SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr. M.G.R Medical University, Chennai

DEPARTMENT OF RADIOGRAPHY AND IMAGING TECHNOLOGY

COURSE NAME : HUMAN ANATOMY AND PHYSIOLOGY RELEVANT TO RADIOLOGY

UNIT : LYMPHATIC SYSTEM

TOPIC : NAME AND FUNCTION OF LYMPH GLANDS, LYMPHATICS AND LYMPHATIC PATHWAY OUTLINE.

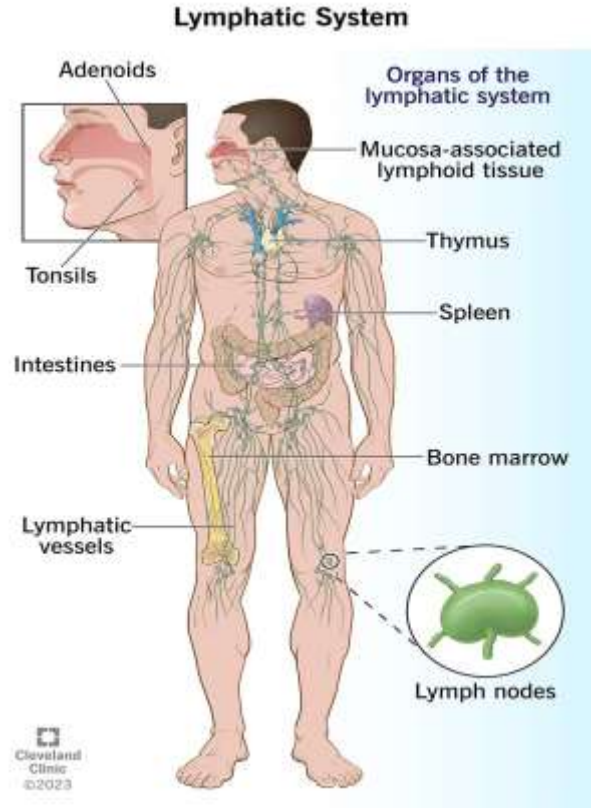
FACULTY NAME : MRS.G.HELANA JOY

INTRODUCTION (Define)

The lymphatic system is a network of vessels, nodes, and organs that maintains fluid balance, supports immunity, and aids fat absorption.

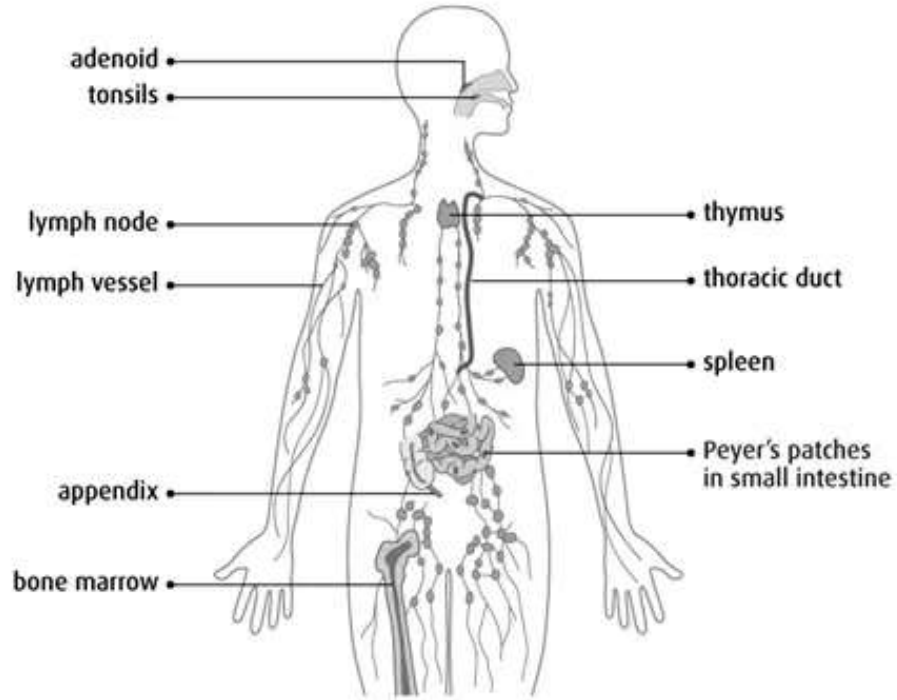
Three Main Functions:

- Drains excess interstitial fluid back to the bloodstream.
- Transports dietary lipids from the digestive system.
- Facilitates immune responses by filtering pathogens and producing lymphocytes.



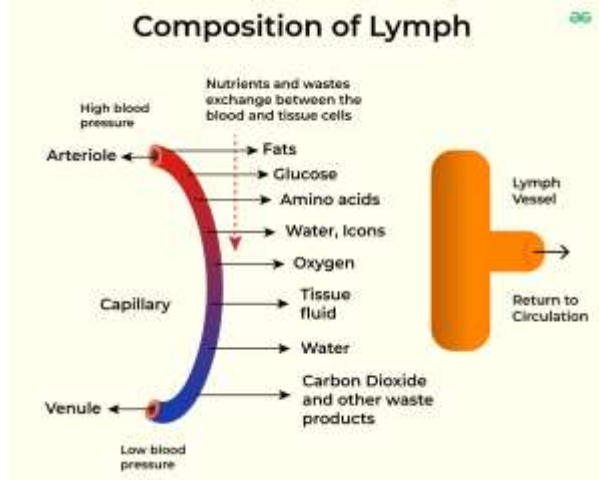
COMPONENTS OF THE LYMPHATIC SYSTEM

- Lymphatic Fluid (Lymph)
- Lymphatic Vessels
- Lymph Nodes (Lymph Glands)
- Lymphatic organs



LYMPH AND ITS COMPOSITION

Lymph is a clear, colorless fluid derived from interstitial fluid, found in lymphatic vessels.



Composition:

•Water, electrolytes, proteins, and glucose.

•Contains lymphocytes (white blood cells, mainly T and B cells).

•May include chyle (lipid-rich lymph from the intestines).

Formation: Lymph forms when interstitial fluid enters lymphatic capillaries.

LYMPHATIC VESSELS (LYMPHATICS)

Structure: Thin-walled vessels with valves to prevent backflow, similar to veins.

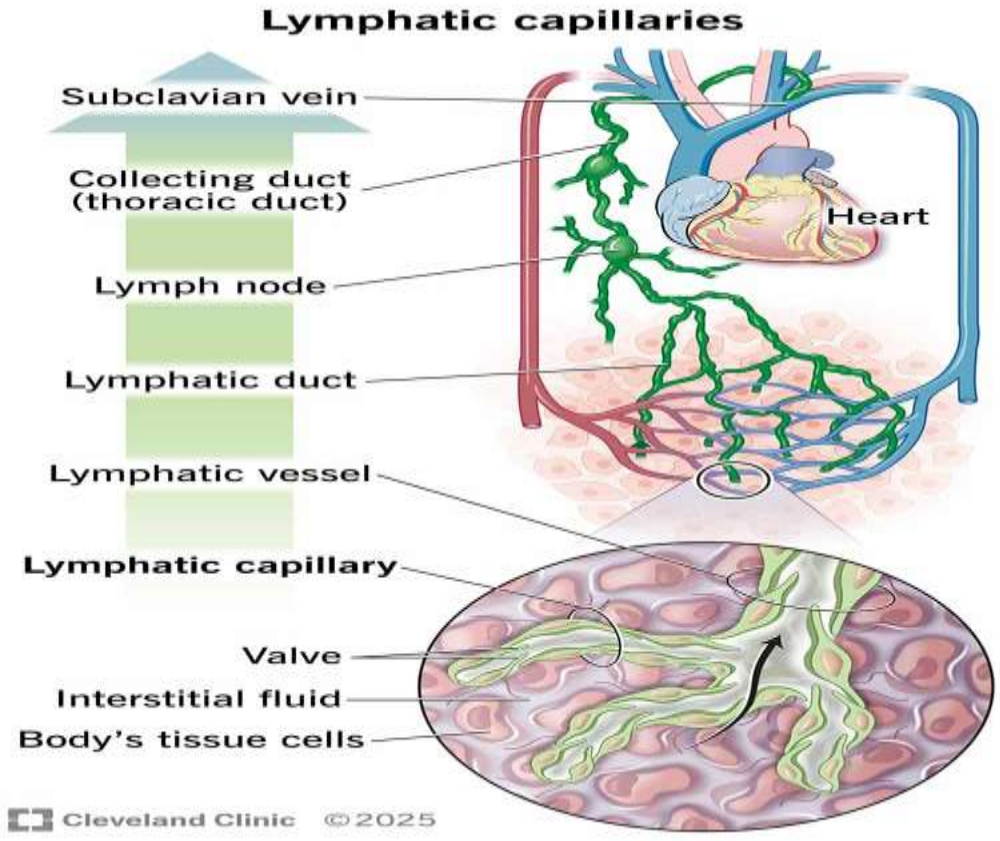
Types:

1.Lymphatic Capillaries: Blind-ended, highly permeable, collect interstitial fluid.

2.Collecting Vessels: Transport lymph to lymph nodes.

3.Lymphatic Trunks and Ducts: Drain lymph into venous circulation (e.g., thoracic duct, right lymphatic duct).

Function: Transport lymph from tissues to bloodstream, filter pathogens in nodes.

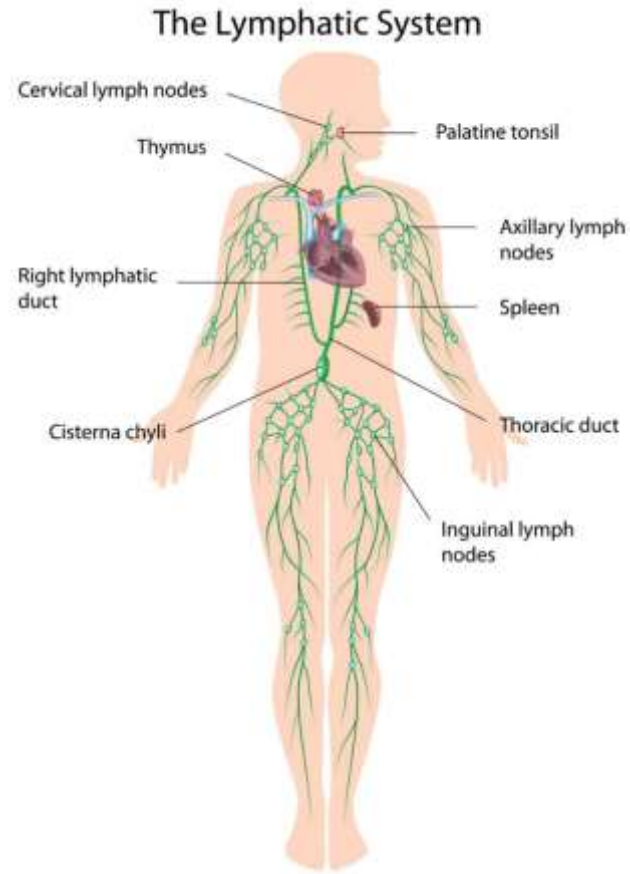

Lymphatic capillaries
Subclavian vein
Collecting duct
(thoracic duct)
Lymph node
Lymphatic duct
Lymphatic vessel
Lymphatic capillary
Valve
Interstitial fluid
Body's tissue cells
Heart
Cleveland Clinic ©2025

LYMPH GLANDS (LYMPH NODES)

Definition: Small, bean-shaped structures along lymphatic vessels that filter lymph.

Locations:

- Cervical (neck), axillary (armpit), inguinal (groin), mediastinal, and mesenteric nodes.
- Clustered in strategic areas to monitor lymph from specific regions.



Structure:

•Outer cortex: Contains B lymphocytes, follicular dendritic cells.

•Inner medulla: Contains T lymphocytes, macrophages.

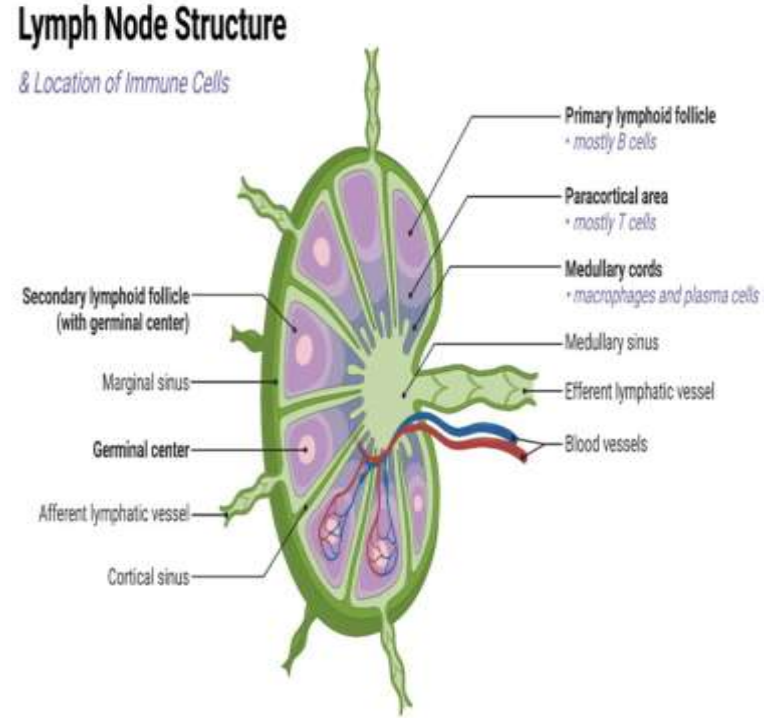
•Capsule and trabeculae provide structural support.

Functions:

1.Filter lymph, removing pathogens and debris.

2.Activate immune responses via lymphocyte proliferation.

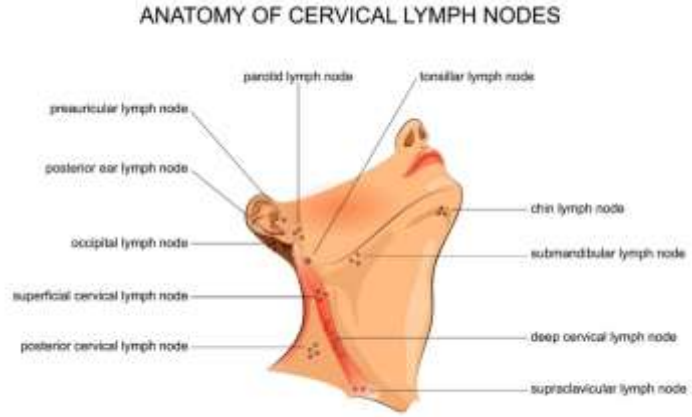
3.Store lymphocytes for immune surveillance.



MAJOR LYMPH NODES AND THEIR FUNCTIONS

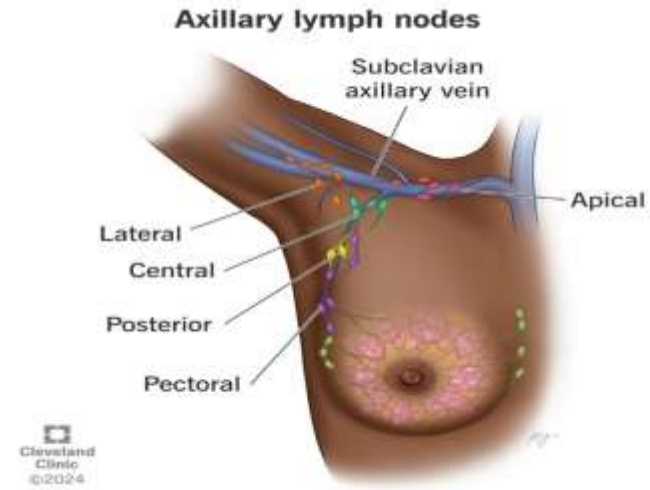
Cervical Lymph Nodes: Location: Neck region.

- Function: Drain and filter lymph from head and neck; critical in infections like tonsillitis.



Axillary Lymph Nodes: Location: Armpit.

- Function: Drain lymph from upper limbs, breast, and chest wall; key in breast cancer staging.



Inguinal Lymph Nodes:

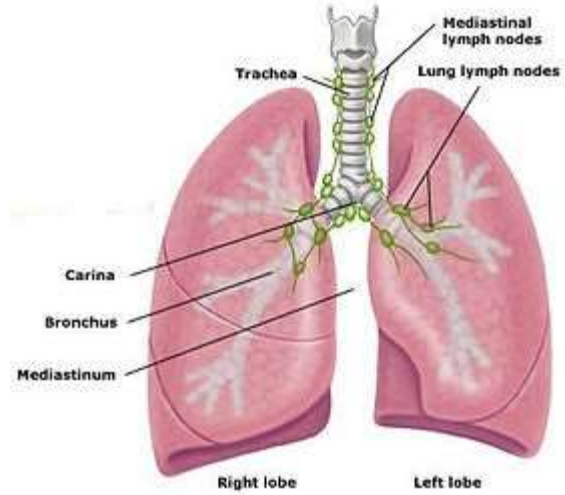
•Location: Groin.

•Function: Drain lymph from lower limbs, external genitalia, and lower abdomen.

Mediastinal Lymph Nodes:

•Location: Chest, near lungs and heart.

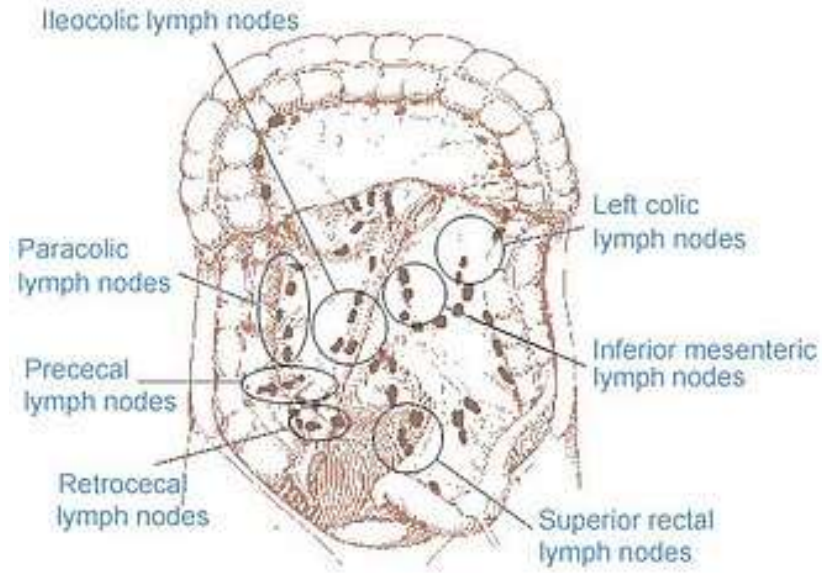
•Function: Drain lymph from thoracic organs; involved in lung infections or cancers.



Mesenteric Lymph Nodes: Location:

Abdominal cavity, near intestines.

- Function: Drain lymph from intestines; key in gastrointestinal infections.



LYMPHATIC PATHWAY OUTLINE

Step 1: Lymph Formation

- Interstitial fluid enters lymphatic capillaries in tissues, becoming lymph.

Step 2: Lymph Transport

- Lymph flows through lymphatic capillaries to collecting vessels, passing through lymph nodes for filtration.

Step 3: Lymph Node Filtration

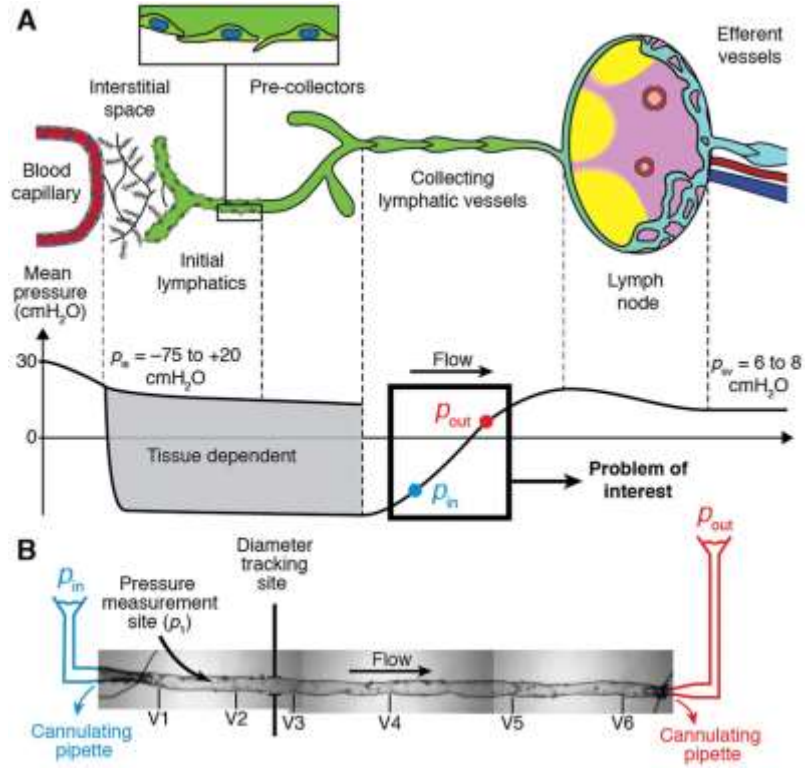
- Nodes filter pathogens, debris, and cancer cells; activate immune responses.

Step 4: Lymph Collection

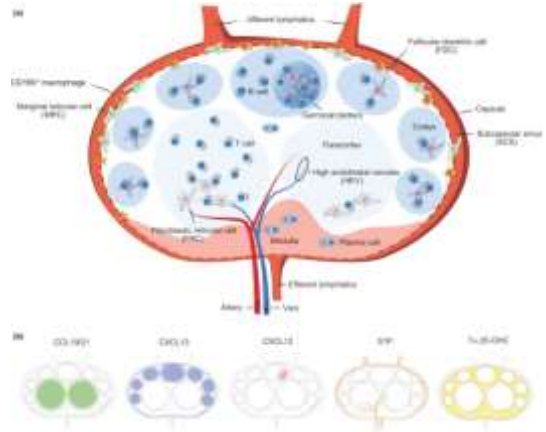
- Filtered lymph enters lymphatic trunks, then major ducts (thoracic duct or right lymphatic duct).

Step 5: Return to Bloodstream

- Lymph drains into subclavian veins, rejoining the cardiovascular system.

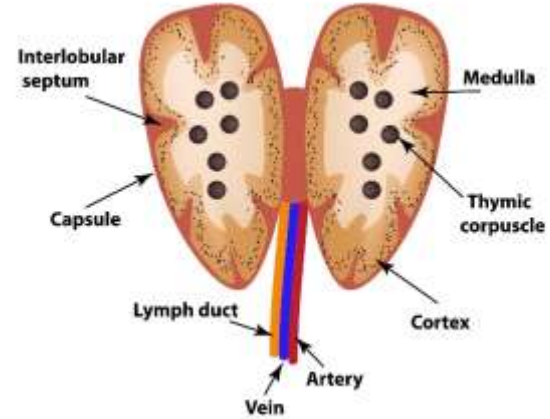


LYMPHATIC ORGANS



Spleen:

- Function: Filters blood, removes old red blood cells, stores lymphocytes, and activates immune responses.
- Location: Left upper abdomen.

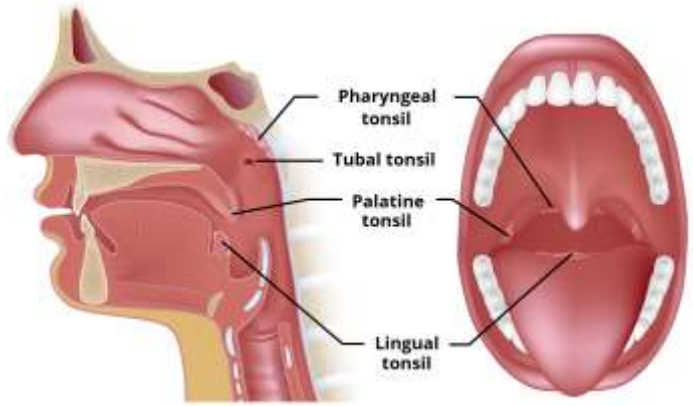


Thymus:

- Function: Matures T lymphocytes for immune function; most active in childhood.
- Location: Upper chest, behind sternum.

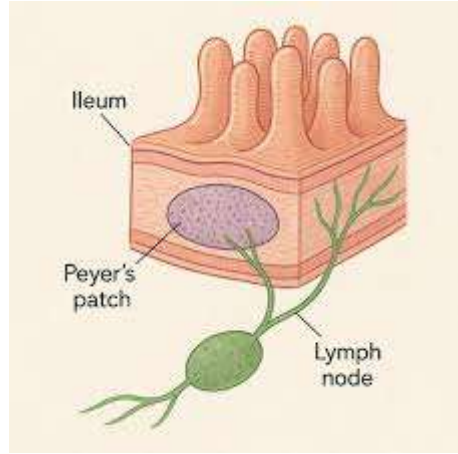
Tonsils:

- Function: Trap pathogens entering via mouth/nose; initiate immune responses.
- Location: Pharynx (palatine, lingual, pharyngeal tonsils).



Peyer's Patches:

- Function: Monitor intestinal bacteria, initiate immune responses in the gut.
- Location: Small intestine mucosa.



PHYSIOLOGY OF THE LYMPHATIC SYSTEM

- **Fluid Homeostasis**: Returns ~3 liters of fluid daily to the bloodstream, preventing edema.
- **Immune Surveillance**: Lymphocytes and macrophages detect and destroy pathogens or abnormal cells.
- **Lipid Transport**: Chyle from intestines is transported via lymph to the bloodstream.
- **Mechanisms**:

✓ Lymph movement aided by skeletal muscle contractions, breathing, and vessel valves.

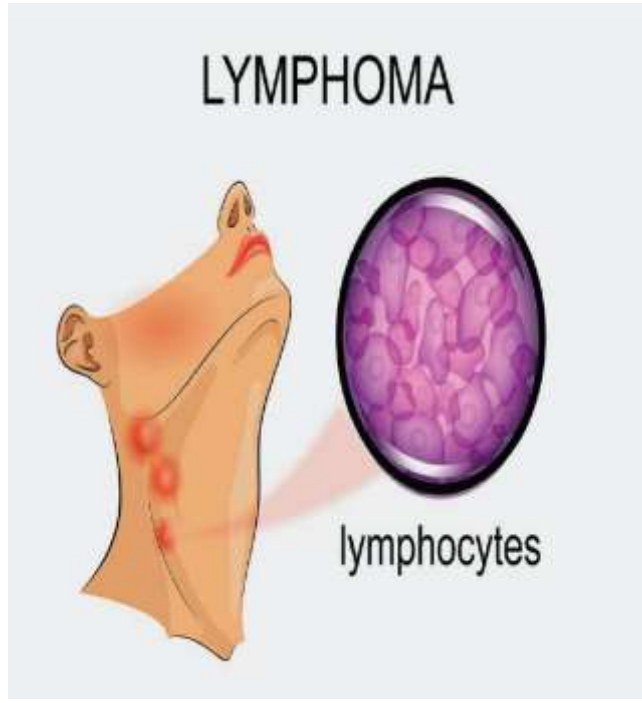
✓ Immune activation involves antigen presentation in lymph nodes.

PATHOLOGY OF THE LYMPHATIC SYSTEM

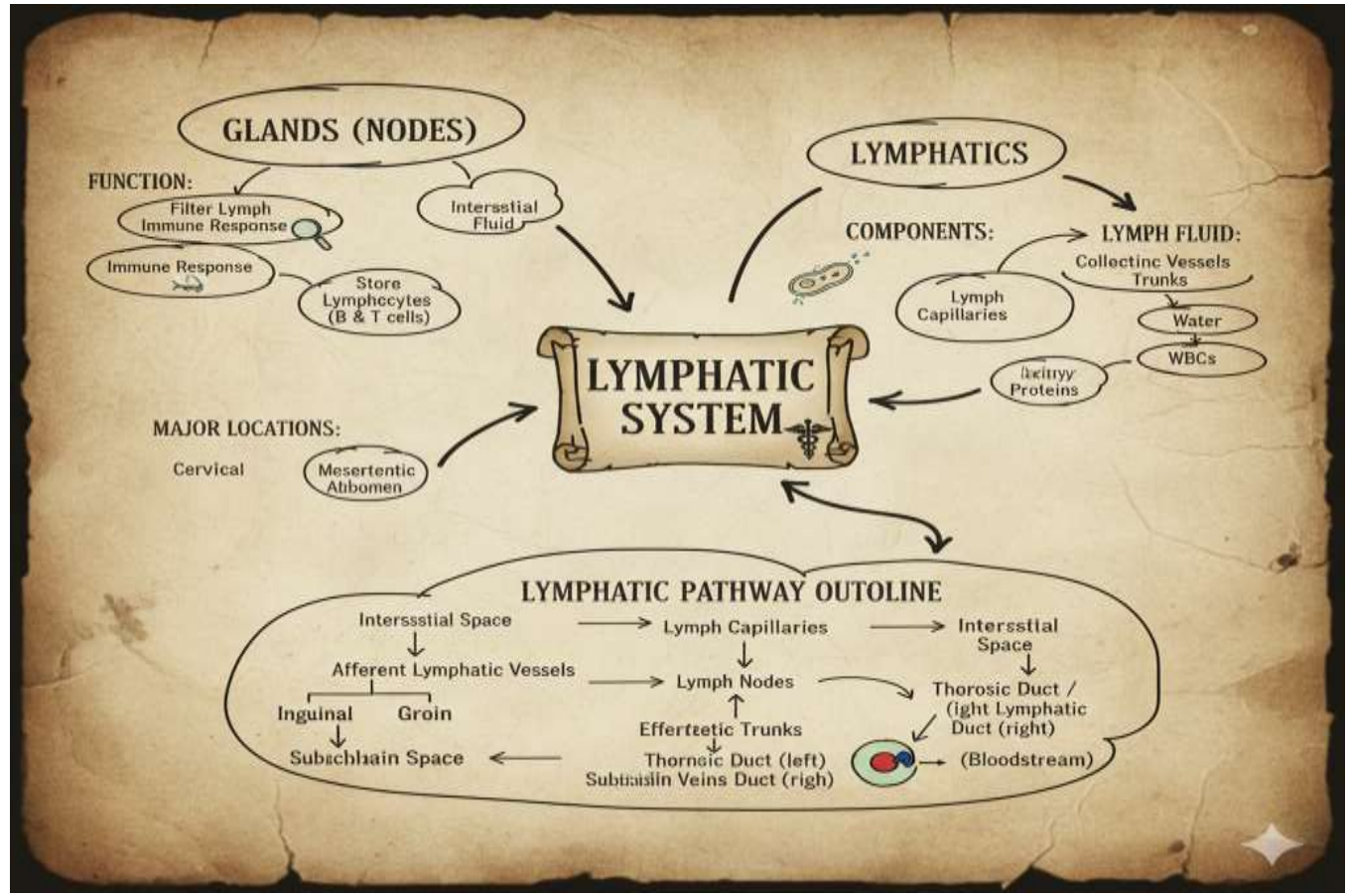
- **Lymphadenopathy**: Enlarged lymph nodes due to infection, inflammation, or malignancy (e.g., lymphoma).
- **Lymphedema**: Swelling from lymphatic obstruction or damage (e.g., post-surgery, filariasis).
- **Lymphangitis**: Inflammation of lymphatic vessels, often due to bacterial infection.
- **Lymphomas**: Cancers of lymphatic tissue (e.g., Hodgkin's and non-Hodgkin's lymphoma).
- **Metastasis**: Cancer cells spread via lymphatics, detected in sentinel lymph nodes.


Lymphedema
Normal
Mild/moderate lymphedema
Lymphatic system


Swollen lymph node


LYMPHOMA
lymphocytes

SUMMARY


GLANDS (NODES)
FUNCTION:
Filter Lymph
Immune Response
Immune Response
Store
Lymphocytes
(B & T cells)
Interssttial
Fluid
LYMPHATICS
COMPONENTS:
LYMPH FLUID:
Collectinc Vessels
Trunks
Lymph
Capillaries
Water
WBCs
Proteins
LYMPHATIC
SYSTEM
MAJOR LOCATIONS:
Cervical
Mesertentic
Atibomen
LYMPHATIC PATHWAY OUTOLINE
Interssstial Space
Lymph Capillaries
Interssttial
Space
Afferent Lymphatic Vessels
Lymph Nodes
Thorosic Duct /
(ight Lymphatic
Duct (right)
Inguinal
Groin
Effertetic Trunks
Subachhain Space
Thorneic Duct (left)
(Bloodstream)

References

- https://my.clevelandclinic.org/health/body/21199-lymphatic-system
- https://teachmeanatomy.info/the-basics/ultrastructure/lymphatic-system/
- https://en.wikipedia.org/wiki/Lymphatic_system