



# HEMATOPOIETIC & LYMPHATIC SYSTEM

SUBJECT : Anatomy

LEC NO. : 4

DONE BY : Ruba Al mshaqba

وَقُلْ رَبِّ زِدْنِي عِلْمًا



# The Lymphatic System

- ▶ **Lymphatic system: a collection of lymphoid organs and cells, lymph, and lymph channels** (lymph vessels)  
نقل
- ▶ **Lymphatic vessels: convey lymph from all parts of the body (through lymphatic capillaries) toward the circulation**
- ▶ **Clears the body from excess fluids, and some proteins, provides it with immunity, and guards against harmful antigens**
- ▶ **Absorption and transport of fats (Lacteals)**
- ▶ **It may be the site of the primary tumor or the vehicle for the spread of other tumors**  
The tumor can be spread locally or to remote areas by lymphatic system or blood stream

Functions

## Absorption and transport of fats (Lacteals) شرح نقطة\*\*\*

**Lacteals** : specialized lymphatic vessels called lacteals, which are located in the walls of the small intestine.

the lacteals within the lymphatic system are responsible for absorbing dietary fats **in the small intestine** and transporting them throughout the body via the lymphatic vessels, ultimately delivering them to the bloodstream for use by cells and tissues.

# Lymphatic vessels

- ▶ Start as a blind-ended tubes
- ▶ Can absorb proteins and large particles
- ▶ Resemble veins but they have valves giving lymphatics a beaded appearance
- ▶ Lymph is the fluid inside them
- ▶ Lymph vessels stop at strategic points to filter lymph before reaching the circulation

مثل المسبحة / مظهر مطرز

↳ = lymph nodes

This filtration process helps to remove harmful substances from the lymphatic fluid and also plays a crucial role in immune system function by trapping and destroying pathogens and activating immune responses when necessary.





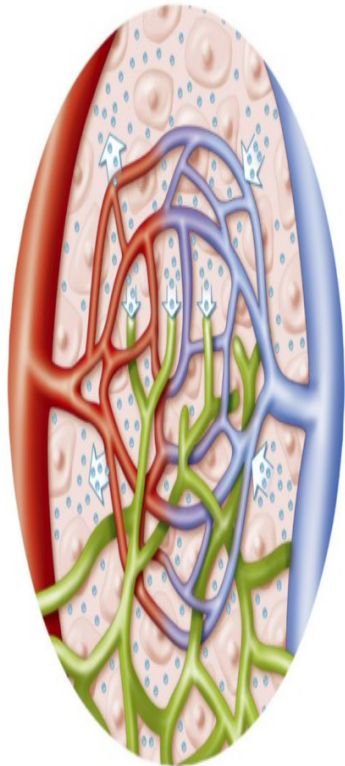
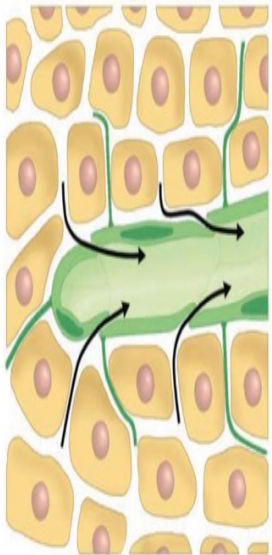
→ Drainage System

→ No circulation

”Lymphatic vessels start as blind-ended tubes“ شرح

means that they originate as closed-ended structures. In the lymphatic system, lymphatic vessels begin as small, thin-walled tubes that lack openings at one end, termed blind-ended or dead-end vessels.

These blind-ended vessels allow lymph fluid to enter but prevent it from leaving, facilitating the drainage and transport of lymph fluid and immune cells throughout the body.

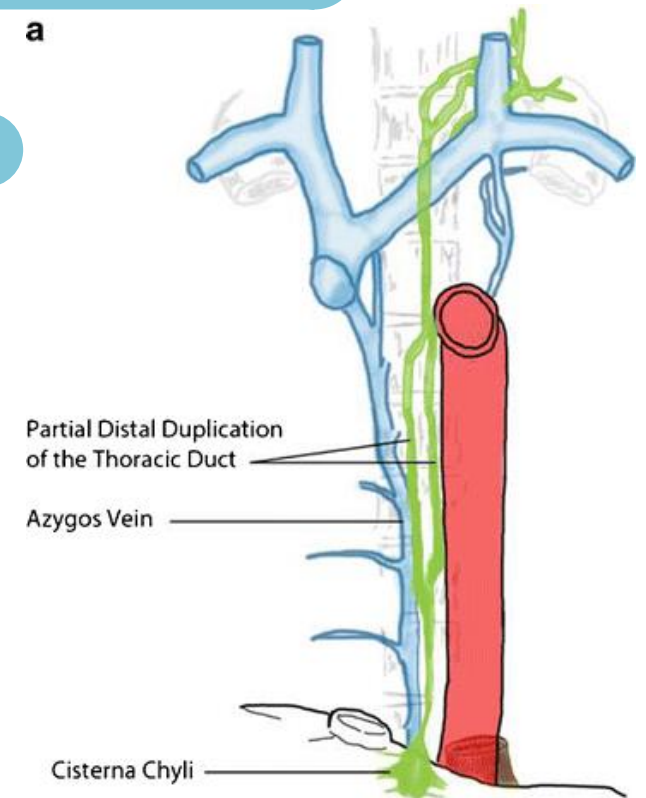


# Major Lymphatic Ducts

## Thoracic Duct

- ▶ Begins in the abdomen at the level of L<sub>2</sub> as a dilated sac called **Cysterna Chyli**
- ▶ **Cysterna Chyli** considered a plexiform convergence of lumbar trunks, one or more intestinal trunks, and two descending thoracic trunks
- ▶ Ascends vertically to enter the thorax through the **aortic hiatus** in the diaphragm at level T<sub>12</sub>

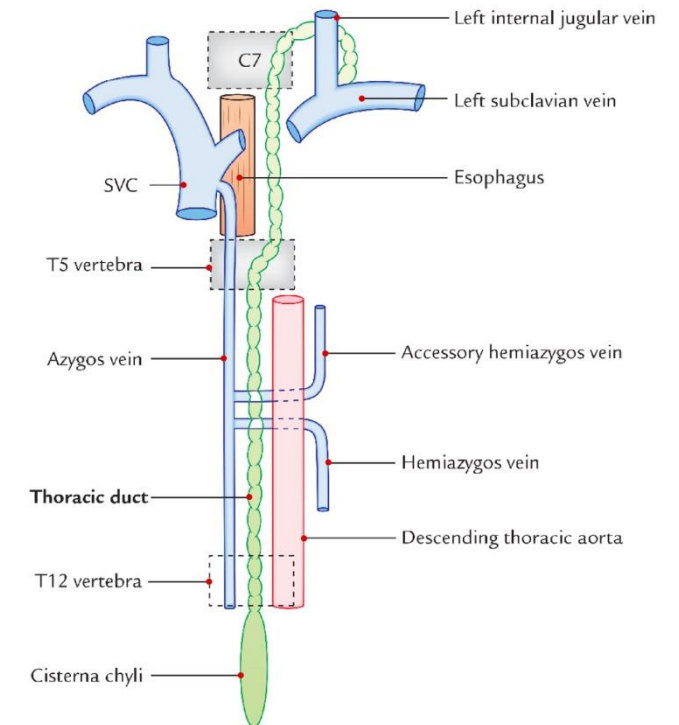
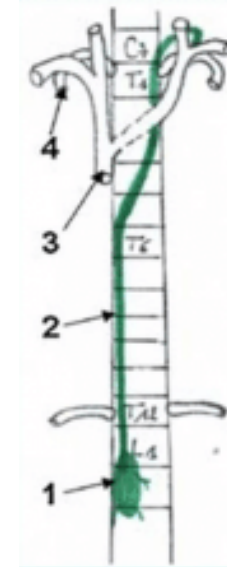
a



## Thoracic Duct Cont.,

- ▶ Starts at the right side of the aorta and ascends in a helical fashion until it becomes at the left side of the esophagus at T<sub>4</sub>
- ▶ Ascends, then turns left, and down to end at the beginning of Lt. brachiocephalic vein at **left venous angle**
- ▶ It drains most of the body

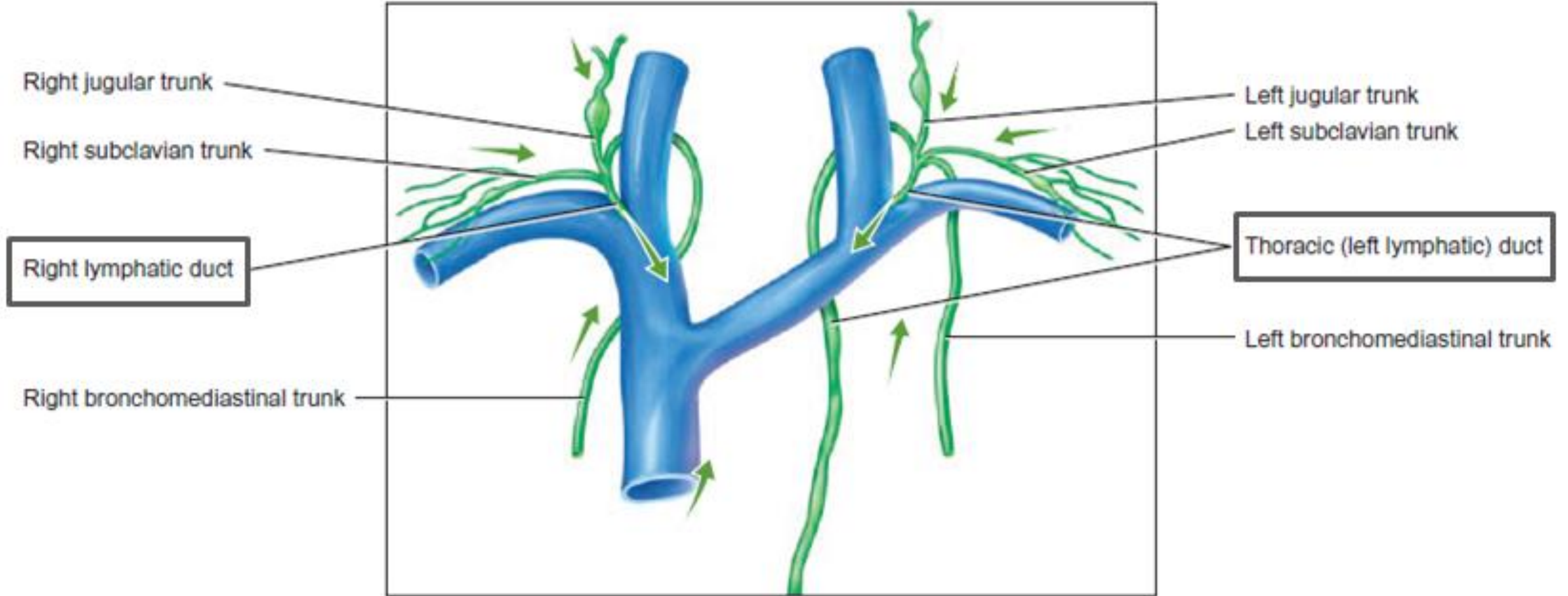
↪ The thoracic duct collects lymph from the left side of the head and neck, left arm, left half of the thorax, and from the entire abdomen and lower limbs.



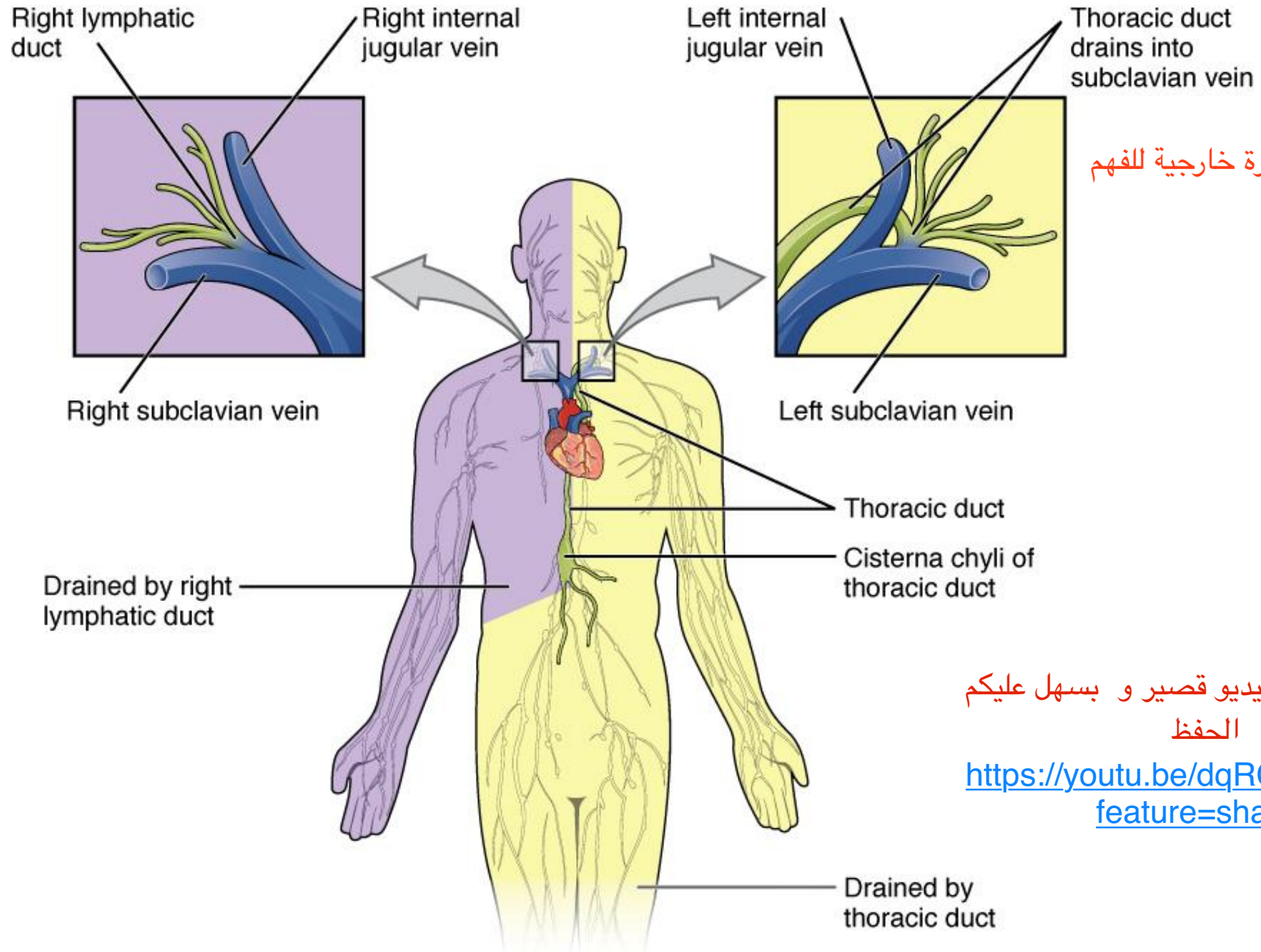
- The thoracic duct originates in the abdomen at the level of **T12 vertebra** and begins as a dilated sac called the **Cisterna Chyli**, which is situated in front of the L1 and L2 vertebral bodies.
- The **Cisterna Chyli** is considered a plexiform convergence of two lumbar trunks, one or more intestinal trunks, and two descending thoracic trunks.
- It **ascends vertically** to enter the thorax **through the aortic hiatus** in the diaphragm **at level T12**, starting on the right side of the aorta.
- Within the thorax, it **ascends in the posterior mediastinum to the right of midline**, passing in front of structures such as the **hemiazygos vein**, **accessory hemiazygos vein**, and **right posterior intercostal arteries**.
- Upon reaching the **T5 vertebra**, it crosses the midline from right to left and enters the superior mediastinum to run along the left border of the esophagus.
- At the root of the neck, it arches laterally at the level of the **C7 vertebra**, behind the left common carotid artery, left internal jugular vein, and left vagus nerve.
- Finally, the duct terminates by opening into the junction of the left subclavian and left internal jugular veins.
- Close to its termination, the thoracic duct receives three main tributaries: **the left jugular trunk**, **the left subclavian trunk**, and **the left bronchomediastinal trunk**.



صورة خارجية للفهم







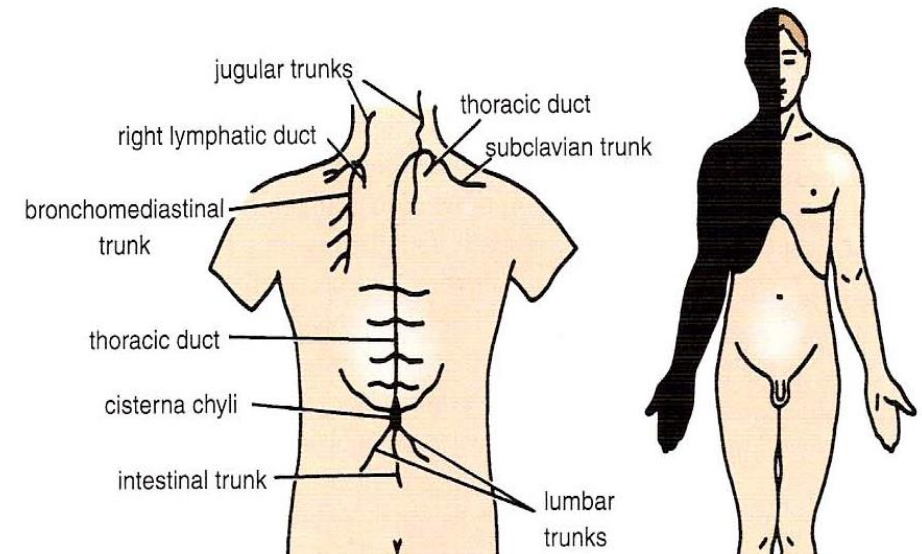
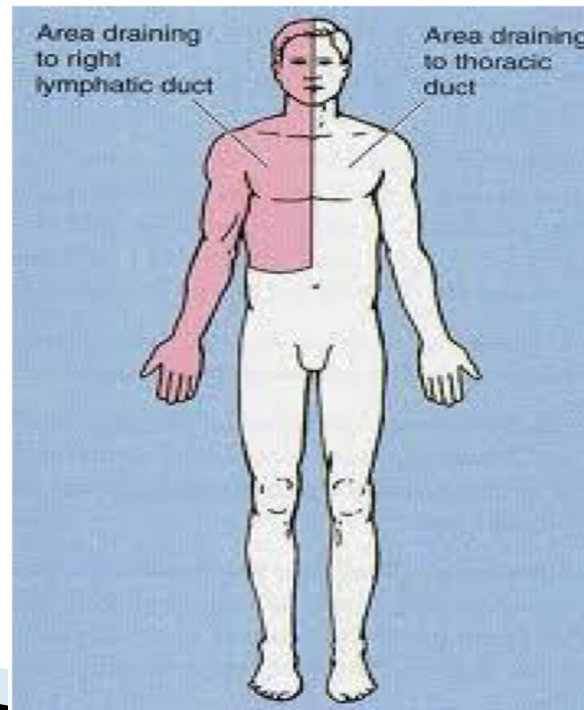
صورة خارجية للفهم

في كمان هاد الفيديو قصير و بسهل عليكم الحفظ

<https://youtu.be/dqRGzbEUBHA?feature=shared>

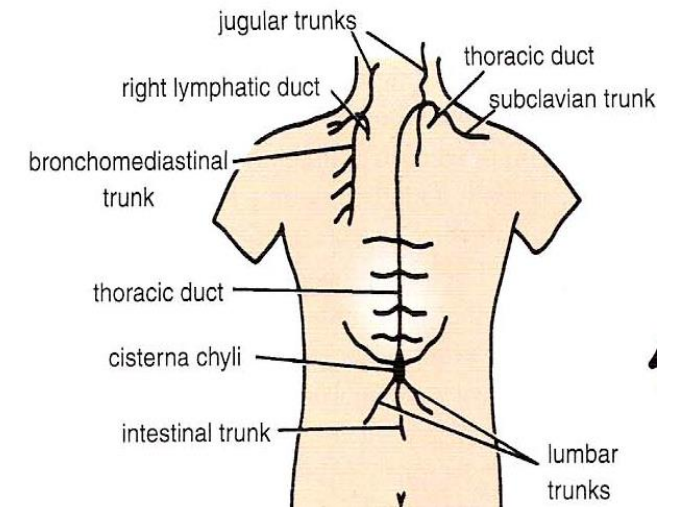
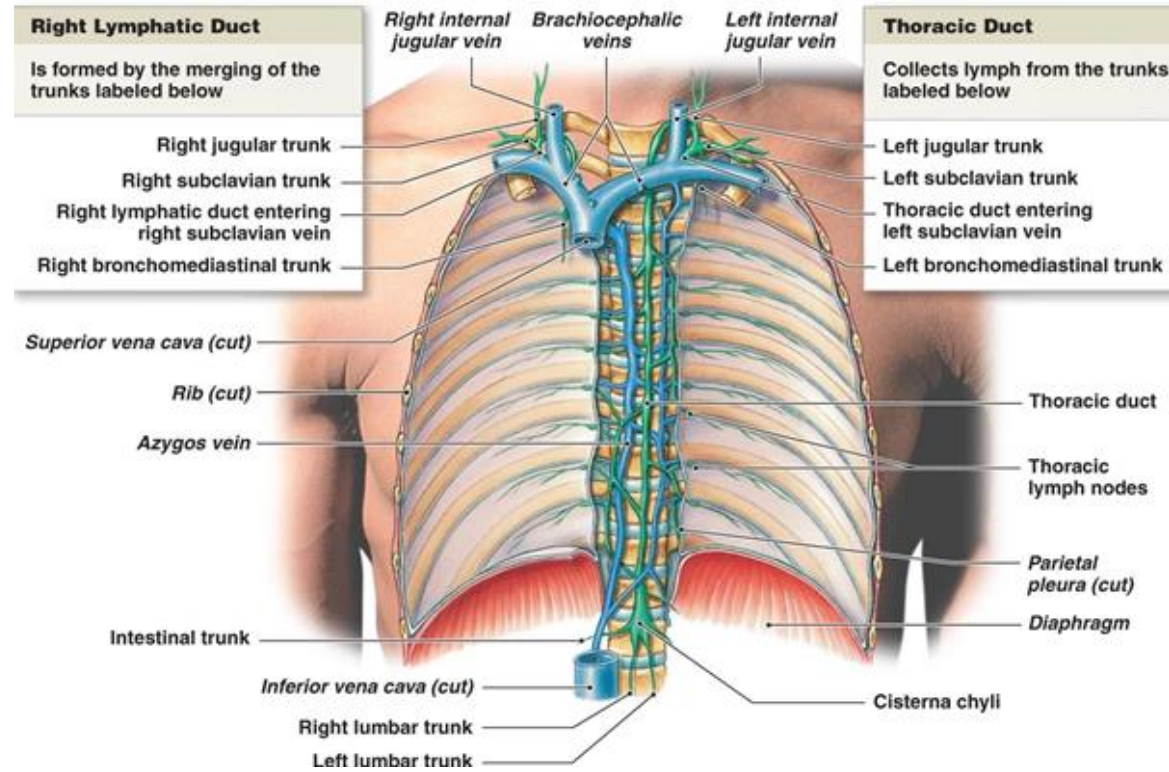
# Right Lymphatic Duct

- ▶ It drains the Rt. Subclavian, Rt. Jugular, and Rt. Bronchomediastinal trunks
- ▶ Collects lymph from the Rt. Side of head and neck, Rt. Upper limb and Rt. Side of the chest
- ▶ It opens at the beginning of the right Brachiocephalic vein



# Z

## The relationship between the right lymphatic and thoracic ducts and the venous system





The lumbar trunks drain lymph from the free lower Limbs , the wall and viscera of the pelvis, the kidneys, the adrenal glands, and the abdominal wall.

The intestinal trunk drains lymph from the stomach, intestines, pancreas, spleen, and part of the liver.

The bronchomediastinal trunks drain lymph from the thoracic wall, lung, and heart.

The subclavian trunks drain the free upper limbs.

The jugular trunks drain the head and neck.

The lymph passage from the lymph trunks to the venous system differs on the right and left sides of the body.

On the right side the three lymph trunks (right jugular trunk, right subclavian trunk, and right bronchomediastinal trunk) usually open independently into the venous system on the anterior surface of the junction of the internal jugular and subclavian veins

the three trunks will join to form a short right lymphatic duct that forms a single junction with the venous system.

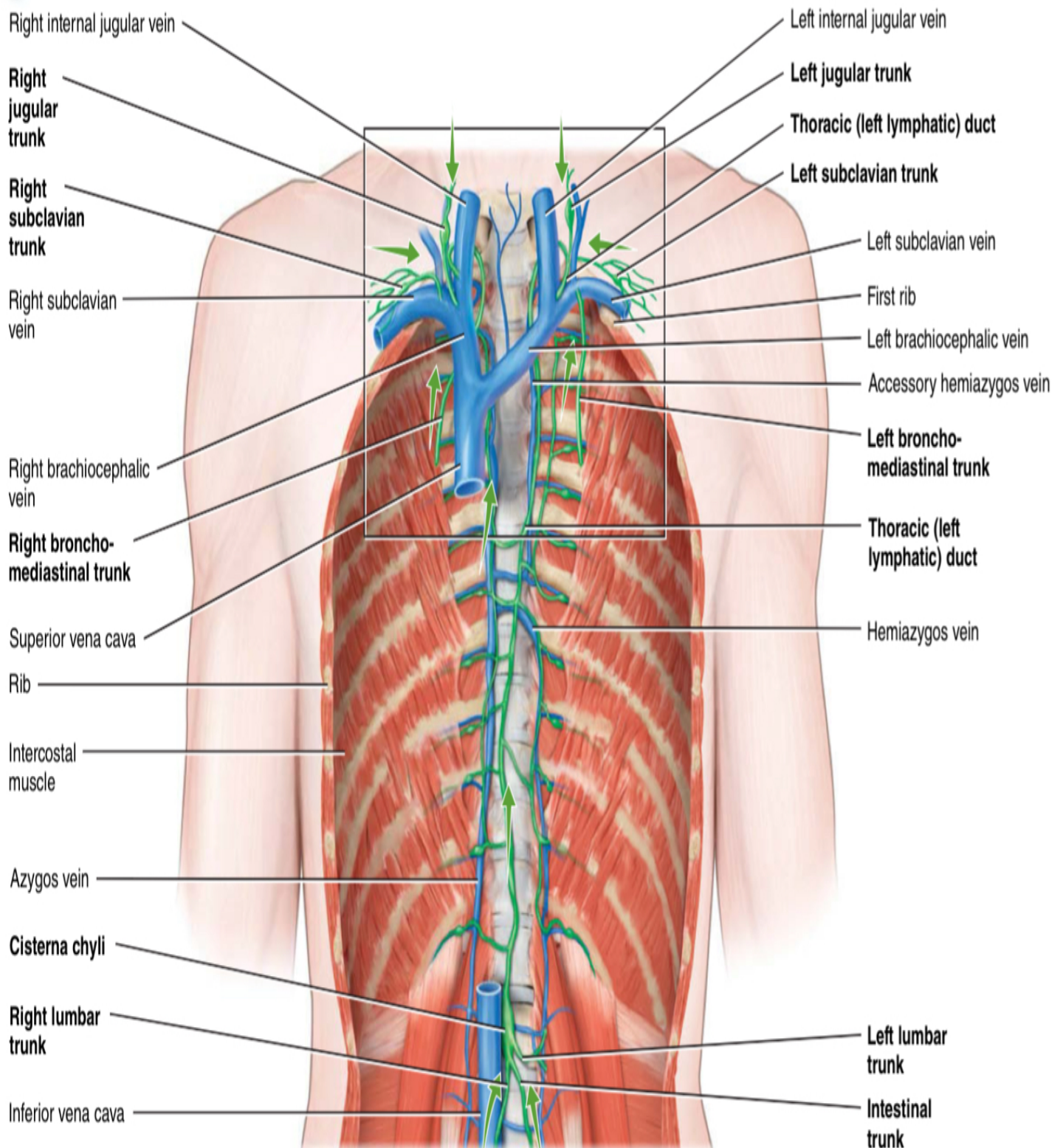
On the left side of the body, the largest lymph vessel, the thoracic (left lymphatic) duct forms the main duct for return of lymph to the blood. This long duct, begins as a dilation called the cisterna chyli anterior to the second lumbar vertebra.

The cisterna chyli receives lymph from the right and left lumbar trunks and from the intestinal trunk.

In the neck, the thoracic duct also receives lymph from the left jugular and left subclavian trunks before opening into the anterior surface of the junction of the left internal jugular and subclavian veins.

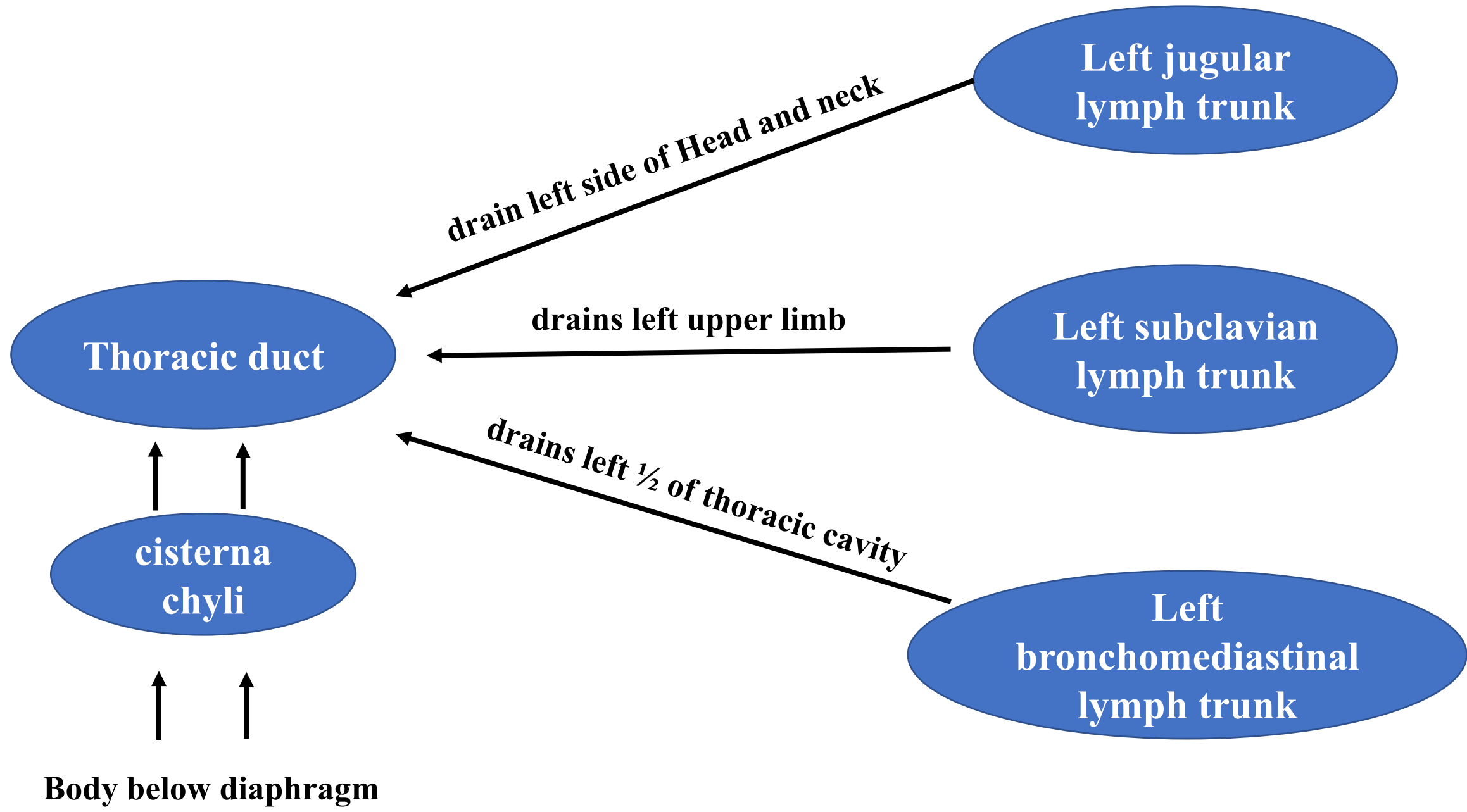
The left bronchomediastinal trunk joins the anterior surface of the subclavian vein independently and does not join the thoracic duct.

As a result of these pathways, lymph from the upper right quadrant of the body returns to the superior vena cava from the right brachiocephalic vein, while all the lymph from the left upper side of the body and the entire body below the diaphragm returns to the superior vena cava via the left brachiocephalic vein.





خارجي



Left jugular lymph trunk

drain left side of Head and neck

drains left upper limb

Left subclavian lymph trunk

Thoracic duct

drains left 1/2 of thoracic cavity

cisterna chyli

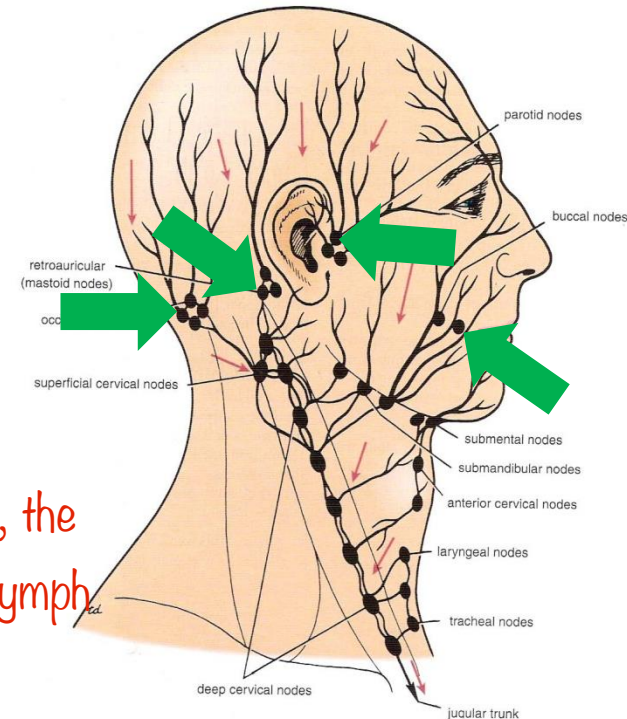
Left bronchomediastinal lymph trunk

Body below diaphragm

# Lymph from Head and Neck

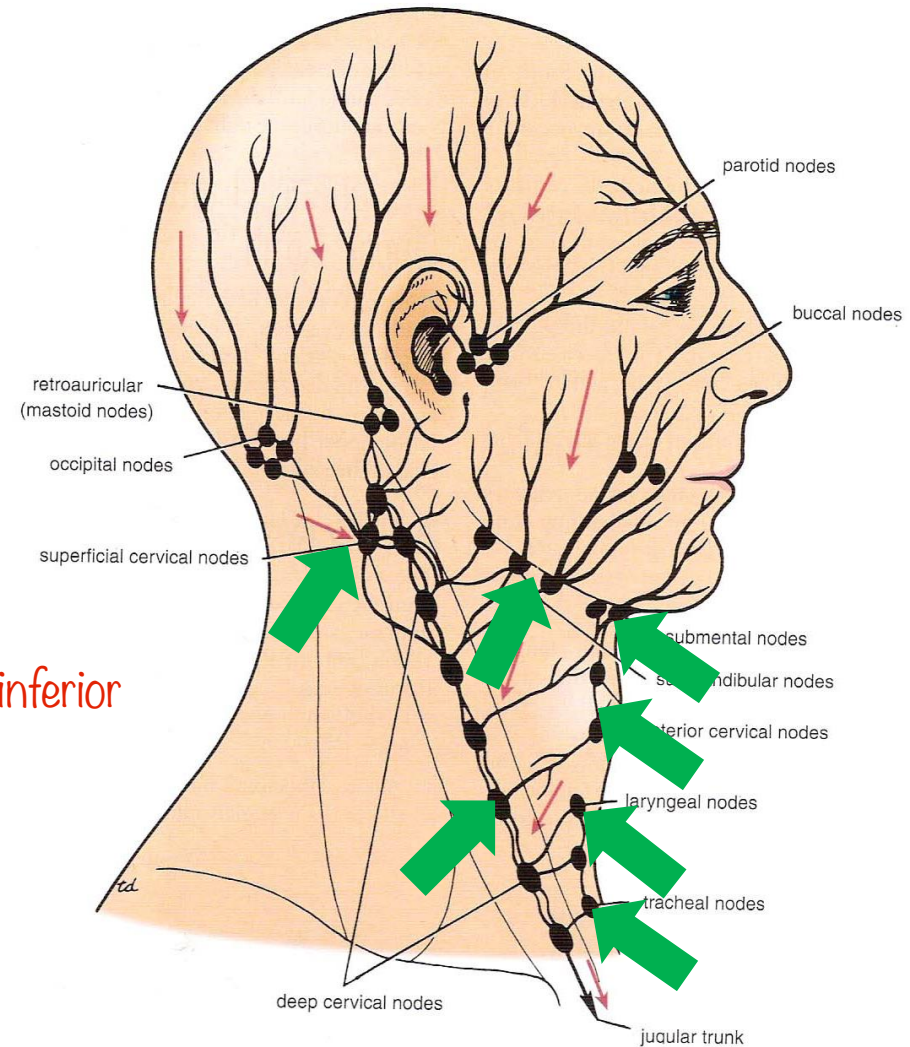
- ▶ Lymph is collected from entire head and neck and ends in either one of the jugular trunks
- ▶ Lymph is filtered in at least one lymph node in regional lymph nodes
- ▶ Regional lymph nodes include the following:
  1. Occipital
  2. Retroauricular
  3. Parotid
  4. Buccal

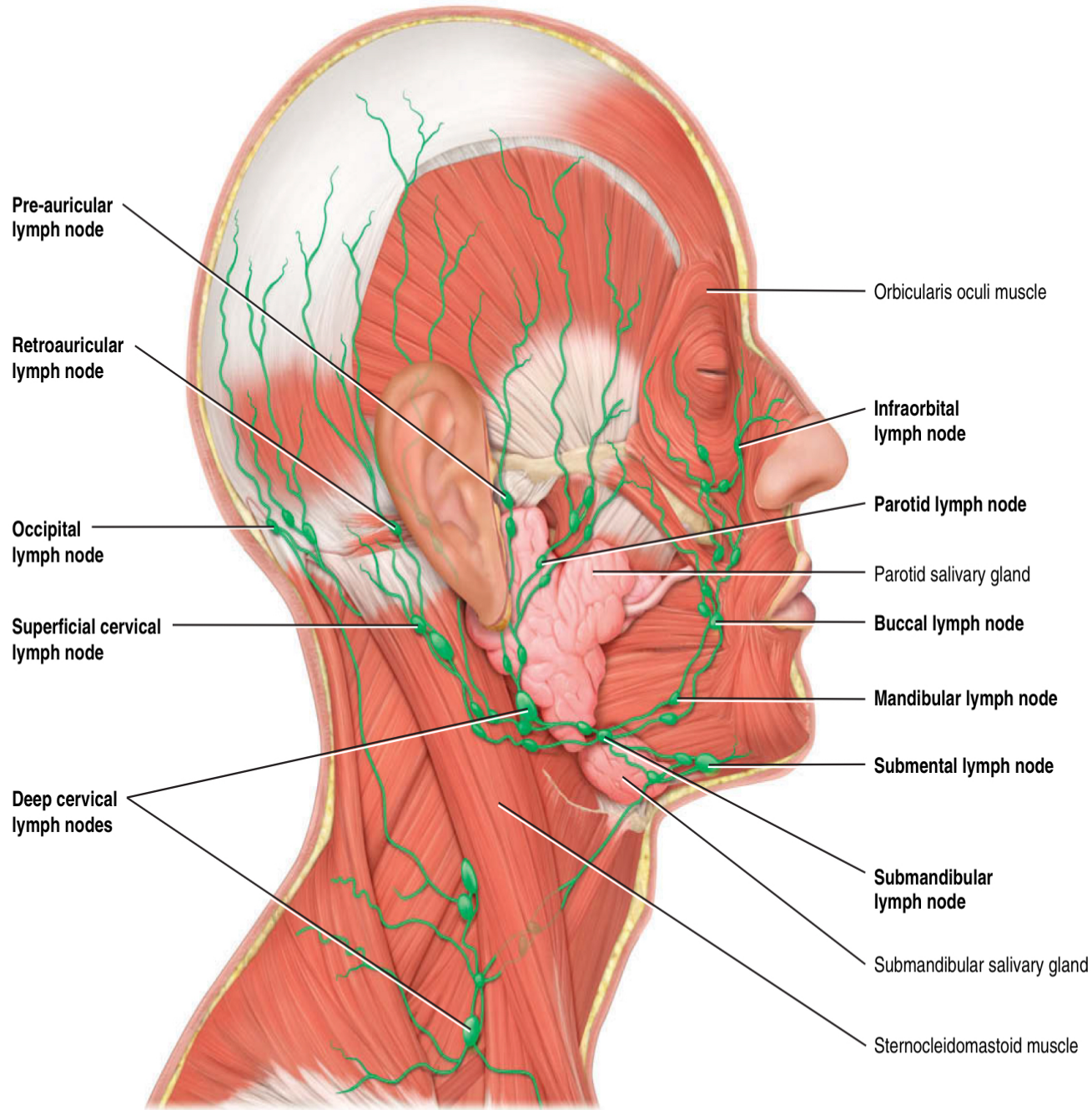
\*\*\*\*\* From lymph nodes (I) to (II), the drainage is to the deep cervical lymph nodes



# Cont.

5. Submandibular
6. Sumental
7. Anterior cervical
8. Superficial cervical
9. Retropharyngeal
10. Laryngeal
11. Tracheal
12. Deep cervical *Superior and inferior*





Lateral view of lymph nodes of the head and neck

- Deep cervical lymph nodes on the left side drain into the thoracic duct.
- Deep cervical lymph nodes on the right side drain into the right lymphatic duct (jugular lymphatic trunk)

• Retropharyngeal lymph nodes receive drainage from the posterior parts of the nasal cavity, pharynx, and larynx, as well as from the retropharyngeal space.

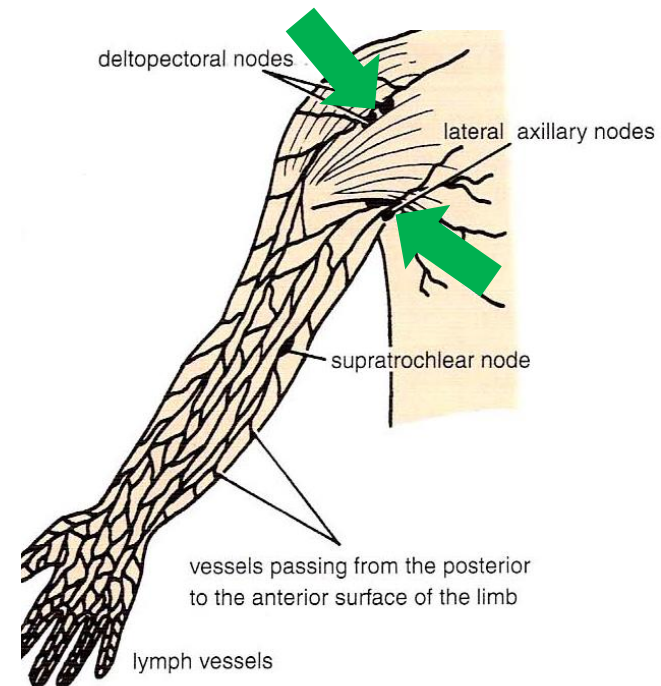
• Occipital lymph nodes receive drainage from the posterior scalp, including the area behind the ears and the nape of the neck.

• Retropharyngeal lymph nodes Not superficial because it's found inside the neck

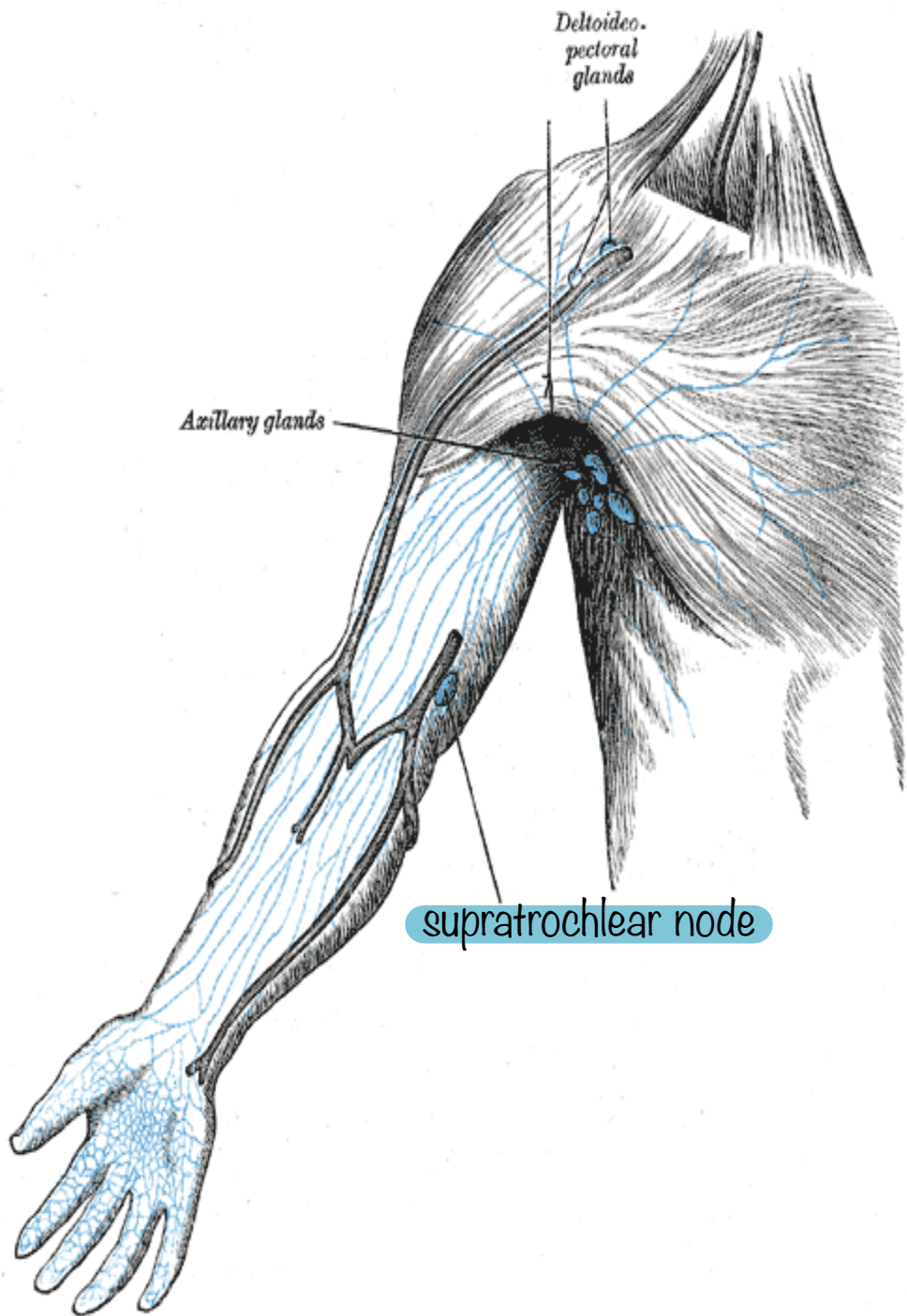


# Lymph from the Upper Limb

- ▶ Superficial lymph vessels accompany superficial veins
- ▶ They drain superficial structures
- ▶ Deep lymph vessels accompany deep veins
- ▶ They drain deep structures
- ▶ Both end in lymph nodes in axilla







The **supratrochlear** lymph nodes are **located in** the elbow region, near the medial epicondyle of the humerus. These nodes **receive lymphatic drainage** from the middle portion of the forearm, including the area around the elbow.

# Axillary Lymph Nodes

▶ They drain upper limb, lateral part of the breast, and superficial lymph of thoracoabdominal wall above umbilicus

▶ They include:

1. Anterior (Pectoral)

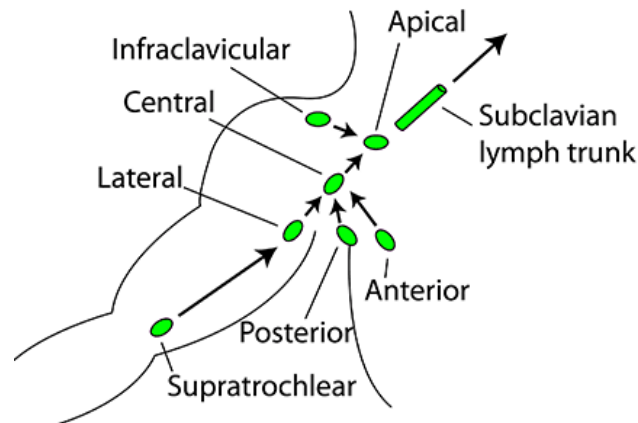
2. Posterior (Subscapular)

3. Lateral (Humeral)

4. Central

5. Apical

6. Infraclavicular



Mnemonic for axillary lymph nodes:

"APICAL"

A - Anterior

P - Posterior

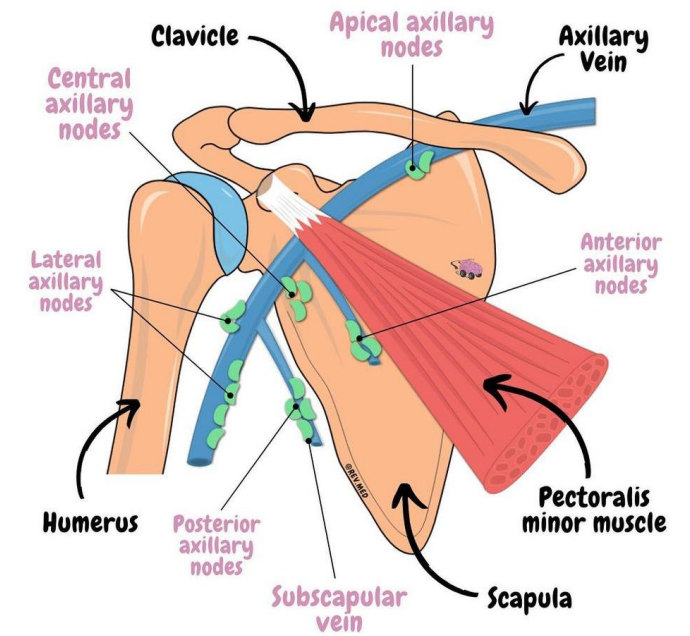
I - Infraclavicular

C - Central

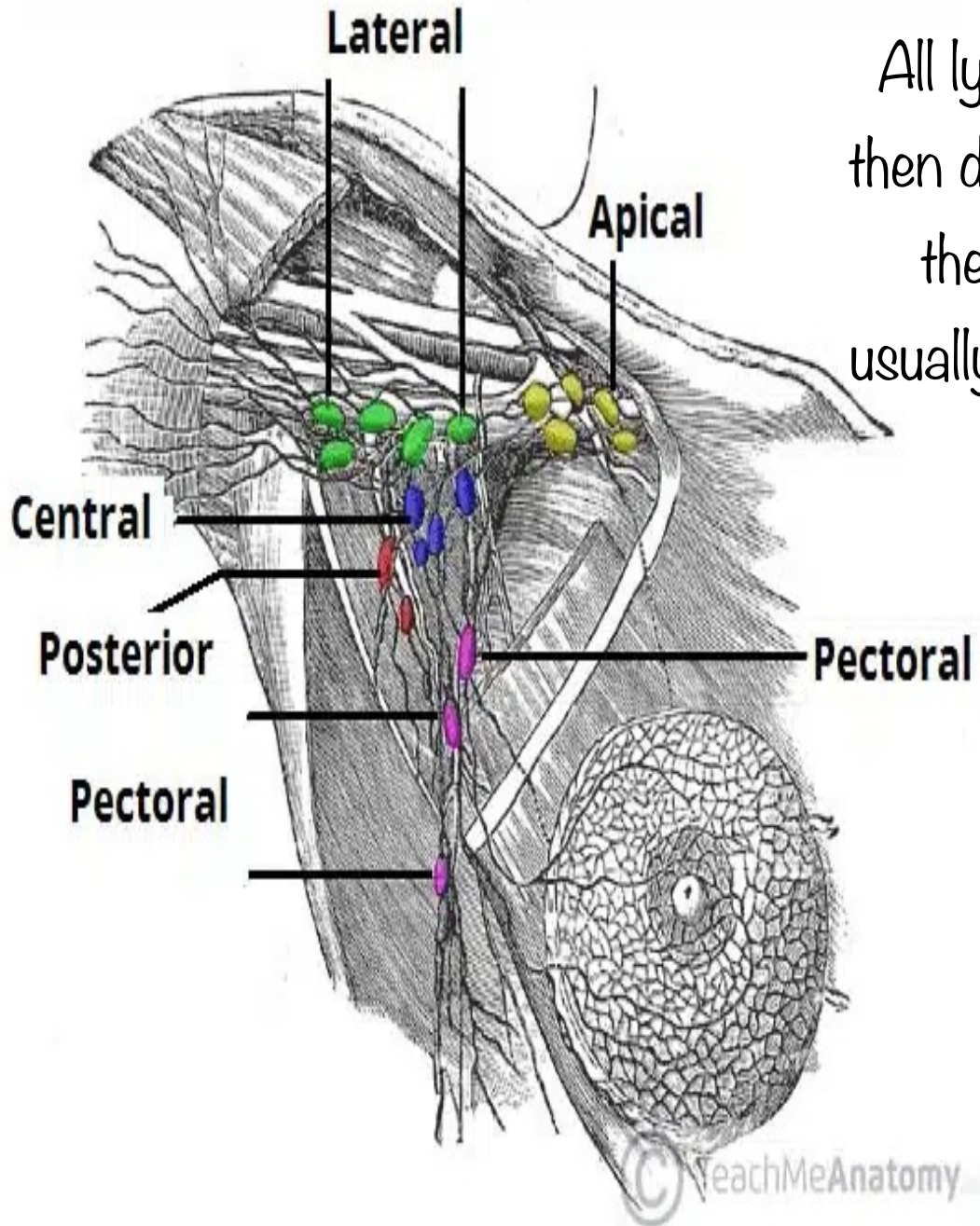
A - Apical

L - Lateral

75% of lymphatics from the breast drain to axillary nodes. Others to internal thoracic, abdominal nodes or to other breast



All lymph from the upper limb ends in the central axillary nodes, then drains to the apical lymph nodes. From there, it typically joins the subclavian trunk. The subclavian trunk on the right side usually meets with the jugular trunk and bronchomediastinal trunk to form the right lymphatic duct



Mnemonic for axillary lymph nodes:

"APICAL"

A - Anterior

P - Posterior

I - Infraclavicular

C - Central

A - Apical

L - Lateral



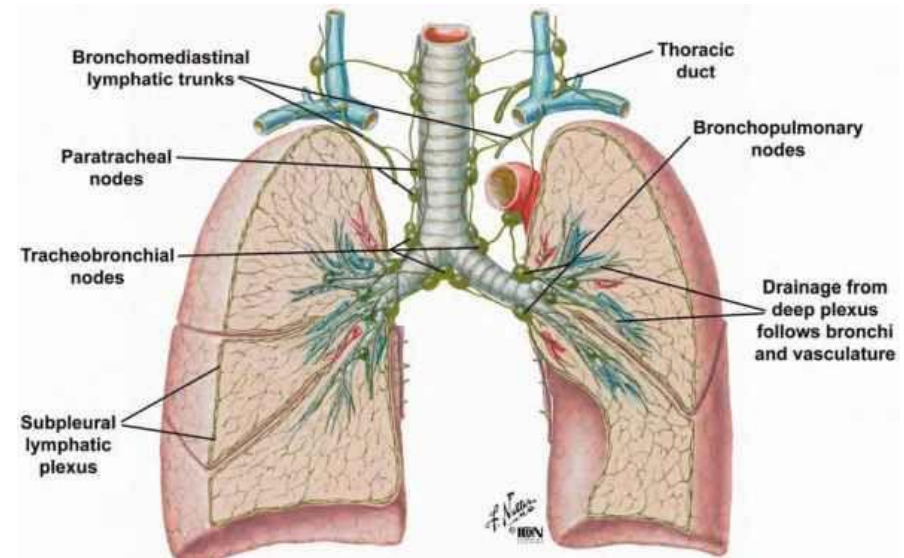
# Lymphatics of the Lungs

- ▶ **Superficial pulmonary plexus (subpleural):**  
drains into Bronchopulmonary (Hilar) lymph nodes.

- ▶ **Deep pulmonary plexus:**  
along the bronchial tree and  
pulmonary vessels.

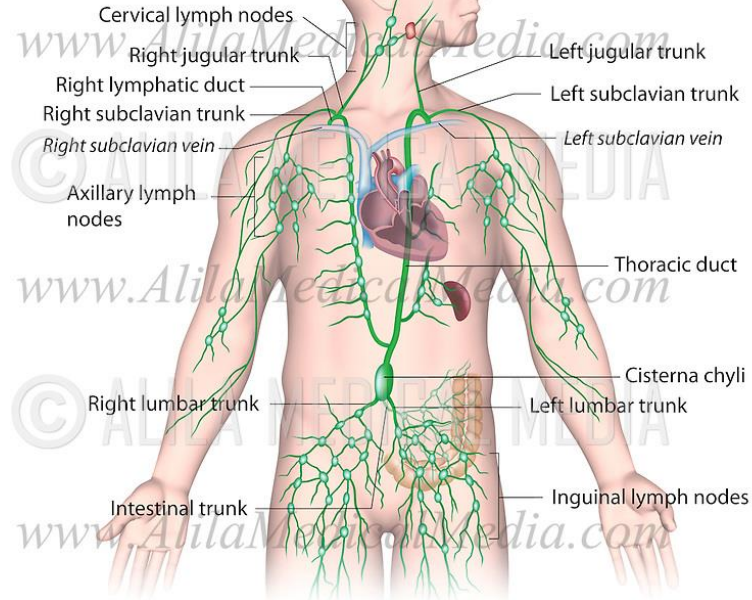
Drain into pulmonary nodes,  
then to Bronchopulmonary  
(Hilar) nodes.

Then to tracheal bronchial (**Inferior or carinal**) and (**lateral or paratracheal**) to end in the Broncho-mediastinal trunk and then to **Right lymphatic duct** or **Thoracic Duct** on the left side

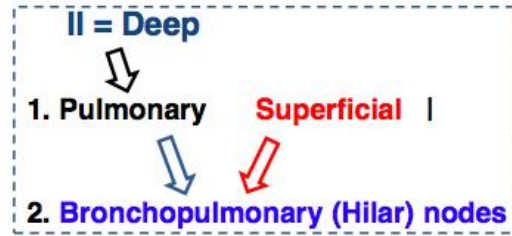


▶ Z

© ALILA MEDICAL MEDIA



© Alila Medical Media - www.AlilaMedicalMedia.com



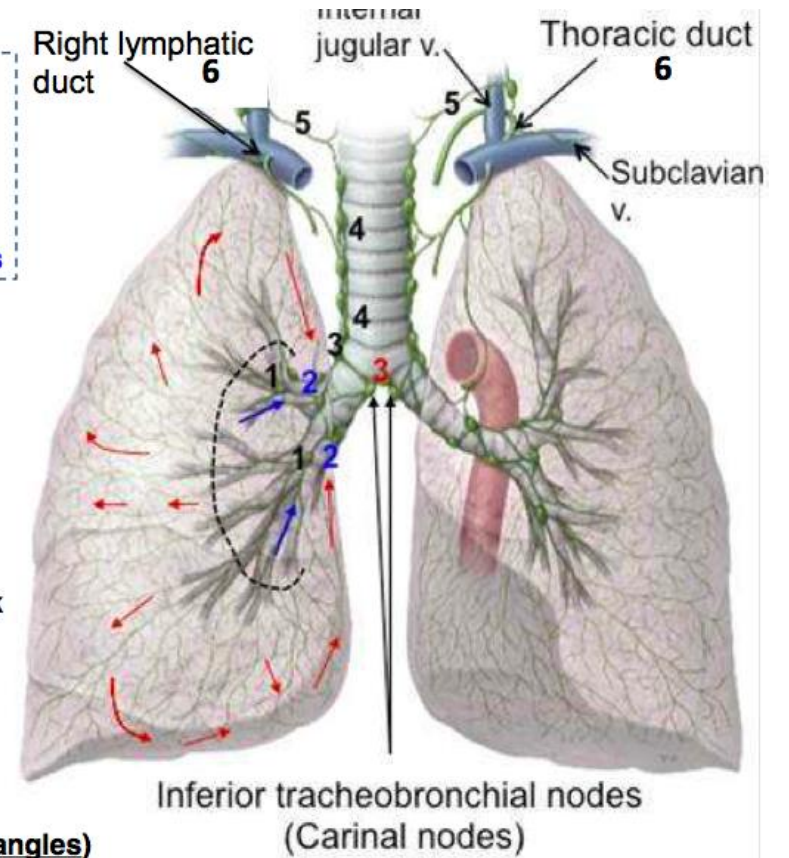
3. Tracheobronchial nodes (Superior & Inferior → Carinal)

4. Paratracheal nodes

5. Bronchomediastinal lymph trunk

6. Left → Thoracic duct & Right → Right lymphatic duct

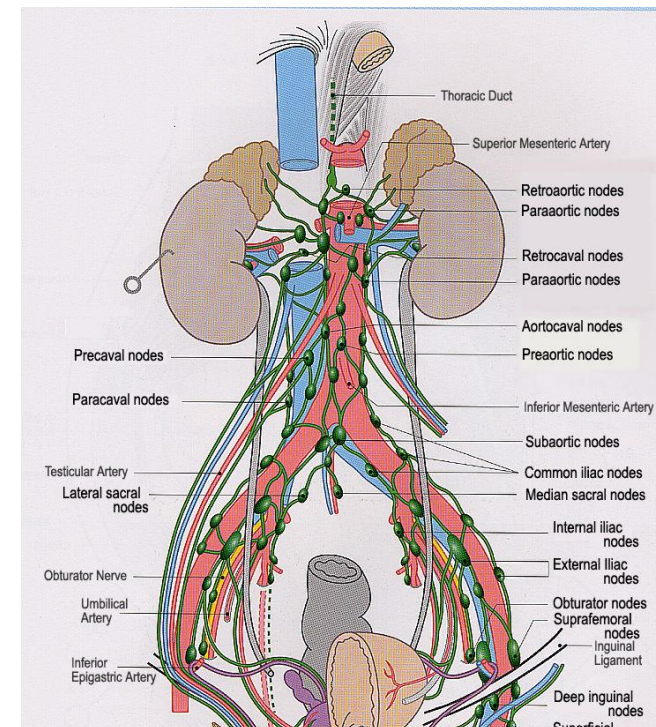
7. Venous system (rt. & lt. Venous angles)



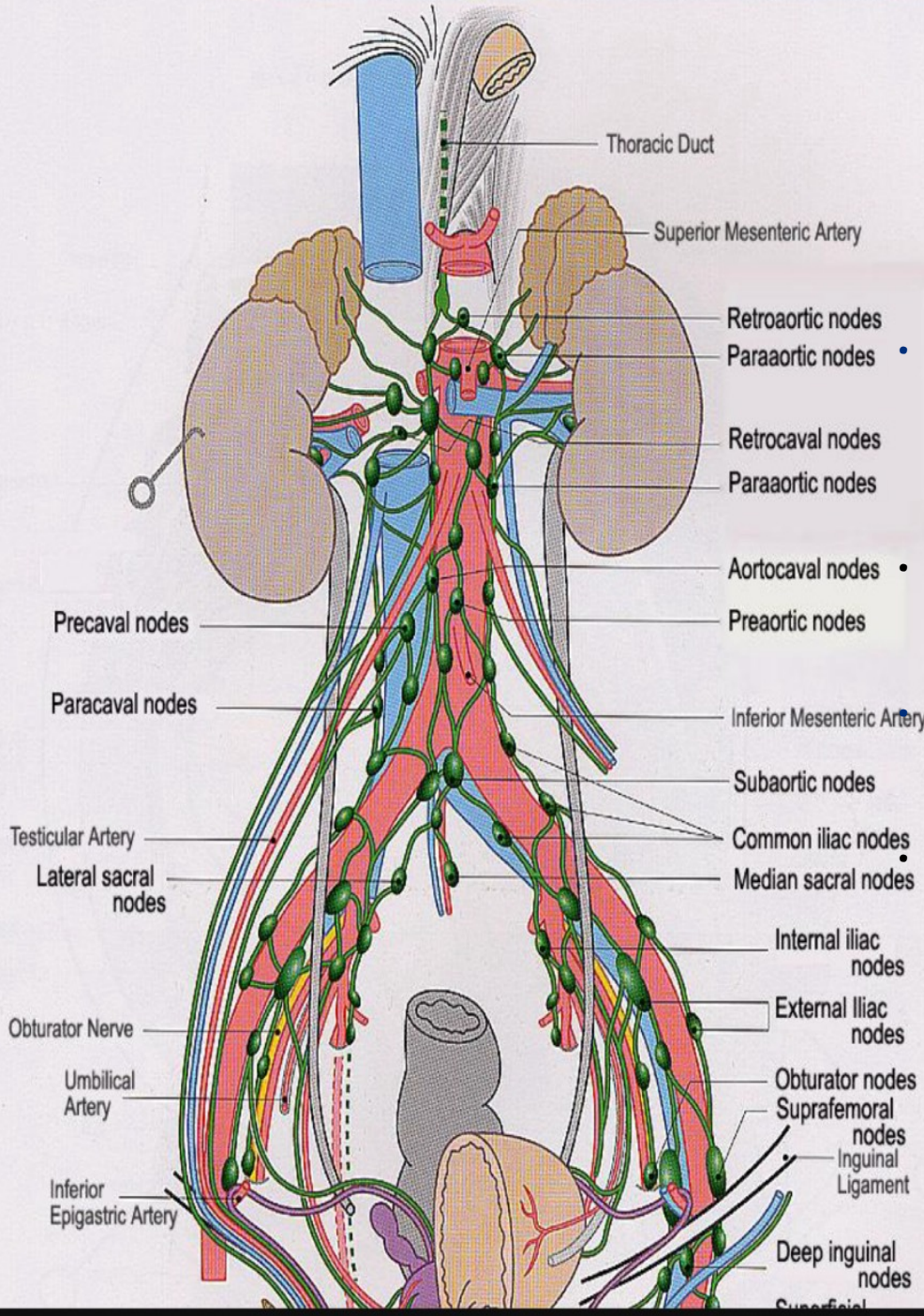


# Lymphatics of Abdomen and Pelvis

- ▶ Most of the abdominal wall, all viscera drain into **Thoracic Duct**
- ▶ All parts of GIT, liver, spleen, and pancreas drain into **preaortic nodes**
- ▶ Their efferent form **Intestinal Trunk** *Cysterna Chyli* يلي بنتهي في
- ▶ Remaining parts drain into **paraaortic nodes**
- ▶ Their efferent forms **Rt. and Lt. Lumbar Trunks**



((بس ترتيب للكلام السابق))



- Abdominal Wall and Viscera Drainage:
- Most of the abdominal wall and all viscera drain into the Thoracic Duct.

### • GIT, Liver, Spleen, and Pancreas Drainage:

- All parts of the gastrointestinal tract (GIT), liver, spleen, and pancreas drain into preaortic nodes.
- The efferent vessels from these nodes form the Intestinal Trunk.

### Remaining Parts Drainage:

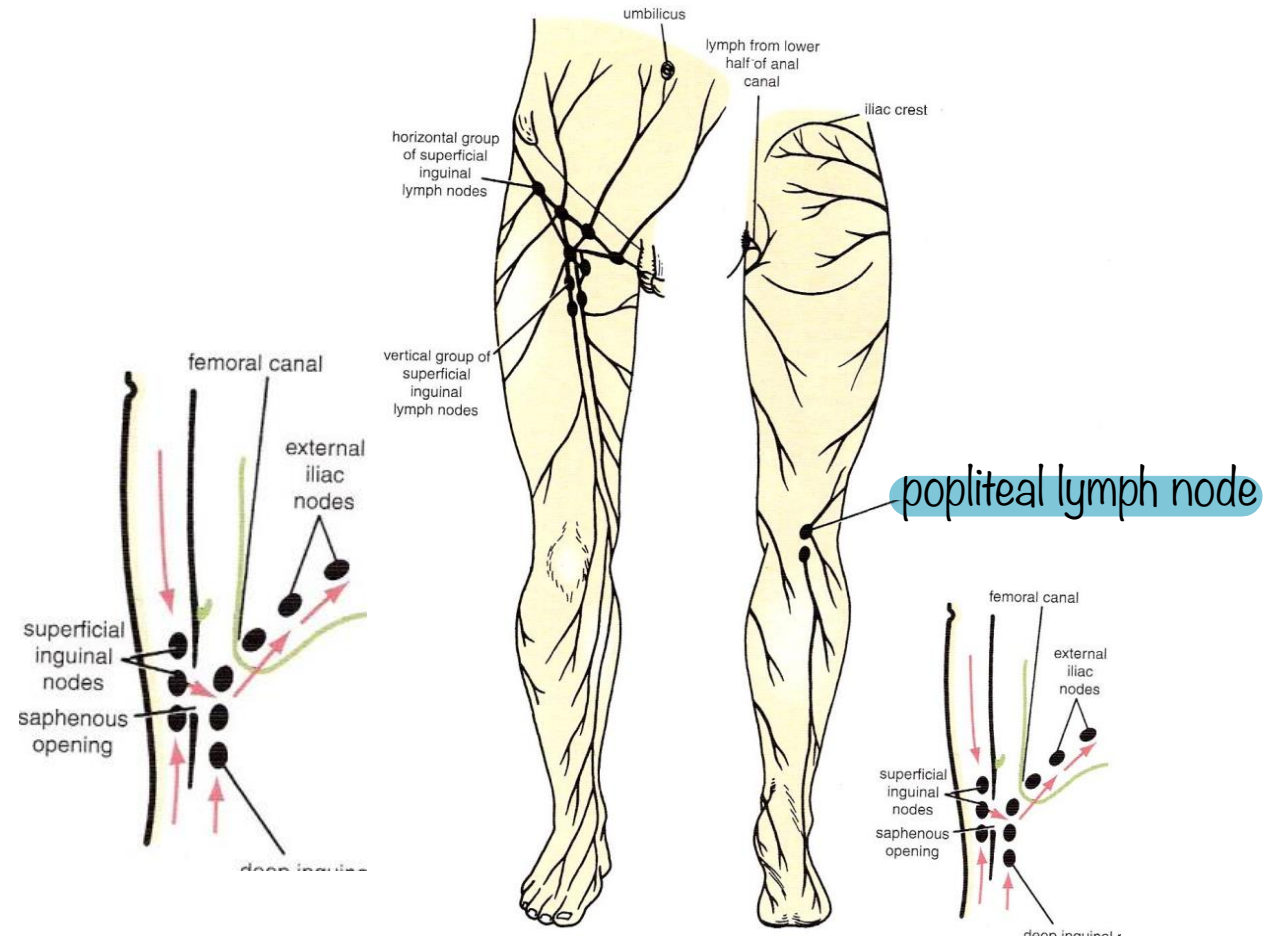
The remaining parts drain into paraaortic nodes.

- The efferent vessels from paraaortic nodes form the Right and Left Lumbar Trunks.



# Lymphatics of Lower Limb

- ▶ Superficial lymph vessels accompany superficial veins
- ▶ Deep lymph vessels accompany deep veins
- ▶ All lymph vessels drain into **Deep Inguinal Lymph Nodes**



# Lymphatics of Lower Limb Cont.

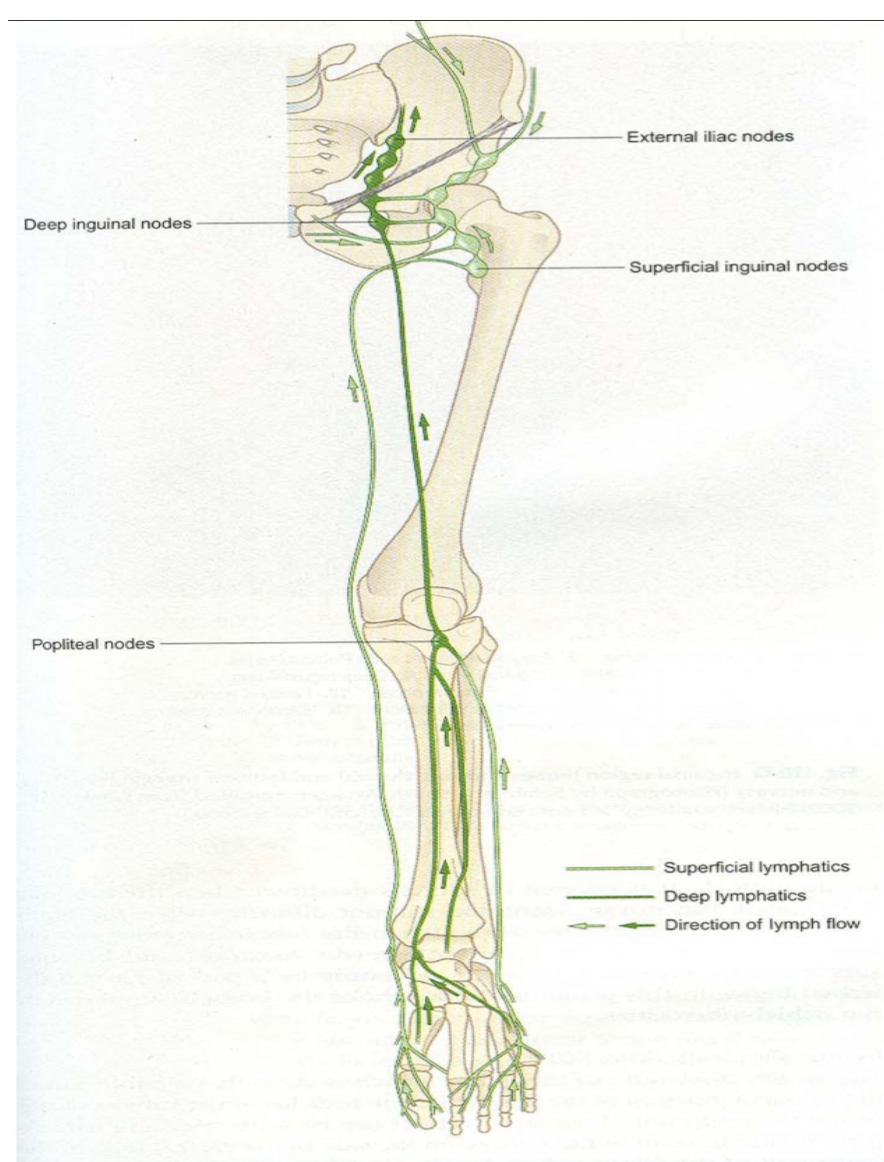
**Superficial inguinal lymph nodes** Divided to 2 groups

- ▶ Lie in superficial fascia
  - 1 ▶ **Horizontal group: drains anterior abdominal wall below umbilicus, perineum, external genitalia, lower anal canal**
  - 2 ▶ **Vertical group: drain superficial parts of L.L except posterior and lateral part of leg and lateral side of foot**
- ③ 1/2/3 drains to popliteal lymph node

**Deep inguinal lymph nodes:**

- ▶ **in femoral canal and drain superficial inguinal and deep structures of L.L.**





- **Lymphatic Drainage of the Lateral Side of the Leg and Foot:**

- All lymphatic vessels in the lateral side of the leg and foot end in the popliteal lymph node.

- **Superficial Lymphatic Vessels Drainage:**

- Most superficial lymphatic vessels end in the superficial inguinal lymph nodes.

- **Deep Inguinal Lymph Nodes:**

- Deep inguinal lymph nodes receive drainage from the superficial inguinal lymph nodes.

- **Pathway to the Cisterna Chyli:**

- The deep inguinal lymph nodes then enter the external iliac nodes, which lead to the internal iliac nodes.
- From there, lymph flows into the lumbar trunks, eventually reaching the cisterna chyli.

