

Anatomy

Momen Zeineddin

Macrophage

- A type of WBC that engulfs and digests microorganisms, cancer cells, debris & foreign substances (Phagocytosis).
- LN >> Histiocyte
- Skin >> Langerhans cell

Hemophagocytic Lymphohistiocytosis (HLH)

- A **life-threatening** syndrome of **excessive immune response** and macrophages activation.
- leading to **phagocytosis** of blood cells and their precursors, **cytopenias**, and symptoms related to systemic inflammation and organ dysfunction.

Hemophagocytic Lymphohistiocytosis (HLH)

- Fever
- Splenomegaly
- Cytopenias
- Liver dysfunction.
- High inflammatory markers eg. ferritin

Hemophagocytic Lymphohistiocytosis (HLH)

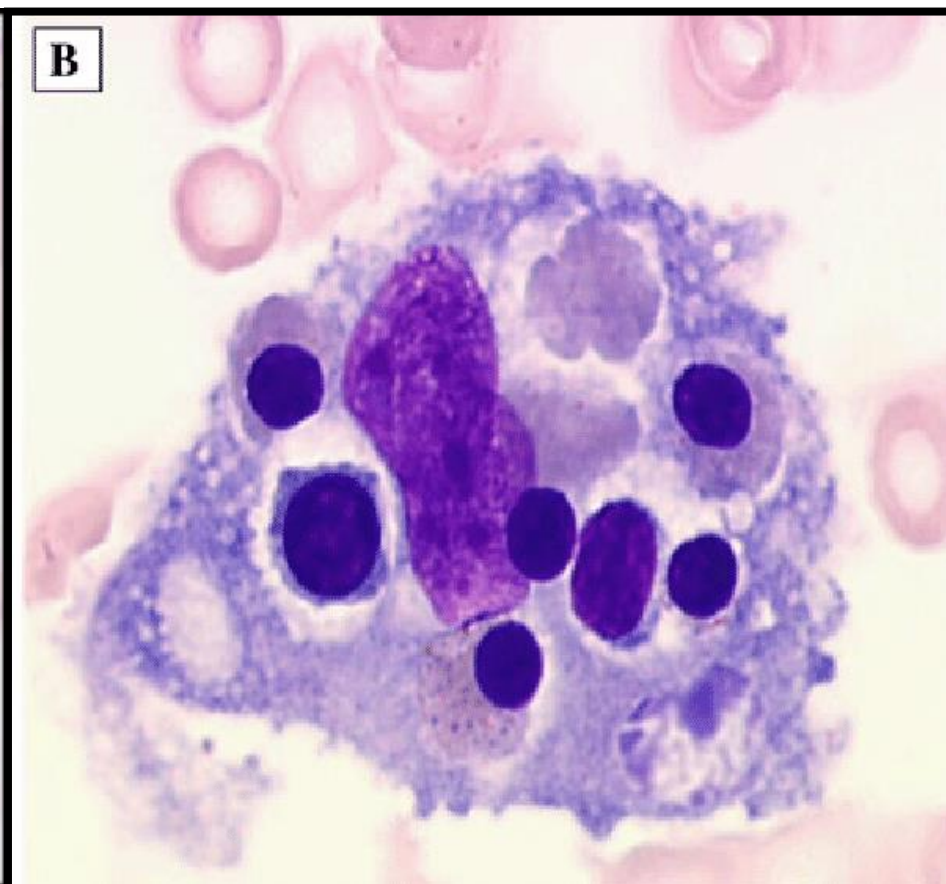
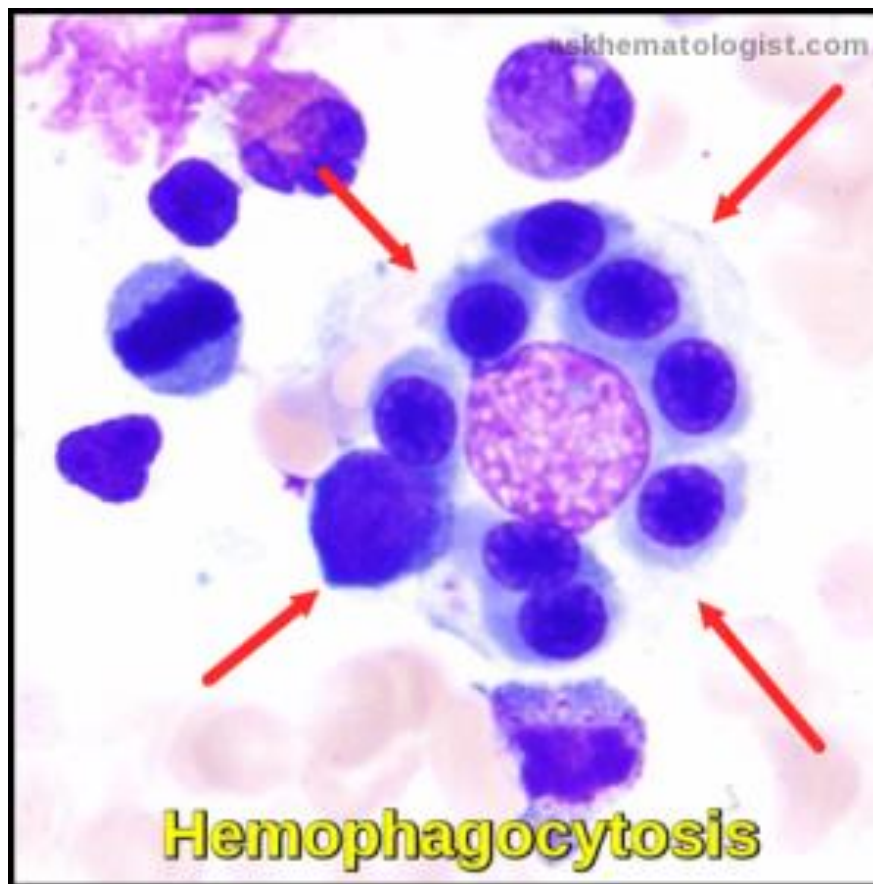
➤ **Primary HLH(Genetic):**

Inherited defects in several genes that regulate the function of immune cells (immunodeficiency, familial)

➤ **Secondary HLH:**

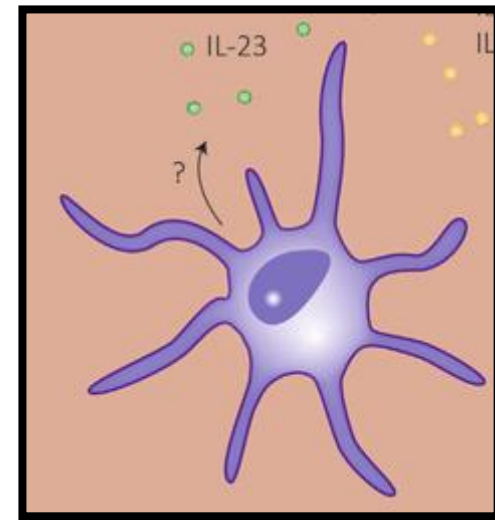
Reactivation in response to infection, inflammation or malignancy

EBV, COVID19, MAS,Lymphoma



Langerhans cell histiocytosis

- Langerhans cells are specialized dendritic cells found predominantly in the skin.
- Derived from bone marrow monocytes
- Present antigen to naïve T cells B.

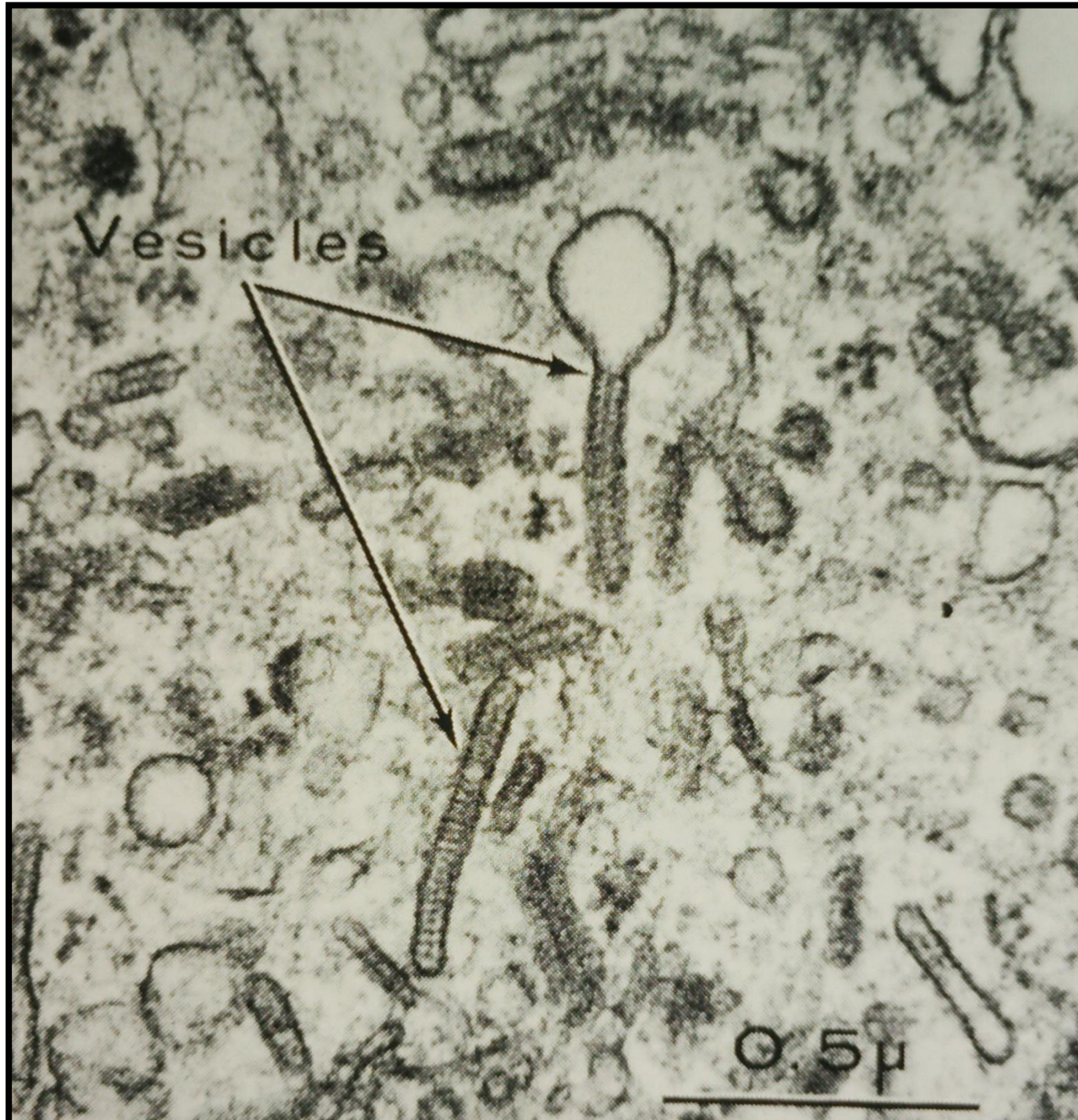


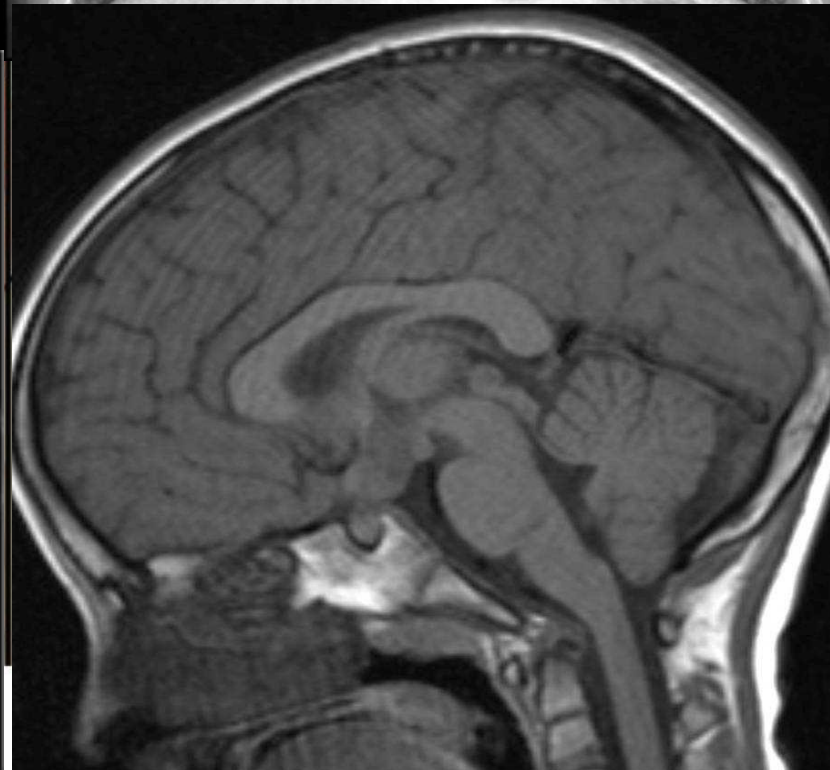
Langerhans cell histiocytosis

- LCH is a neoplastic proliferation of **Langerhans cells**.
- characteristic **Birbeck granules** (tennis racket) on electron microscopy.
- **Multisystem involvement**: bone (Lytic lesions), BM, liver, spleen, skin & pituitary gland.
- IPT: **CD1a +ve** , **S-100 +ve**

Vesicles

0.5 μ







LYMPHOID ORGANS

CENTRAL

PERIPHERAL

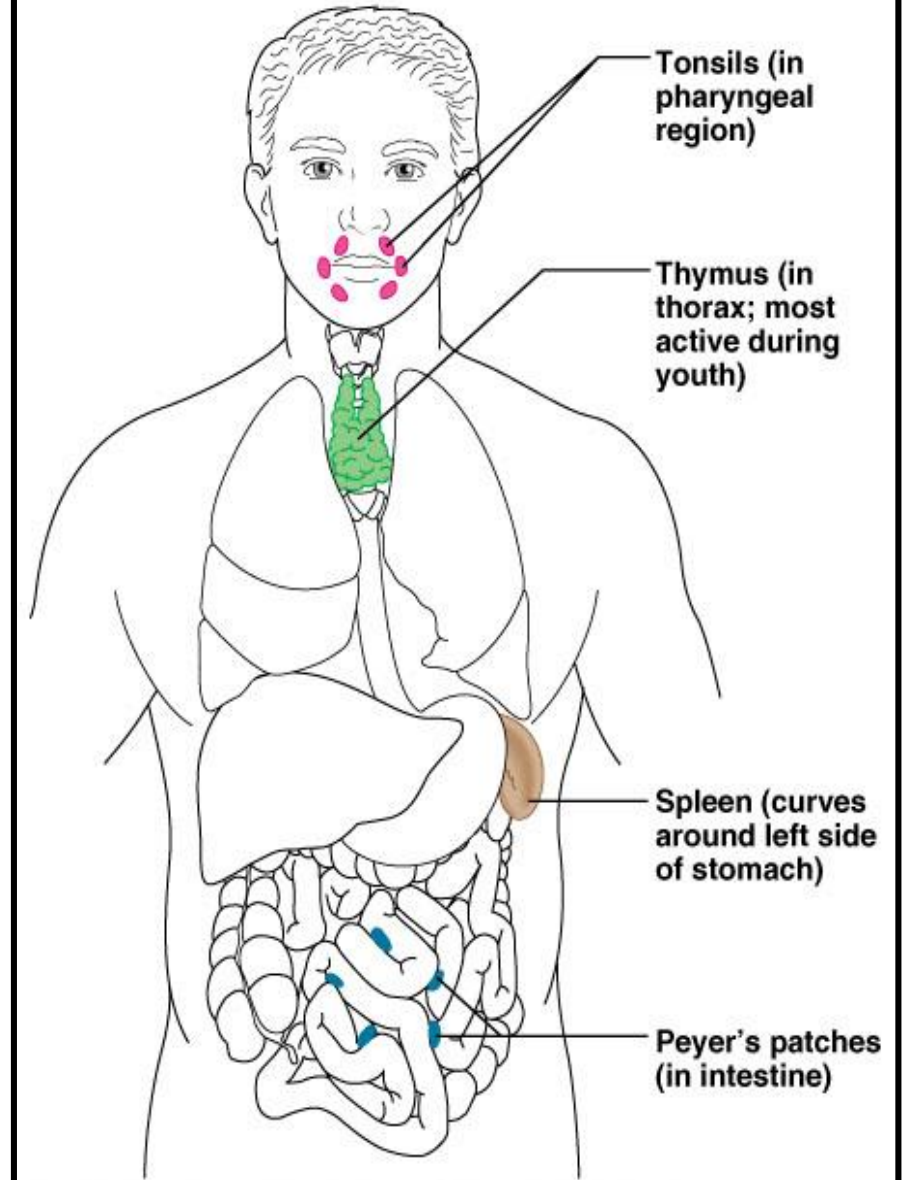
BM

Thymus

Spleen

LN

MALT



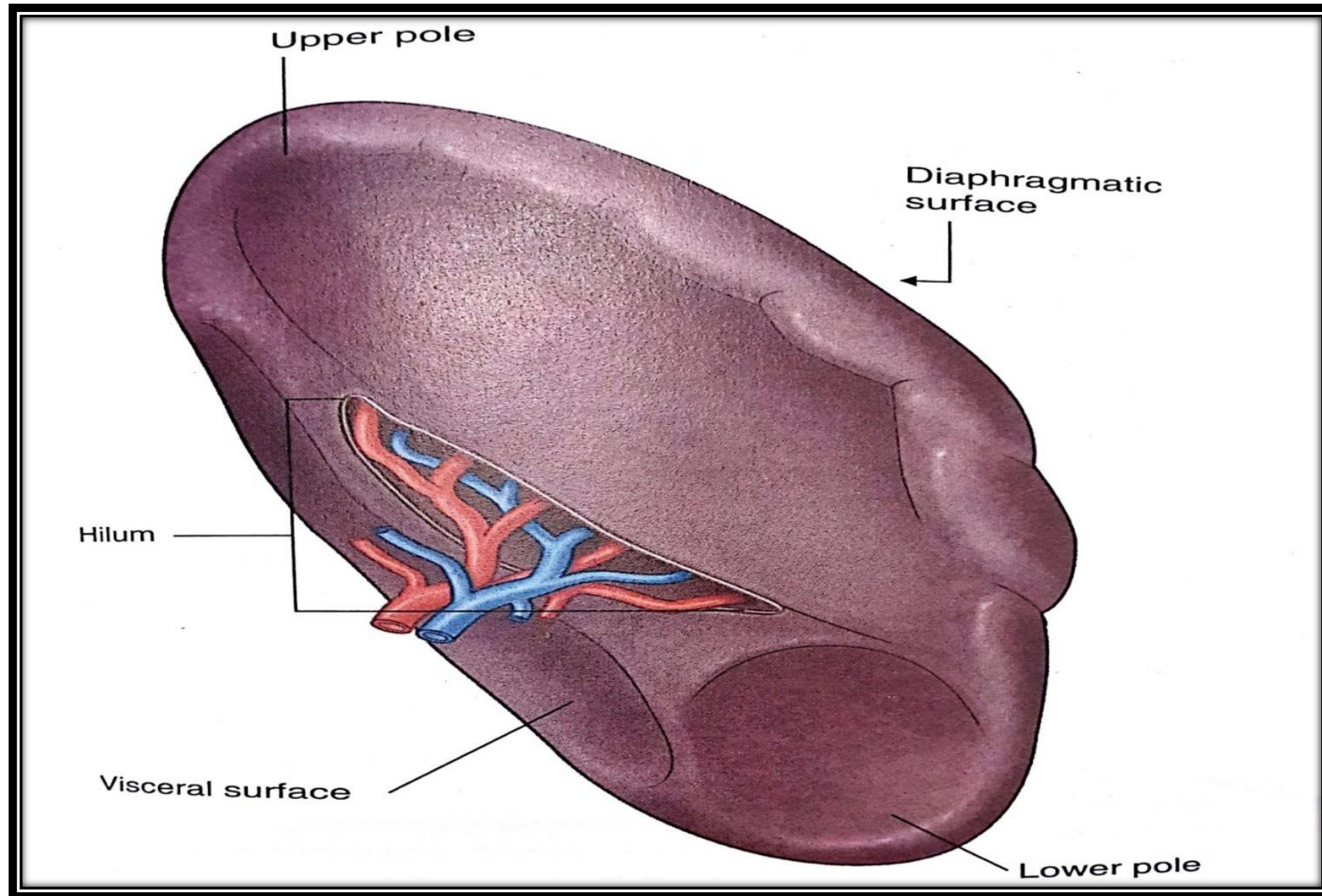
Anatomy of lymphatic system

✓ Spleen

✓ Thymus

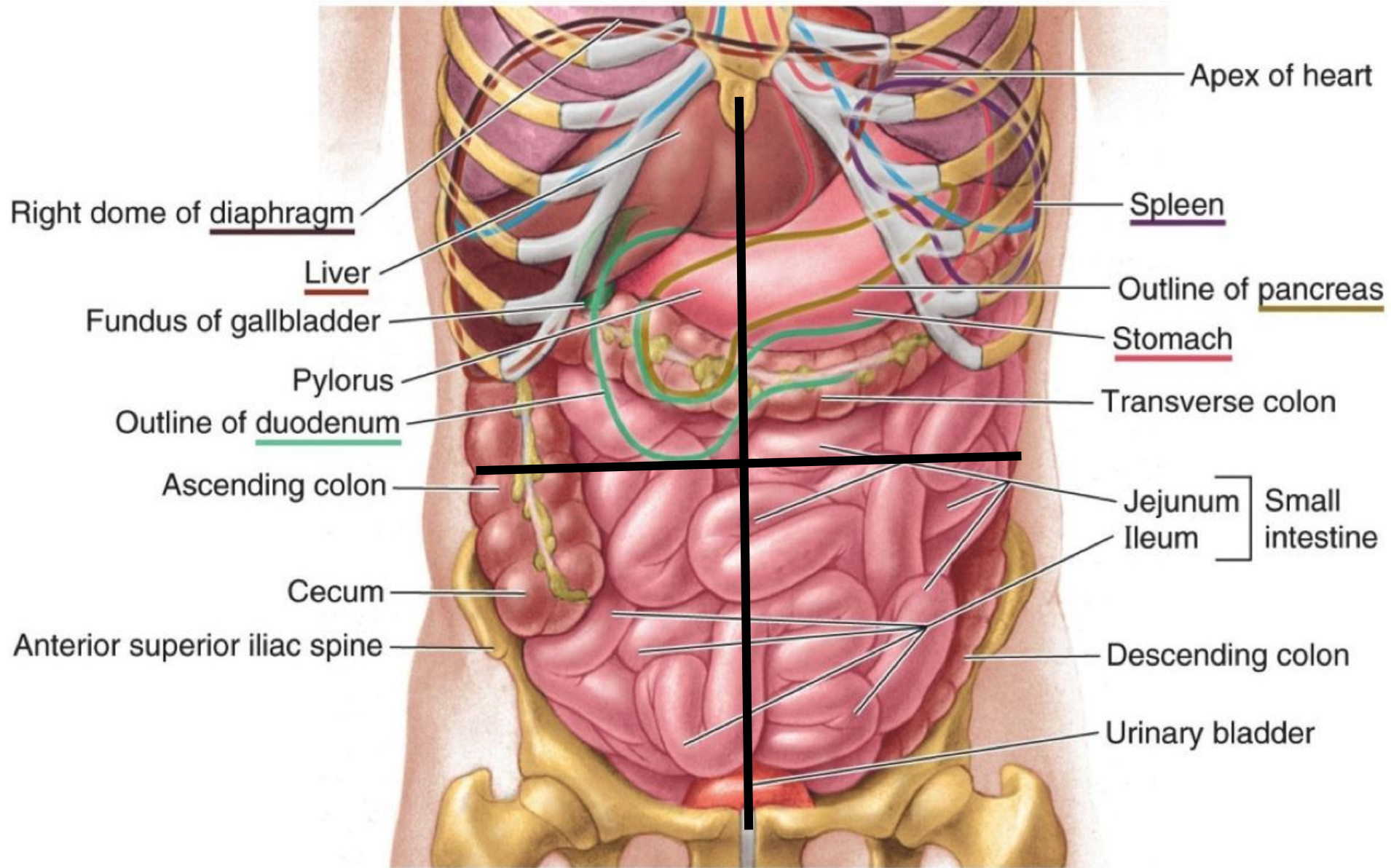
✓ Main duct

✓ LN



INTRODUCTION

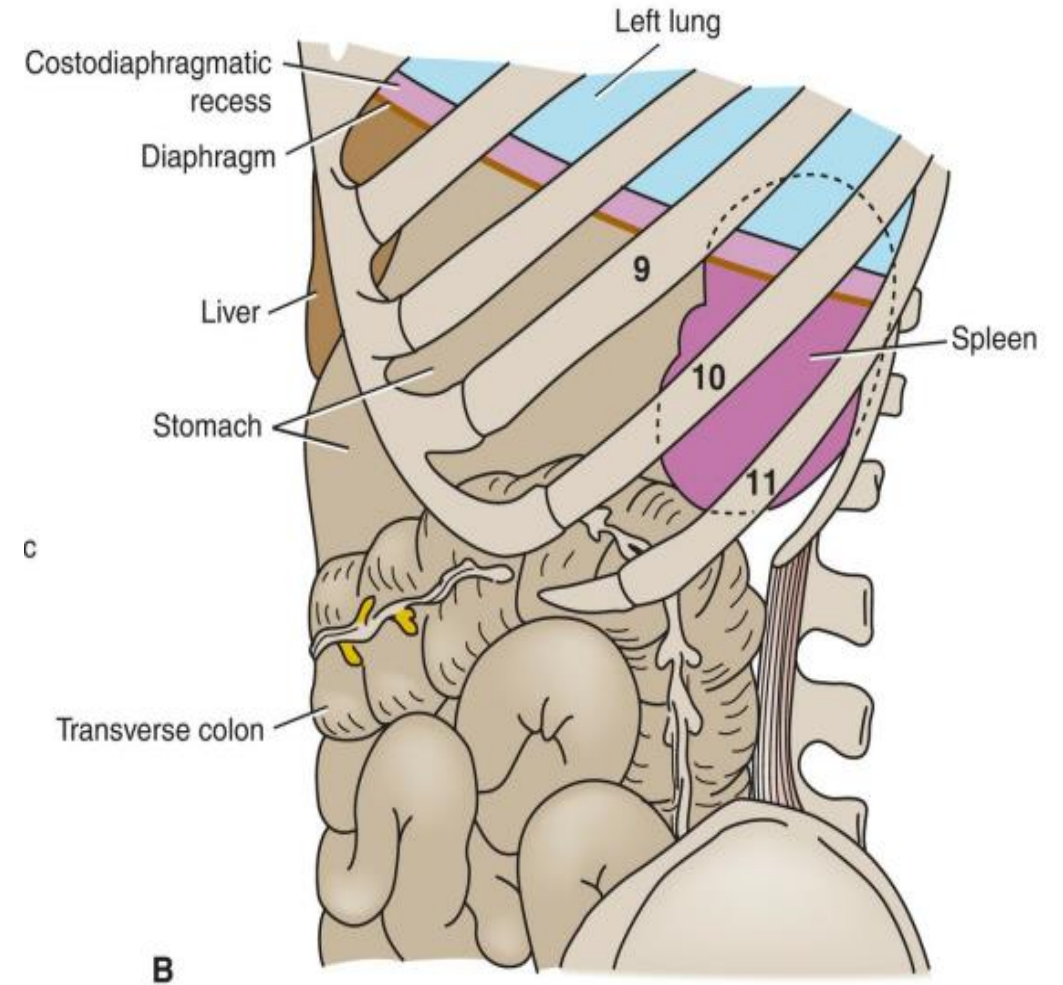
- The spleen is the largest single mass of lymphoid tissue in the body.
- Spleen =(Greek> splen) = (Latin >Lien)
- Oval shaped organ.
- The spleen is soft , highly vascular organ.



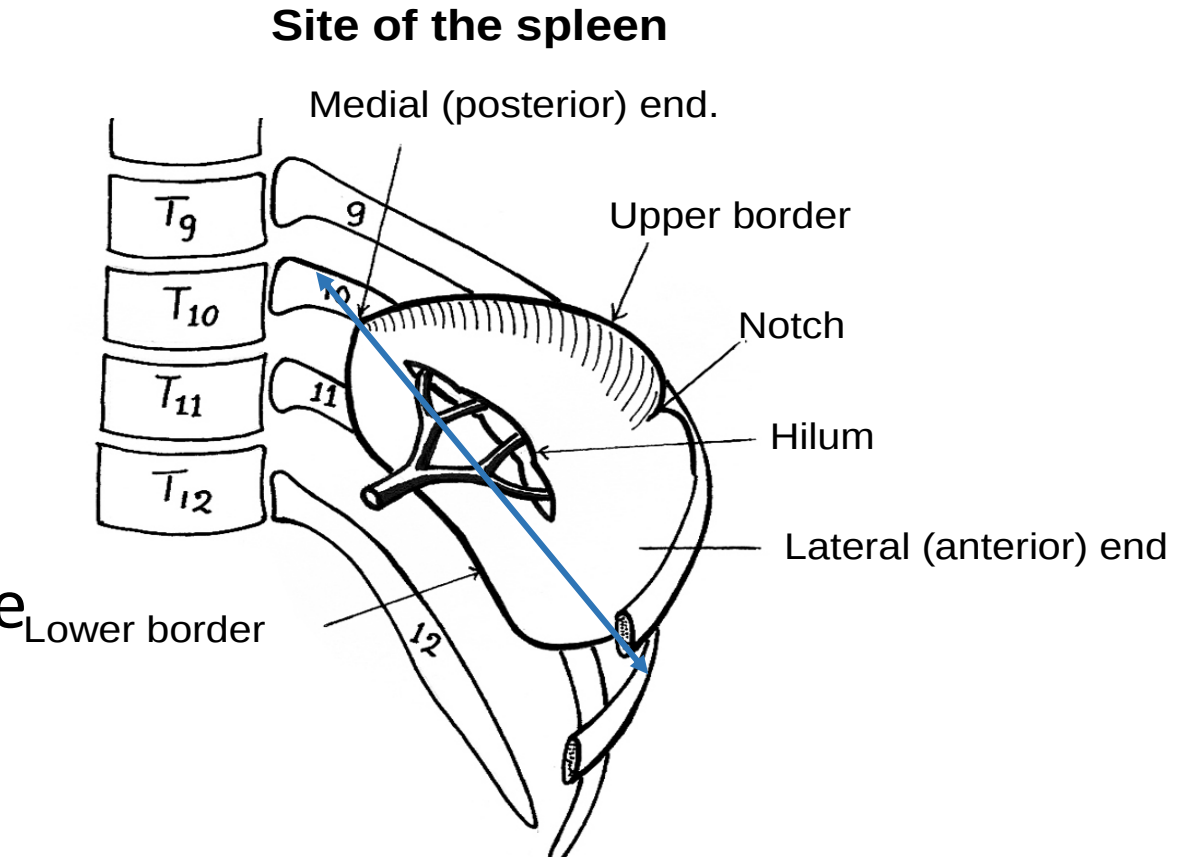
(A) Anterior view

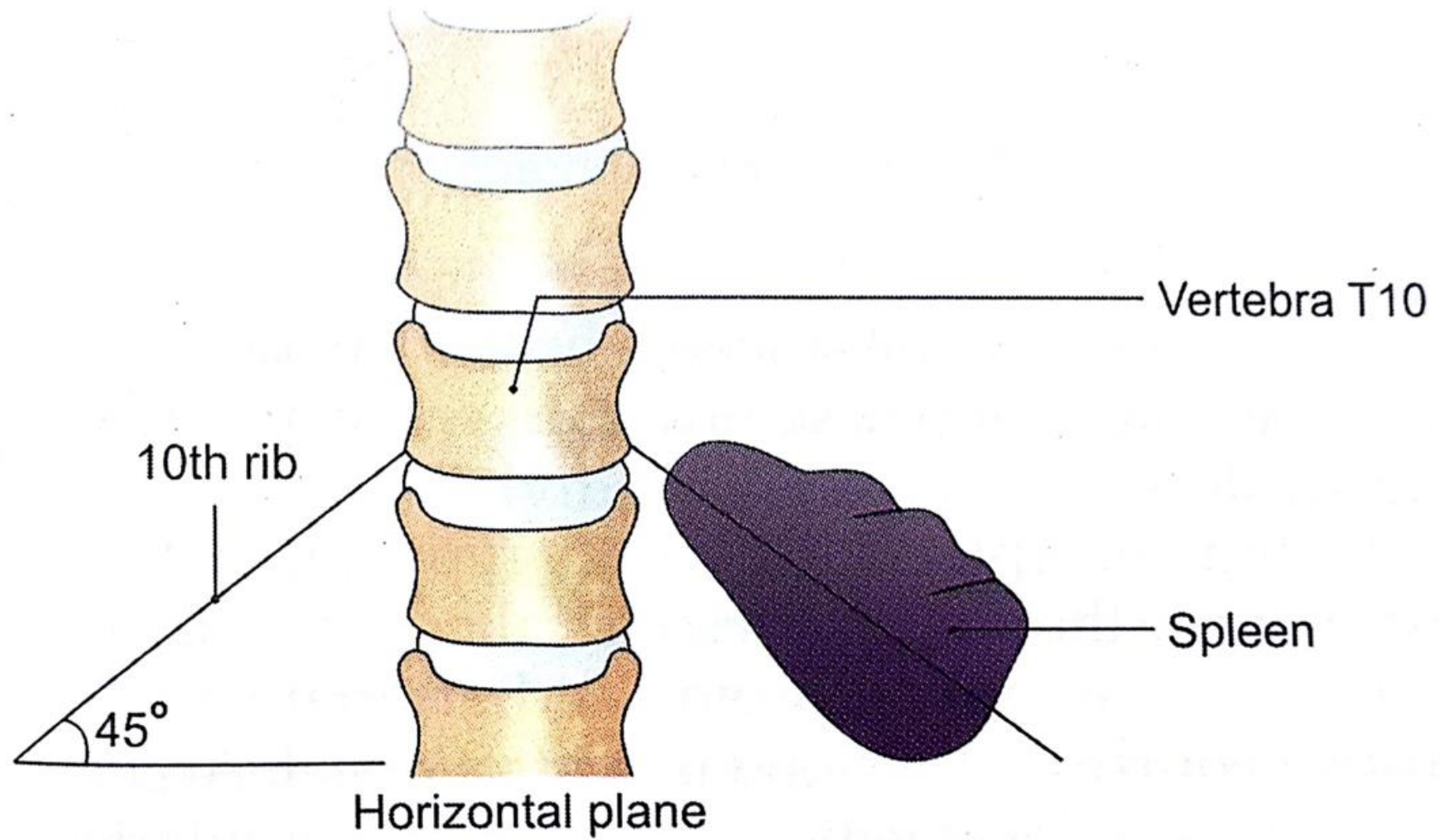
LOCATION

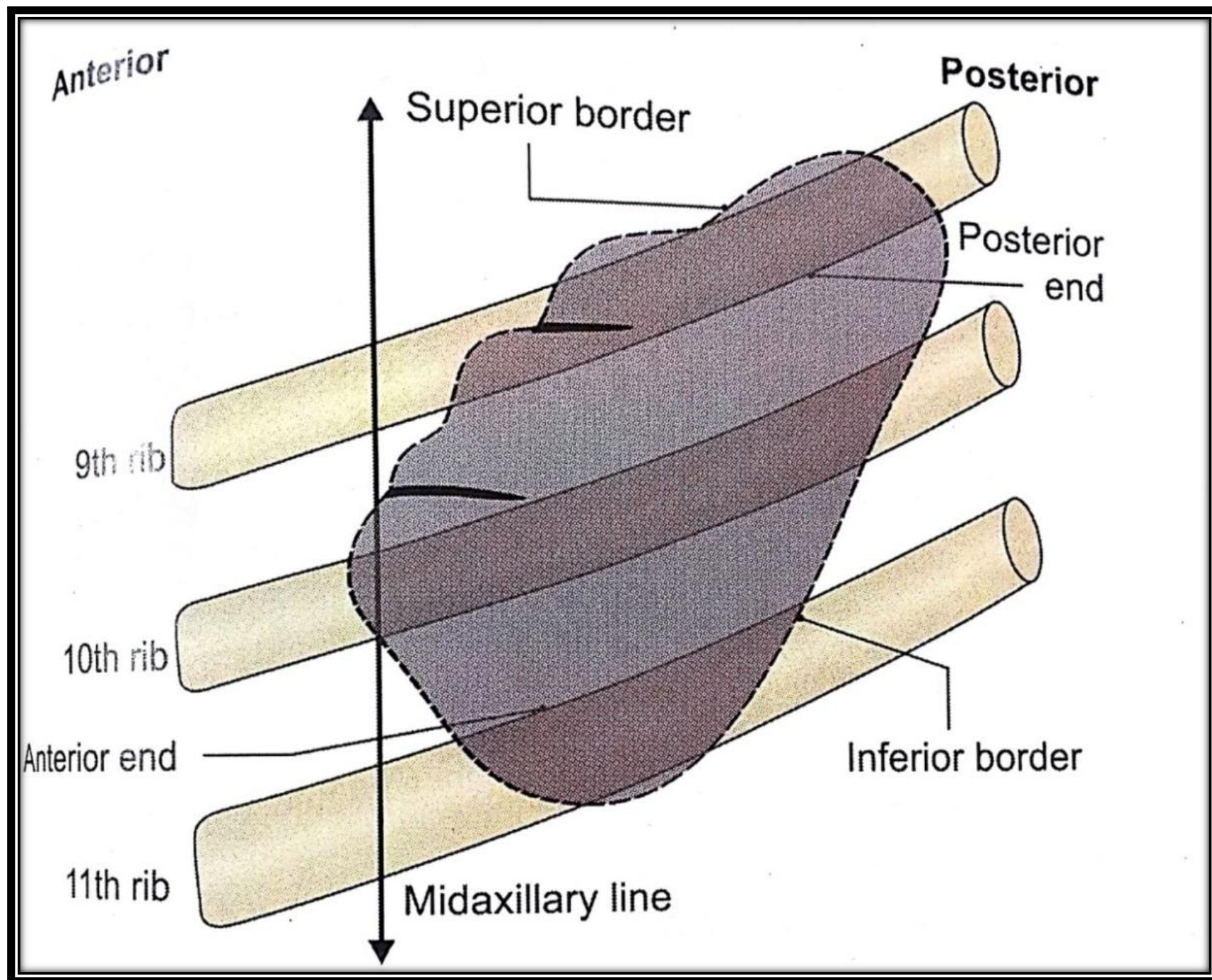
- **The Spleen is a wedge-shaped organ lying mainly in the left hypochondrium**
- **The spleen lies against the diaphragm, in the area of rib 9th, to rib 10th.**



- The spleen lies obliquely along the long axis of the 10th rib.
- Thus it is directed downwards, forward and laterally, making an angle of about 45 degrees with the horizontal plane.





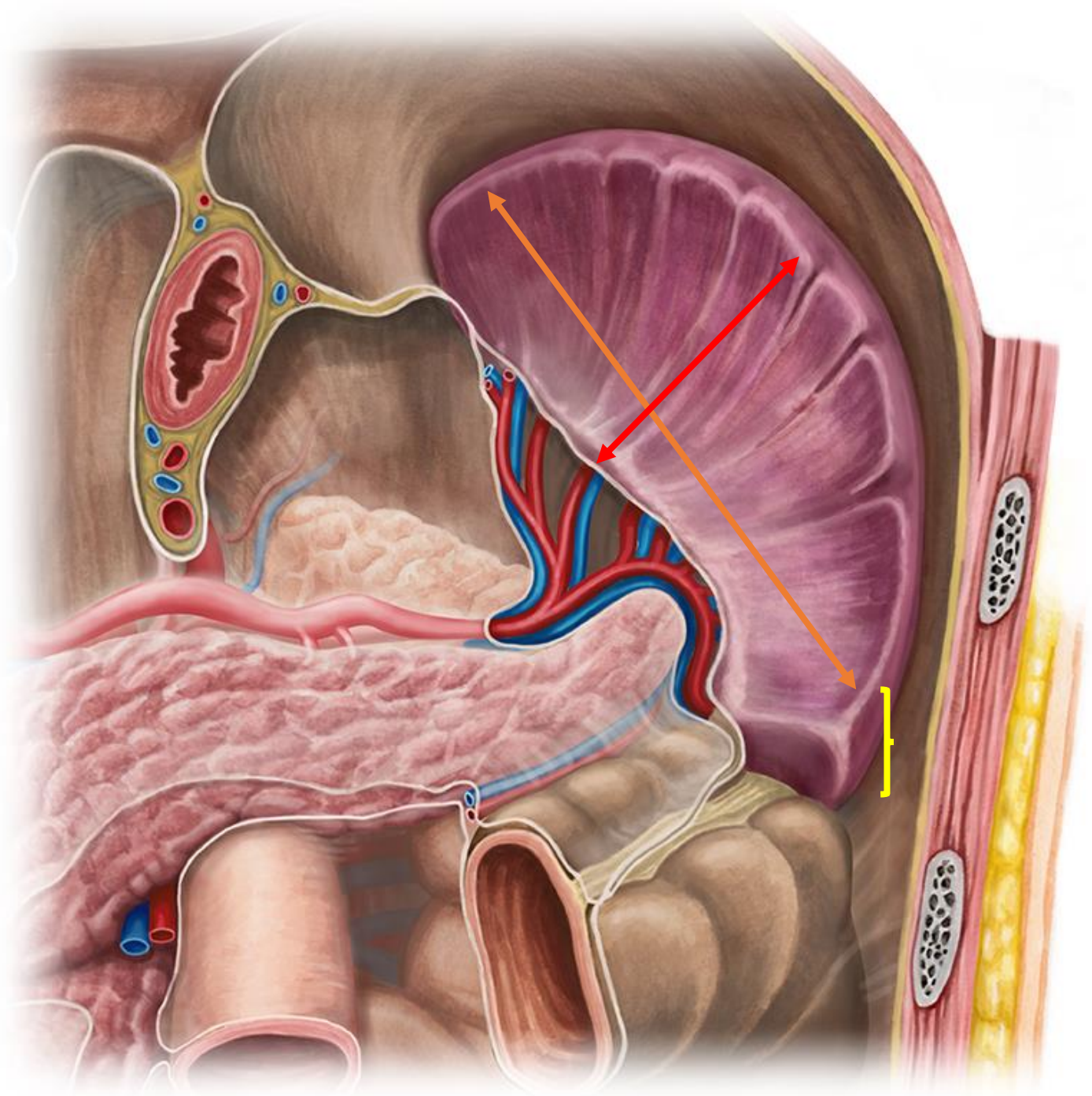


Measurements

- Thickness >> **1** inch
- Breadth >> **3** inch
- Length >> **5** inch

- Weight >> 150-200gm (**7** ounces)

- **9th -11th** ribs

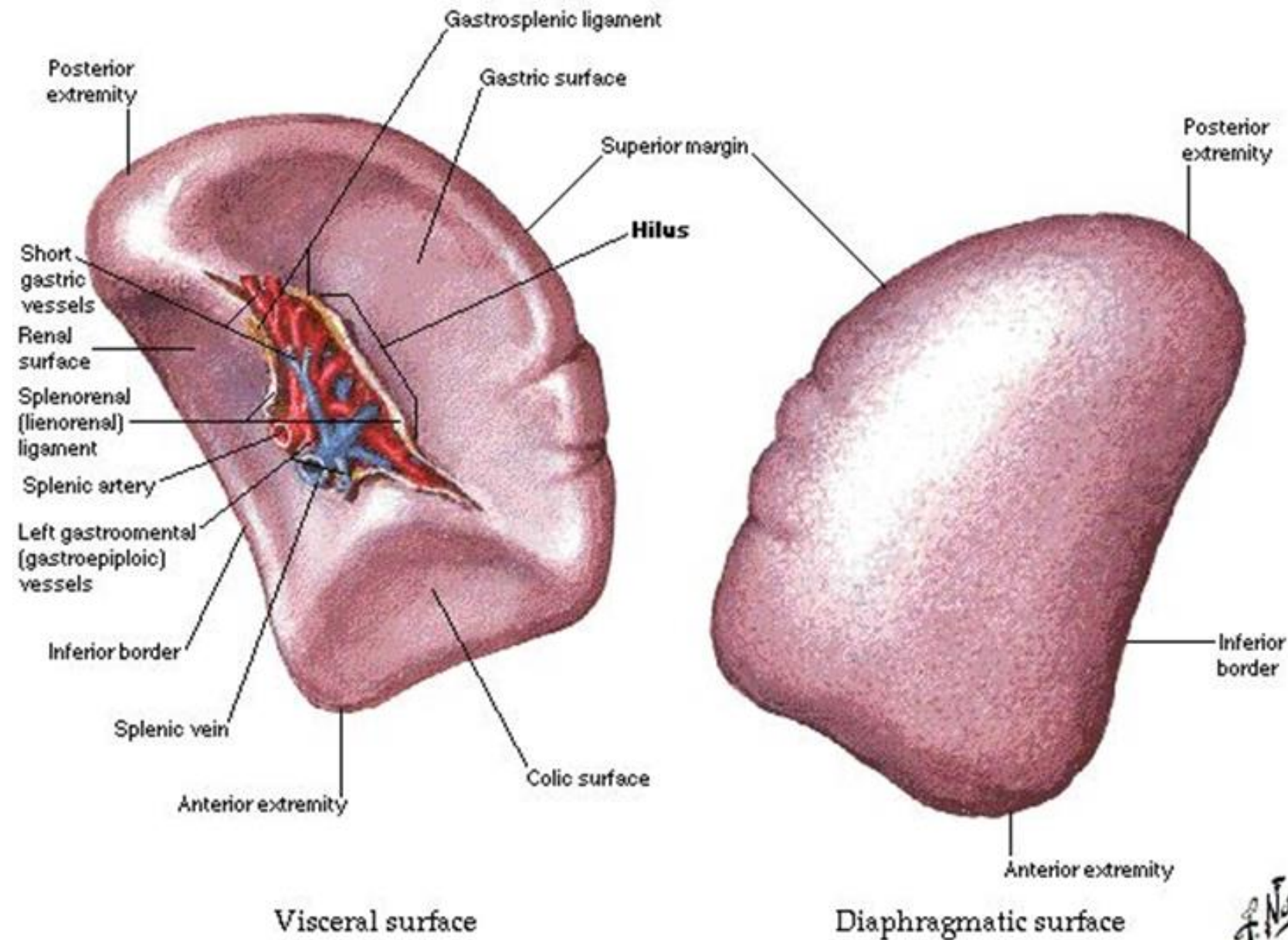


EXTERNAL FEATURES

- Two surfaces.
- The spleen has two ends
- Three borders

Spleen

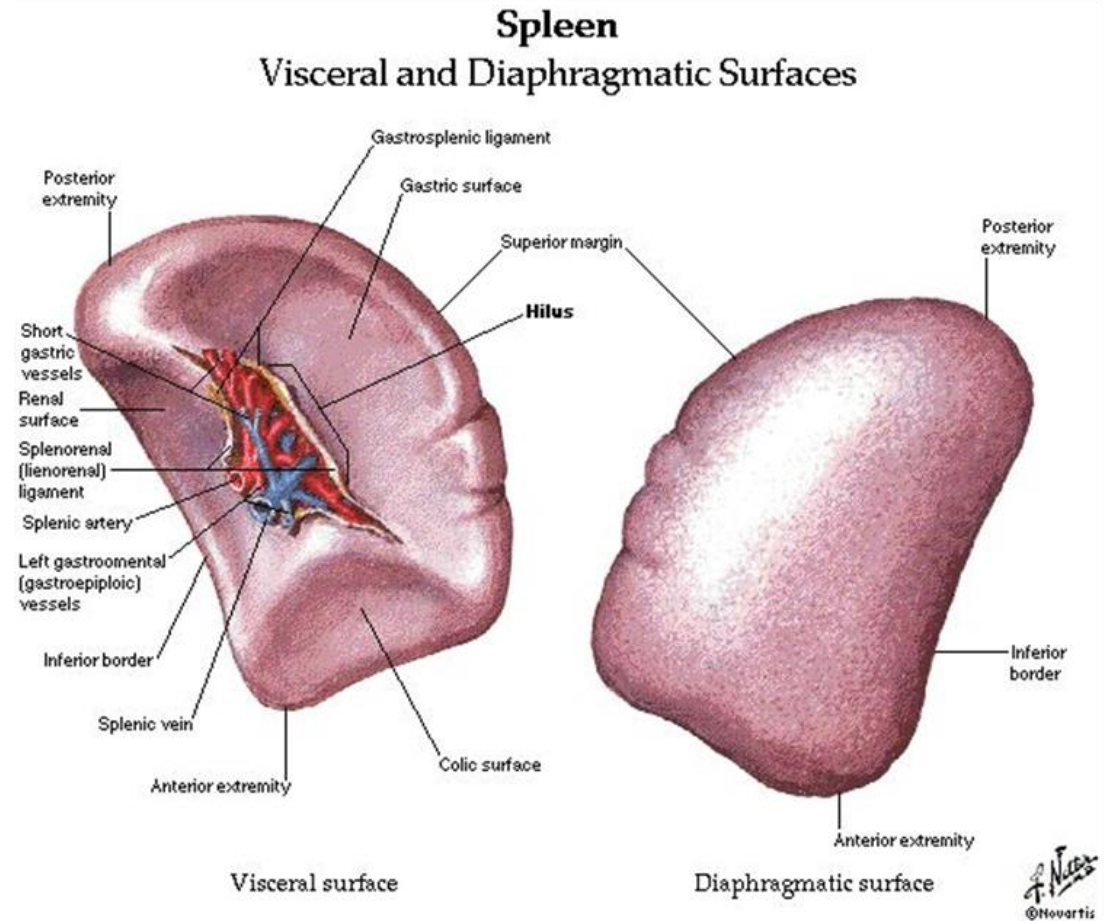
Visceral and Diaphragmatic Surfaces



2 surfaces

1.The diaphragmatic surface is convex and smooth.

2.The visceral surface is concave and irregular.



TWO ENDS

1 -The **anterior or lateral end**

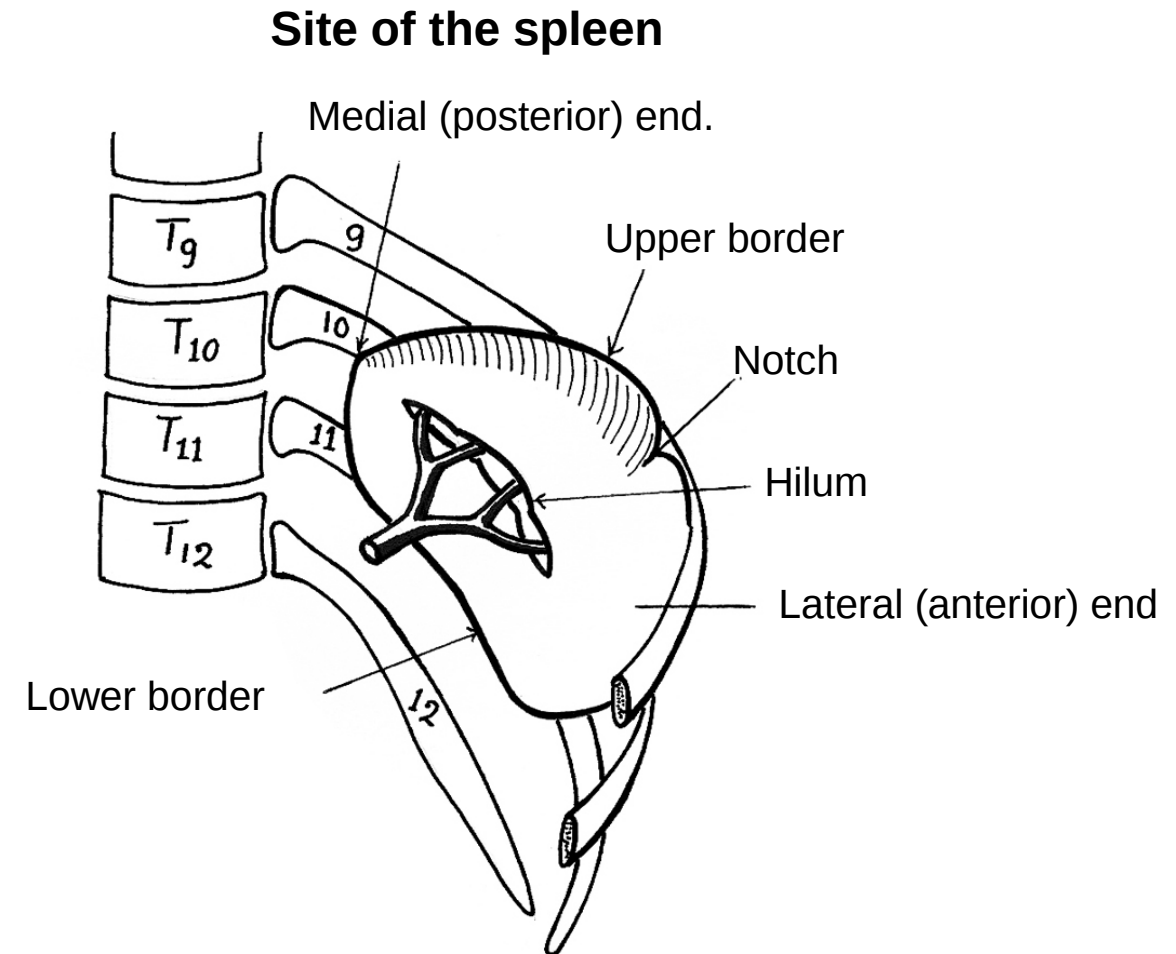
is expanded and is **broad**.

It is **directed downwards and forwards**, and reaches the midaxillary line.

2-The **posterior or medial end**.

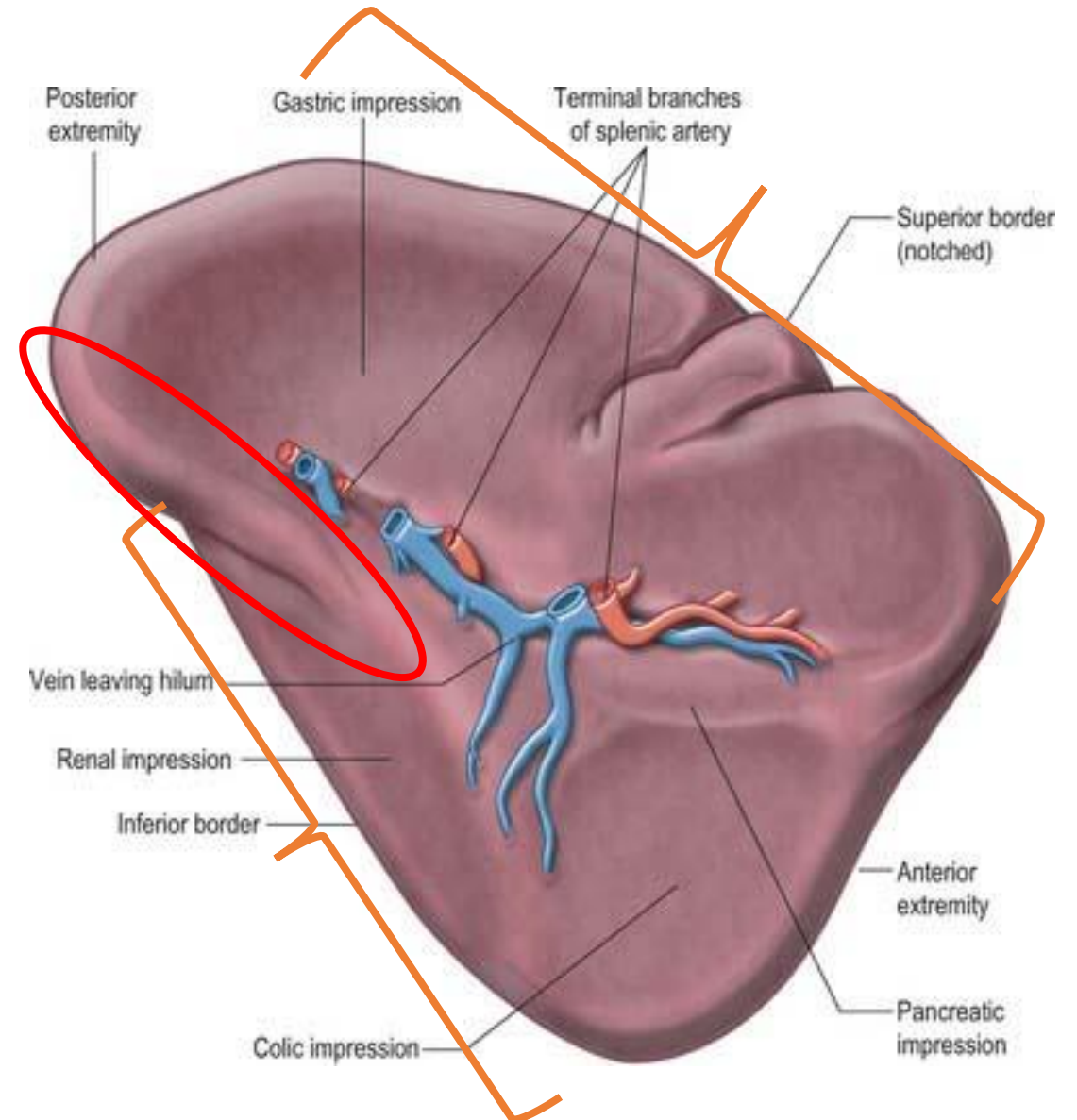
Tapering end

directed **upwards, backwards and medially**.



Three borders

- 1-The superior border is characteristically notched near the anterior end.
- 2-The inferior border is rounded.
- 3-The intermediate border is also rounded .



Liver

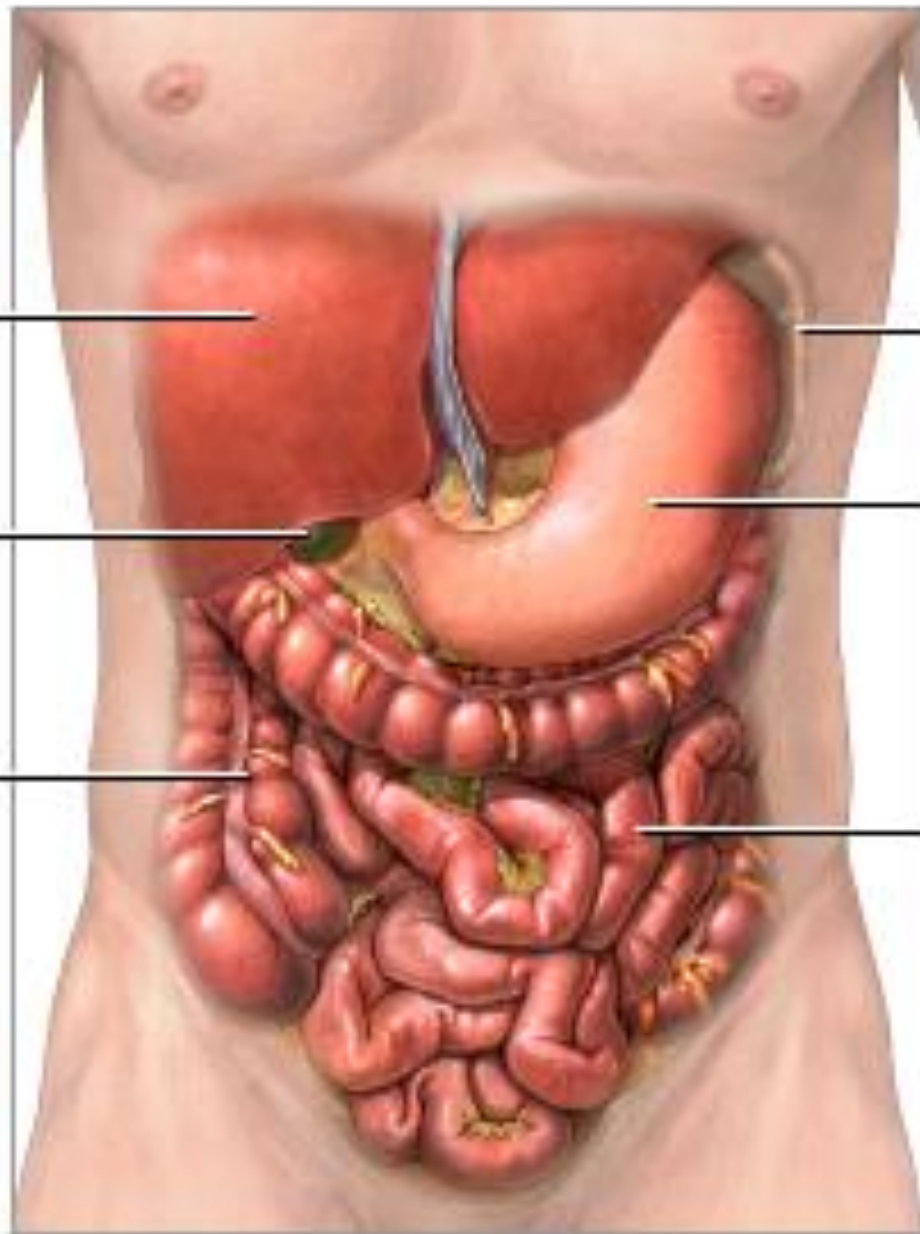
Gallbladder

Large
Intestine

Spleen

Stomach

Small
intestine



IMPRESSIONS ON VISCERAL SURFACE

- Gastric impression
- Renal impression
- Colic impression
- Pancreatic impression (Tail)

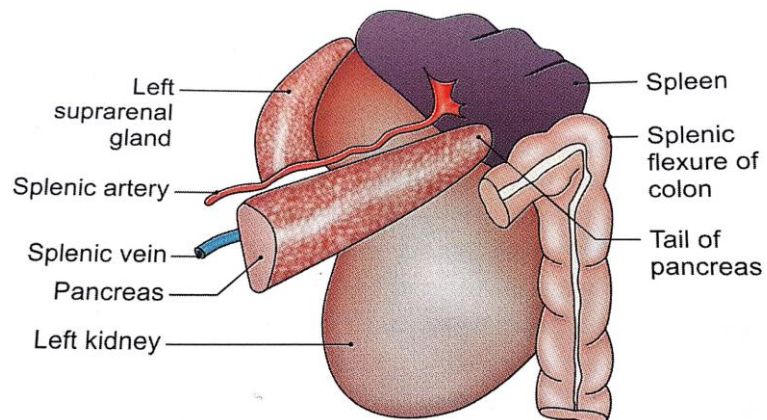
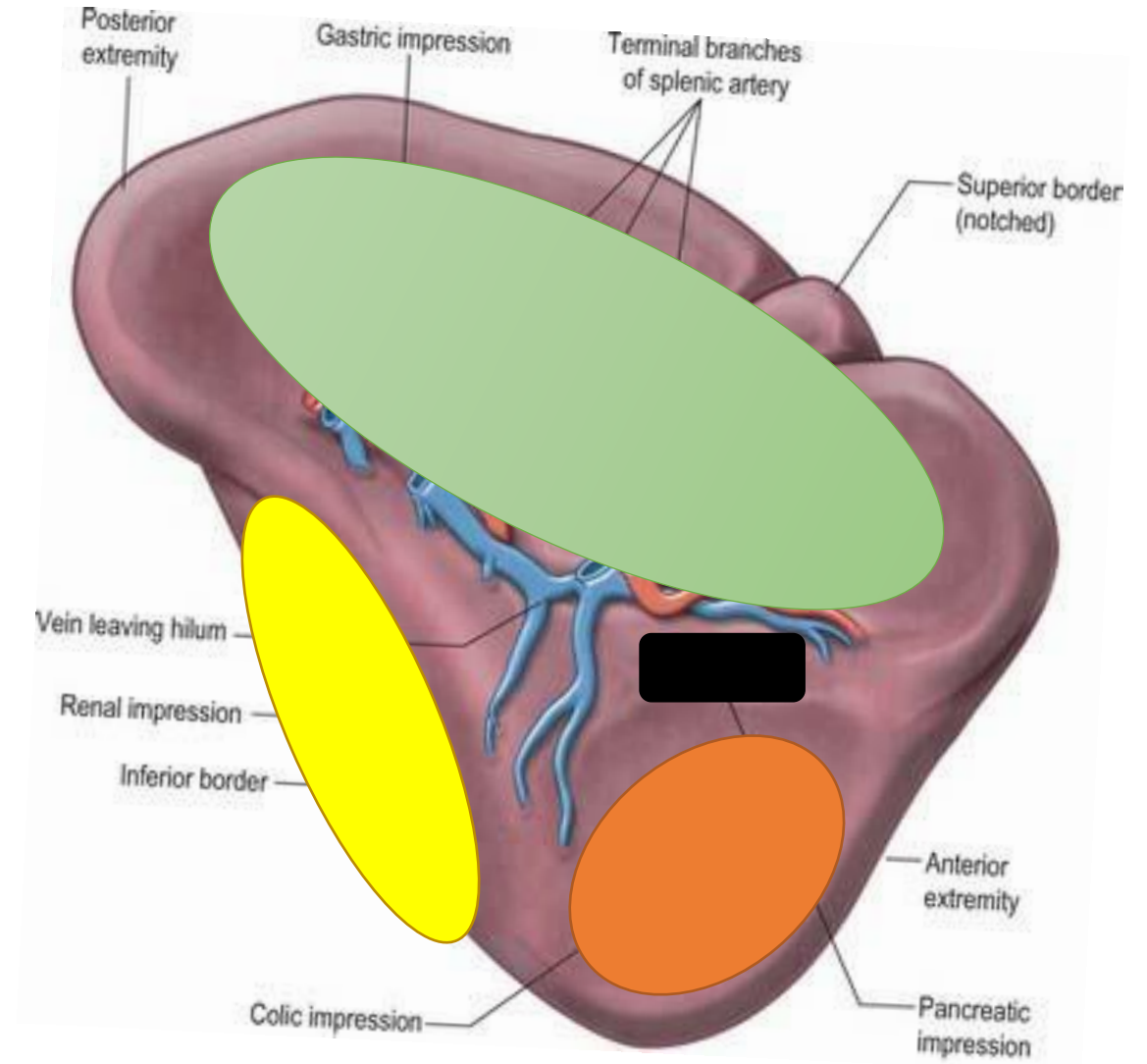
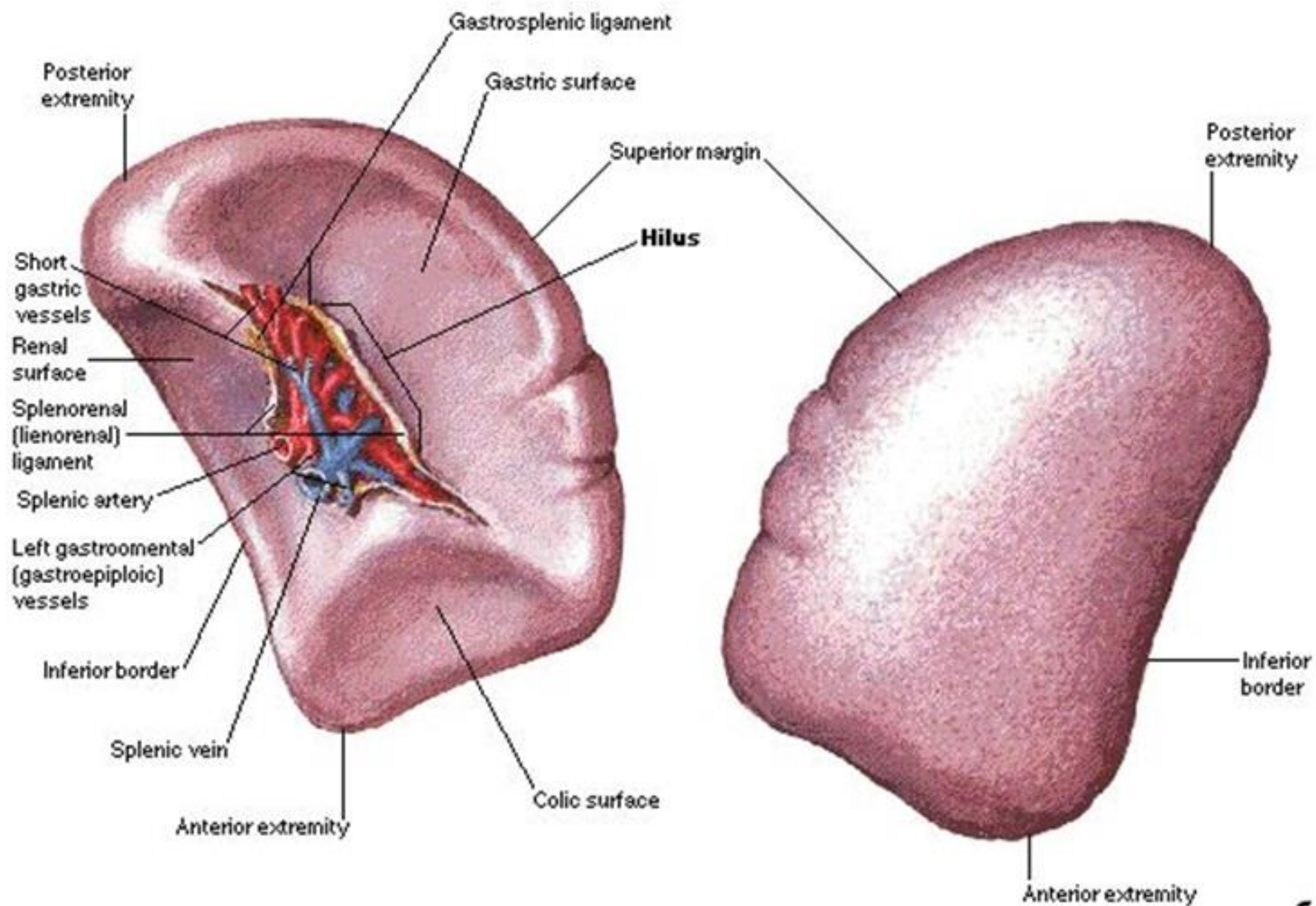


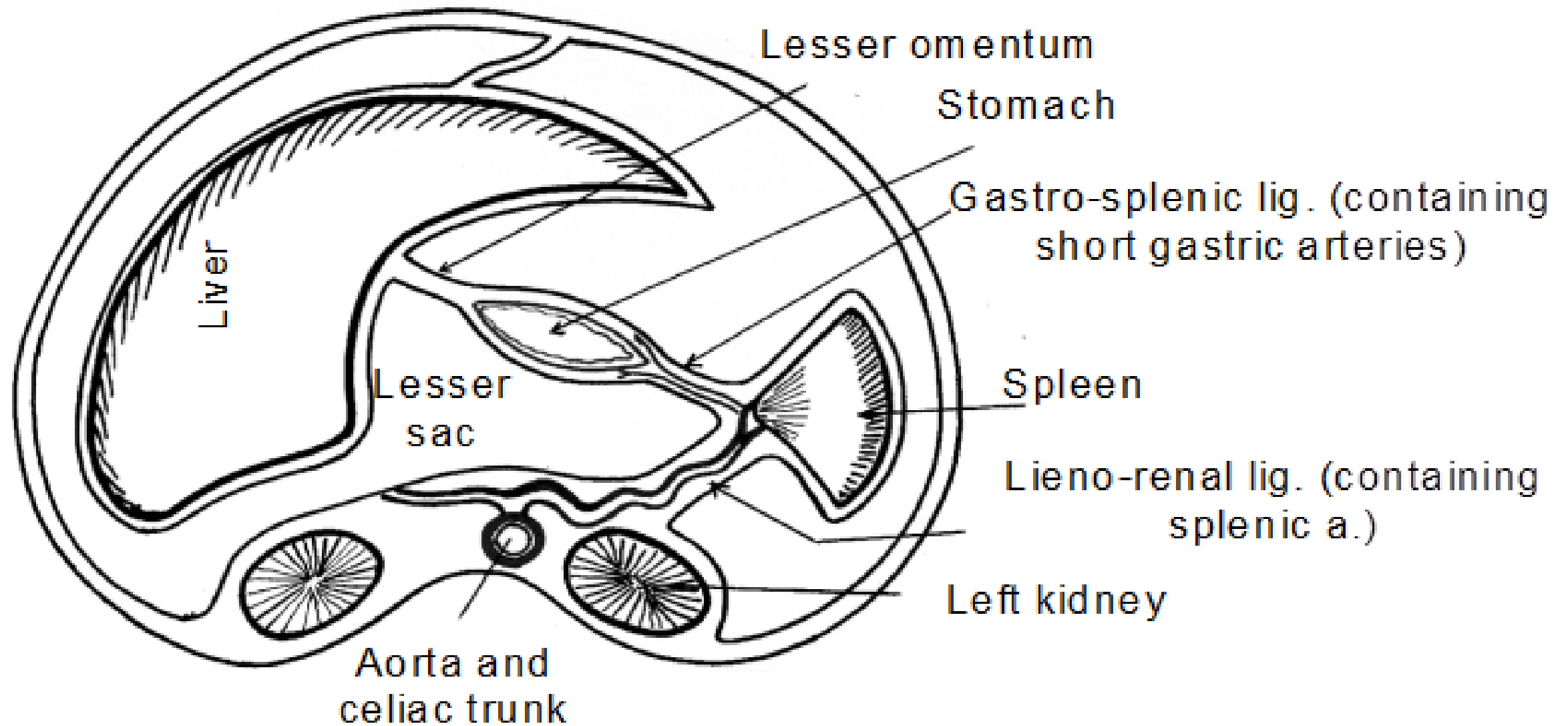
Fig. 23.5: Visceral relations of the spleen

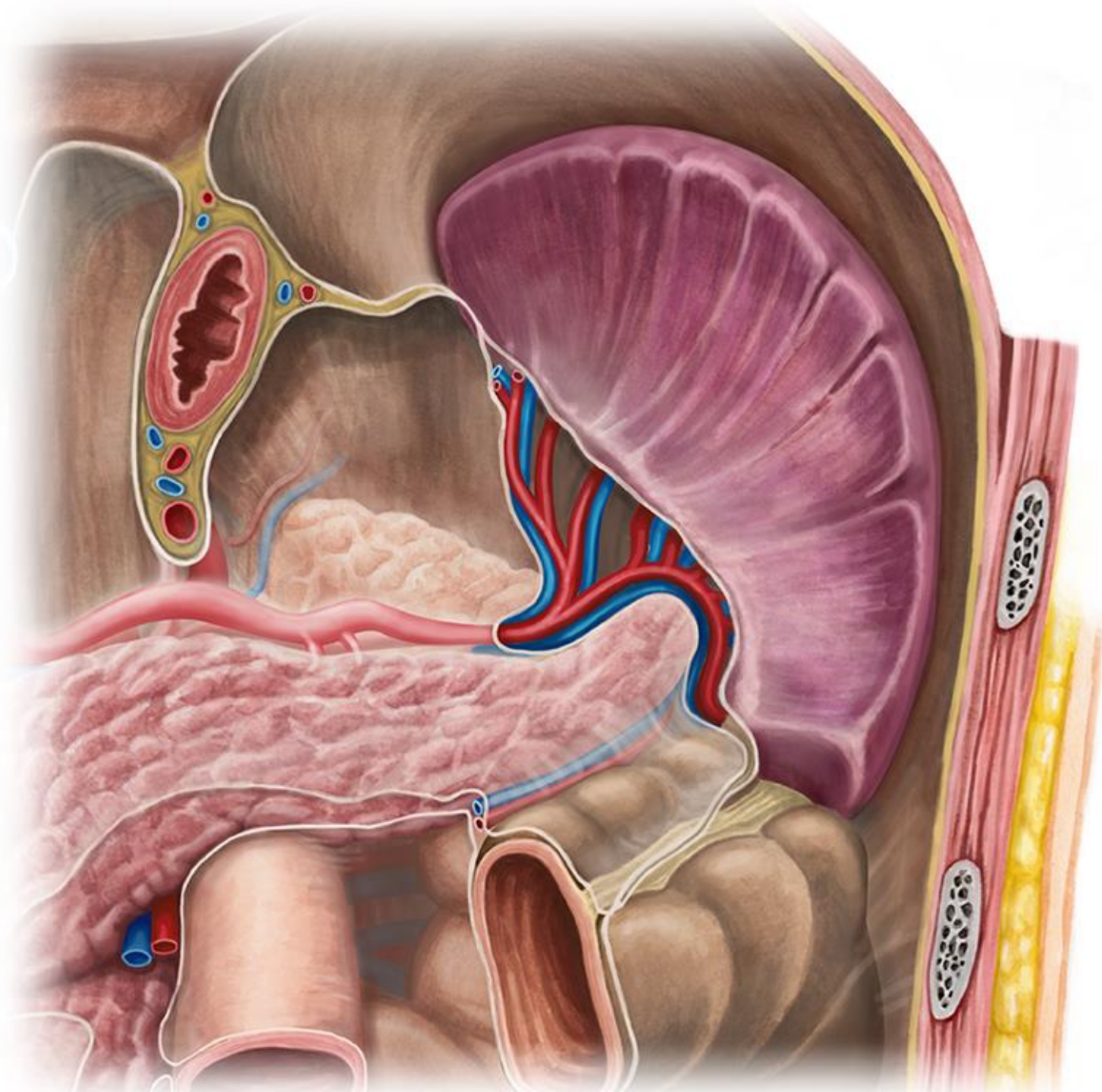


Visceral and Diaphragmatic Surfaces



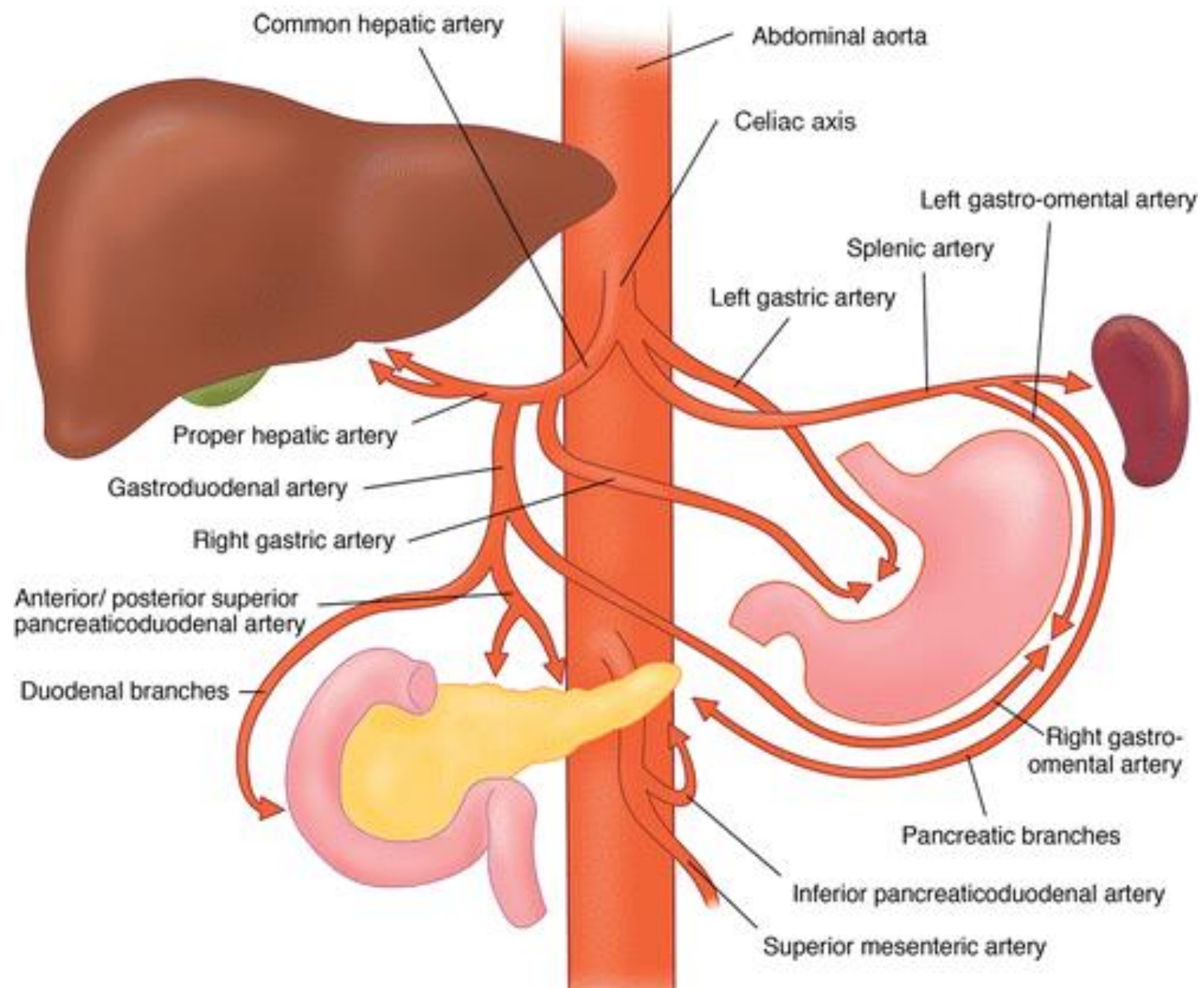
Transverse section showing ligaments of the spleen *

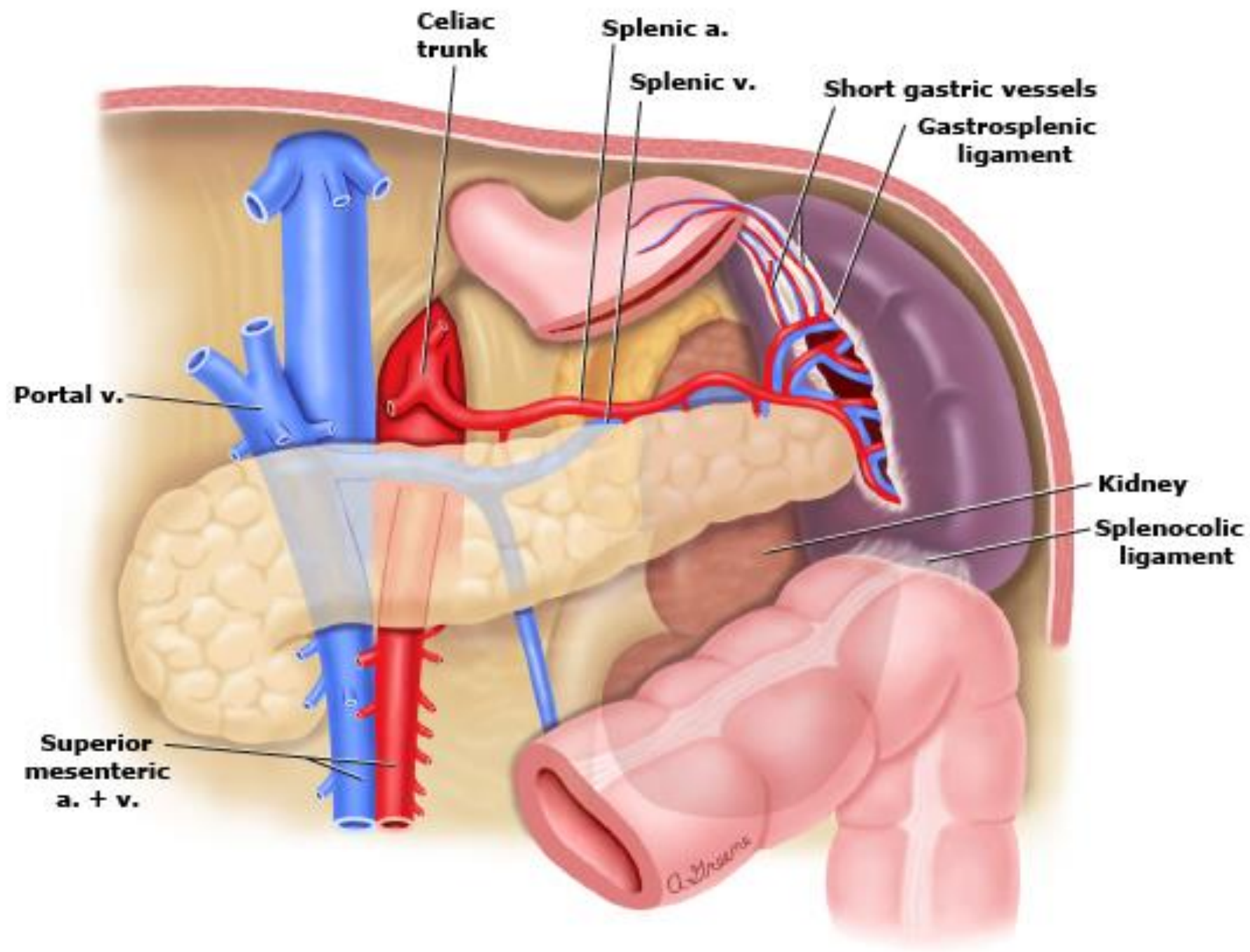




Peritoneal relations

- The spleen surrounded by peritoneum and is suspended by following ligaments.
- **1-Gastrosplnic ligament** extends from the hilum of the spleen to the greater curvature of the stomach, contains short gastric & left gastroepiploic vessels.
- **2-Lienorenal ligament** extends from the hilum of the spleen to the anterior surface of the left kidney, contains tail of pancreas & splenic vessels..
- **3-Phrenicocolic ligament** Support the spleen. This ligament direct the enlarged spleen towards the right iliac fossa.



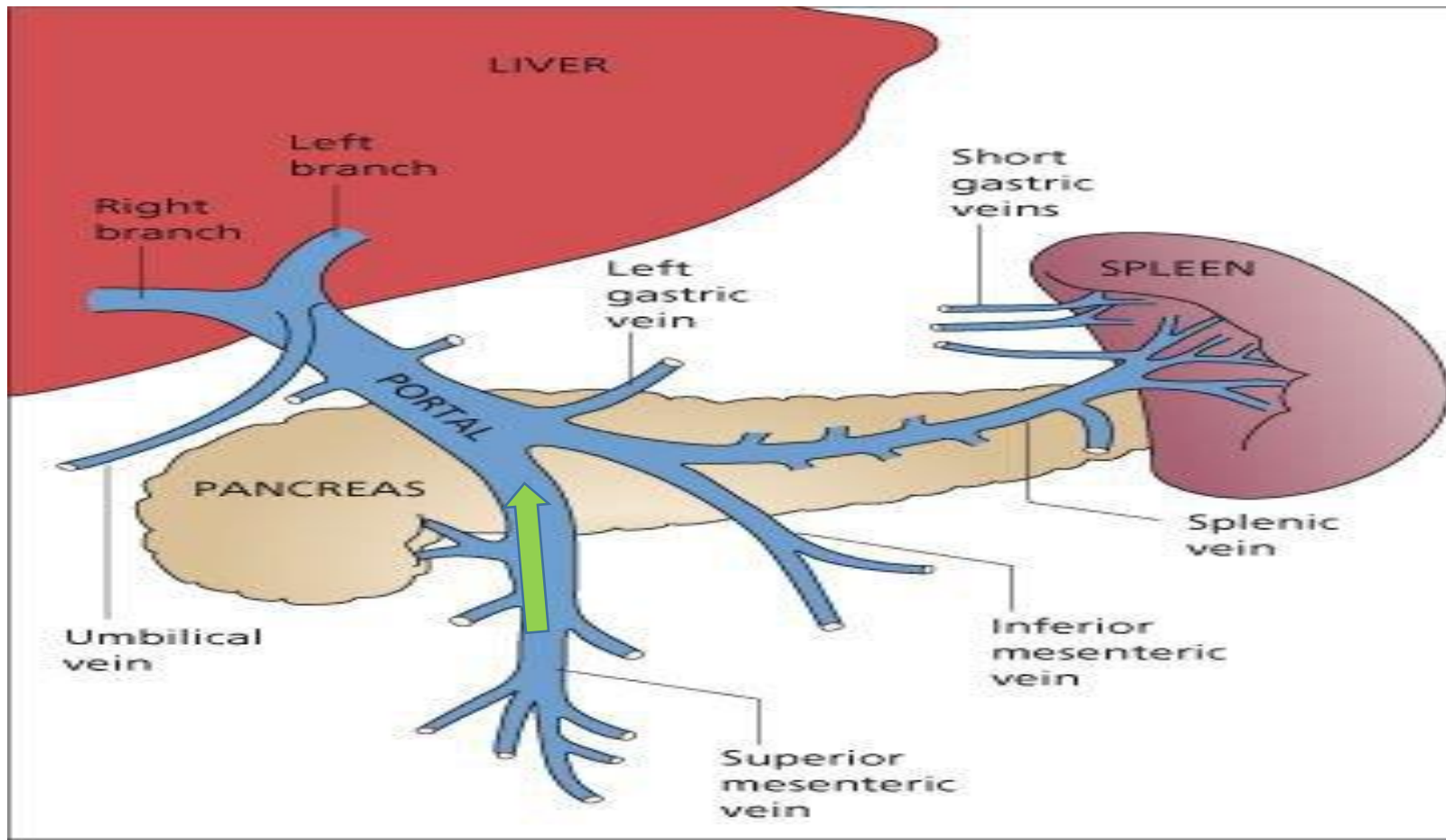


Blood supply of the spleen

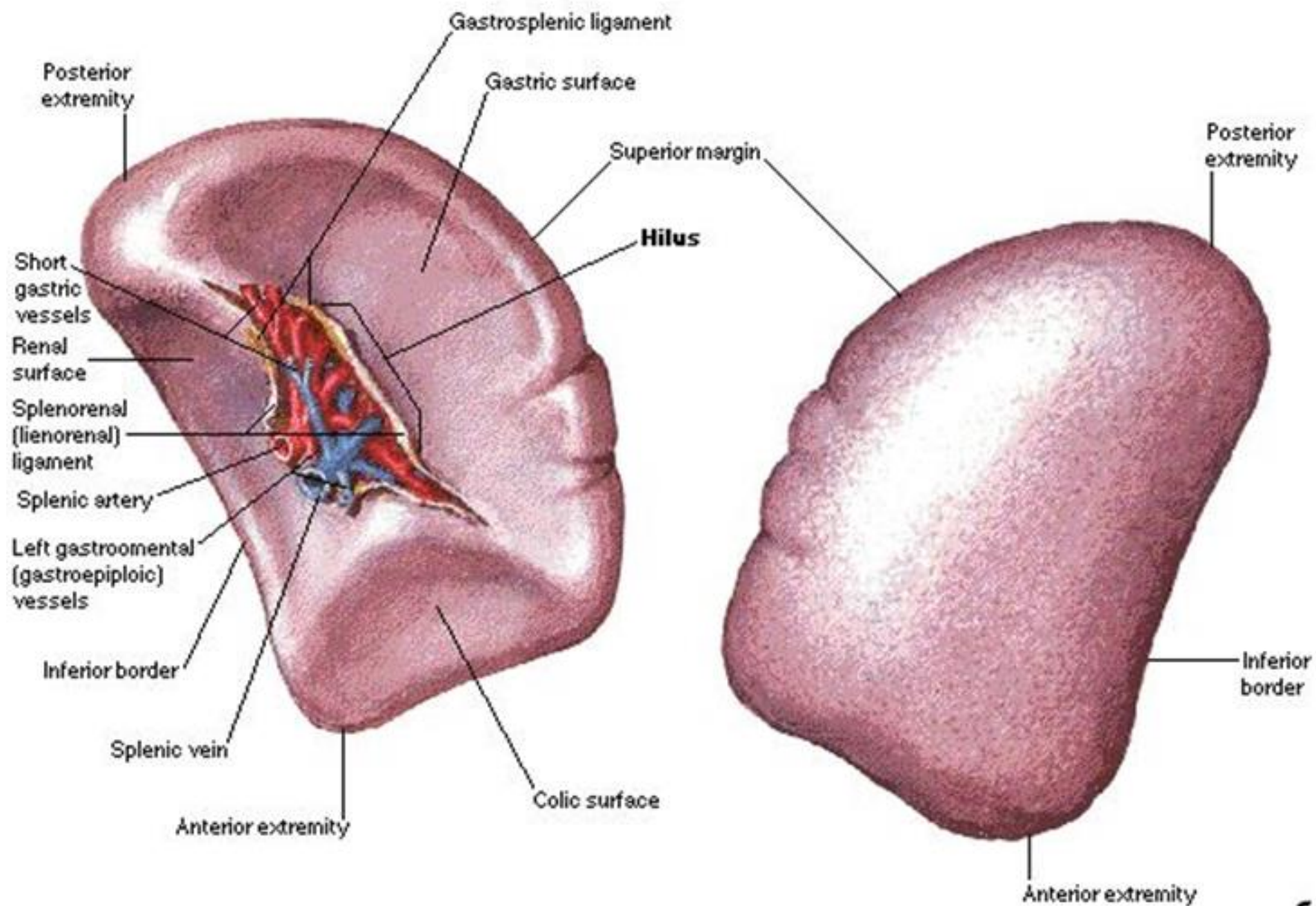
- **Splenic artery:** arises from the coeliac trunk, takes a tortuous course, runs on the upper border of pancreas.
- It travels in the splenorenal ligament and divides in to numerous branches, which enter the hilum of the spleen. As the splenic artery passes along the superior border of the pancreas
- Approaching the spleen **the splenic artery** gives off short gastric arteries, which pass through the gastrosplenic ligament to supply the fundus of the stomach.

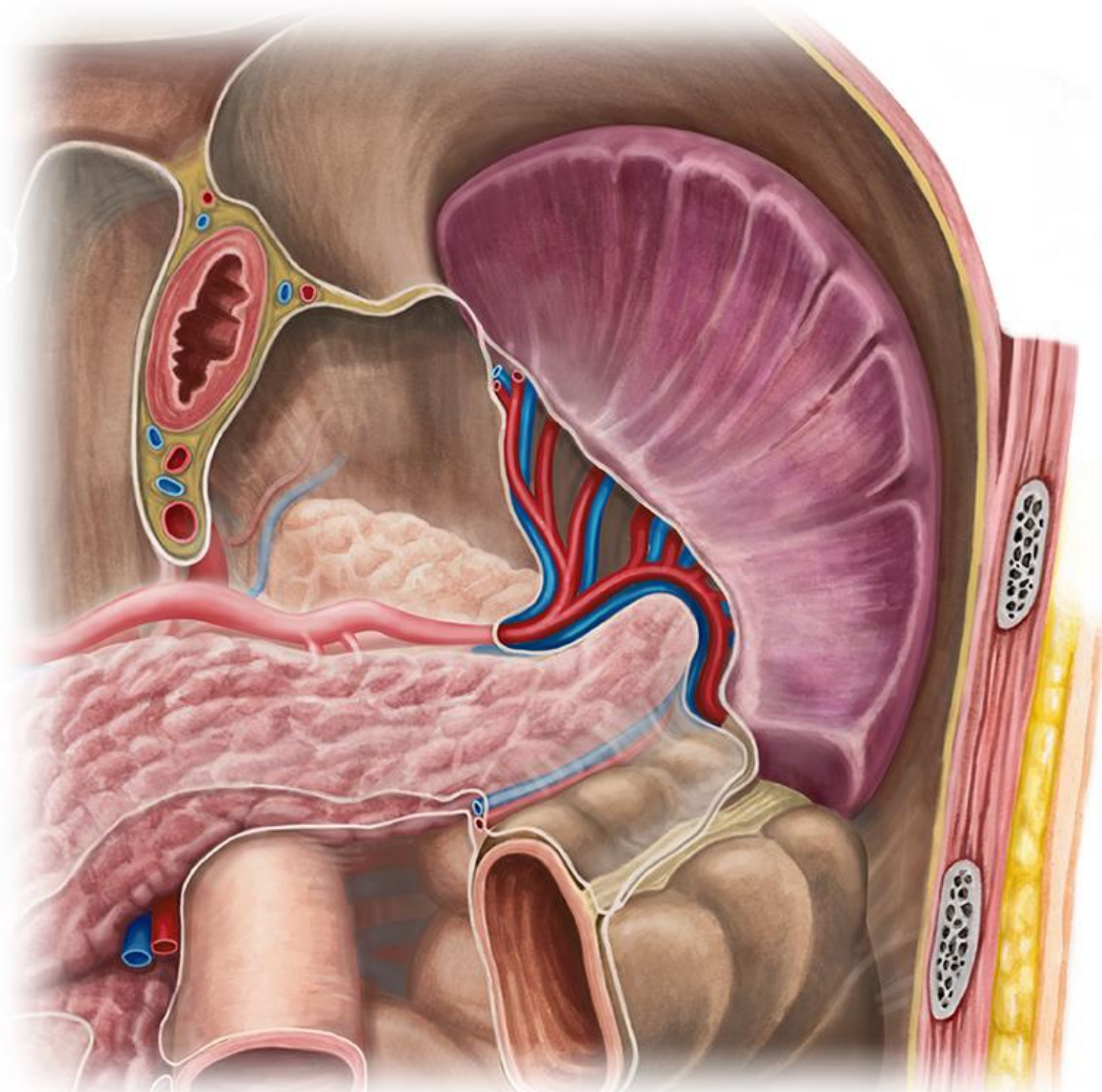
Venous supply

- **The splenic vein** is formed at the hilum of the spleen, it runs a straight course behind the pancreas.
- Joins the superior mesenteric vein behind the neck of the pancreas to form of **portal vein**.



Visceral and Diaphragmatic Surfaces





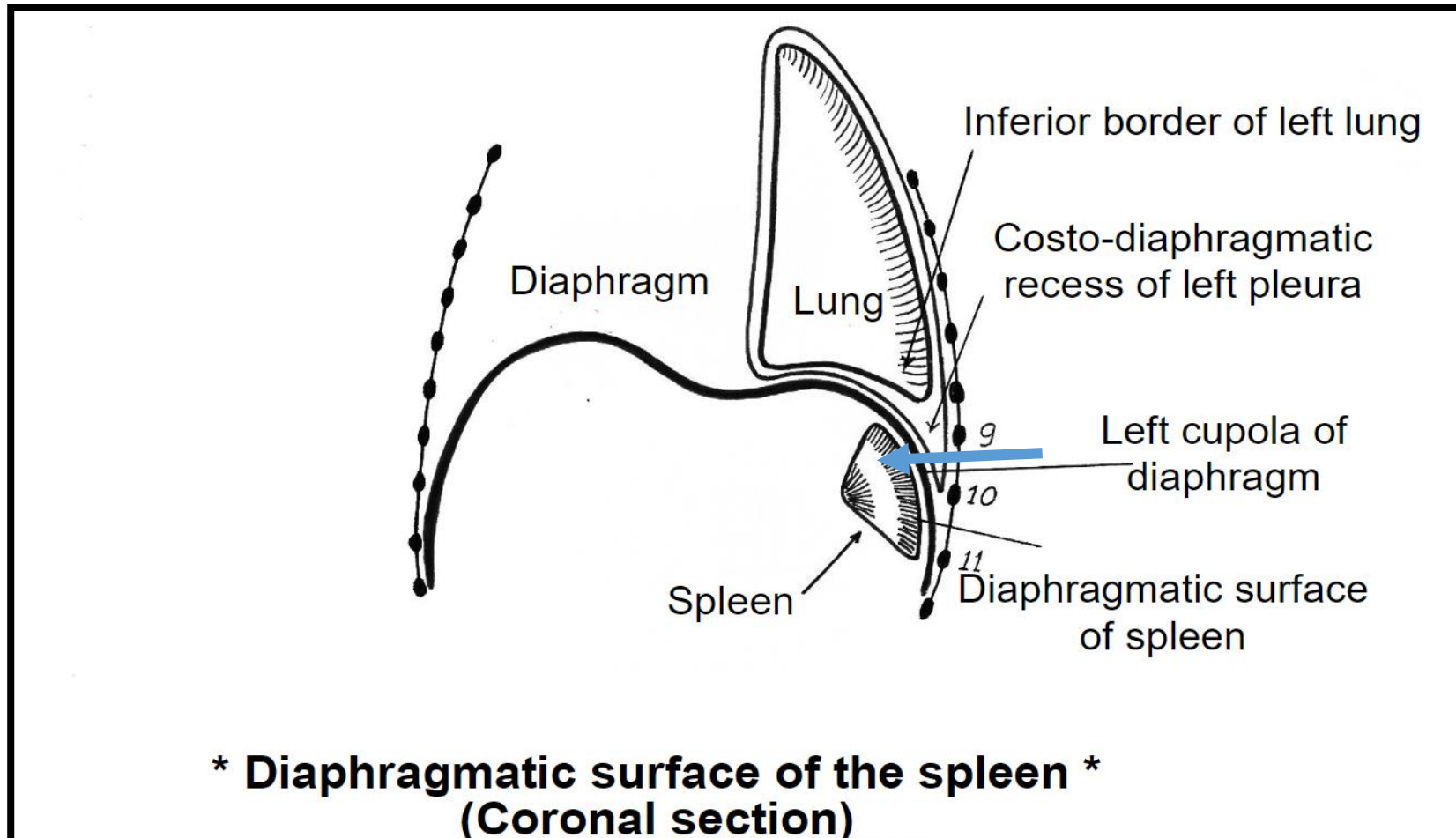
Applied anatomy

APPLIED ANATOMY

- The spleen is soft and friable and therefore it is the **commonest solid abdominal organ** to be injured.
- Spleen is the commonest organ ruptured by blunt trauma.

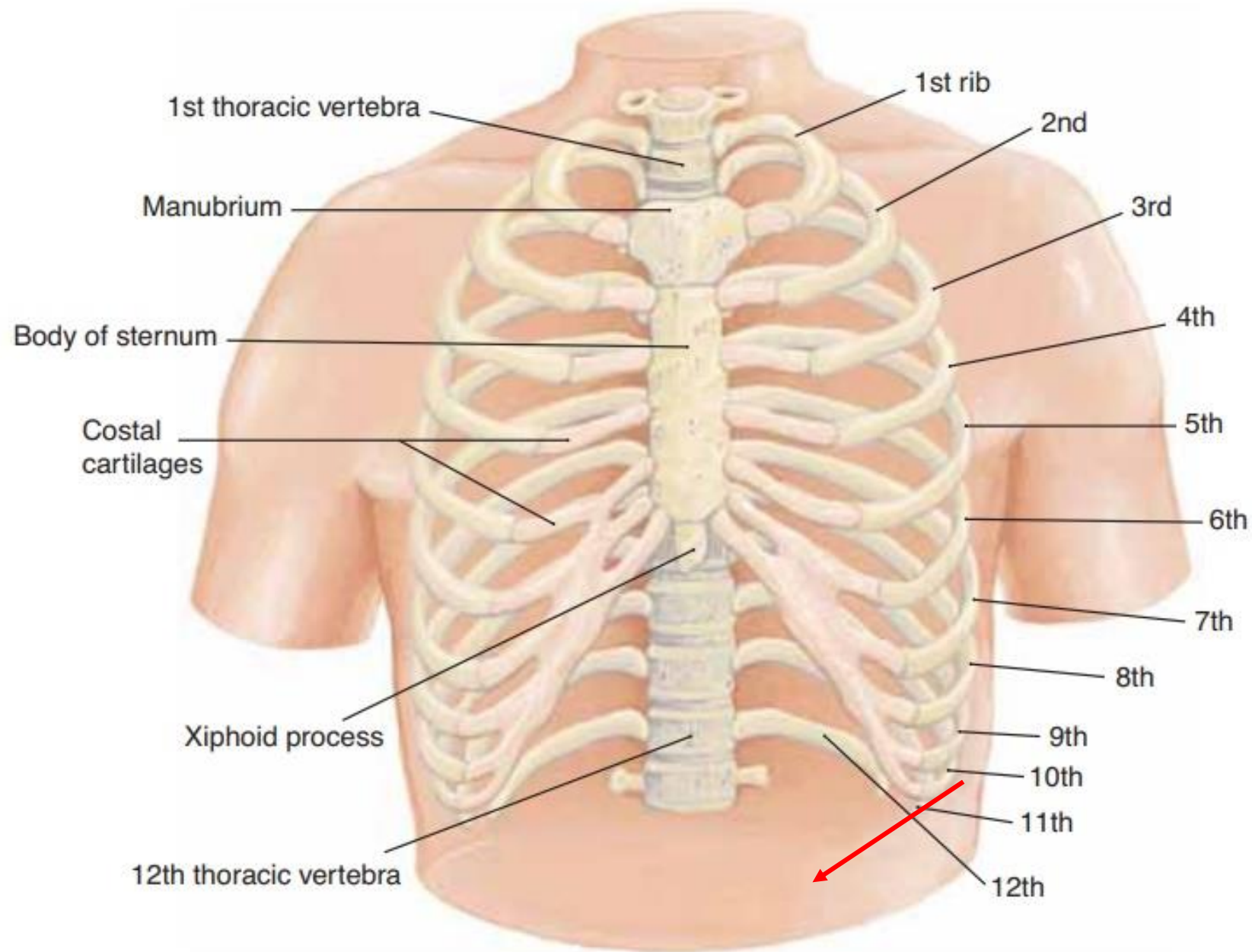
Applied anatomy

Stab wound of posterior left chest may penetrate diaphragm and damage the spleen.



APPLIED ANATOMY

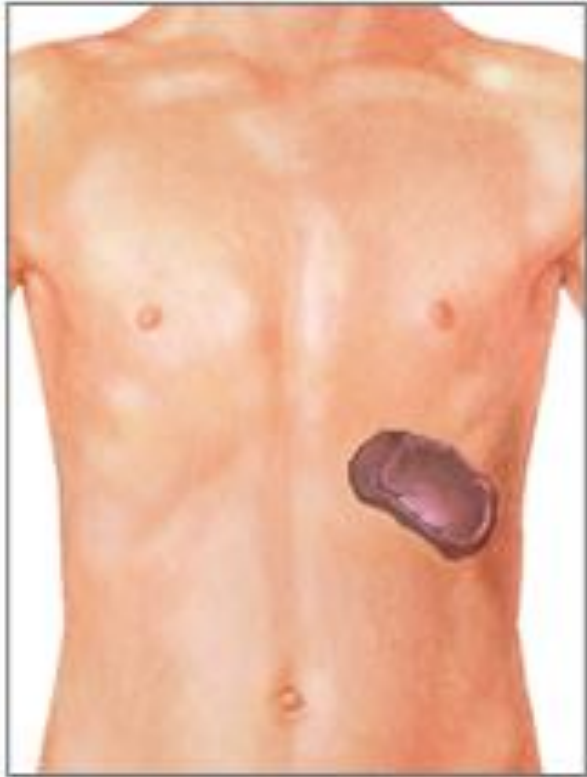
- A normal spleen is not palpable.
- Splenomegaly: An enlarged spleen can be felt under the left costal margin (**2-3 times**).



Figure

Rib cage. Anterior view.

Splenomegaly



Normal spleen



Splenomegaly



ACCESSORY SPLEENS

- In 10% of people, one or more supernumerary spleens may be present.
- **Accessory spleens** may occur near the hilum, in the tail of pancreas, omentum, mesentery, ovary.
- Their clinical importance is that they may hypertrophy after splenectomy causing recurrence of symptoms of the disease for which splenectomy done.

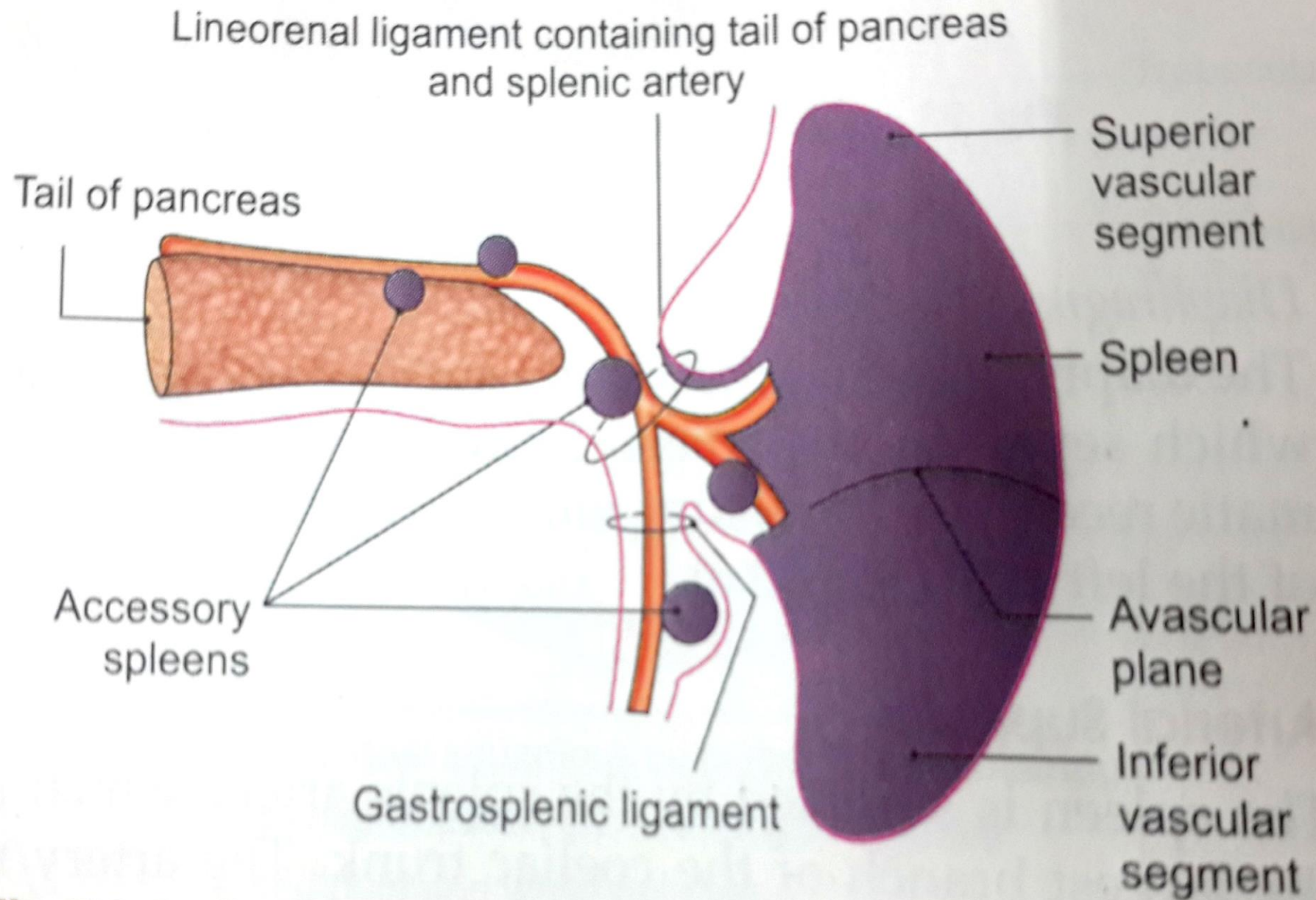


Fig. 23.4: Peritoneal ligaments attached to the spleen, and common sites of accessory spleen

APPLIED ANATOMY

- Splenectomy: Surgical removal of the spleen is called splenectomy.
- Partial splenectomy.



Anatomy of lymphatic system

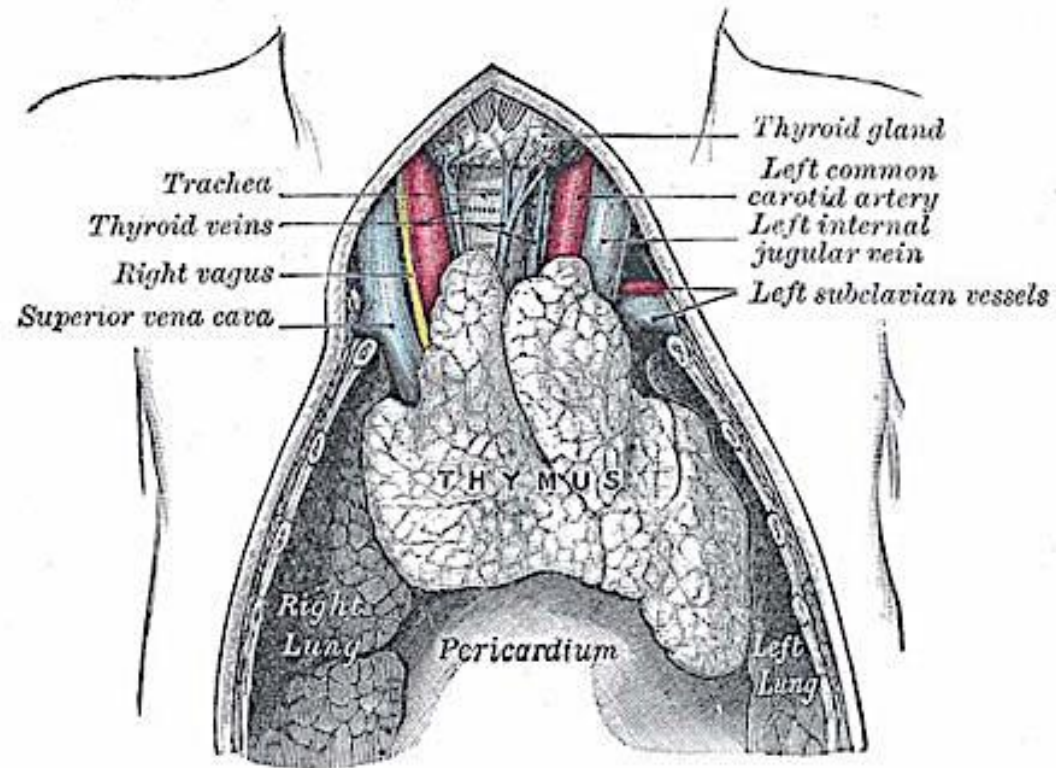
✓ Spleen

✓ Thymus

✓ Main duct

✓ LN

Thymus



Thymus

- **Site:** in the upper anterior mediastinum
Between the sternum & the pericardium.
- Wt: 5-50 gm
- 3rd pharyngeal pouch

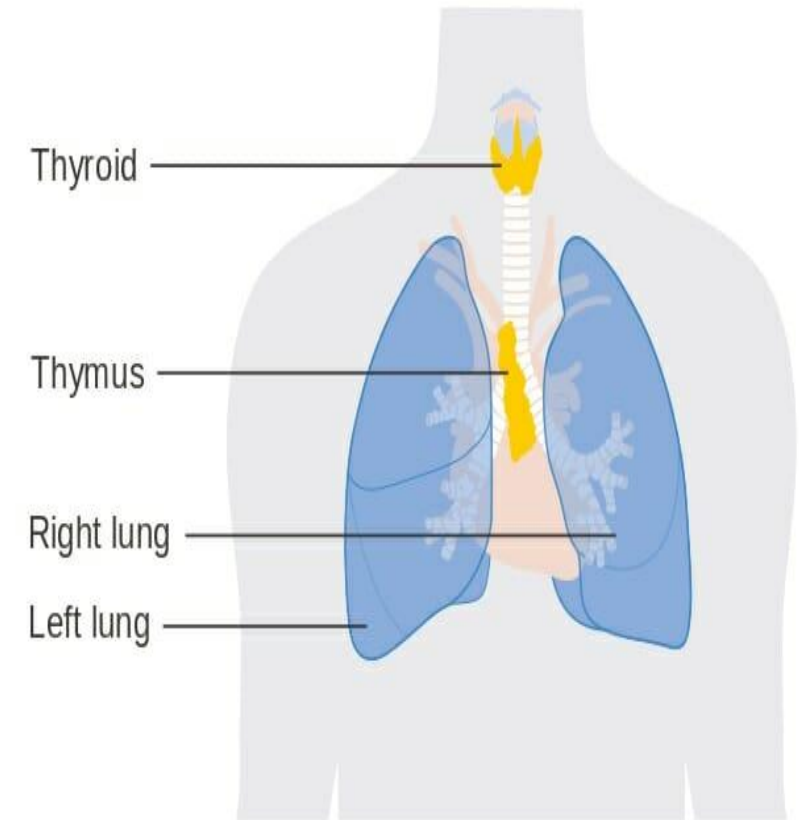
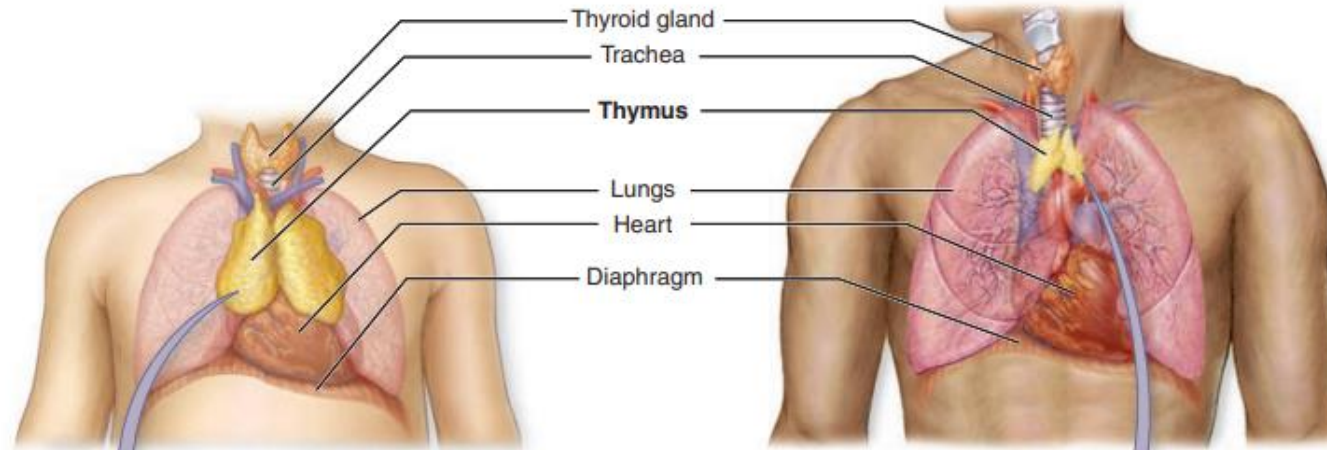
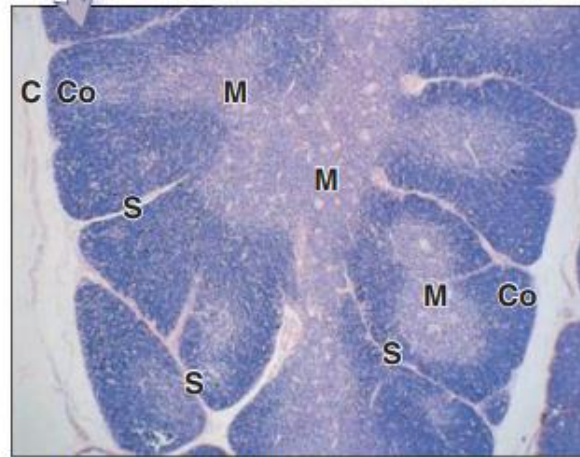


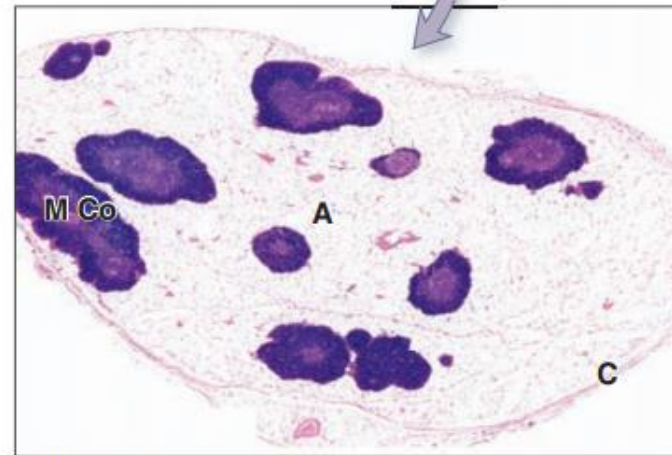
FIGURE 14–8 Thymus.



(a) Child (left) and adult (right) thorax, anterior view



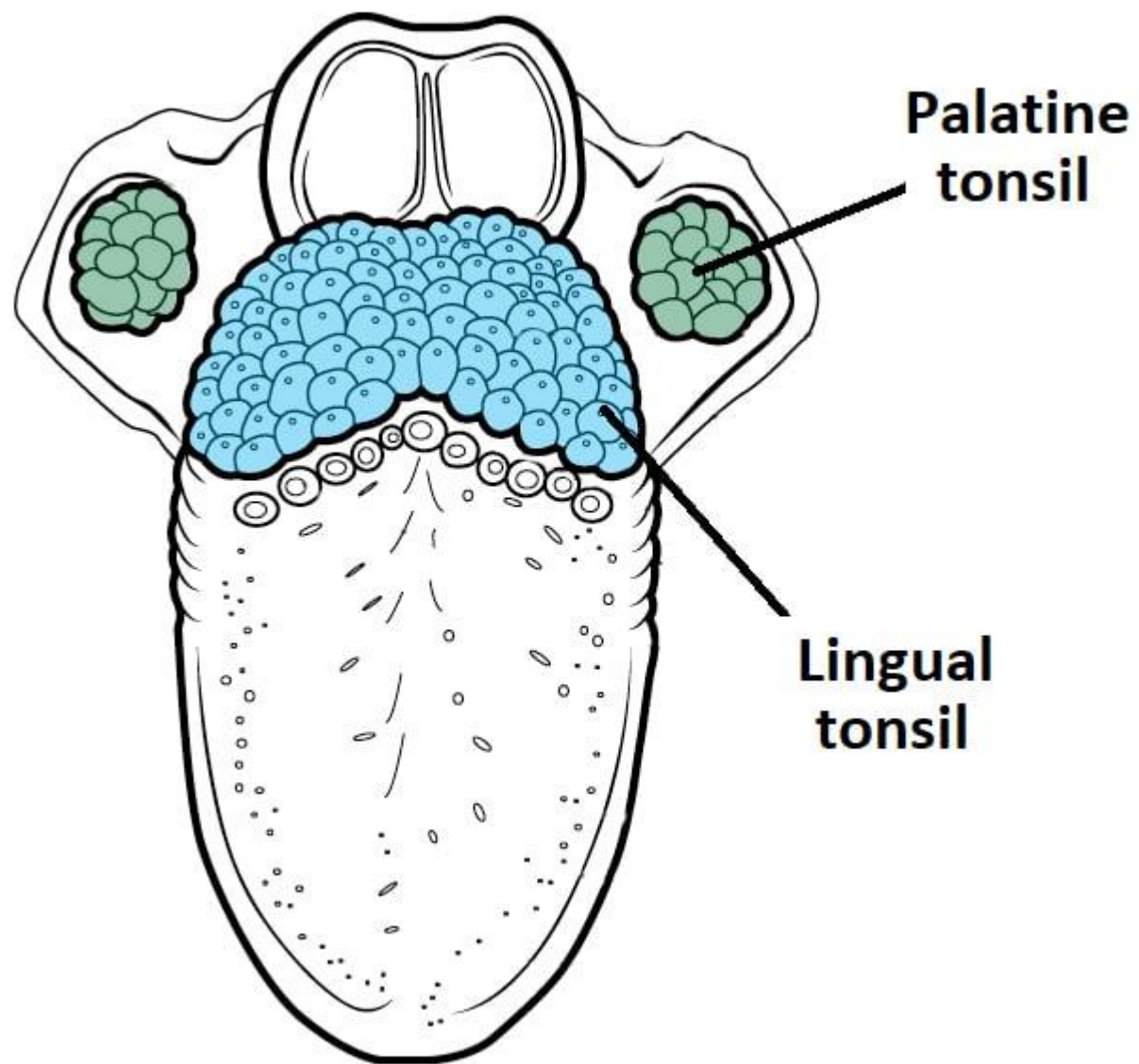
(b) Micrograph of child's thymus



(c) Micrograph of adult's thymus

Thymus

- The thymus is a flattened, bilobed structure.
- It has a pink, lobulated appearance and is the site for development of T (thymic) lymphocytes.
- Blood Supply: The inferior thyroid and internal thoracic arteries supply blood to the thymus.

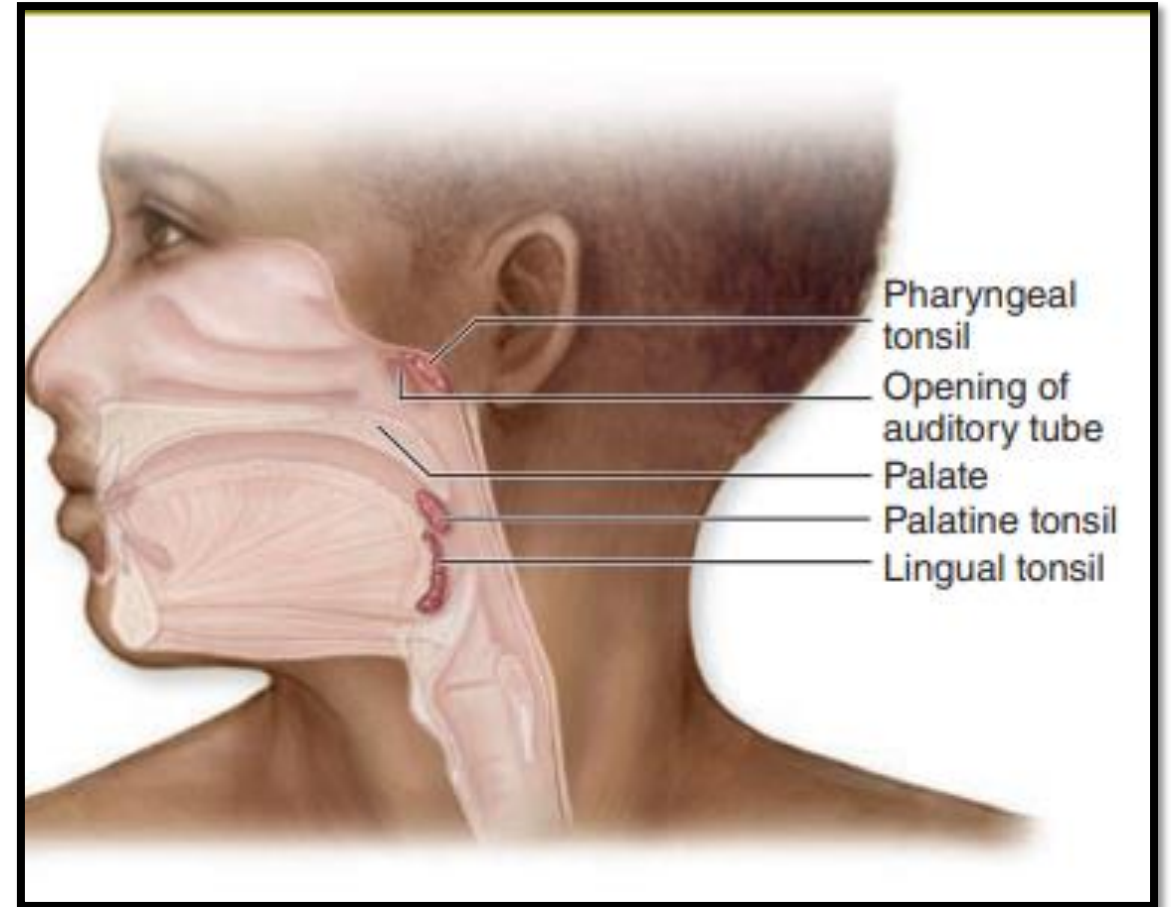


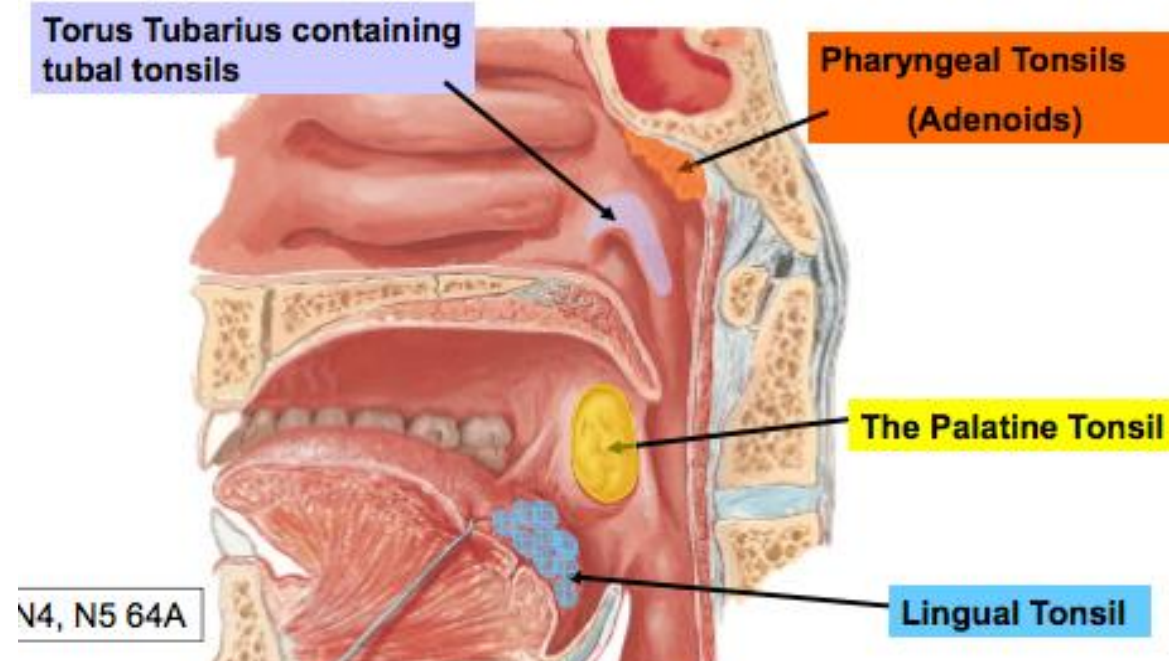
Tonsils

- Collections of lymphoid tissue
- Tonsils are located at the junction of the mouth with the oral part of the pharynx (palatine and lingual tonsils) and the nose with the nasal part of the pharynx (pharyngeal tonsil).
- Trap and remove bacteria and other foreign materials
- The **palatine tonsils** and the **pharyngeal tonsils** are the most important.

Tonsils

- Palatine tonsils.
- Lingual tonsils:
 -
- Pharyngeal tonsils:

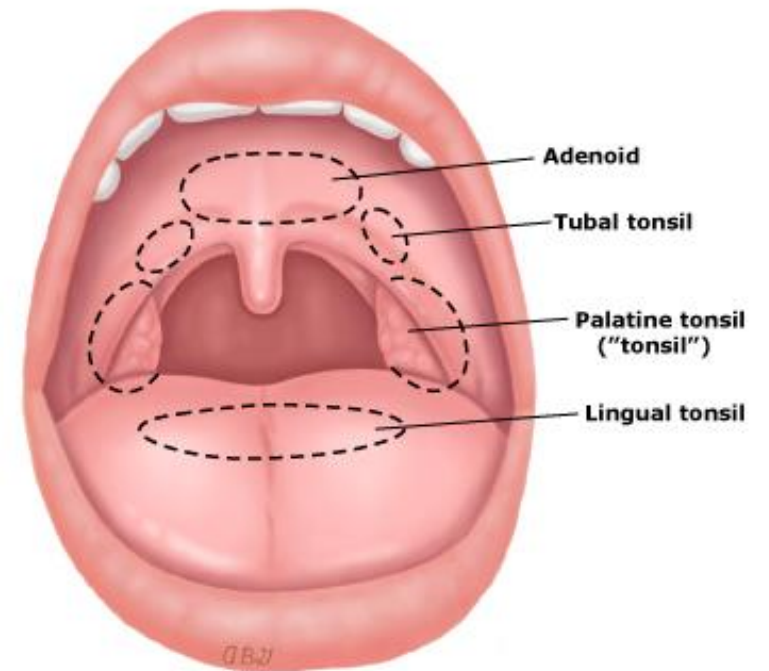




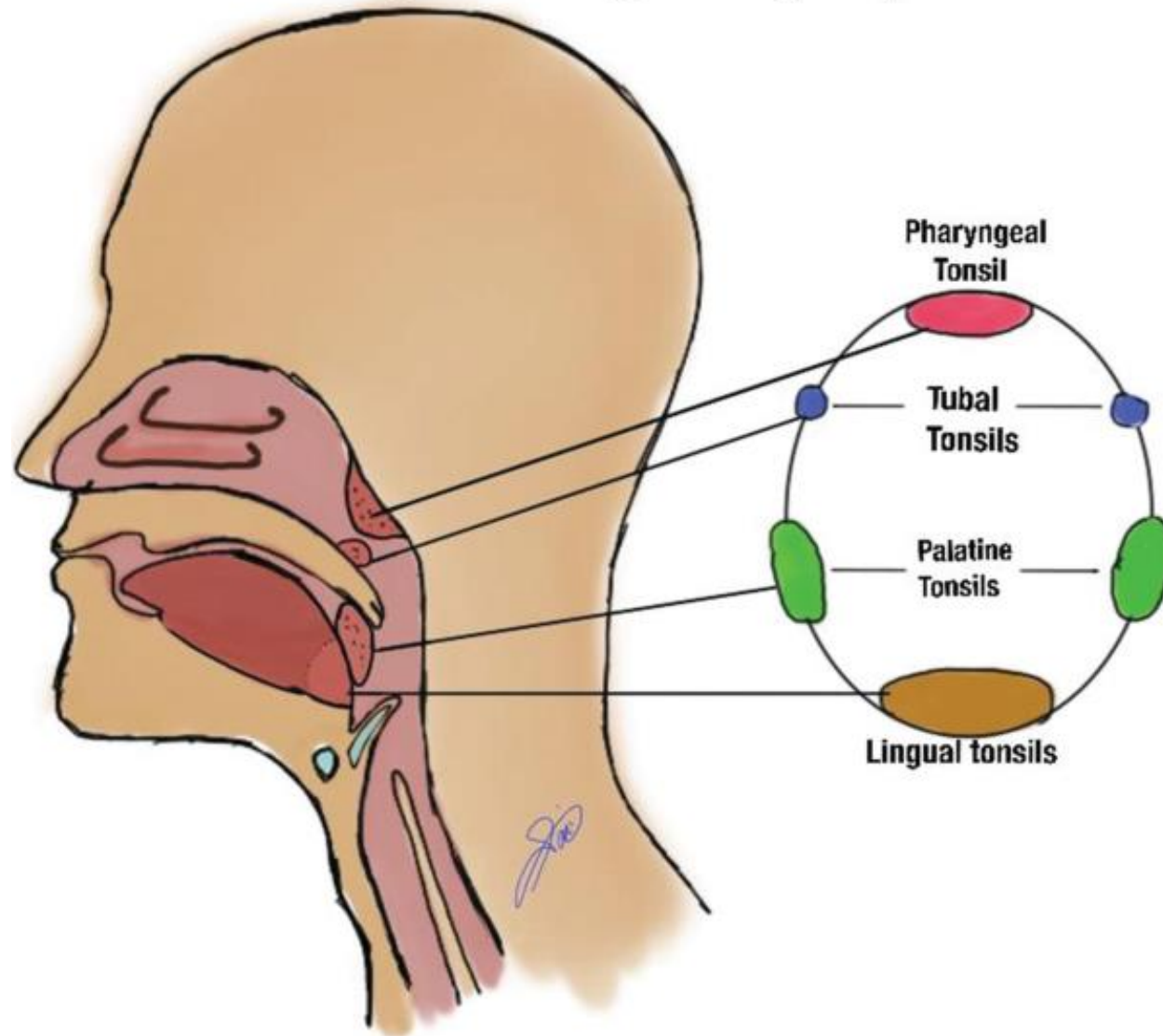
Palatine tonsils	Lingual tonsils	Adenoid (Pharangeal tonsil)
Pair	multiple	single
In Oropharynx		post. Wall of the Nasopharynx
Crypts		Shallow invaginations
Stratified squamous epithelium		Ciliated Pseudostratified columnar epithelium
Encapsulated	lack distinct capsules	Not capsulated

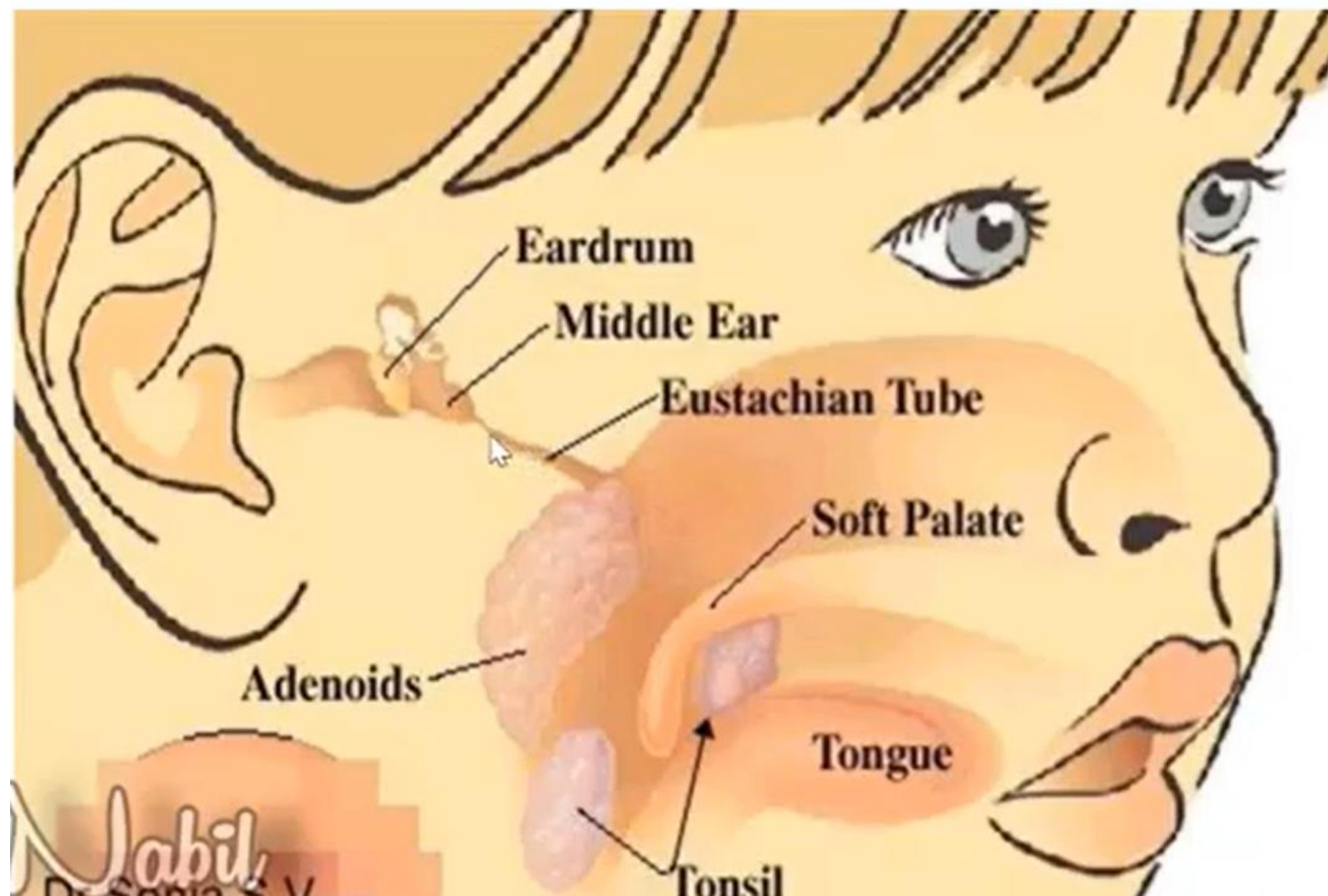
Waldeyer's Ring

- A ring of lymphoid tissues at the entrance of the respiratory and digestive systems.
- The **palatine tonsils and tubal tonsils** (lymphoid tissue around the opening of the auditory tube) form **the lateral part**.
- The **pharyngeal tonsil (Adenoid)** in the roof of the nasopharynx forms **the upper part**
- The **lingual tonsil** on the posterior third of the tongue forms **the lower part**.



Waldeyer ring of lymphoid tissues



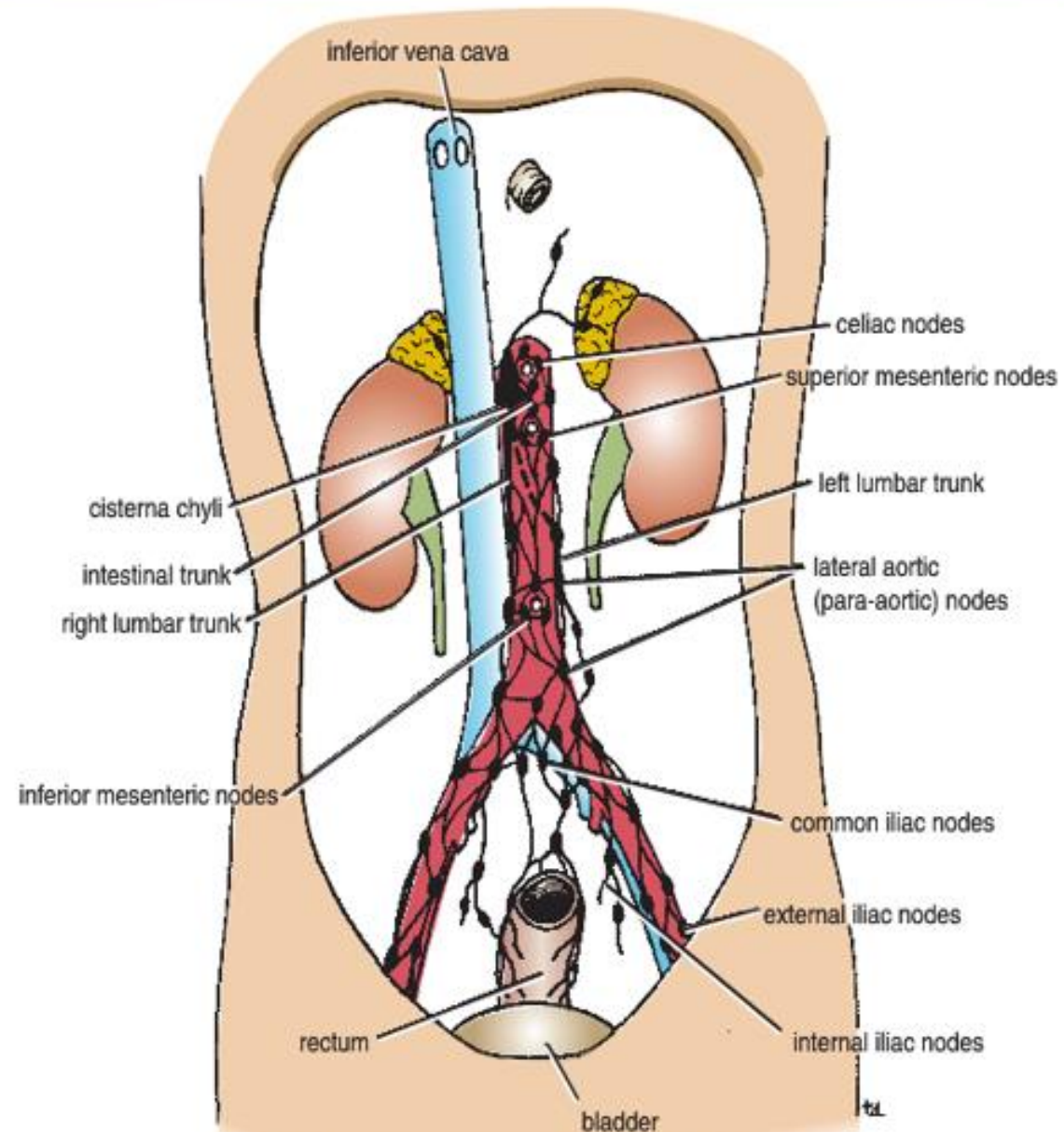


Lymphatics on the Posterior Abdominal Wall...LNs

a preaortic-CSI

a right and left lateral
aortic(para-aortic or lumbar)
chain

kidneys and suprarenals; from
the testes in the male and from
the ovaries, uterine tubes,
and fundus of the uterus in the
female; from the deep lymph
vessels of the abdominal walls;
and from the common iliac nodes.
The efferent lymph
vessels form the right
and left lumbar trunks



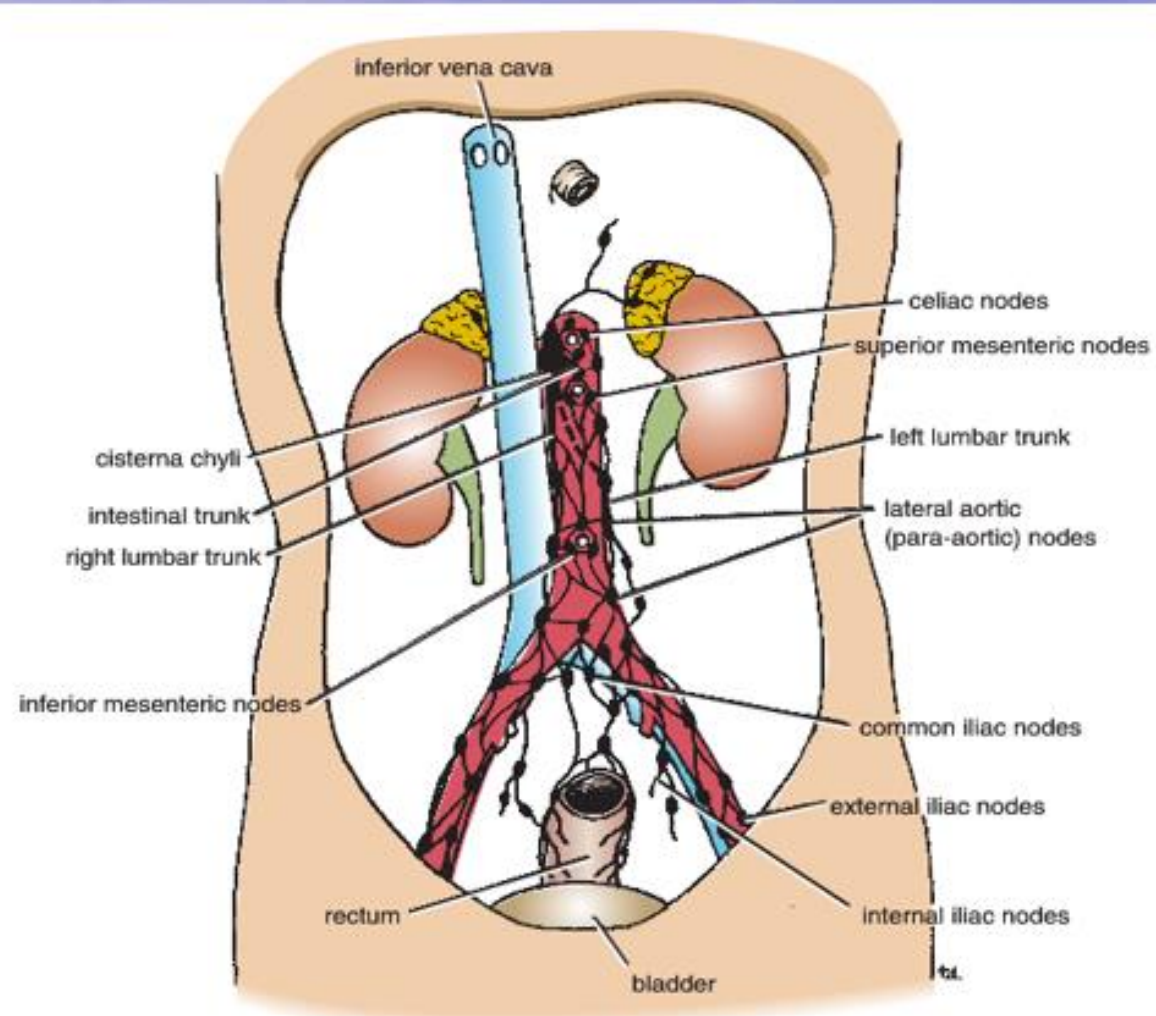
Lymphatics on the Posterior Abdominal Wall...

Lymph Vessels

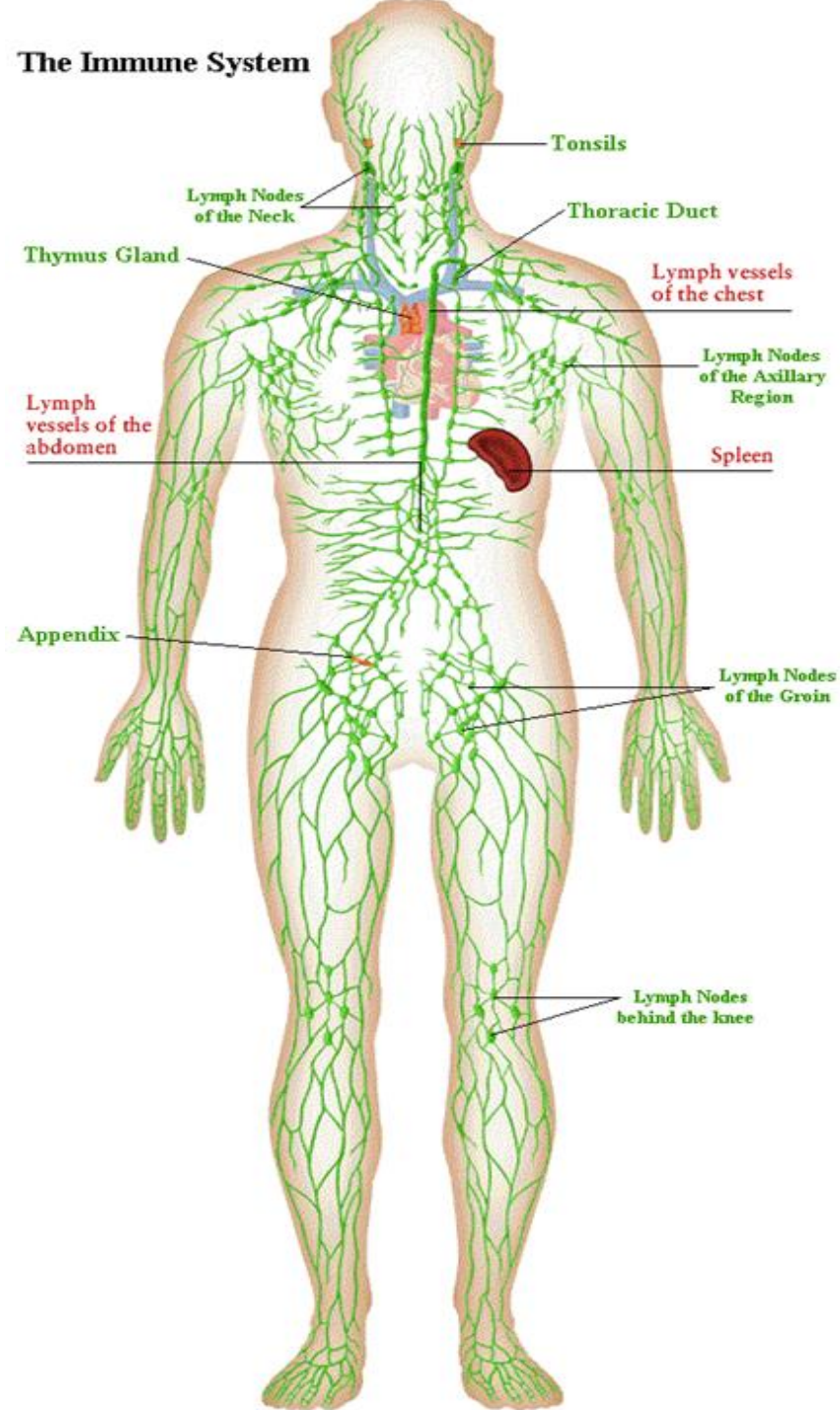
cisterna chyli :below the diaphragm in front of L1-2

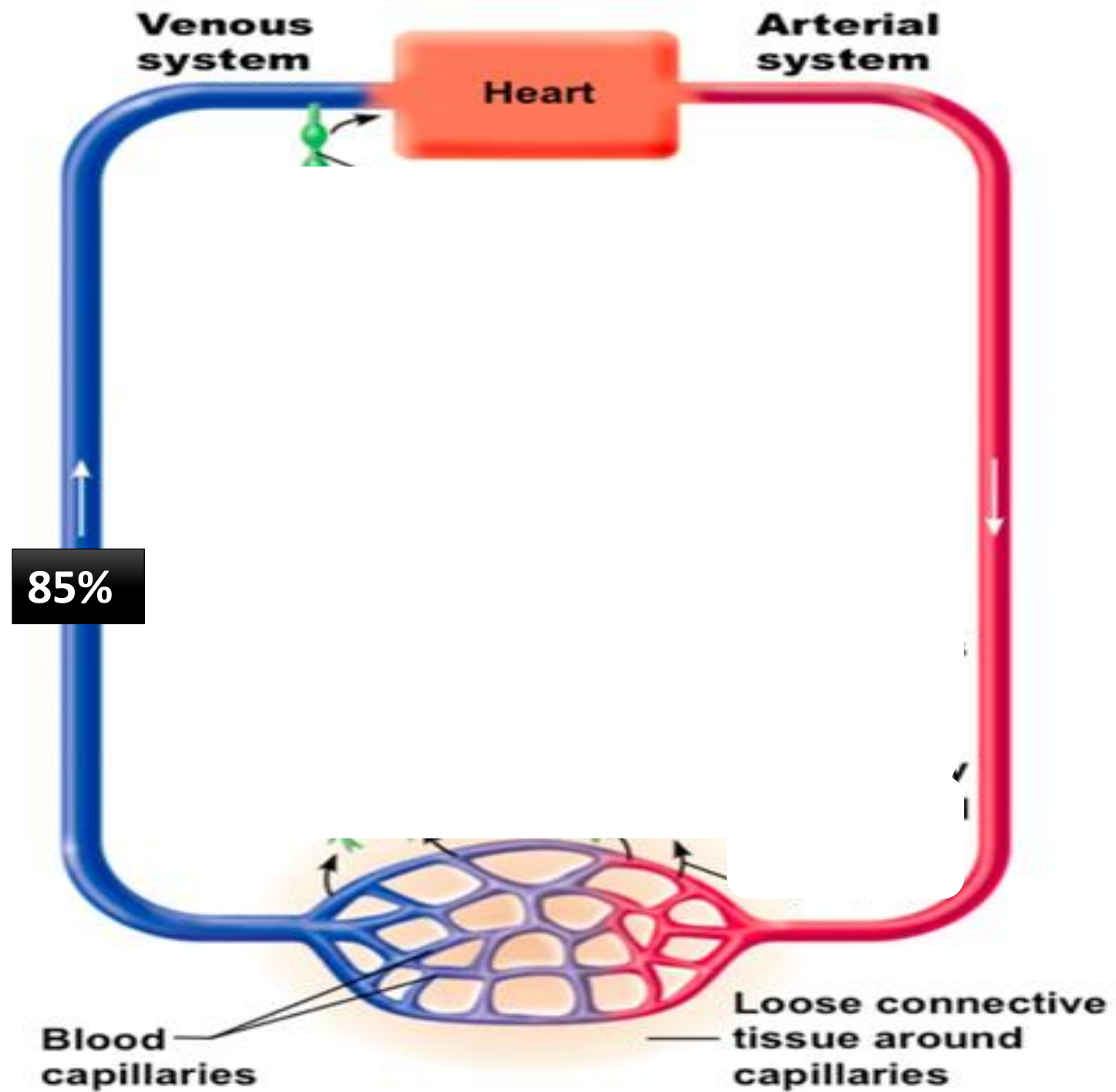
intestinal trunk, the right and left lumbar trunks, and some small lymph vessels that descend from the lower part of the thorax.

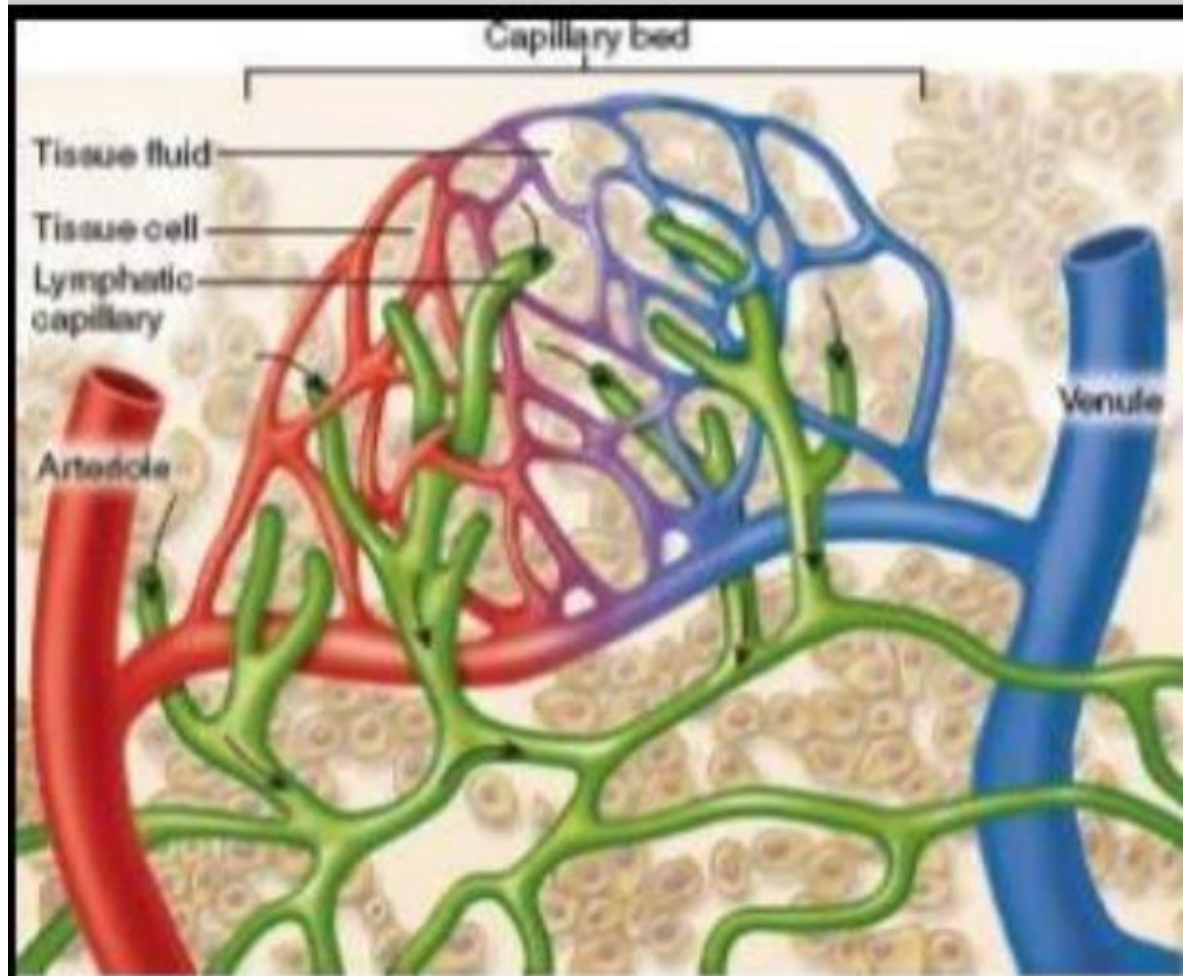
the thoracic duct, which transports lymph and chyle from the abdomen via the aortic opening of the diaphragm up to the junction of left subclavian vein and internal jugular veins.



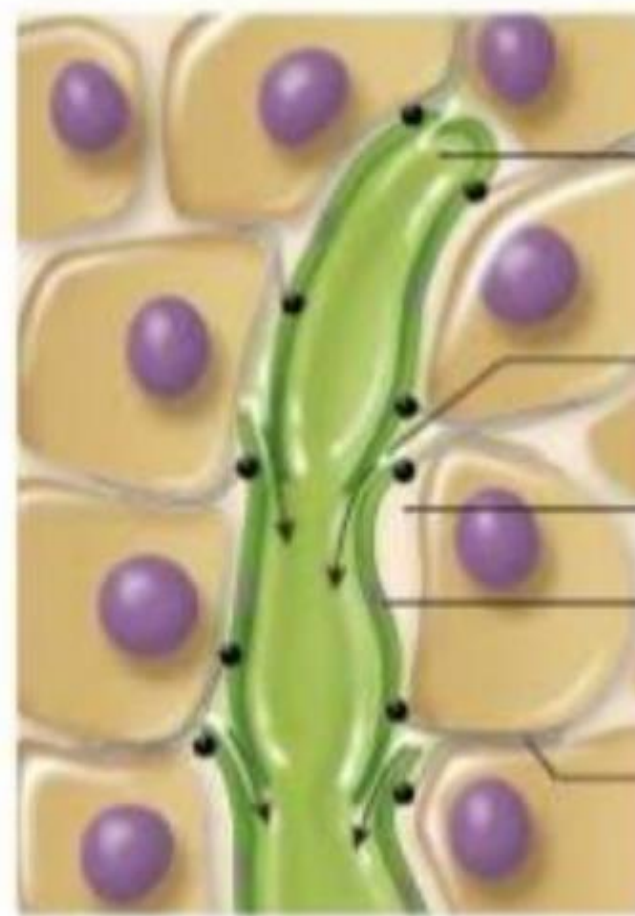
The Immune System







(a)



(b)

lymphatics

- **lymph** is a colorless fluid drained from the extra-cellular fluid by lymphatics.
- The lymph is filtered in the lymph nodes .
- ***Finally*** the collected lymph pass to the ***veins*** .

lymphatics

- The lymphatic system is ***formed mainly*** of lymph vessels and lymph nodes .
- Lymphatics accompanies vessels
- ***Lymphatic drainage of head & neck and limbs accompanies the veins while that of thorax & abdomen accompanies mainly the arteries.***

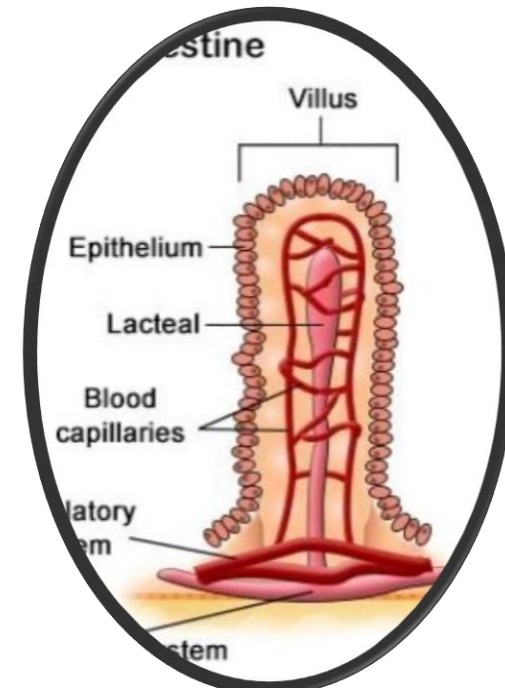
lymphatics

- Lymphatic vessels are found in all tissues **except** cartilage, bone, the CNS, the eyeball, the internal ear, and the epidermis of the skin.
- The flow of lymph is driven by **extravessel forces**, for eg. contractions of neighboring muscles or the negative pressure during inspiration.
- Obstruction of lymph flow from a given area results in accumulation of tissue fluid in that area (*lymphedema*)



Lymphatic capillaries

- They form wide-meshed plexuses in the extracellular matrices of most tissues.
- They begin as dilated, blind-ended tubes with larger diameters than those of blood capillaries.
- In the small intestine, lymphatic capillaries, called **lacteals**.



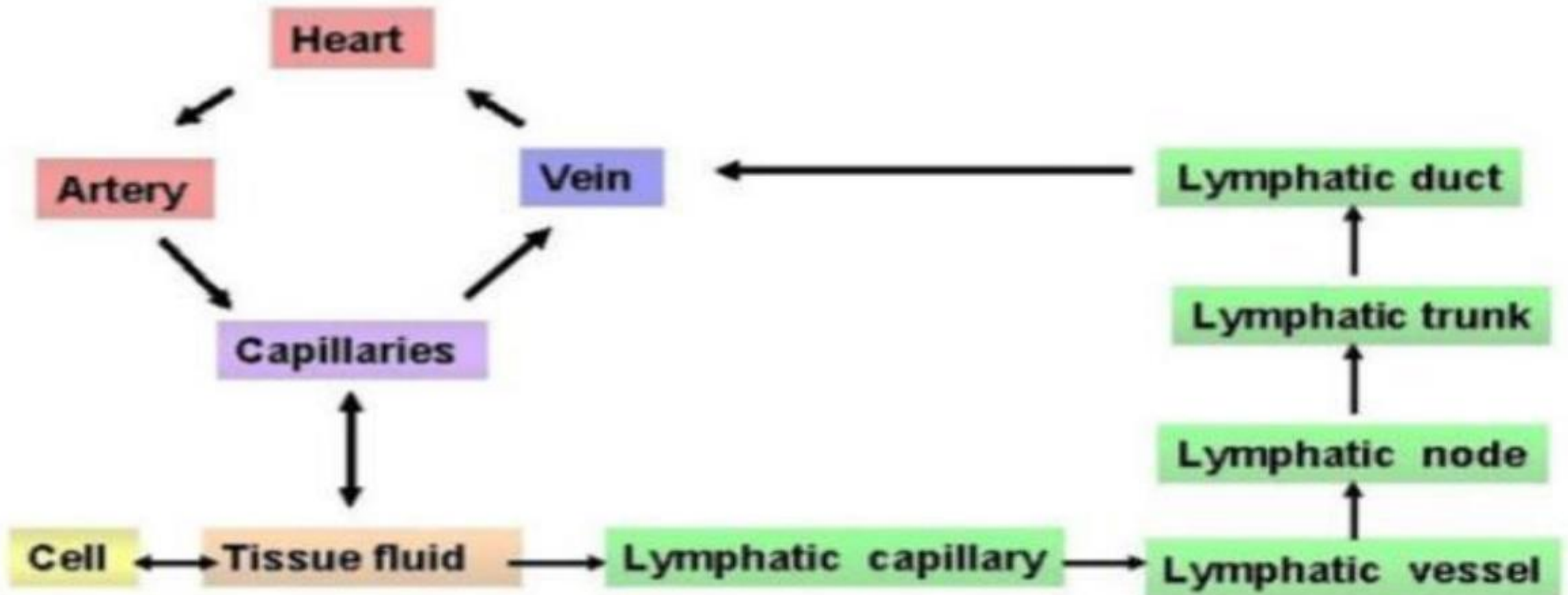
Lymphatic Vessels, Trunks, and Ducts

- The lymphatic **capillaries** converge and join to form lymphatic **vessels**, which in turn join to form **larger lymphatic vessels with valves**.
- These one-way valves are located close to one another, and each one causes a bulge in the lymphatic vessel, giving the vessels a **beaded appearance**

Lymphatic Vessels, Trunks, and Ducts

- Lymphatic vessels deliver lymph to lymph nodes.
- Superficial lymphatic vessels that drain the subcutaneous tissues and the skin.
- The superficial and deep lymphatic vessels eventually merge to form larger lymphatic vessels known as **lymphatic trunks**.
- Lymphatic trunks drain **into lymphatic duct**.

The Lymphatic System



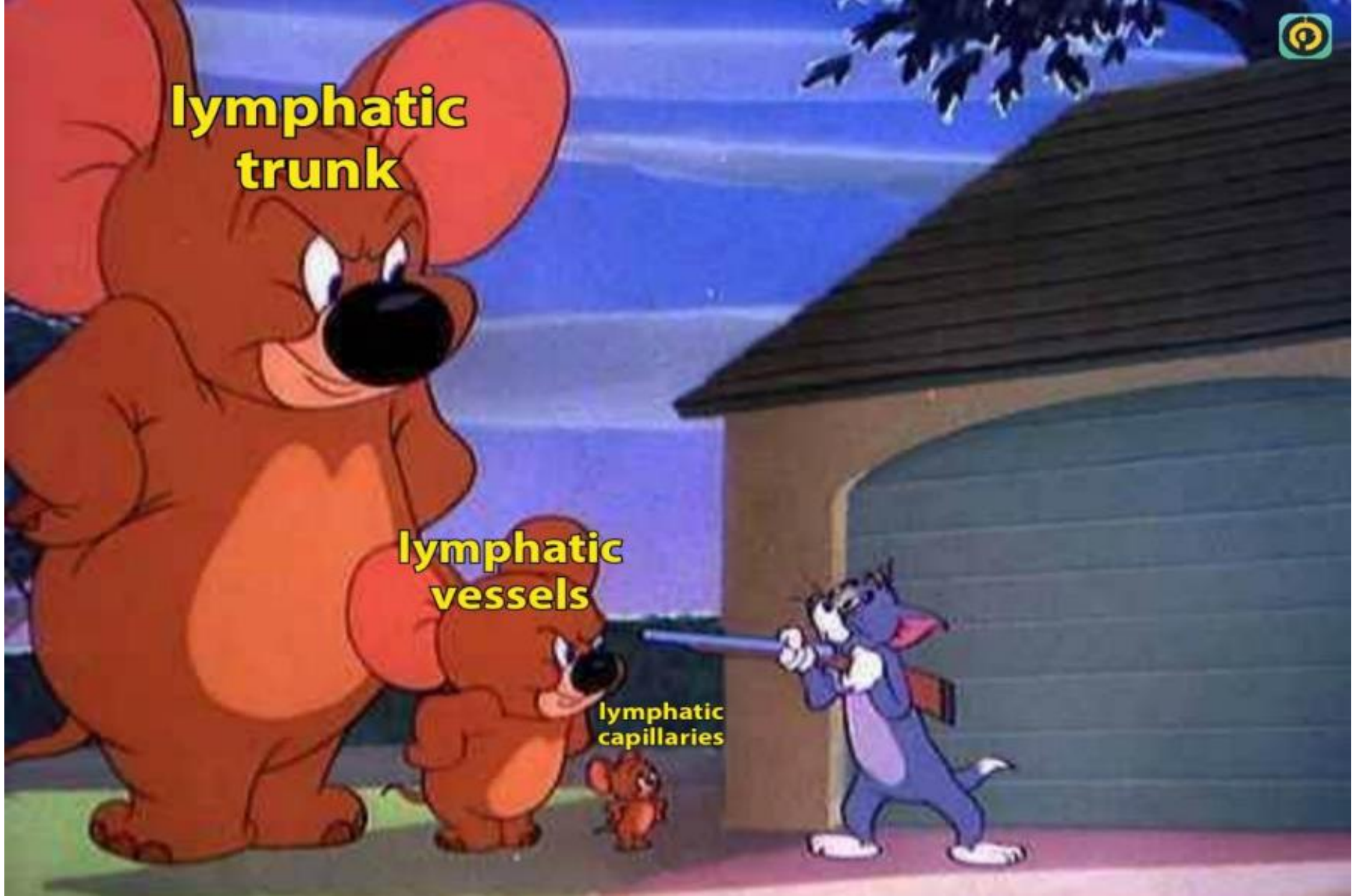




**lymphatic
trunk**

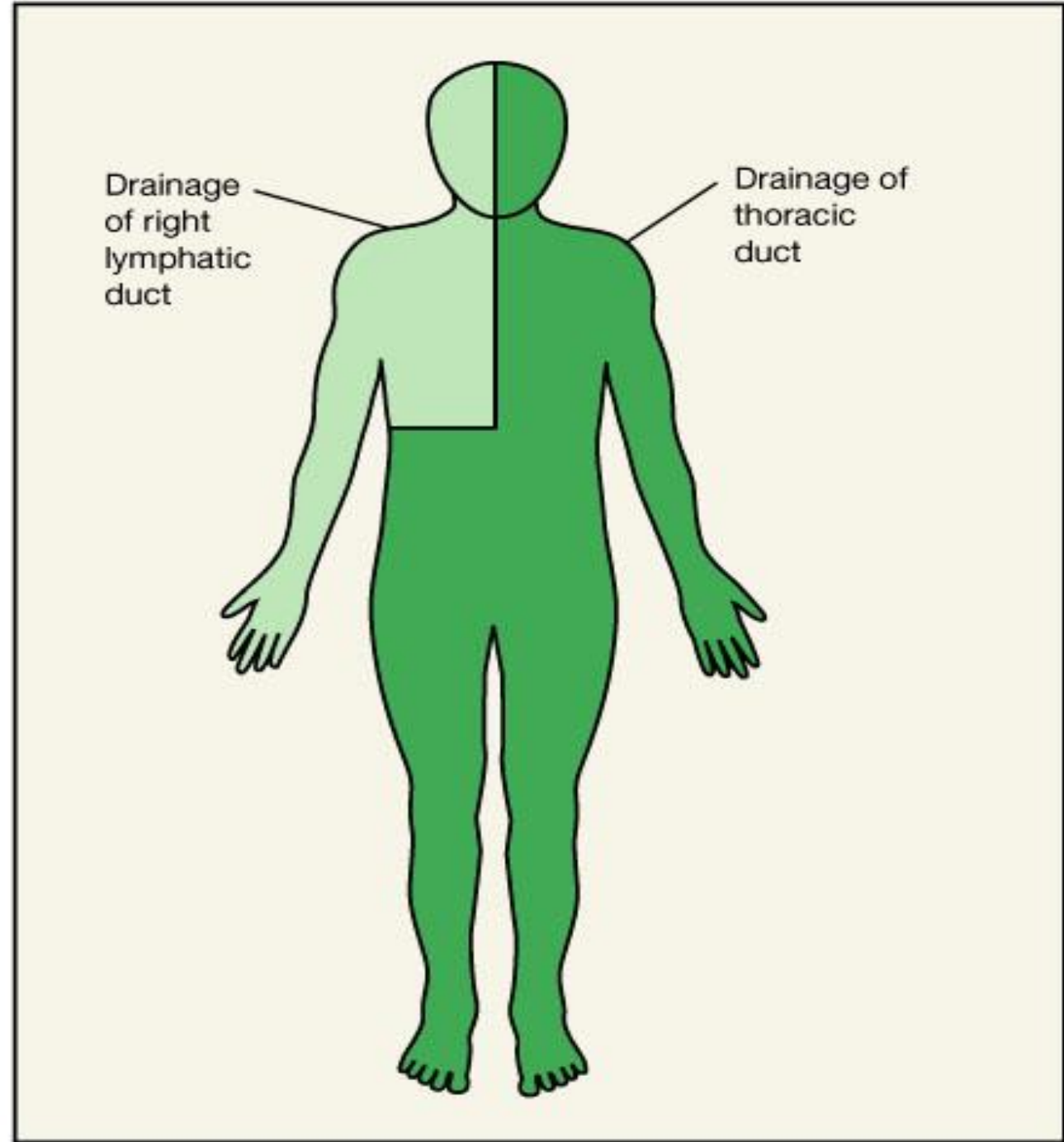
**lymphatic
vessels**

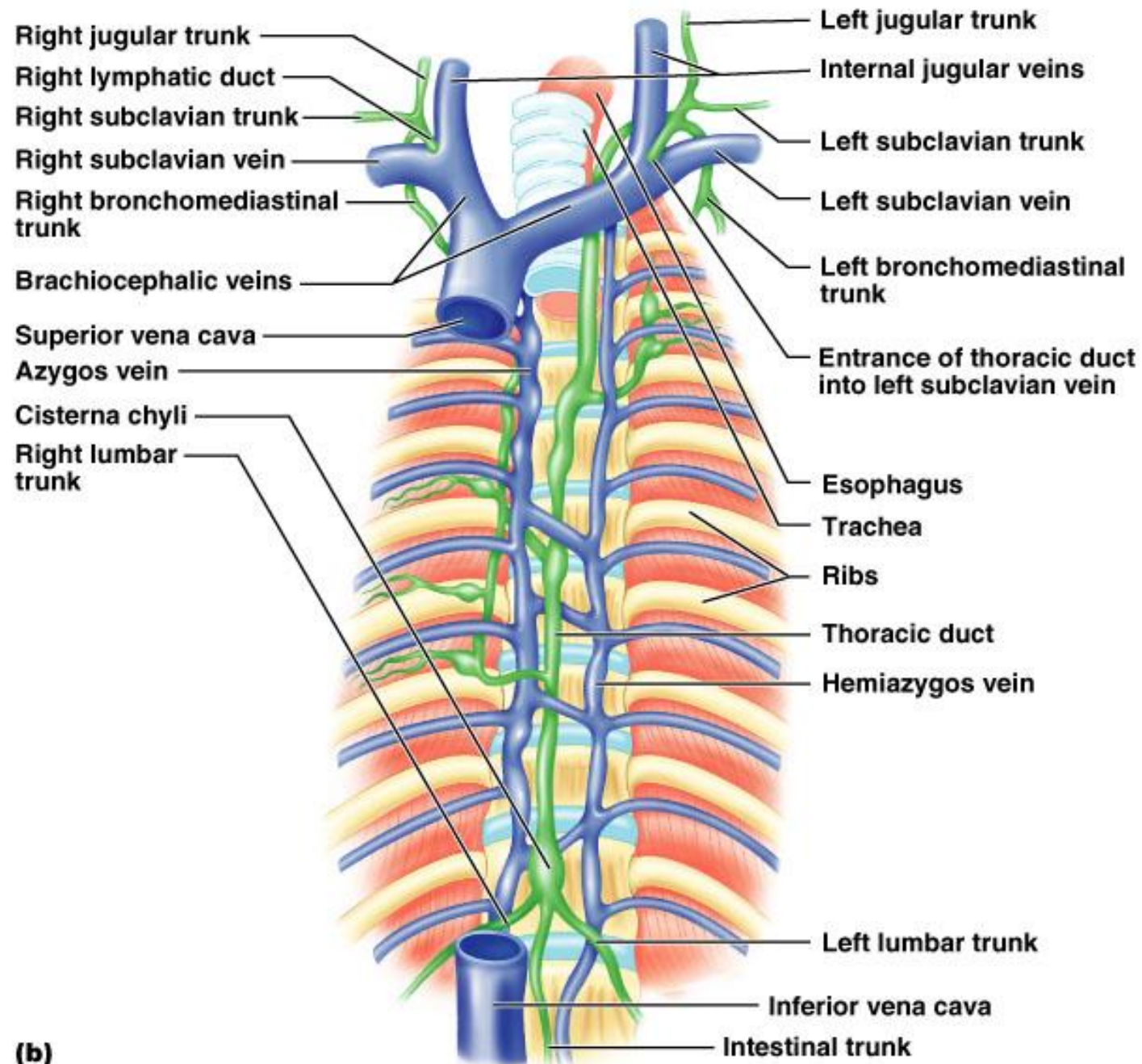
**lymphatic
capillaries**



Lymphatic Vessels, Trunks, and Ducts

- The upper right quadrant of the body (right sides of the head& neck, right side of the chest, and right upper limb) drains via **the right lymphatic duct**.
- The remaining portions of the body drain into the larger **thoracic duct**.
- Lymph is returned to the **systemic venous circulation** via either the right lymphatic duct or the thoracic duct





(b)

The right lymphatic duct

- It lies in the right side of the root of the neck.
- It opens into the junction of the **right subclavian and right internal jugular veins**.
- It receives the following 3 main lymph trunks:
 - • Right jugular lymph trunk.
 - • Right subclavian lymph trunk.
 - • Right broncho-mediastinal lymph trunk

Thoracic duct

- It is vein - like vessel, which conveys most of the lymph fluid to the venous blood stream.
- It is about 38-45cm long in adults.
- Begins at the **upper end of cisterna chyli opposite L₁ vertebra to the base of the neck (the junction of the lt subclavian and lt internal jugular veins.)**.

Thoracic duct

- It enters the thorax by passing through **the aortic opening of the diaphragm**.
- It ascends in front of thoracic vertebrae.
- At the level of **T₅** it turns to the **left** behind the oesophagus and ascends in superior mediastinum .
- It enters the root of the neck on the left side, then arches to the left opposite the **7th** cervical vertebra.
- Finally, the duct descends and ends by opening into the junction of the left subclavian and internal jugular veins.

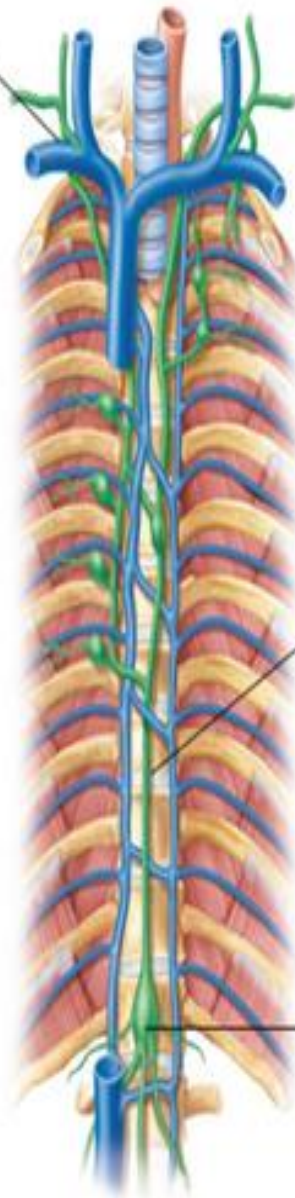
Tributaries of the thoracic duct

- Left jugular lymph trunk: drains left 1/2 of head and neck.
- Left subclavian lymph trunk: drains left upper limb
- Left bronchomediastinal lymph trunk: drains left 1/2 of thorax.

- Through **cisterna chyli**:
draining the lower limbs and abdomen through **lumbar and gastro-intestinal** lymph trunks (lower 1/2 of the body below the diaphragm).

Lymphatic Ducts

Right Lymphatic Duct empties at junction of right internal jugular and right subclavian veins



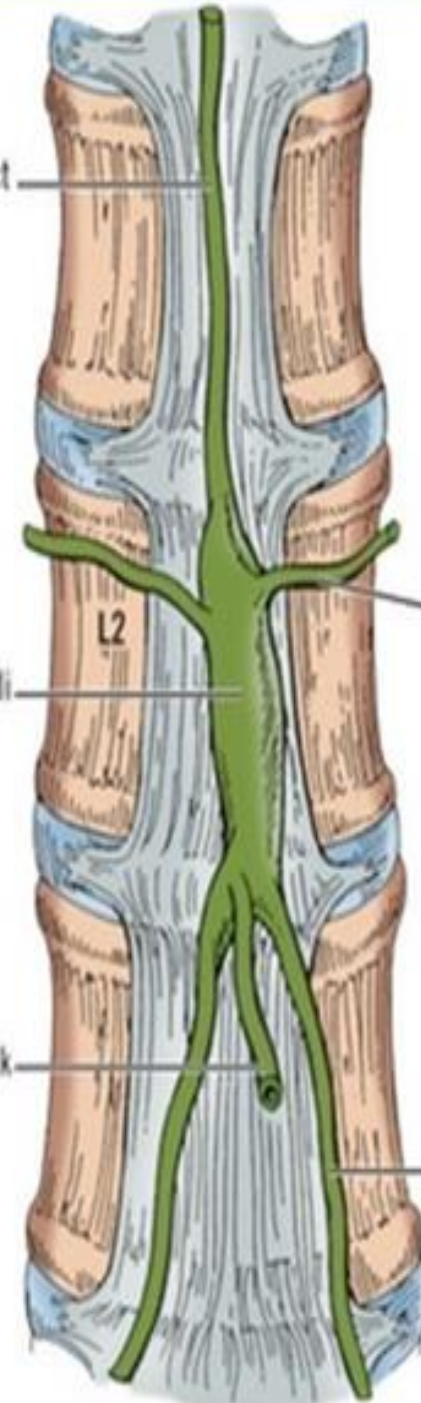
Thoracic Duct - empties into junction of left internal jugular and left subclavian veins

Cisterna Chyli – most inferior part of thoracic duct

Thoracic duct

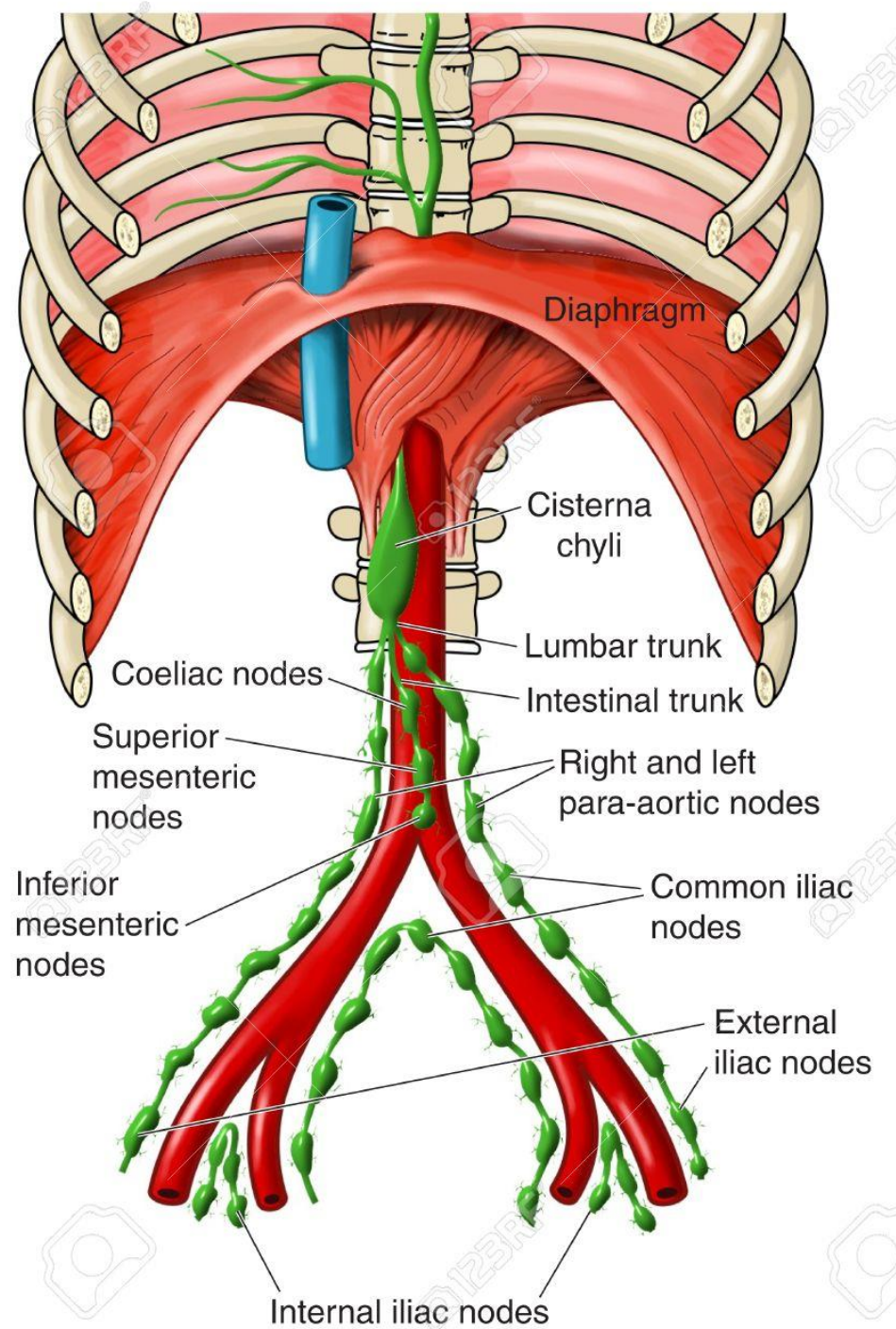
Cisterna chyli

Intestinal trunk



Intercostal trunk

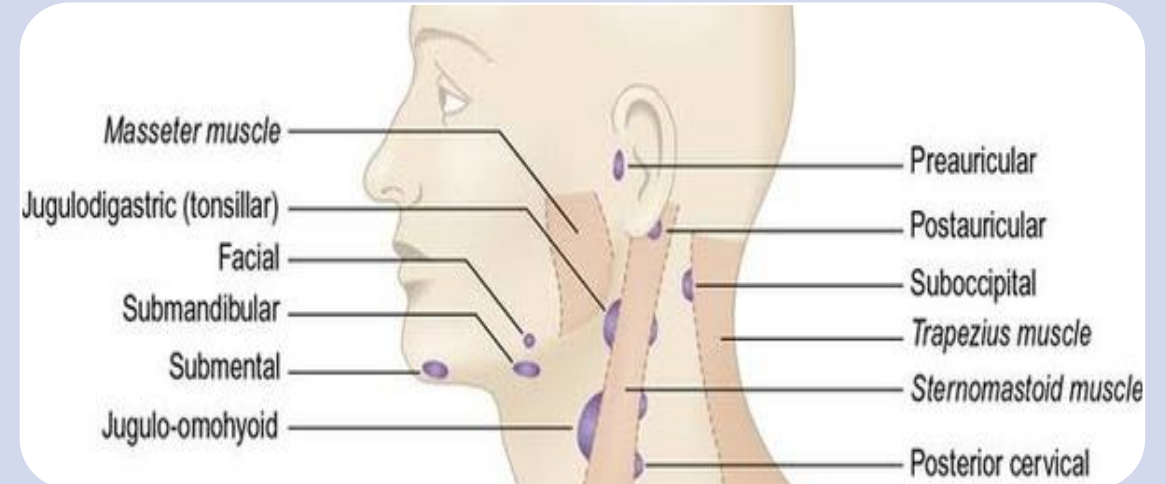
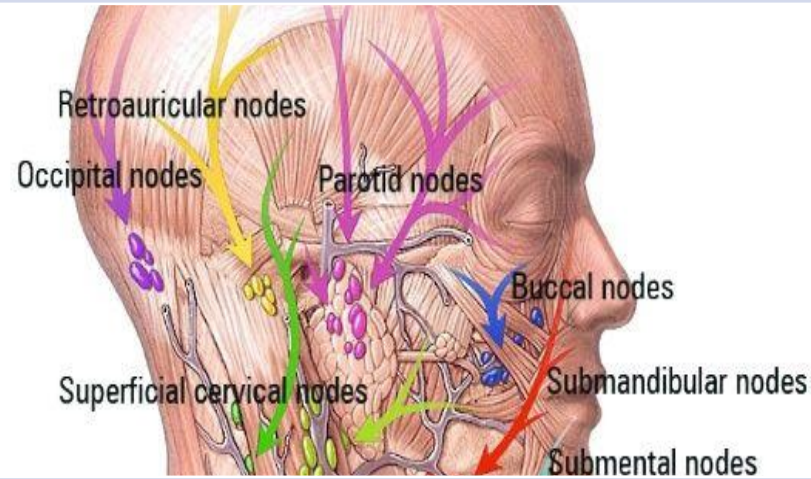
Lumbar trunk



Cisterna chyli

- It is a sac-like chamber. It is 5-7 cm long.
- It lies anterior slightly to the right of L1-L2 vertebral bodies.
- It receives lymph from :
 - The left and right **lumbar trunks** (drain para-aortic nodes) that drain lower limbs and pelvic organs.
 - The **intestinal lymph trunk** (drain pre-aortic nodes) that drain lymph from GIT

The lymph nodes of head and neck are arranged **into two groups:**

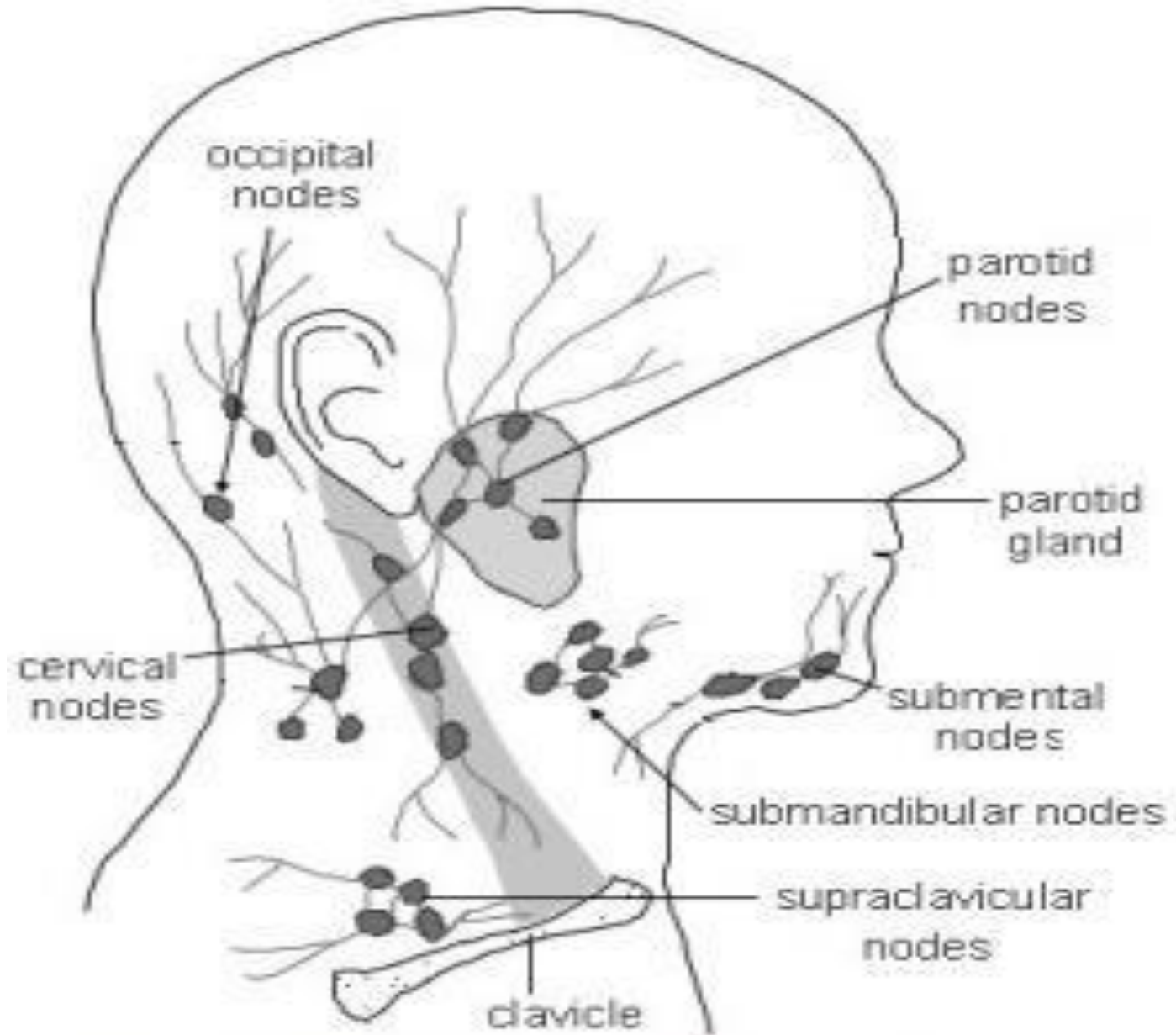


Regional (circular) group:

form a circle around the head and neck. It begins from the chin to external occipital protuberance

vertical group:

embedded in the carotid sheath along the internal jugular vein.

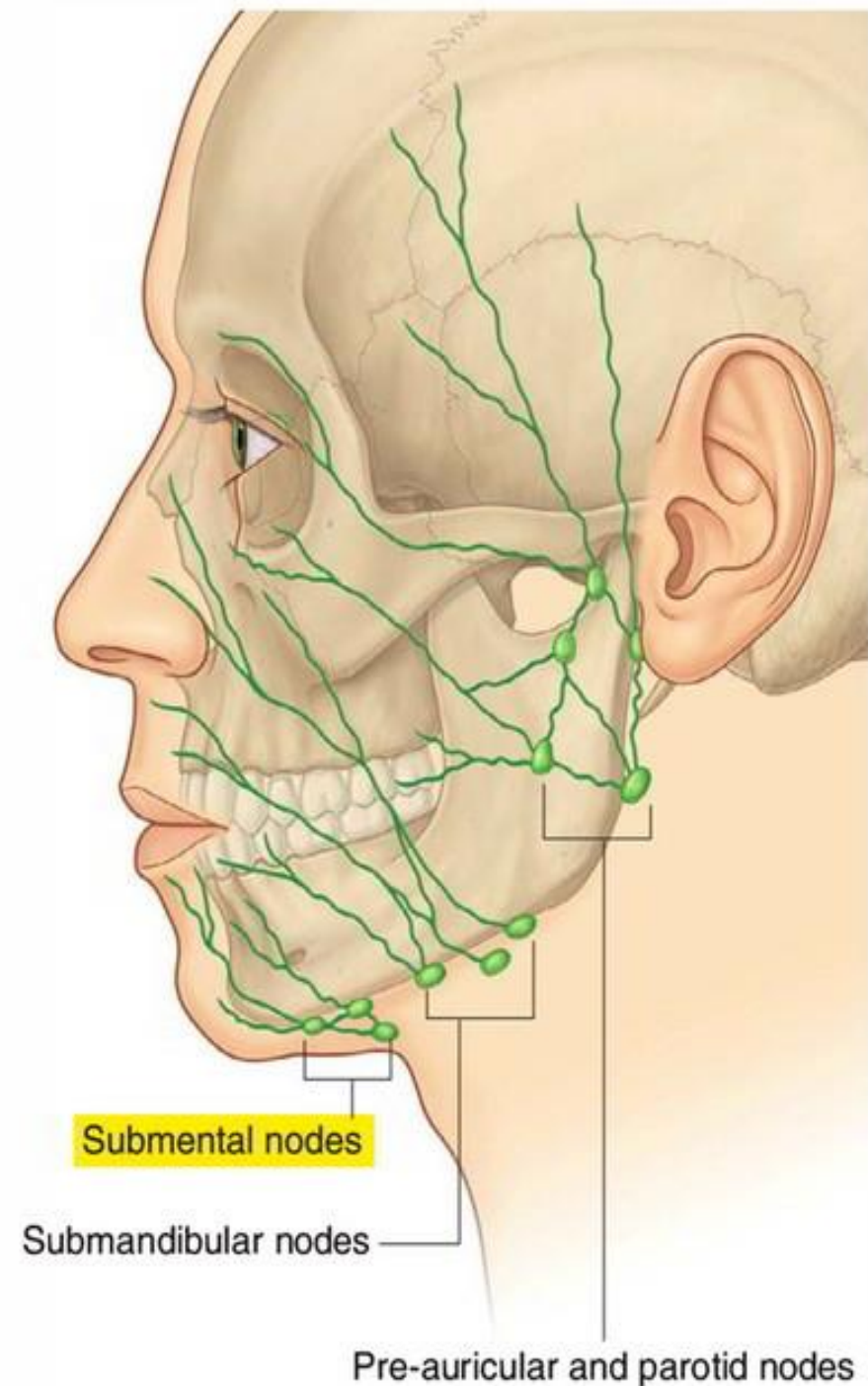


(Fig. 2): Superficial cervical lymph nodes.

Regional group: arranged as follows:

1- **Submental lymph nodes**: they lie in the submental triangle and drain lymph from the following regions:

- a- Central part of lower lip.
- b- Tip of tongue.
- c- Incisor teeth.
- d- Skin of chin.
- e- Anterior part of the floor of mouth.

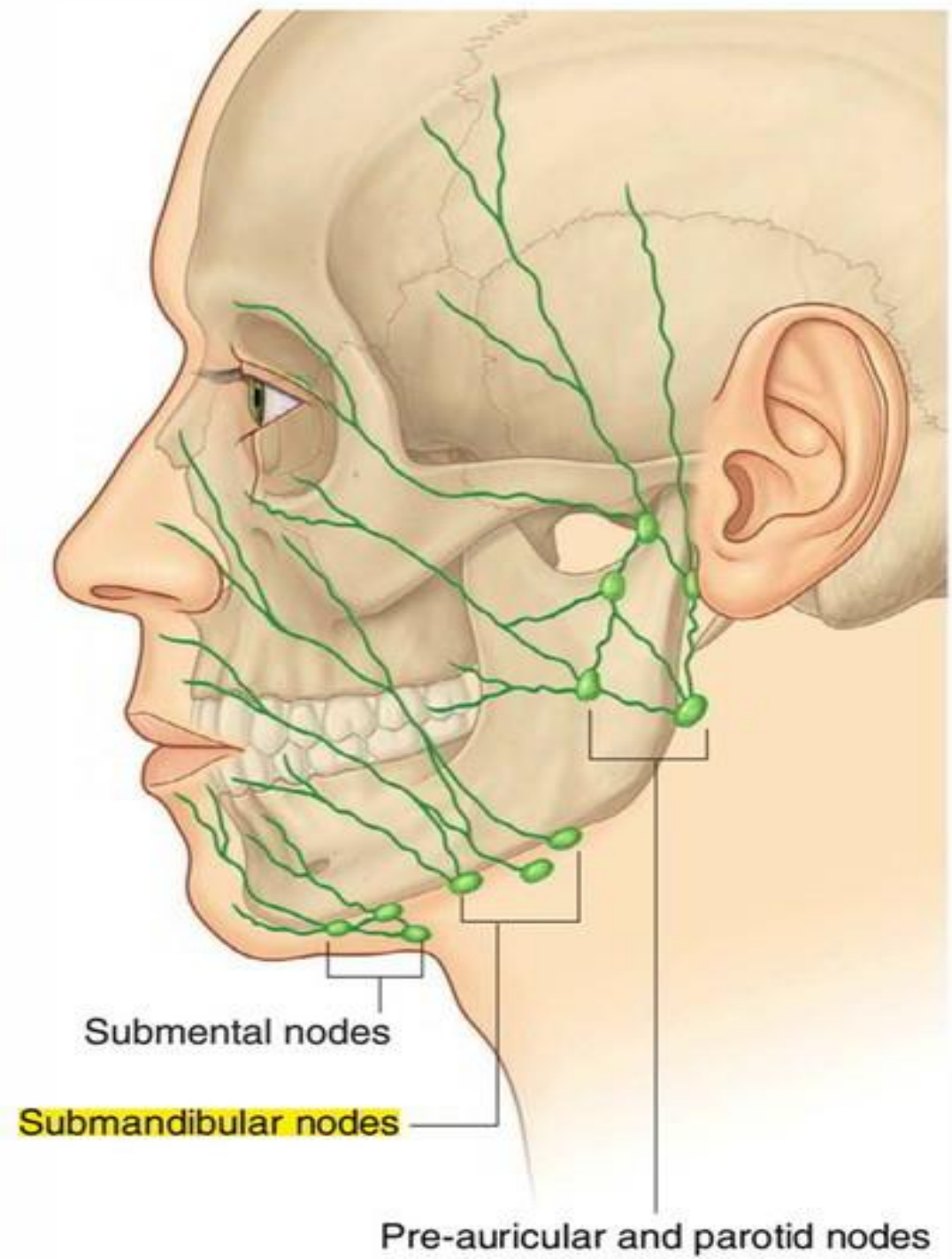


2- Submandibular lymph nodes:

situated in the **digastric triangle**
superficial to the **submandibular salivary**
gland.

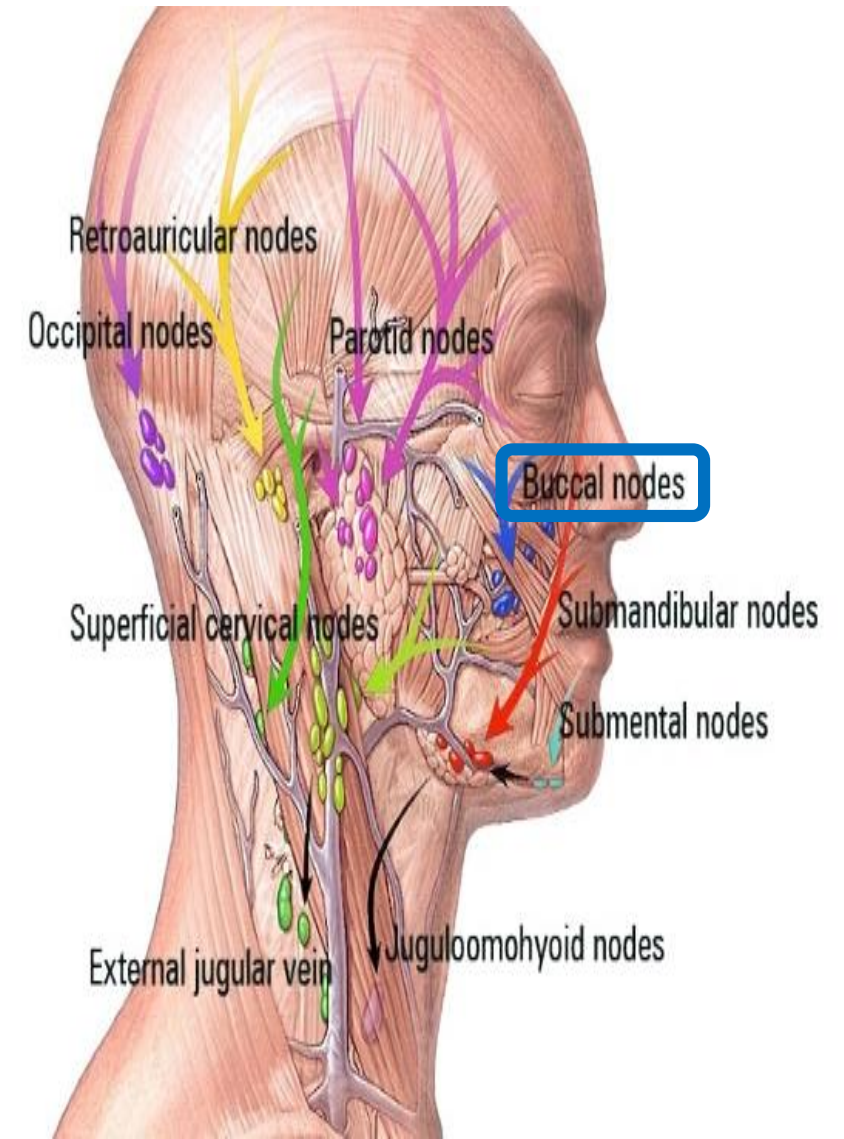
They receive lymph from the following :

1. Front of scalp, nose and cheek.
2. Upper lip and lower lip, except its central part.
3. Anterior two thirds of the tongues except its tip.
4. Floor and vestibule of mouth and the gums.
5. Upper and lower teeth except the incisor teeth.



3- Buccal lymph nodes:

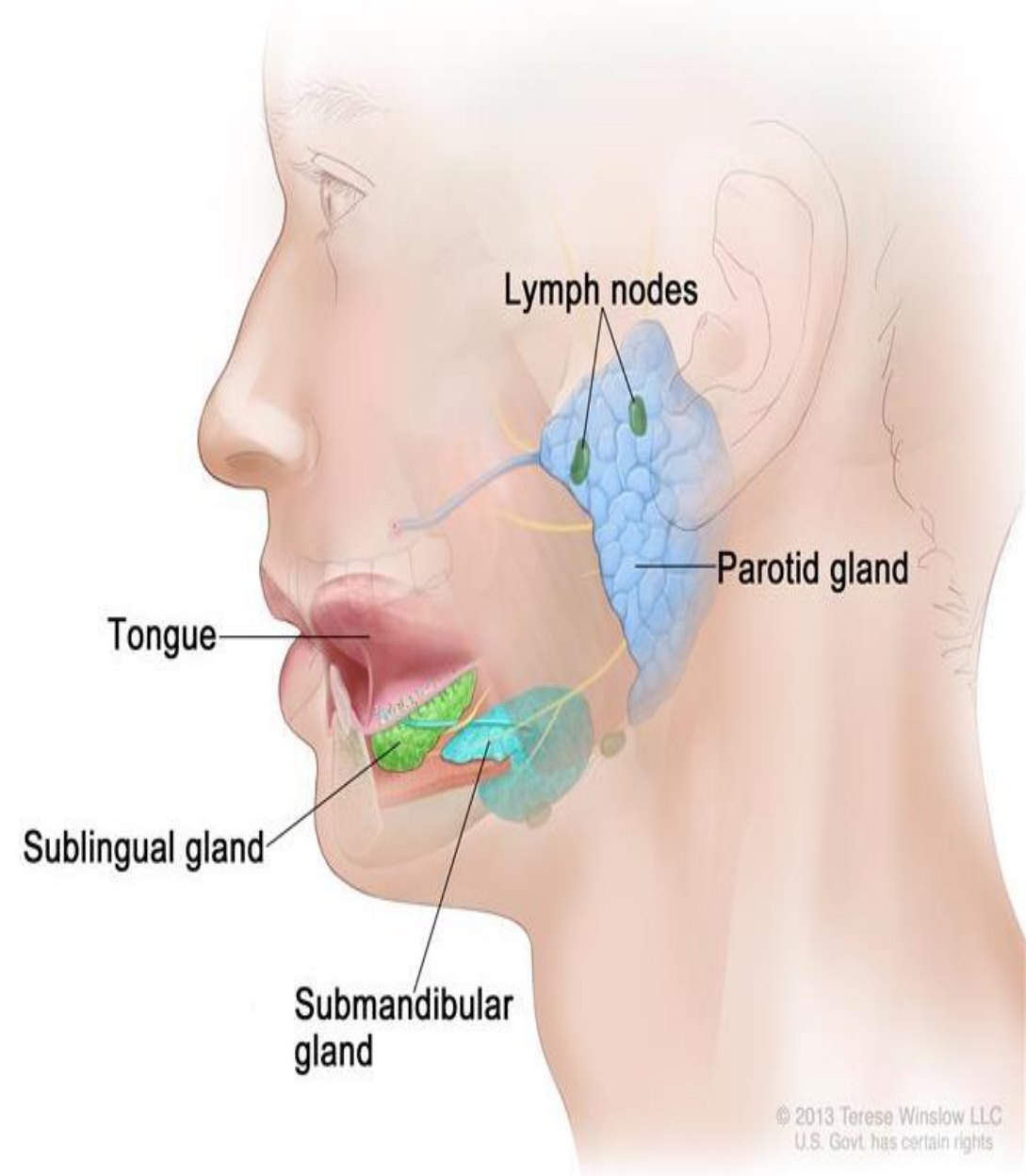
these are one or two lymph nodes which lie in **cheek** over the **buccinator muscle**. They drain lymph from the adjacent regions and give efferent to the **submandibular lymph nodes**.



4- Parotid lymph

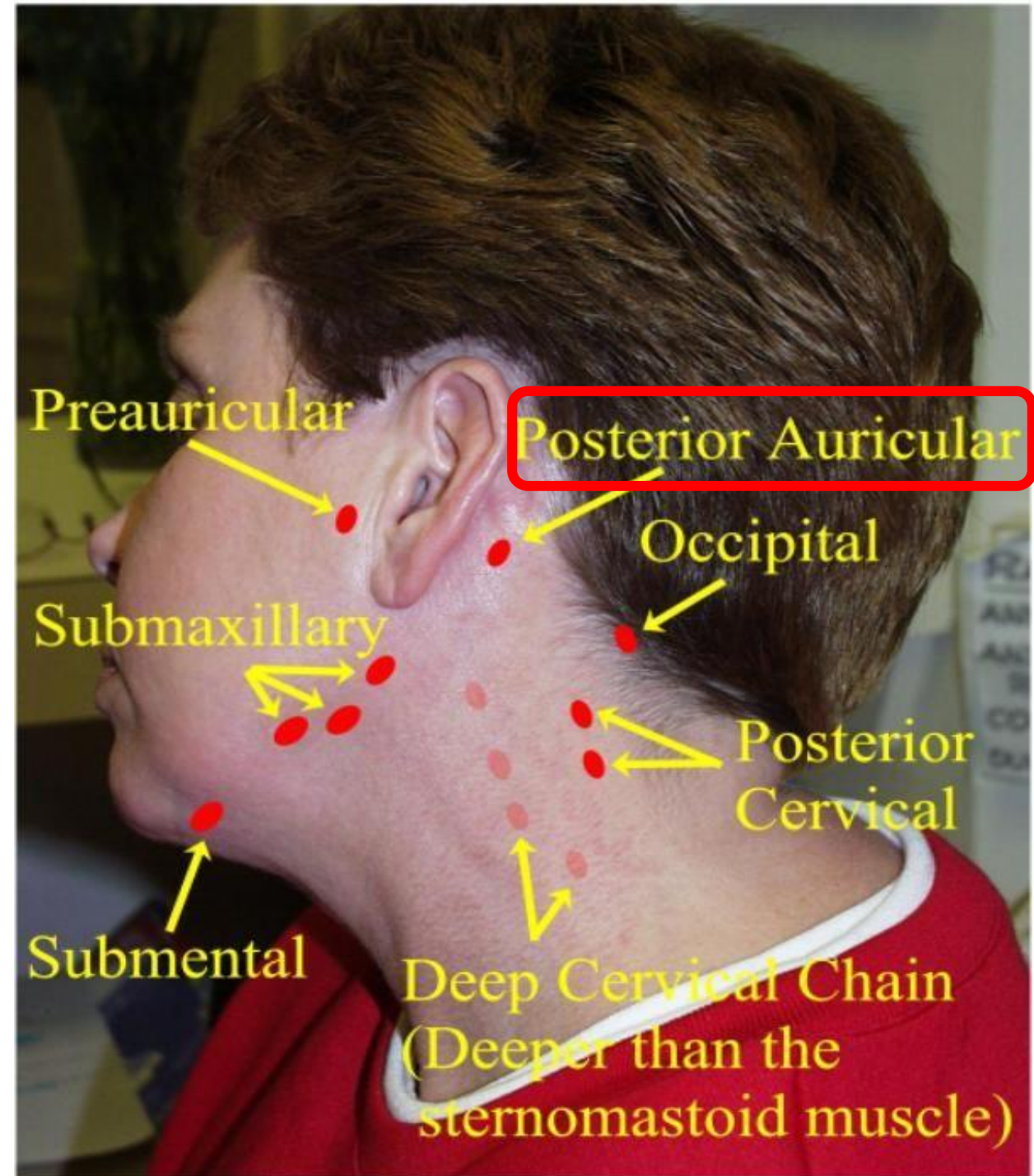
nodes: present on or within the parotid gland. They receive lymph from the following regions:

- a- Parotid gland.
- b- The auricle and the external acoustic meatus.
- c- Lateral side of the scalp.
- d- Eyelids.



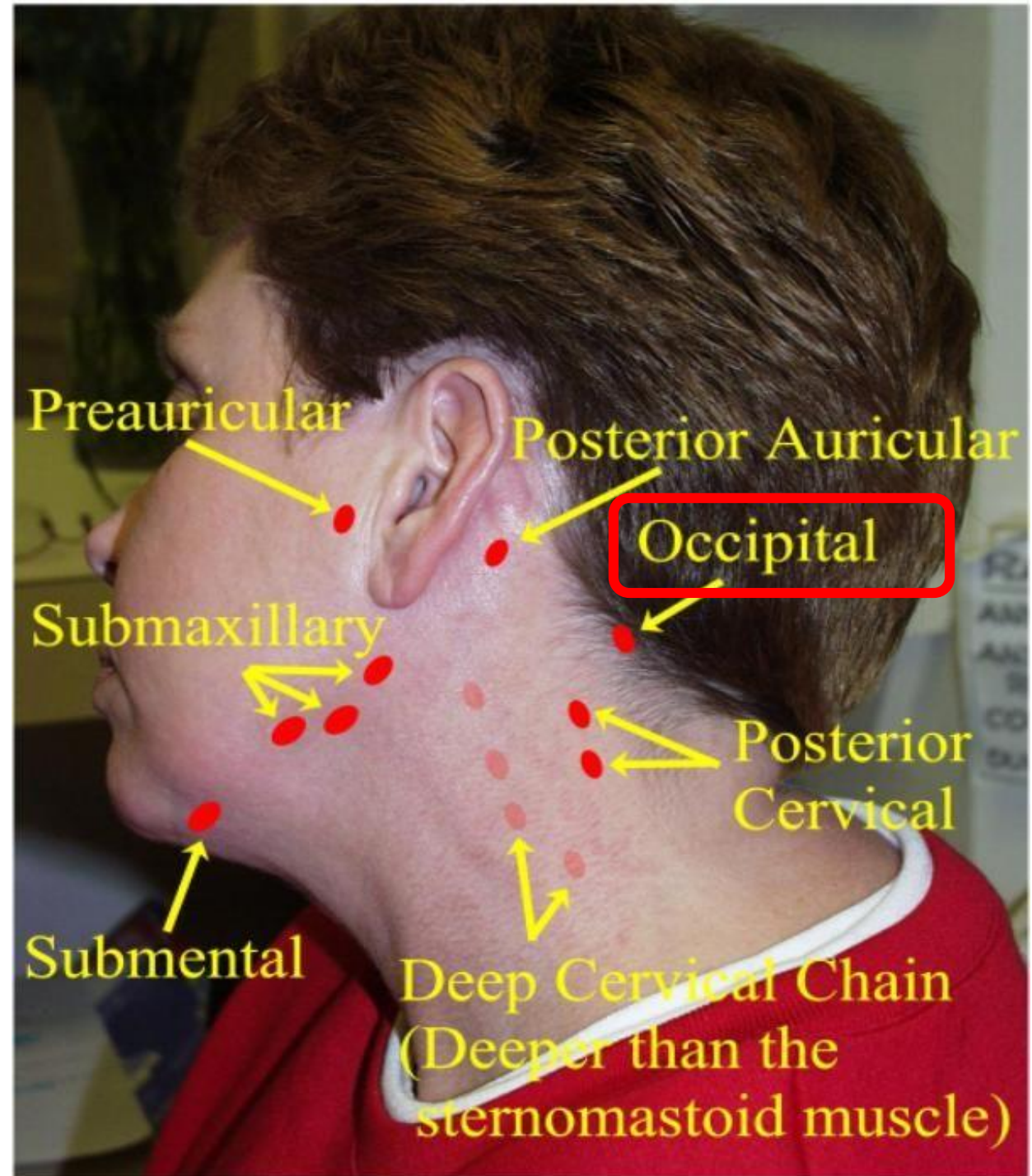
5- Posterior auricular lymph nodes:

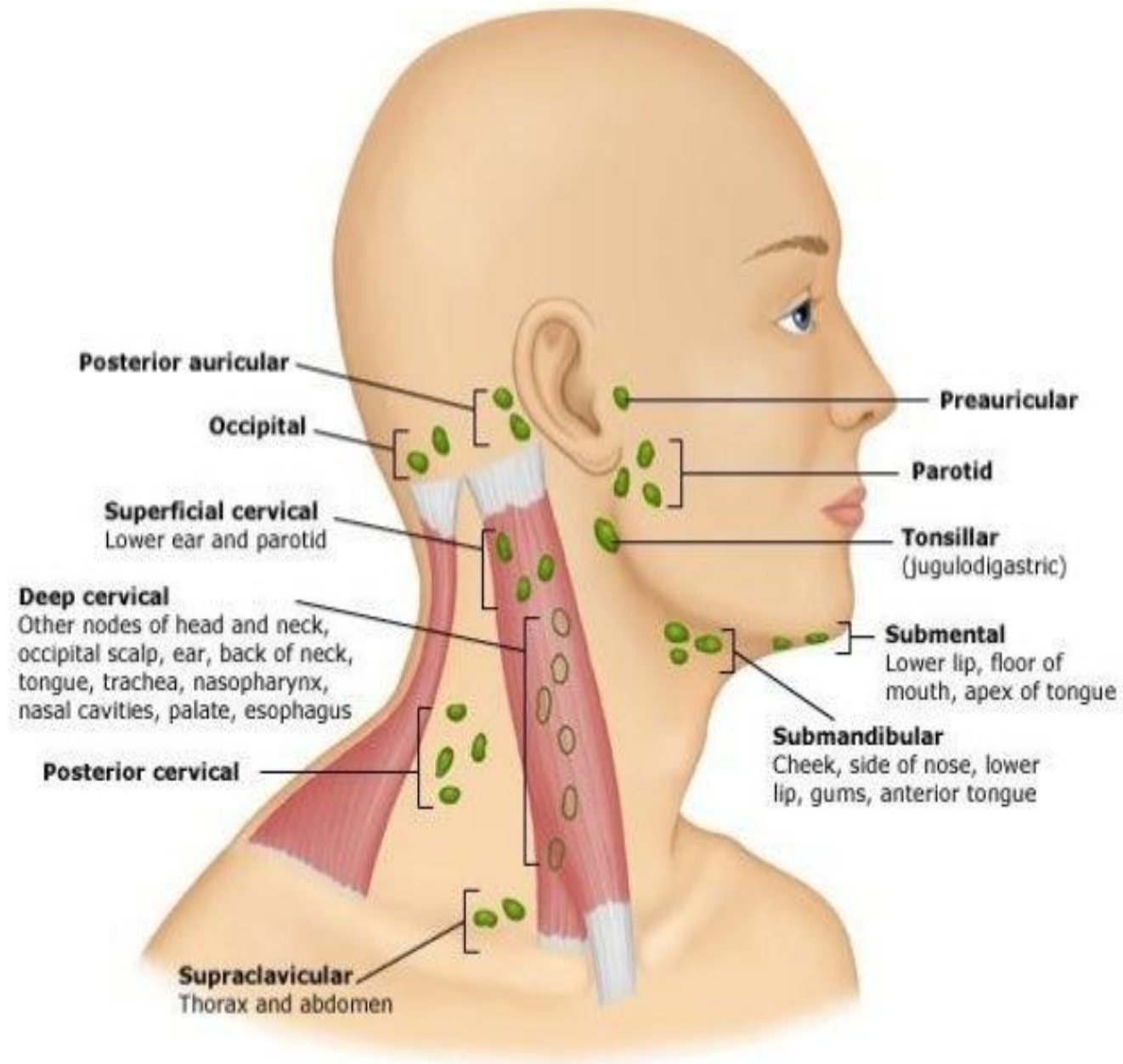
present behind the auricle. They receive lymph from the external acoustic meatus, the auricle and back of the scalp.



6- Occipital lymph nodes:

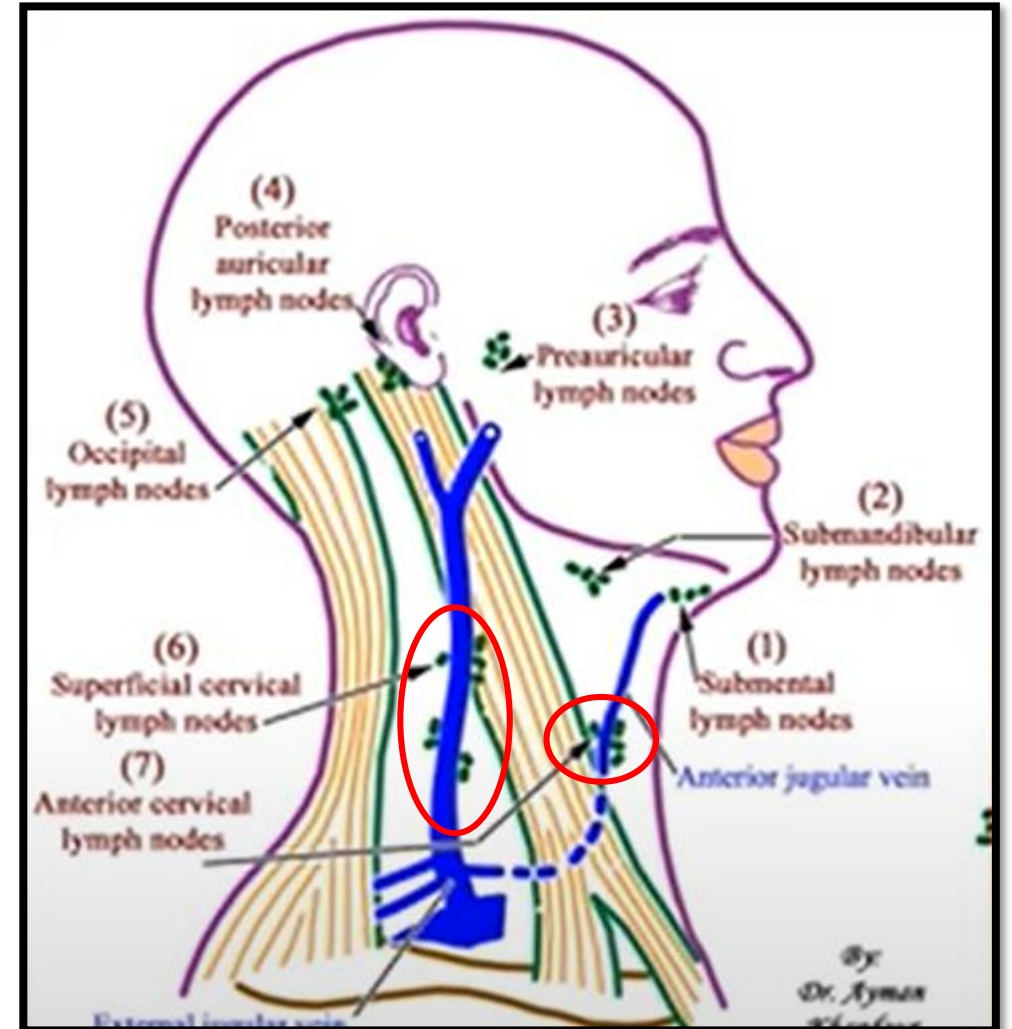
present on the back of the skull near the external occipital protuberance. They receive lymph from the back of the scalp.





Vertical LN group

- ❑ Superficial Cervical LN
Along external jugular vein
- ❑ Anterior cervical LN
Along the ant. Jugular vein



Deep cervical LN

1-Paratracheal and pretracheal LNs

2-Laryngeal LNs

3- Retropharyngeal LNs

4-jugulodigastric and jugulo-omohyoid.

5-supraclavicular nodes

Thank
you!

