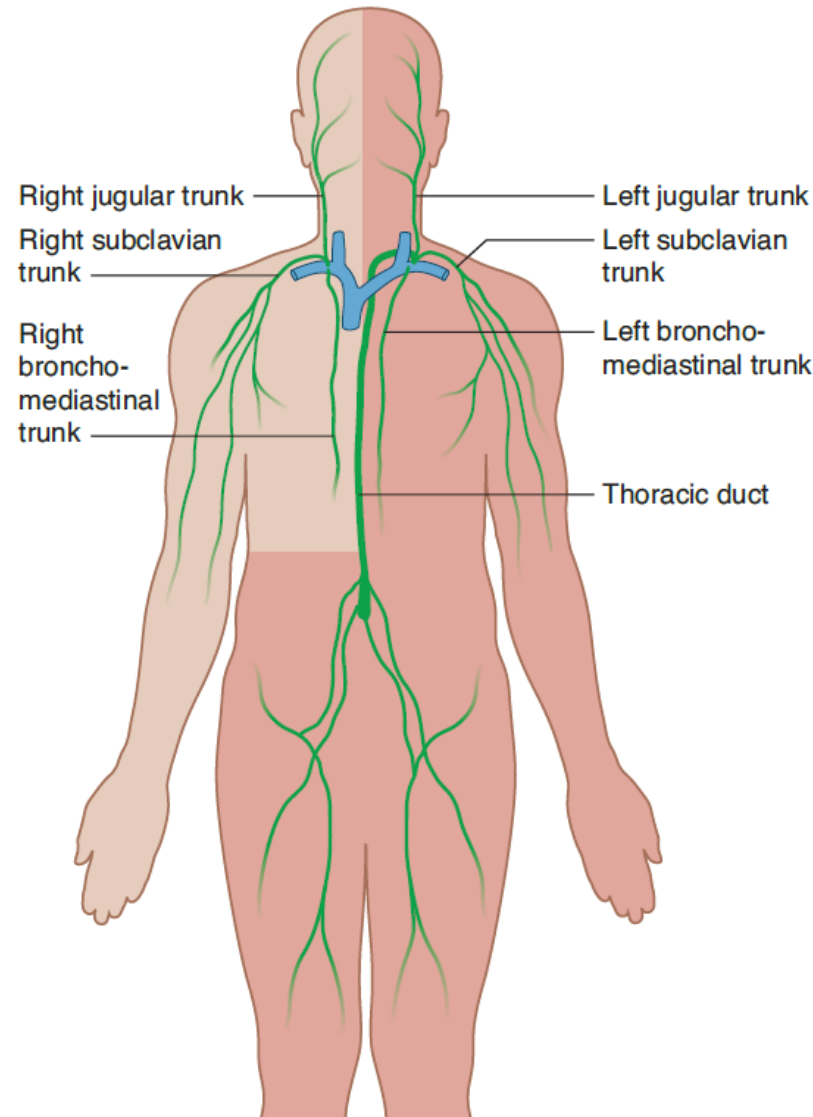
VASA DIAPHRAGMATIS

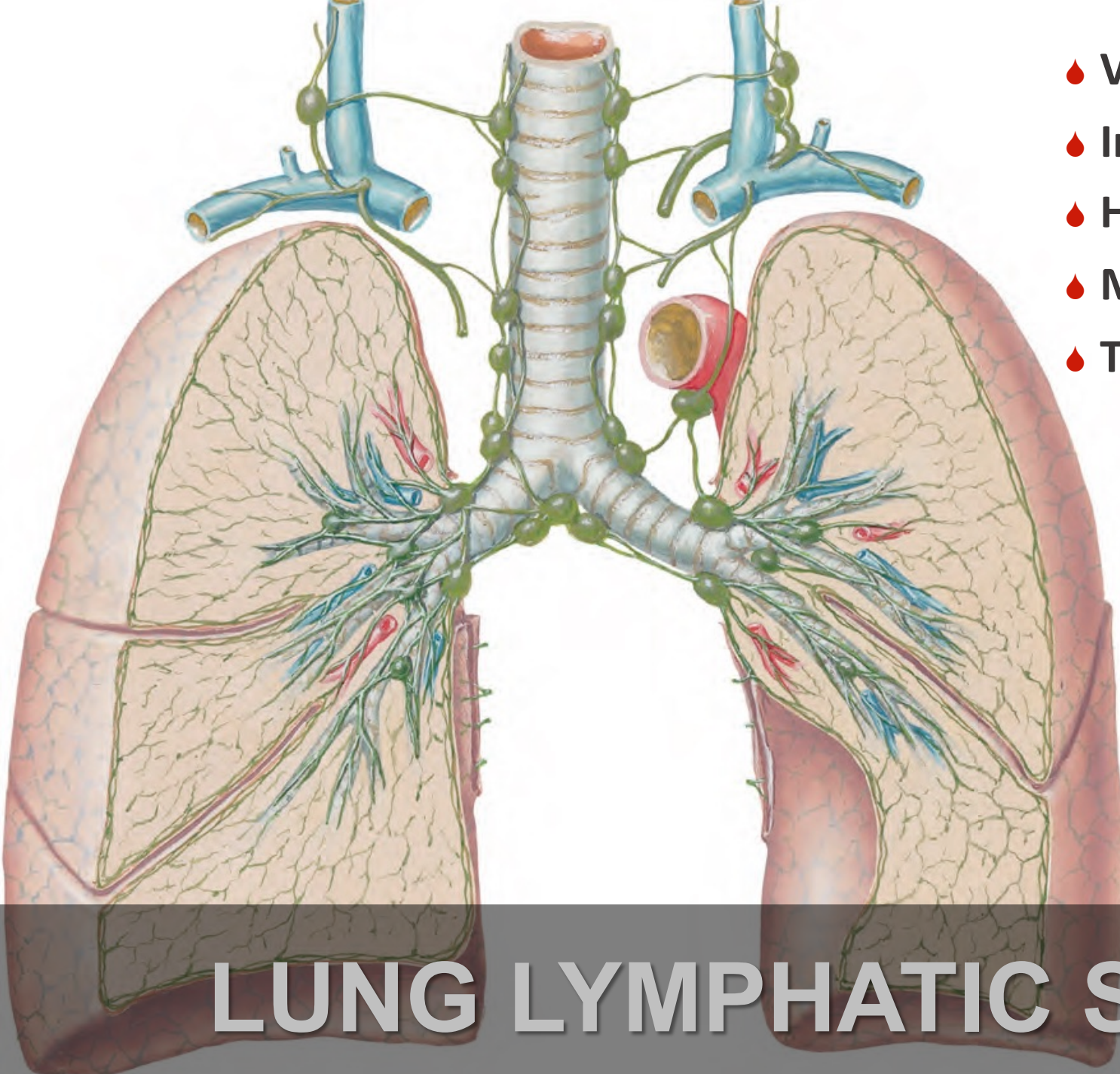
Thorax – lymphatics

Prof. MUDr. Jiří Ferda, Ph.D.

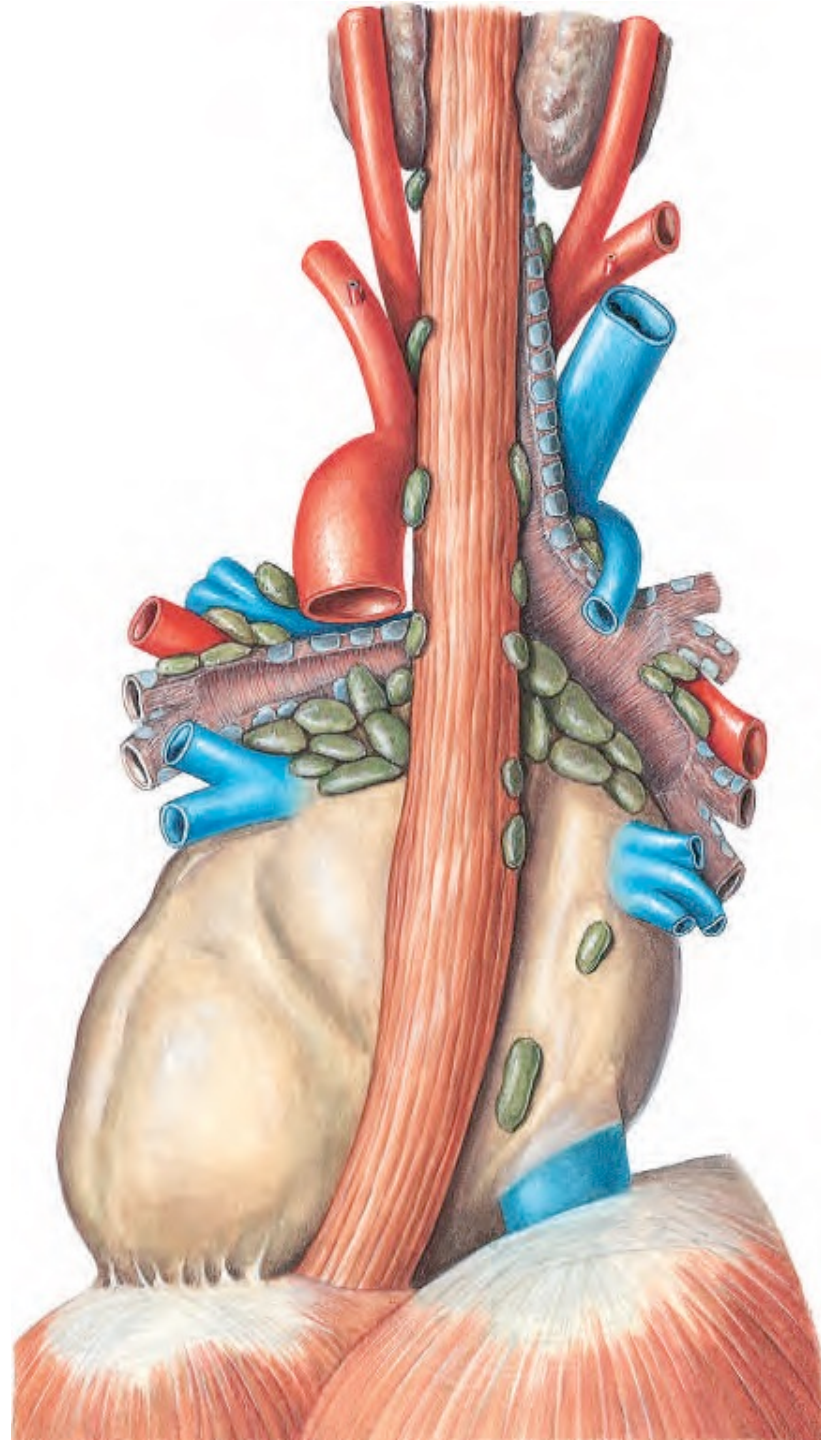
TRUNCI

- ♦ *Trunci lumbales*
- ♦ *Trunci intestinales*
- ♦ *Cisterna chyli*
- ♦ **Ductus thoracicus (hiatus aorticus)**
- ♦ *Tr. brochomediastinalis sinister*
- ♦ *Tr. subclavius sinister*
- ♦ *Tr. jugularis sinister*
- ♦ **Angulus venosus sinister (3/4 těla)**
- ♦ *Tr. brochomediastinalis sinister*
- ♦ *Tr. subclavius sinister*
- ♦ *Tr. jugularis sinister*
- ♦ *Tr. lymphaticus dexter*
- ♦ *Angulus venosus dexter (1/4 těla)*



- 
- The diagram illustrates the lymphatic system of the lungs and mediastinum. It shows the trachea in the center, with the bronchial tree branching out to the left and right lungs. The lymphatic system is represented by green lines and green circular nodes. The nodes are distributed throughout the lung tissue (intrapulmonary), at the hilum of each lung (hilar), and along the bronchovascular bundles in the mediastinum (mediastinal). The lymphatic system eventually drains into the venous system at the junction of the internal jugular and subclavian veins. The diagram also shows the major blood vessels (red for oxygenated, blue for deoxygenated) and the trachea.
- ♦ Vasa lymphatica
 - ♦ Intrapulmonal nodes
 - ♦ Hilar nodes
 - ♦ Mediastinal nodes
 - ♦ Truncus bronchomedistinales

LUNG LYMPHATIC SYSTEM



Station Description according to Gray's Anatomy

1. The highest mediastinal nodes

lying above a horizontal line, at which level the left brachiocephalic vein crosses the trachea

2. Upper paratracheal nodes

lying below the line of the highest mediastinal nodes and above a line drawn horizontally at the level of the upper border of the aortic arch

3. Prevascular and retrotracheal nodes

lying behind the trachea but in front of the great vessels

4. Lower paratracheal nodes

lying below the upper margin of the aortic arch and down to the upper margin of the corresponding upper lobe bronchus. On the right side, this is the upper margin of the right upper lobe bronchus; the majority of nodes in this area tend to be positioned anterolateral to the trachea. On the left side, the nodes are located below the upper margin of the aortic arch and above the margin of the left upper lobe bronchus. They lie to the right of the ligamentum arteriosum, between the ligament and the trachea

5. Subaortic nodes

lying in the aortopulmonary window and situated to the right of the ligamentum arteriosum, aorta or left pulmonary artery, but proximal to the first division of the left pulmonary artery

6. Para-aortic nodes

lying between the upper margin of the aortic arch and lateral to the ascending aorta and aortic arch

7. Subcarinal nodes

are not associated with the lower lobe bronchi

8. Para-oesophageal

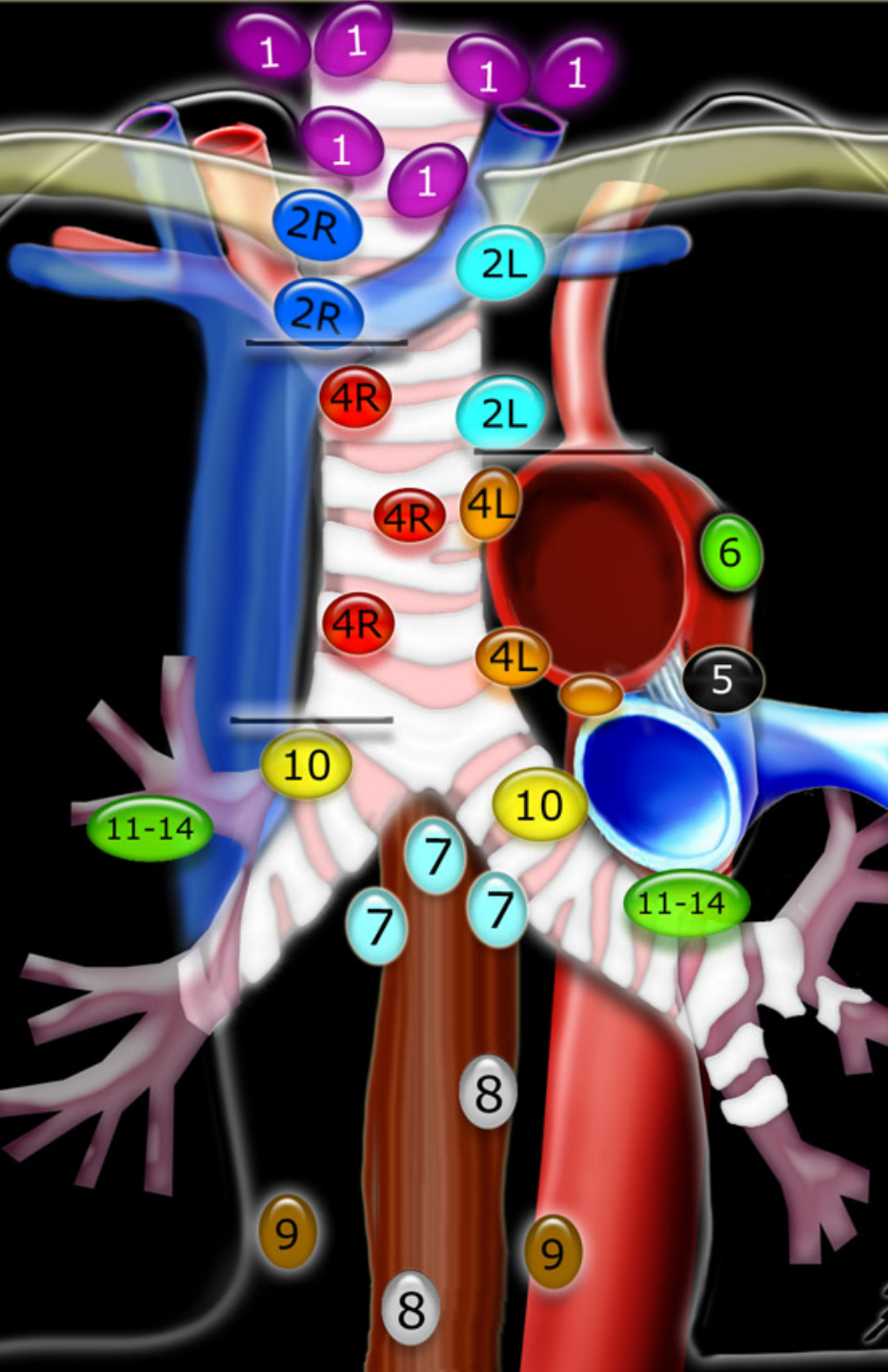
nodes lie well below the subcarinal nodes, close to the pulmonary veins

9. Nodes lying within the pulmonary ligament

10. Hilar node

11. Interlobar nodes

12. Lobar nodes



Station Description according to Gray's Anatomy

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lying above a horizontal line, at which level the left brachiocephalic vein crosses the trachea

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