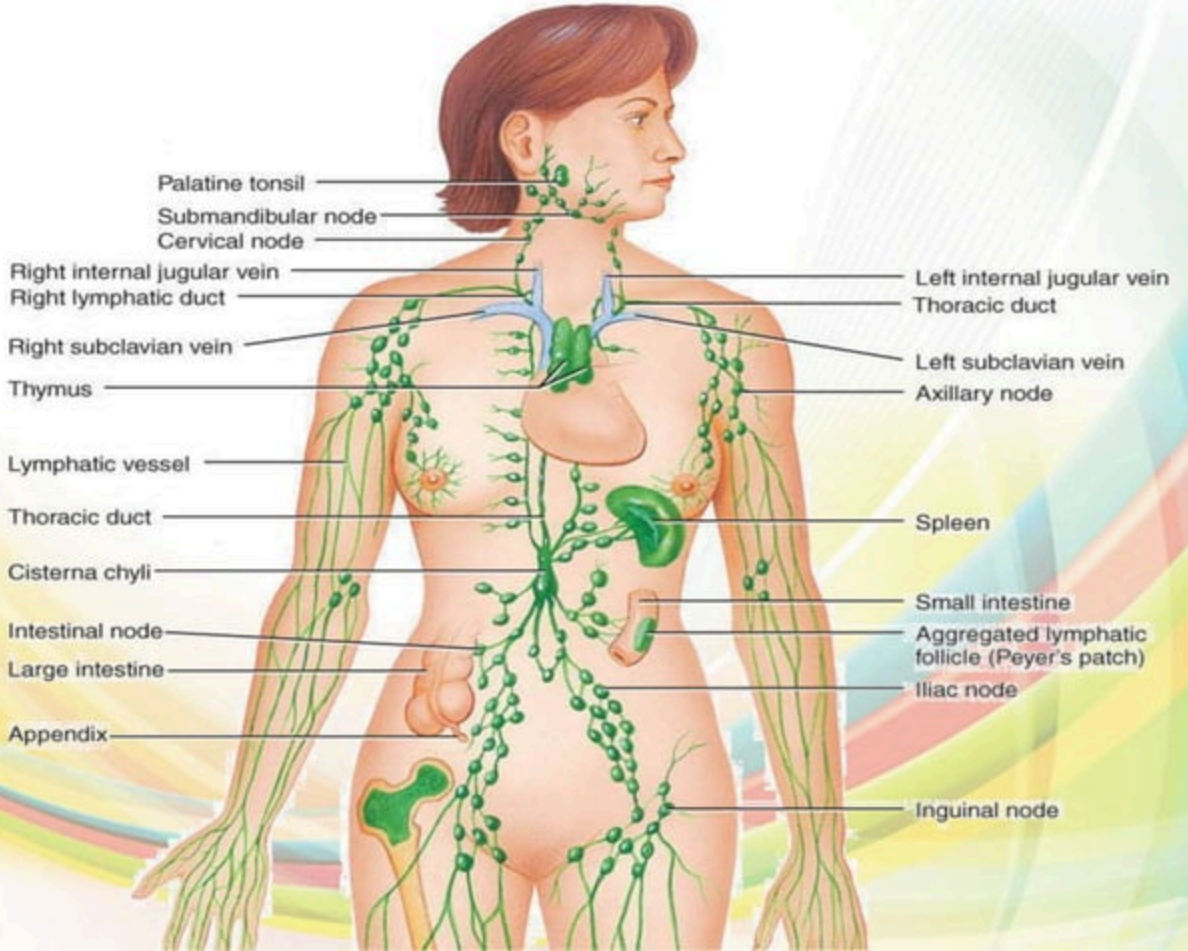
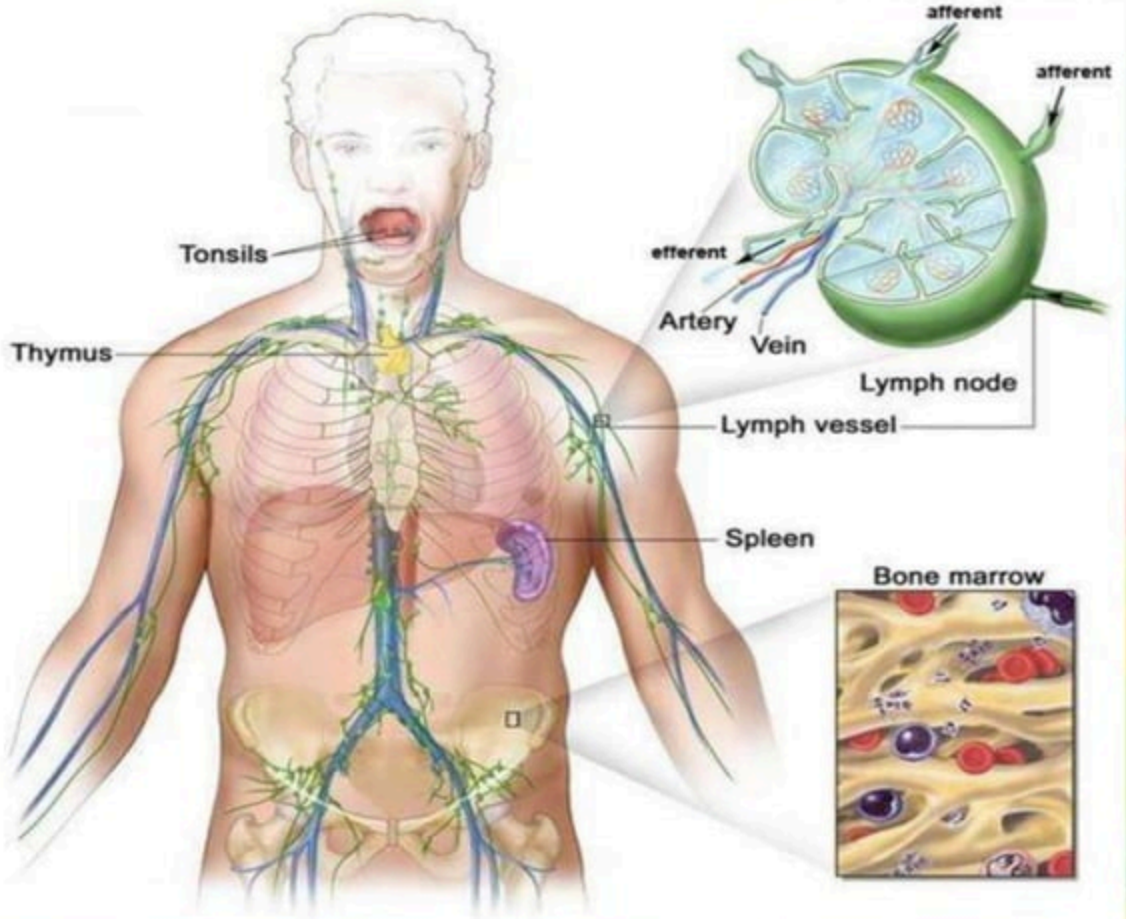
Lymphatic system


Palatine tonsil
Submandibular node
Cervical node
Right internal jugular vein
Right lymphatic duct
Right subclavian vein
Thymus
Lymphatic vessel
Thoracic duct
Cisterna chyli
Intestinal node
Large intestine
Appendix
Left internal jugular vein
Thoracic duct
Left subclavian vein
Axillary node
Spleen
Small intestine
Aggregated lymphatic follicle (Peyer's patch)
Iliac node
Inguinal node

- The **lymphatic system** is a network of lymphatic vessels and lymph nodes in different areas of body that maintains homeostasis as well as immunity of our body.
- Lymphatic system returns fluids that have leaked from the blood vascular system back to the blood to maintain the blood volume.
- The lymphatic system consists of:
  - ❑Lymph
  - ❑Lymphatic vessels
  - ❑Lymph nodes
  - ❑Lymphoid organs and tissues

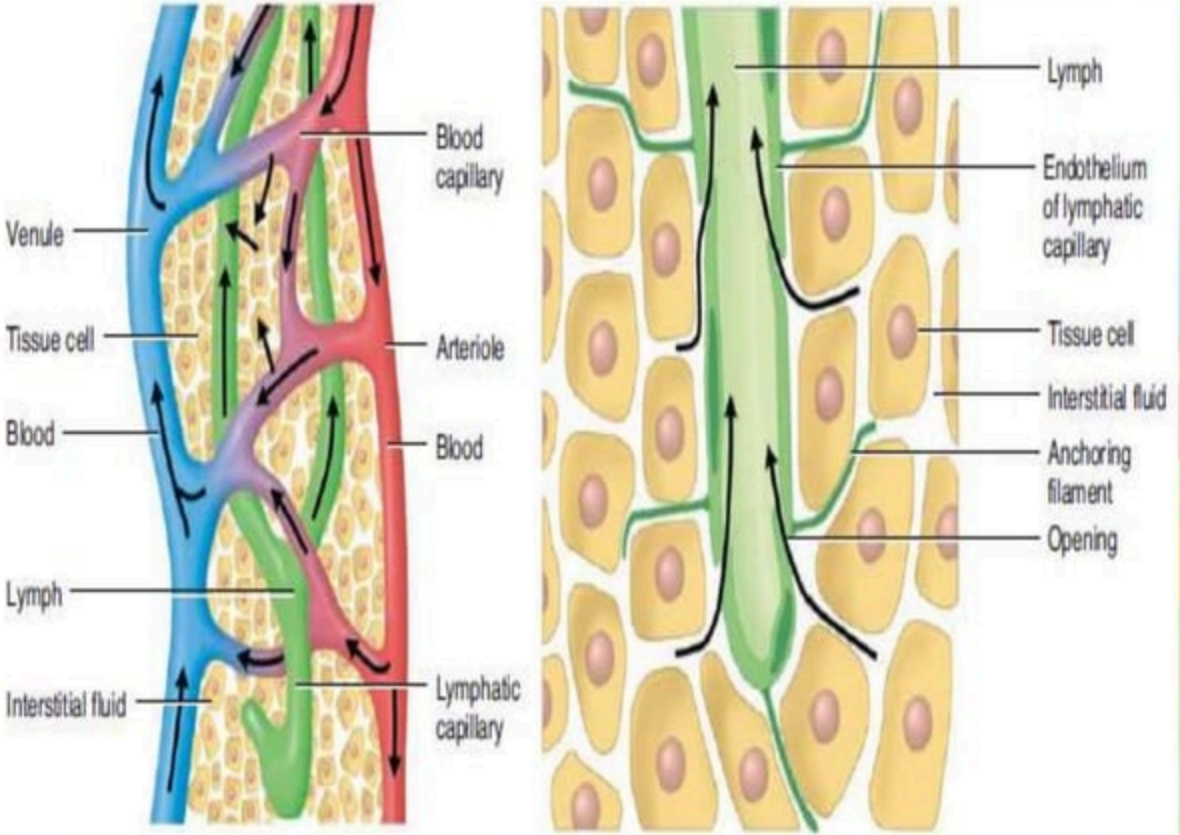

afferent
afferent
efferent
Artery
Vein
Lymph node
Lymph vessel
Tonsils
Thymus
Spleen
Bone marrow

LYMPH

- Lymph is a clear watery fluid that circulates through the lymphatic vessels.
- Once the interstitial fluid drains into the lymphatic vessels, it is called **lymph.** So lymph is identical in composition to interstitial fluid.

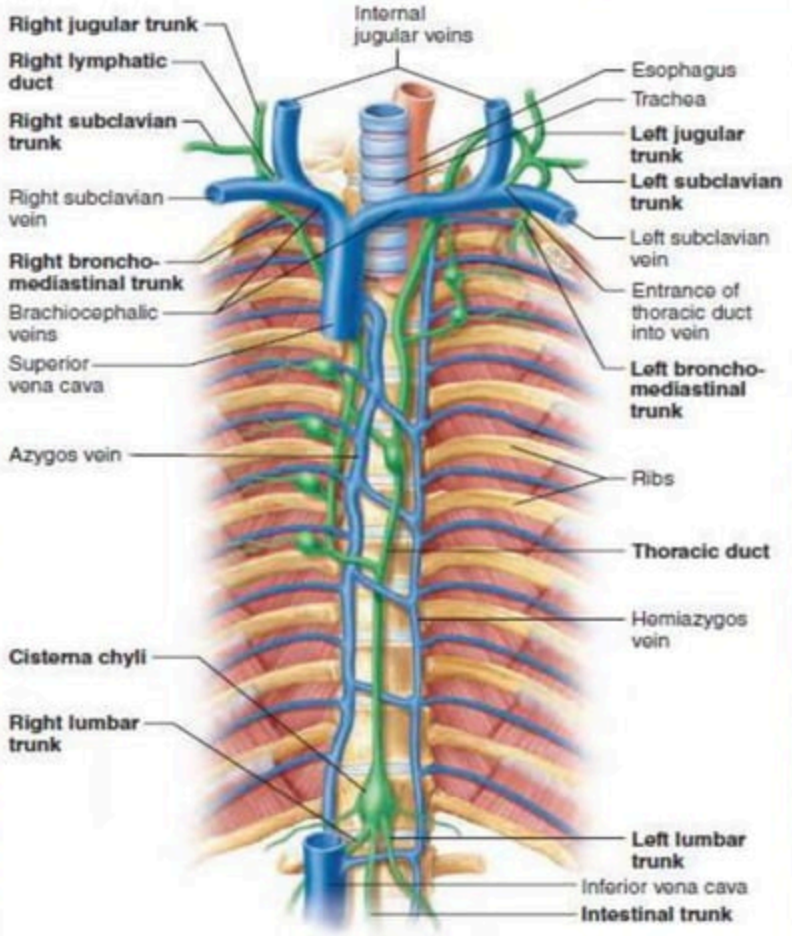
Formation of lymph

As blood circulates through the body, most components of blood plasma such as nutrients, gases, and hormones filter through blood capillary walls to form interstitial fluid and reabsorbed back by venous capillaries. The excess filtered fluid (about 3 liters per day) drains into lymphatic vessels and becomes lymph. ie. the interstitial fluid enters into lymphatic vessels is called **lymph.**


Blood capillary
Venule
Tissue cell
Arteriole
Blood
Blood
Lymph
Interstitial fluid
Lymphatic capillary
Lymph
Endothelium of lymphatic capillary
Tissue cell
Interstitial fluid
Anchoring filament
Opening

LYMPH VESSELS

- **Lymph vessels** are thin walled, valved structures that carry lymph.
- Lymphatic vessels begin as lymphatic capillaries, which join up to form lymphatic vessels.
- Larger lymphatic vessels unite to form lymphatic trunk.
- Lymphatic trunk opens into two large lymphatic duct – right lymphatic duct and thoracic (left lymphatic)duct.


Right jugular trunk
Right lymphatic duct
Right subclavian trunk
Right subclavian vein
Right broncho-mediastinal trunk
Brachiocephalic veins
Superior vena cava
Azygos vein
Cisterna chyli
Right lumbar trunk
Internal jugular veins
Esophagus
Trachea
Left jugular trunk
Left subclavian trunk
Left subclavian vein
Entrance of thoracic duct into vein
Left broncho-mediastinal trunk
Ribs
Thoracic duct
Hemiazygos vein
Left lumbar trunk
Inferior vena cava
Intestinal trunk

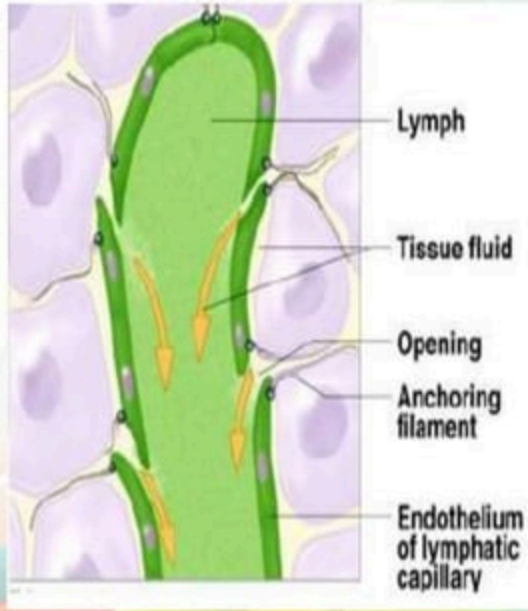
- In small intestine, specialized lymphatic capillaries called lacteals absorb dietary lipids into lymphatic vessels and ultimately into the blood. The presence of these lipids causes the lymph draining from the small intestine to appear creamy white. Such lymph is referred to as **chyle**.

- Tissues that lack lymphatic capillaries include avascular tissues (such as cartilage, the epidermis, and the cornea of the eye), the central nervous system, bones, teeth, portions of the spleen, and red bone marrow.

Structure

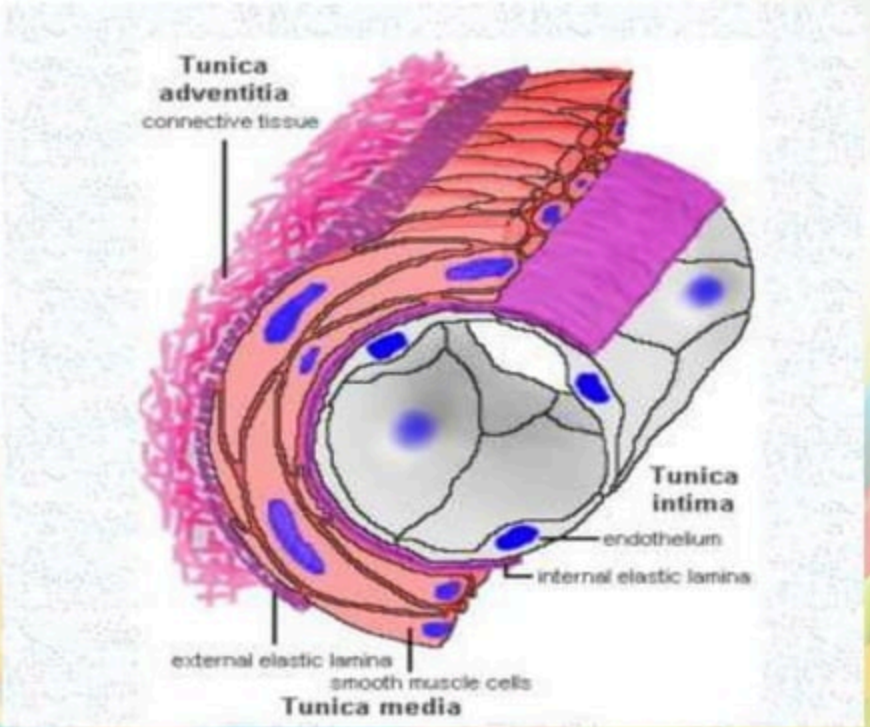
Lymph capillaries

- Lymph capillaries are made up of single layered endothelial cells.
- The edge of one endothelial cell overlap with other endothelial cell and forms flap like **minivalves** that ensure lymph flow only in one way , i.e. towards the thorax.
- Lymphatic capillaries are attached to the surrounding tissue by **anchoring filaments**, which contain collagen filaments and elastic fibers.
- Greater permeability than blood capillaries



Lymphatic vessels

- Structure similar as veins.
- Thin walls and more valves.
- 3 tunica layers – intima, media and adventitia.
  - ❑ Tunica intima, the inner layer is made up of single flattened simple squamous epithelium composed of epithelium called endothelium, and the cells are called endothelial cells.
  - ❑ The middle tunica media is of smooth muscles and elastic tissue that are arranged in a circular fashion around the endothelium.
  - ❑ The outermost adventitia consists of fibrous tissue.
- **Afferent lymphatic vessels** – the vessel that enters lymph node.
- **Efferent lymphatic vessel** – the vessel that leaves lymph node.


Tunica
adventitia
connective tissue
Tunica
intima
endothelium
internal elastic lamina
external elastic lamina
smooth muscle cells
Tunica media

Lymphatic trunk

- Lymphatic vessels exit lymph nodes and unite to form lymphatic trunks.
- The major trunks are
  - Lumbar trunks (right and left lumbar trunks)
  - Intestinal trunk
  - Bronchomediastinal trunks (right and left)
  - Subclavian trunks (right and left)
  - Jugular trunks (right and left)
- The lumbar trunks drain lymph from the 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 upper limbs.
- The jugular trunks drain the head and neck.

Lymphatic duct

- Thoracic duct
- Right lymphatic duct

Thoracic duct / Left lymphatic duct

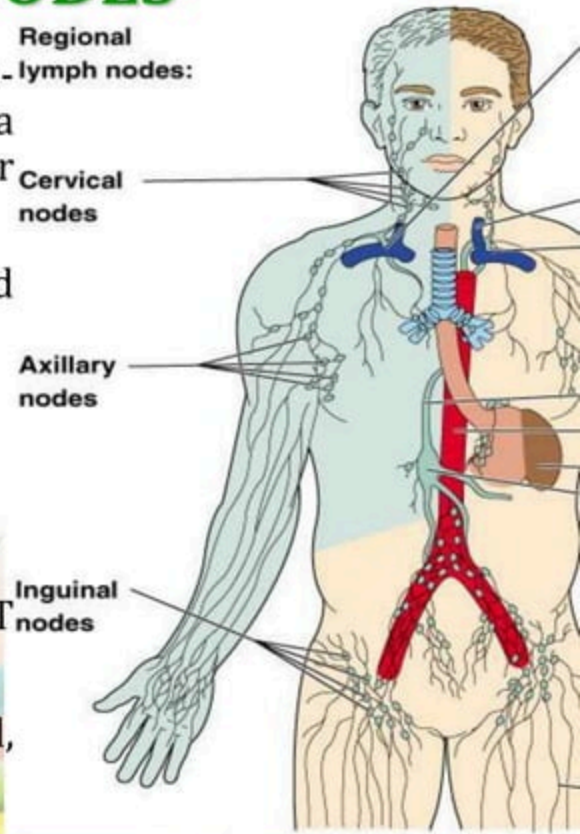
- Main duct for the return of lymph to blood.
- 38 – 45 cm length.
- Begins at cisterna chyli (anterior to 2nd lumbar vertebrae).
- **Cisterna chyli** is an enlarged lymph sac which receives lymph from right and left lumbar trunks and intestinal trunk.
- Receives lymph from cisterna chyli, left jugular, left subclavian, and left bronchomediastinal trunks.
- The thoracic duct drains lymph into venous blood at the junction of the left internal jugular and left subclavian veins.

Right lymphatic duct

- About 1.2 cm length.
- Receives lymph from the right jugular, right subclavian, and right bronchomediastinal trunks.
- Drains into venous blood at the junction of the right internal jugular and right subclavian veins.

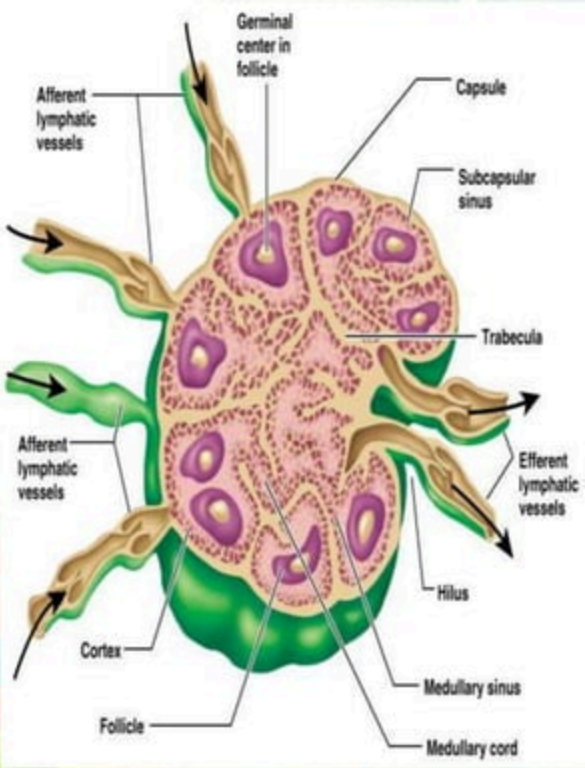
LYMPH NODES

- A **lymph node** is a small, bean-shaped organ that serves as a filtering and processing center for immune system.
- It filter lymph before it is returned to the blood.
- Located along lymph vessels.
- About 600 lymph nodes in body.
- Usually occur in groups.
- Lymph nodes are major sites of B, T and other immune cells
- It can be seen widely in cervical, auxiliary and inguinal regions

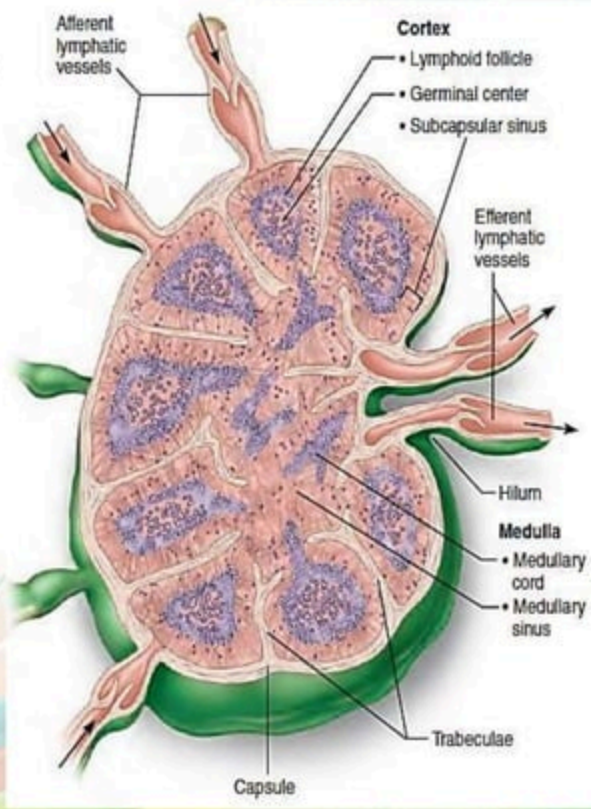


Lymph Node Structure

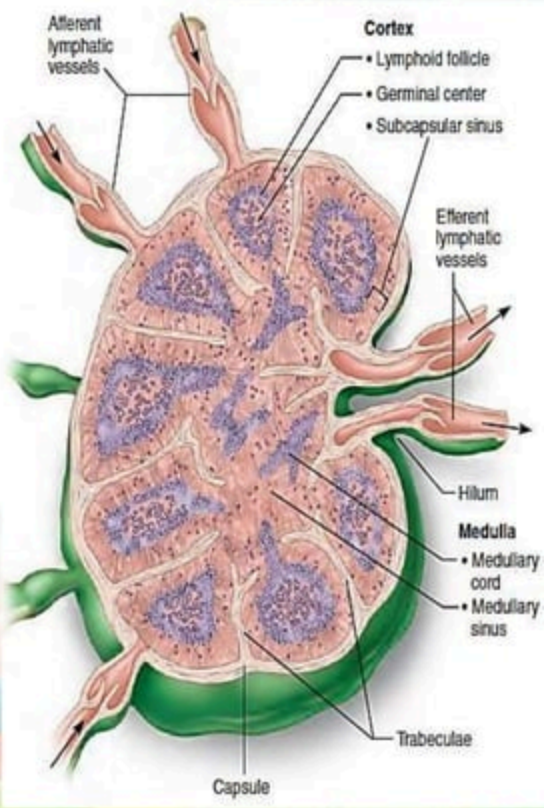
- Bean or kidney-shaped.
- 1–25 mm length.
- Covered by **capsule**.
- Capsule is composed of connective tissue.
- Trabeculae, the capsular extensions divide the node into compartments which provide a route for blood vessels into the interior of a node.
- Internal to the capsule is a supporting network of reticular fibers and fibroblasts.
- The capsule, trabeculae, reticular fibers, and fibroblasts constitute the **stroma** of a lymph node.



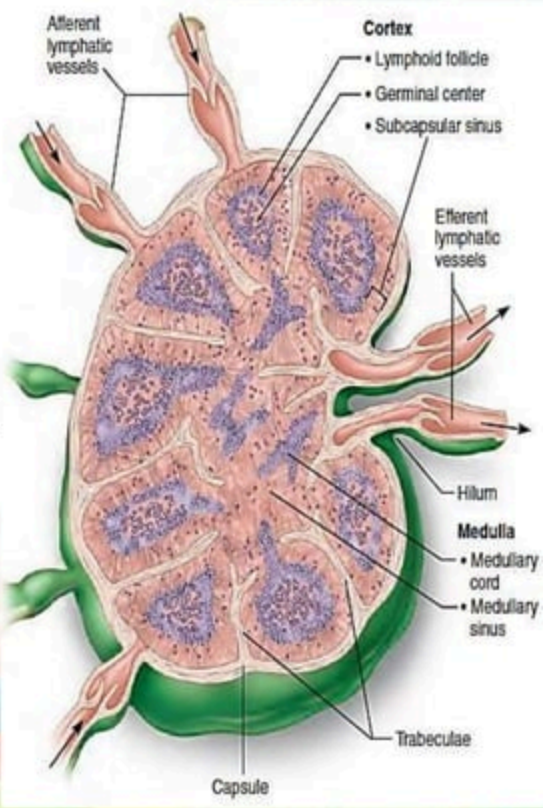
- **Subcapsular sinus** is the space between capsule and cortex.
- The lymph node is divided into
  - superficial cortex
  - deep medulla
- **Cortex** is the portion beneath subcapsular sinus.
- Cortex consists
  - outer cortex
  - inner cortex
- **Outer cortex** contain
  - Lymphatic nodules
  - Germinal center
- Lymphatic nodules (follicles)are egg-shaped aggregates of B cells in outer cortex
  - Primary lymphatic nodule
  - Secondary lymphatic nodules



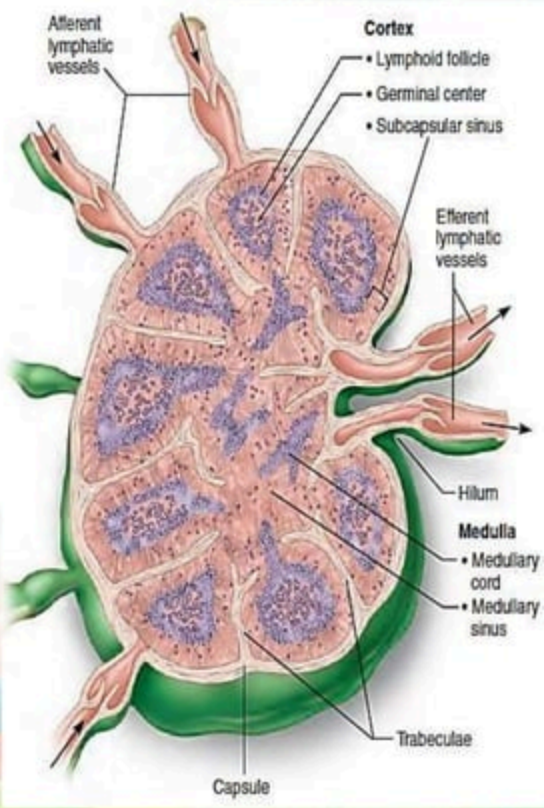
- Primary lymphatic nodule consist of B cells .
- Secondary lymphatic nodules form in response to an antigen.
- After B cells in a primary lymphatic nodule recognize an antigen, the primary lymphatic nodule develops into a secondary lymphatic nodule.
- The center of a secondary lymphatic nodule contains a region of light-staining cells called a **germinal center**.
- Germinal center are B cells, follicular dendritic cells and macrophages.



- The **inner cortex** consists mainly of T cells and dendritic cells that enter lymph node from other tissues.
- **Medulla** is the inner part of lymph node.
- Medulla includes,
  - Medullary cords
  - Medullary sinuses
- The medullary cords are thin inward extensions from the cortical lymphoid tissue and include plasma cells, macrophages, and B cells.
- Medullary sinuses are spaces separating medullary cords.



- Several **afferent lymphatic vessels** penetrate the convex surface of the node directs the lymph inside the node.
- One or two **efferent lymphatic vessels** convey lymph outside the node.
- Efferent lymphatic vessels emerge from one side of the lymph node at a slight depression called a **hilum** or **hilus.**
- Blood vessels also enter and leave the node at the hilum.



Flow of lymph inside a node

Lymph enters into node through

Afferent lymphatic vessel

↓

Subcapsular sinus

↓

Trabecular sinus

↓

Medullary sinus

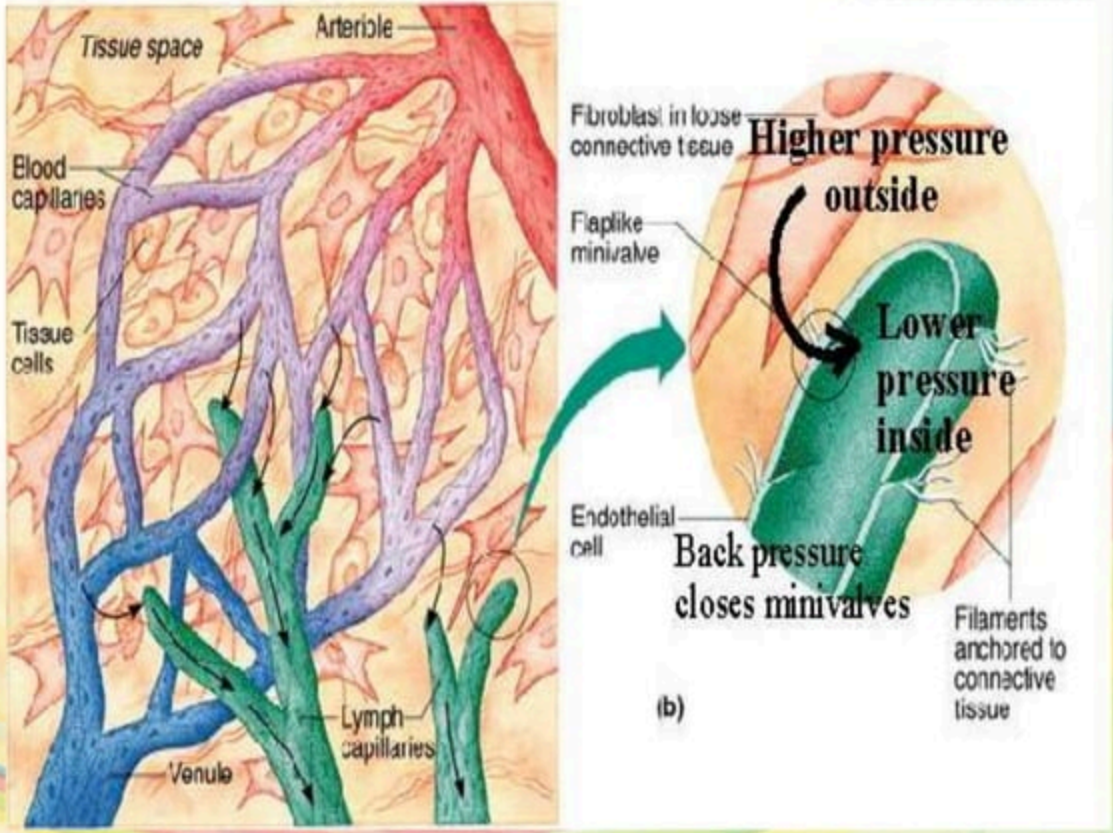
↓

Efferent lymphatic vessel

And finally leaves the node.

FLOW/TRANSPORT/CIRCULATION OF LYMPH

- Lymphatic capillaries have greater permeability than blood capillaries. Greater pressure in interstitial fluid opens lymph valves and fluid enters into lymphatic capillaries.
- Lymph passes from lymphatic capillaries into lymphatic vessels and then through lymph nodes.
- Later drains into lymphatic trunk.
- Lymph passes from lymphatic trunks into two main ducts, the thoracic duct and the right lymphatic duct, and then drains into venous blood at the junction of internal jugular and subclavian veins.


Tissue space
Arteriole
Blood capillaries
Tissue cells
Venule
Lymph capillaries
Fibroblast in loose connective tissue
Higher pressure outside
Flaplike minivalve
Lower pressure inside
Endothelial cell
Back pressure closes minivalves
Filaments anchored to connective tissue
(b)

The sequence of lymph flow is

Blood capillaries (blood)

↓

Interstitial spaces (interstitial fluid)

↓

Lymphatic capillaries (lymph)

↓

Lymphatic (afferent) vessels (lymph)

↓

Lymph node (lymph) →

Subcapsular sinus

↓

Trabecular sinus

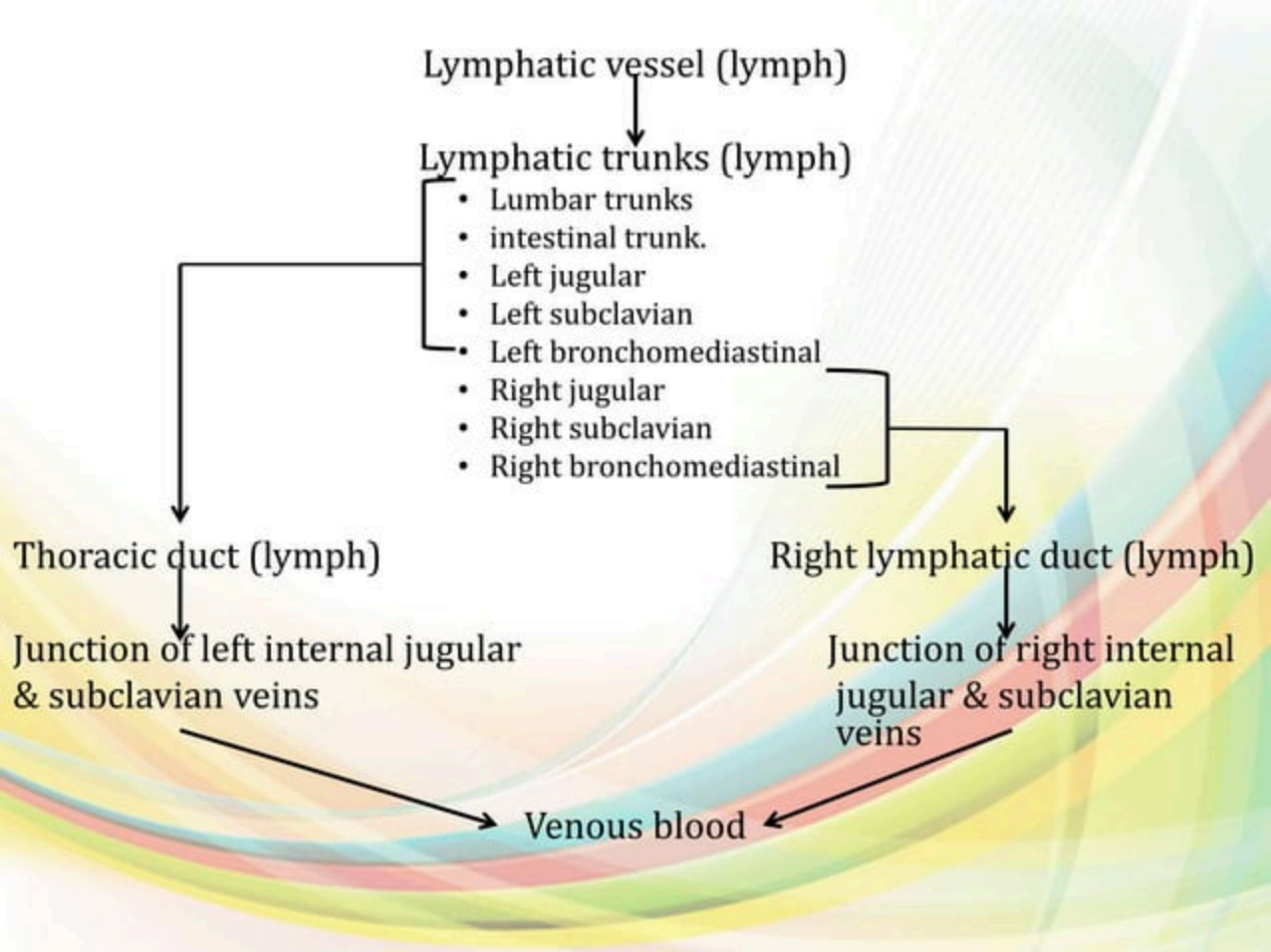
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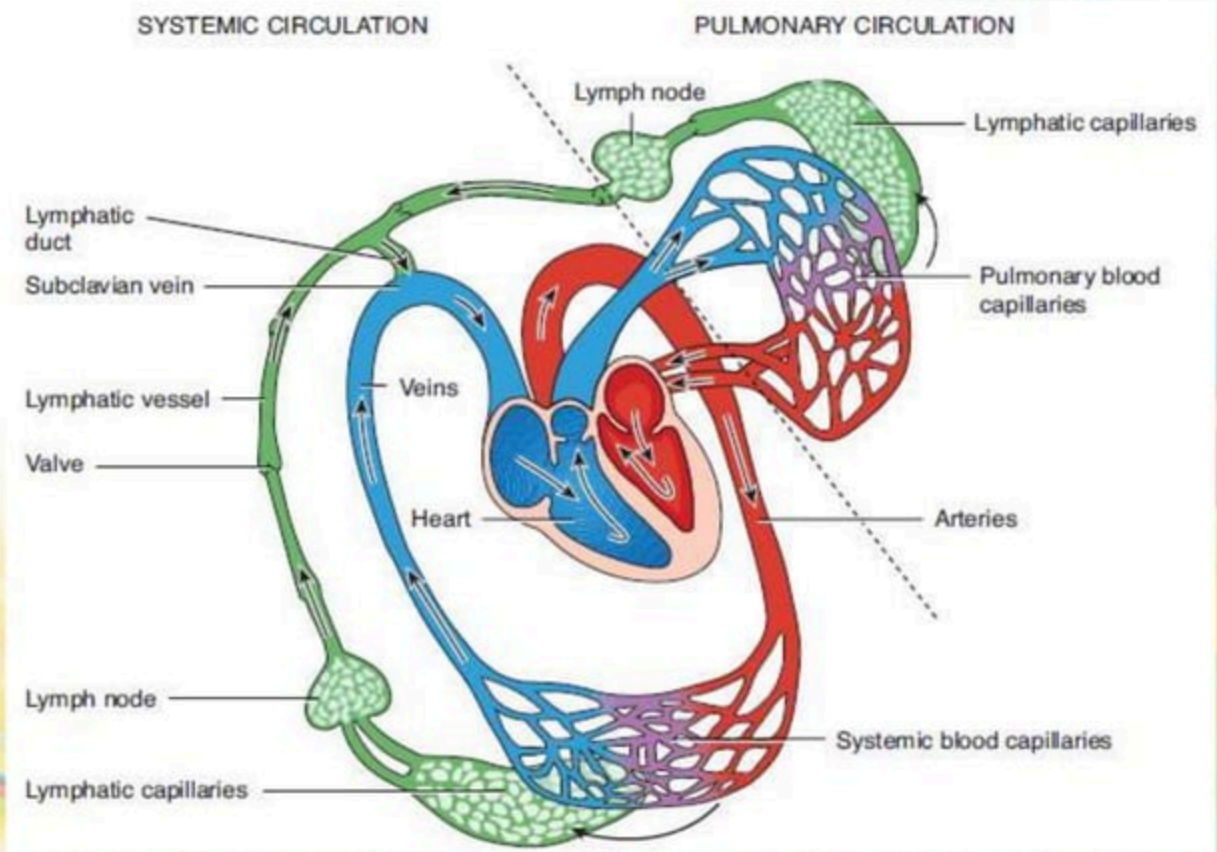
Medullary sinus

↓

Lymphatic (efferent) vessels (lymph)

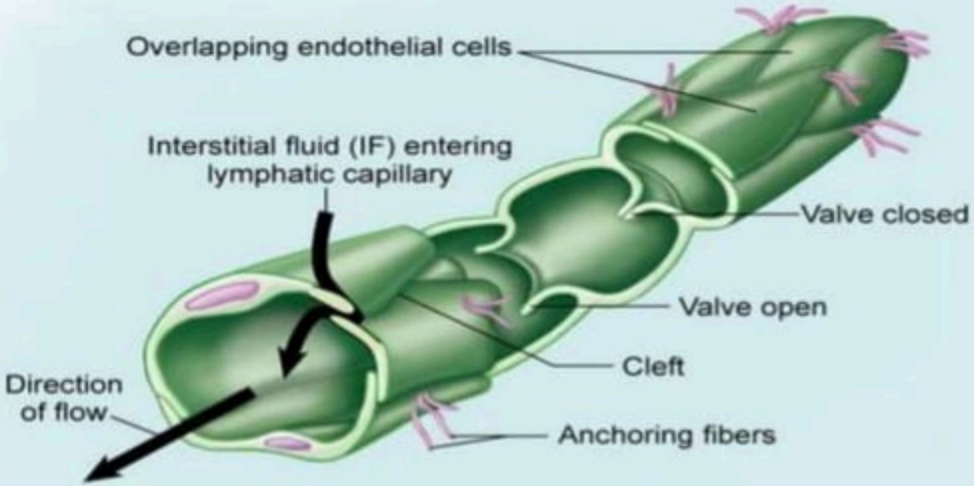
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Lymphatic vessel (lymph)
Lymphatic trunks (lymph)
Lumbar trunks
intestinal trunk.
Left jugular
Left subclavian
Left bronchomediastinal
Right jugular
Right subclavian
Right bronchomediastinal
Thoracic duct (lymph)
Right lymphatic duct (lymph)
Junction of left internal jugular & subclavian veins
Junction of right internal jugular & subclavian veins
Venous blood


SYSTEMIC CIRCULATION
PULMONARY CIRCULATION
Lymph node
Lymphatic capillaries
Lymphatic duct
Subclavian vein
Pulmonary blood capillaries
Veins
Lymphatic vessel
Valve
Heart
Arteries
Lymph node
Systemic blood capillaries
Lymphatic capillaries

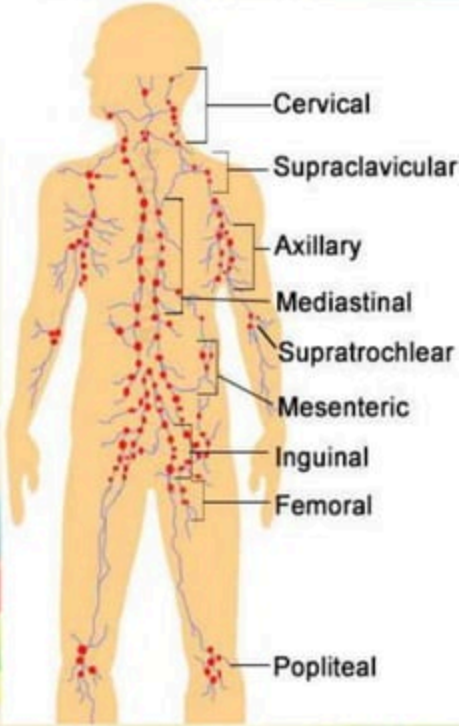
The flow of lymph is regulated by;

- The milking action of active skeletal muscles.
- Pressure changes in the thorax during breathing.
- Pulsations of nearby arteries promote lymph flow.
- Rhythmic contraction of smooth muscle in the walls lymphatic vessels.
- Valves in lymphatic vessels prevent backflow.


Overlapping endothelial cells
Interstitial fluid (IF) entering lymphatic capillary
Valve closed
Valve open
Cleft
Direction of flow
Anchoring fibers

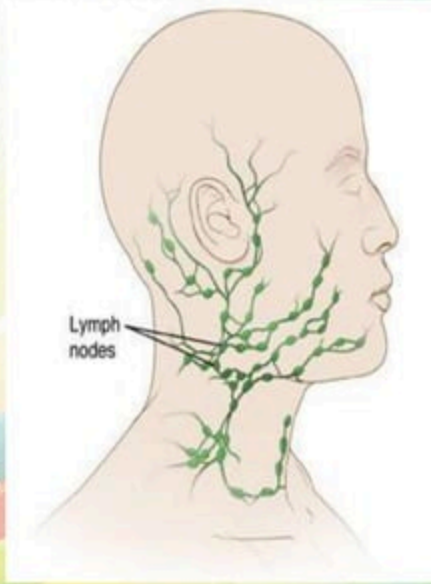
Lymph node groups (Distribution of lymph nodes)

- Lymph nodes throughout the body are arranged in clusters. They are classified according to their location. The major cluster of lymph nodes are;
  - Cervical nodes
  - Axillary nodes
  - Thoracic nodes
  - Mediastinal nodes
  - Supratrochlear nodes
  - Abdominal nodes
  - Mesentric nodes
  - Inguinal nodes
  - Femoral nodes
  - Popliteal nodes



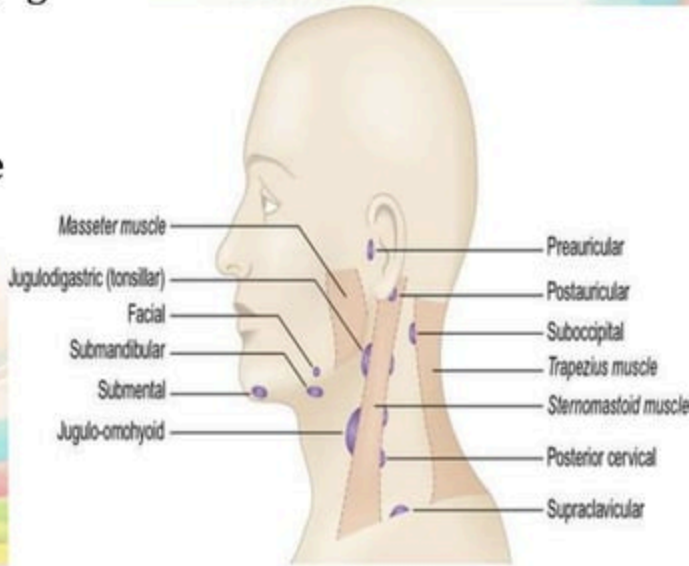
Cervical lymph nodes

- Located in the head and neck region.
- Found deep in the neck, behind the ears and bottom of the jaw.
- Draw lymph from the scalp, face, nasal cavity and pharynx.
- Drains into right and left jugular trunks.
- Cervical lymph node group include
  - Deep cervical lymph nodes
  - Regional cervical lymph nodes
- **Deep cervical lymph nodes**
  - Jugulodigastric node
  - Jugulo-omohyoid node
  - Supra clavicular node
- **Regional cervical lymph nodes**
  - Arranged in two circles – superficial and deep.
    - Superficial regional cervical lymph nodes
    - Deep regional cervical lymph nodes



Deep cervical lymph nodes

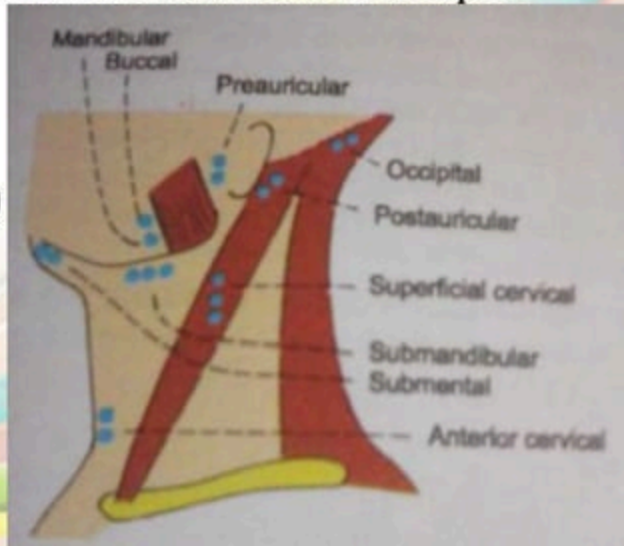
- Situated along the entire length of internal jugular vein.
- The entire lymph from head and neck drains ultimately into deep cervical lymph nodes either directly or through regional cervical lymph nodes.
- Drains into right and left jugular trunks.
- It includes,
  - Jugulodigastric node
  - Jugulo-omohyoid node
  - Supra clavicular node



- **Jugulodigastric node:**
  - situated where the posterior belly of the digastric muscle crosses the internal jugular vein, between the angle of mandible and anterior border of sternocleidomastoid.
  - Drains from tonsils and tongue.
- **Jugulo-omohyoid node:**
  - Situated above the intermediate tendon of the omohyoid, under cover of the posterior border of sternocleidomastoid.
  - Drains from tongue.
- **Supra clavicular node:**
  - Situated superior to clavicle.
  - Drain from upper chest.

Regional cervical lymph nodes

- Arranged in two circles – superficial and deep.
  - Superficial regional cervical lymph nodes
  - Deep regional cervical lymph nodes
- **Superficial regional cervical lymph nodes**
  - It forms the outer circle and extend from chin to occiput.
  - It includes;
    1. Submental
    2. Submandibular
    3. Buccal and mandibular (facial)
    4. Preauricular (parotid)
    5. Postauricular (mastoid)
    6. Occipital
    7. Anterior cervical
    8. Superficial cervical



1. **Submental nodes**
   - Lie below the chin.
   - Drains from;
     - Tip of tongue
     - Floor of anterior part of mouth
     - Incisors
     - Central part of lower lip
     - Skin over chin
   - Drains into submandibular nodes and few into Jugulo-omohyoid node
2. **Submandibular nodes**
   - Lie beneath the deep cervical facia on the surface of submandibular salivary glands.
   - Drains from;
     - Center of forehead
     - Nose
     - Frontal, maxillary and ethmoidal sinuses
     - Inner canthus of eye
     - Upper lip
     - Anterior part of cheek with underlying gum and teeth
     - Lower lip
     - Lower gum and teeth
     - Anterior ⅓ of tongue
     - Floor of mouth
     - Submental nodes
   - Drains mostly into Jugulo-omohyoid node and partly into Jugulodigastric node.

3. **Buccal and mandibular (facial)**
   - Buccal node lies on the buccinator muscle.
   - Mandibular node lie on the lower border of the mandible at the anterior border of masseter.
   - They drain part of the cheek and lower eyelid.
   - Drains into Jugulodigastric node.
4. **Preauricular (parotid)**
   - Lies on or within parotid gland, partly in superficial fascia and partly in deep fascia.
   - Drains from;
     - Temple
     - Side of scalp
     - Lateral surface of auricle
     - External acoustic meatus
     - Middle ear
     - Parotid gland
     - Upper part of cheek
     - Parts of eyelid
     - Orbit
   - Drains into Jugulodigastric node.

5. **Postauricular (mastoid)**
   - Lie on mastoid process.
   - Drain from;
     - Part of scalp just above and below auricle
     - Upper half of auricle
     - Posterior wall of external acoustic meatus.
   - Drain into jugulo-omohyoid node.
6. **Occipital**
   - Located at the back of head, apex of the posterior triangle superficial to trapezius.
   - Drains occipital region of head.
   - Drains into supraclavicular nodes.
7. **Anterior cervical**
   - Lie along anterior jugular vein.
   - Drain from skin of anterior part of neck.
   - Drain into jugulo-omohyoid node and jugulodigastric node.
8. **Superficial cervical**
   - Lie along external jugular vein.
   - Drains from lobule of auricle, floor of external meatus, skin of parotid region, angle of jaw.
   - Drains into jugulo-omohyoid node, jugulodigastric node and supraclavicular node.

Deep regional cervical lymph nodes

- It forms the inner circle which surrounds larynx, trachea and pharynx.
- It includes;
  1. Prelaryngeal and Pretracheal
  2. Paratracheal
  3. Retropharyngeal

1. Prelaryngeal and Pretracheal

- Prelaryngeal nodes lies on cricothyroid membrane.
- Pretracheal nodes lies in front of the trachea below the isthmus of thyroid gland.
- They drain from larynx, trachea and isthmus of thyroid gland.
- Also drains from anterior cervical nodes of superficial regional cervical lymph nodes.
- Drain into nearby deep cervical lymph nodes.

2. Paratracheal

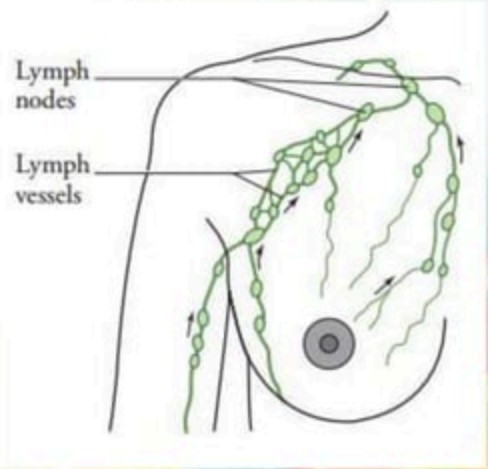
- Lies on sides of trachea and esophagus.
- Drains lymph from esophagus, trachea and larynx.
- Drains into deep cervical nodes.

3. Retropharyngeal

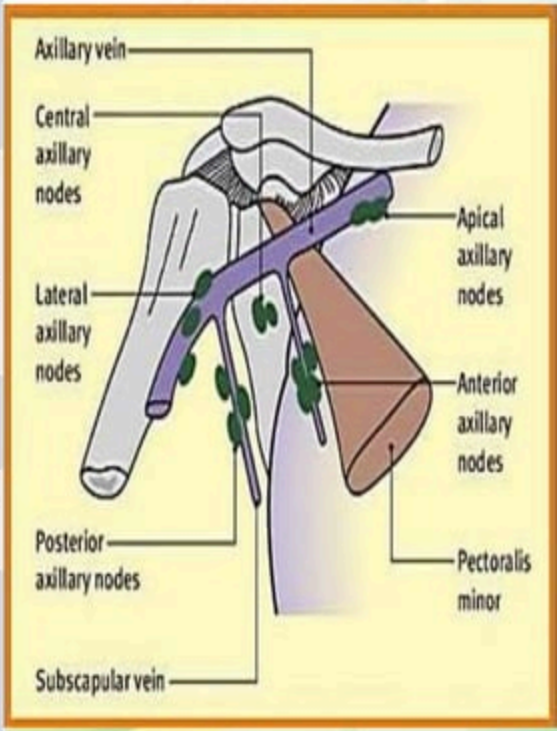
- Lie in front of the prevertebral fascia and behind the buccopharyngeal fascia covering the posterior wall of pharynx.
- Drains from,
  - Pharynx
  - Auditory tube
  - Soft palate
  - Posterior part of hard palate
  - Nose
- Drains into jugulodigastric node.

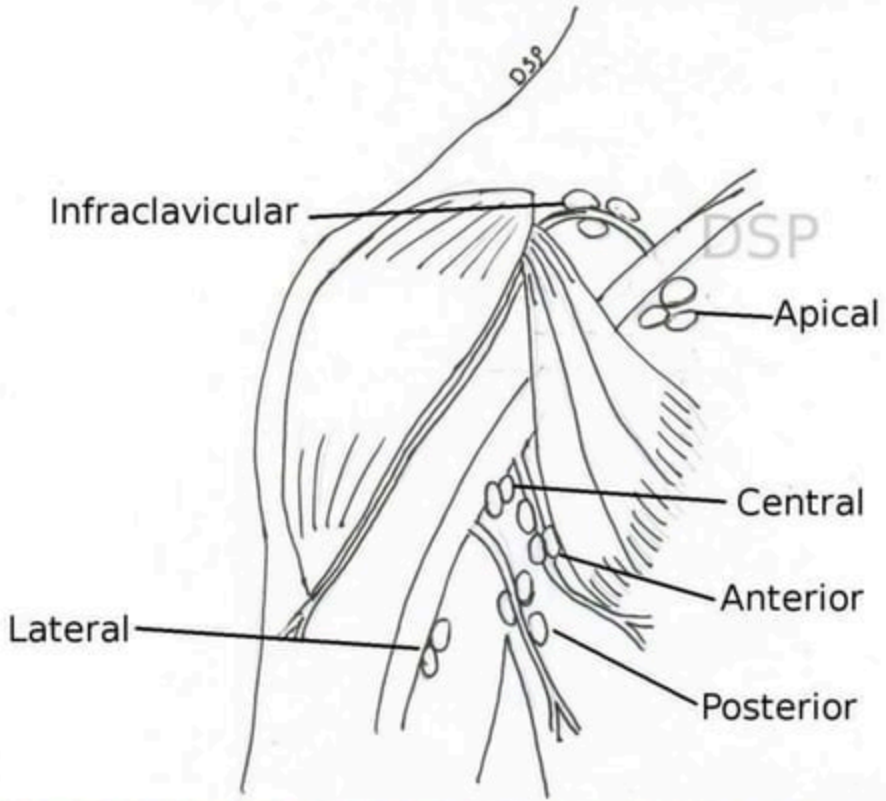
Axillary lymph nodes

- Present in the armpit area.
- Two types- superficial and deep lymph nodes.
- Drain lymph from arm, walls of thorax and breast.
- Divided into 5 groups.
  - Pectoral (anterior) group
  - Scapular (posterior) group
  - Lateral group
  - Central group
  - Apical or infraclavicular group
- Lymph from pectoral, scapular and lateral groups drains into central group, later into apical and finally reaches subclavian trunks.



Groups	Site	Drainage
Pectoral	Lower border of pectoralis minor	• From upper half of anterior wall of the trunk. • From major part of the breast.
Scapular	Posterior fold of axilla	• From posterior wall of the upper half of the trunk. • From axillary tail of the breast
Lateral	Medial to the axillary vein.	• From upper limb.
Central	Upper axilla	• From above groups.
Apical or infra clavicular	Along axillary vessel below clavicle.	• From central group. • From upper part of breast. • From thumb.




Infraclavicular
Apical
Central
Anterior
Lateral
Posterior

Thoracic lymph nodes

- Located in thoracic region.
- Two types - parietal lymph nodes and visceral lymph nodes.



Parietal lymph nodes

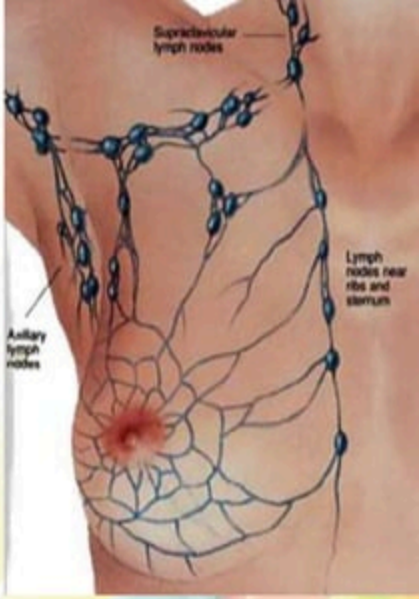
- Situated in the thoracic wall.
- It includes;
  - Parasternal nodes
  - Intercostal nodes
  - Diaphragmatic (phrenic) nodes

Visceral lymph nodes

- Located in relation to internal organs of chest.
- It includes;
  - Tracheobronchial nodes
  - Mediastinal nodes

Parasternal nodes:

- Placed behind the sternum, anterior ends of the intercostal spaces by the side of the internal mammary artery.
- Derive lymph from,
  - Mammary gland
  - Anterior abdominal wall above umbilicus.
  - Upper surface of the liver .
  - Anterior thoracic wall.
- At the right side it drains into right subclavian trunk or right lymphatic duct.
- At the left side it drains into thoracic duct.

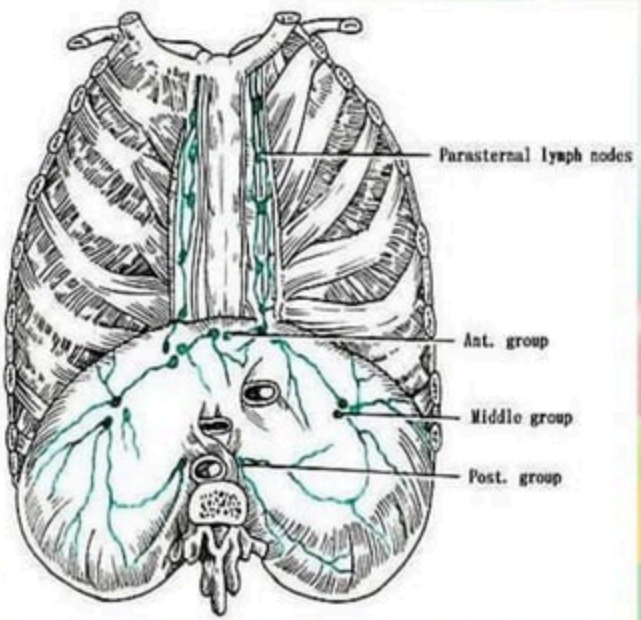


Intercostal nodes

- Located at posterior part of intercostal spaces.
- Drains from posterior and lateral part of chest wall and parietal pleura.
- Drains into,
  - Right side of upper intercostal nodes into right lymphatic duct.
  - Left side of upper intercostal nodes into thoracic duct.
  - Lower intercostal nodes into Cisterna chyli.

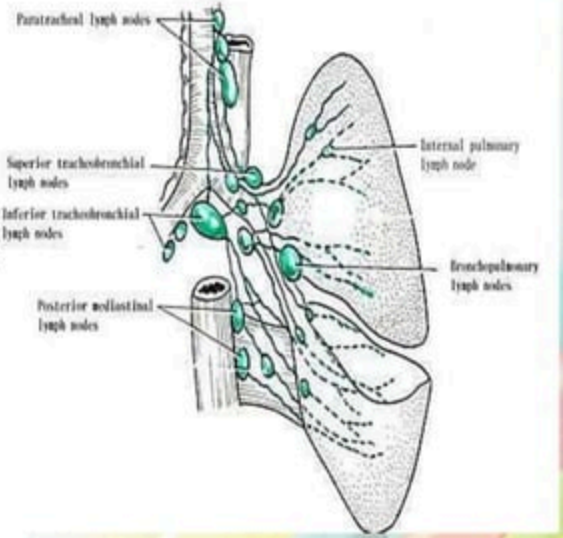
Diaphragmatic (phrenic) nodes

- Lie on the upper surface of the diaphragm.
- It consist of three sets
  - Anterior
  - Middle
  - Posterior
- Receive lymph from
  - Diaphragm
  - Pericardium
  - Pleura
  - Upper surface of liver
- Drains into parasternal nodes and posterior mediastinal nodes.



Tracheobronchial nodes

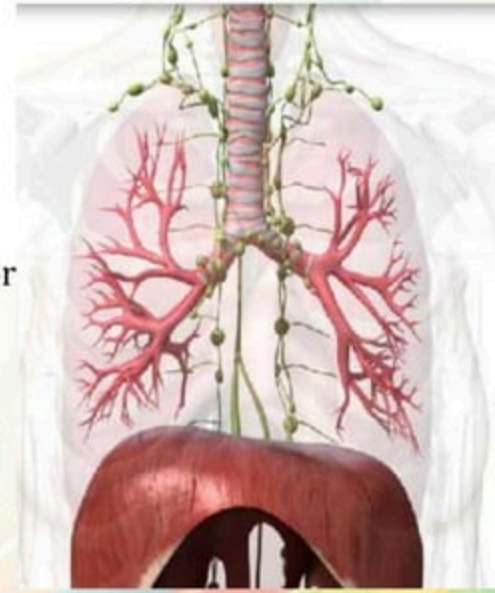
- Nodes around trachea and bronchi.
- It includes,
  - Pulmonary lymph nodes
  - Bronchopulmonary lymph nodes
  - Trachobronchial lymph nodes
- Pulmonary lymph nodes locate in receive lymph from lung and into bronchopulmonary lymph nodes.



- Bronchopulmonary (hilar) lymph nodes locate in the hilus of each lung and receive lymph from lung and empty into trachobronchial lymph nodes.
- The trachobrochial lymph nodes locate near the bifurcation of trachea. They divided into superior and inferior two groups. They empty into paratracheal lymph nodes and then empty into right and left bronchomediastinal trunks.

Mediastinal nodes

- Present in the central part of the chest, between the lungs.
- It also considered as part of thoracic
- Two major groups
  - Anterior mediastinal
  - Posterior mediastinal
- Mediastinal lymph nodes are responsible for helping bone marrow and thymus produce mature lymphocytes.



Anterior mediastinal lymph nodes

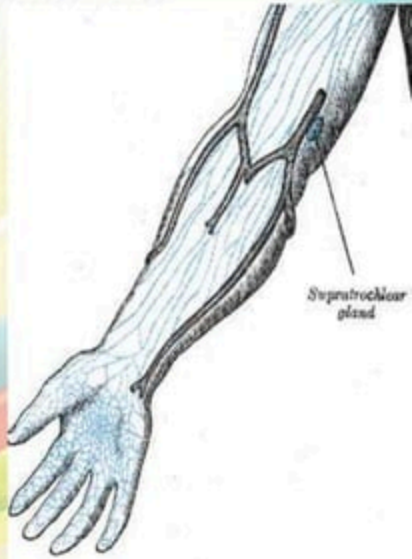
- Located anterior to the heart and posterior to the sternum.
- Receive lymph from,
  - Thymus
  - Heart
  - Pericardium
  - Diaphragm
  - Superior surface of liver
- Drains into right and left bronchomediastinal trunks.

Posterior mediastinal lymph nodes

- Located posterior to the heart and anterior to the spinal column.
- Lie around oesophagus and thoracic aorta.
- It drains from oesophagus and tissues around thoracic aorta.
- Drains into thoracic duct.

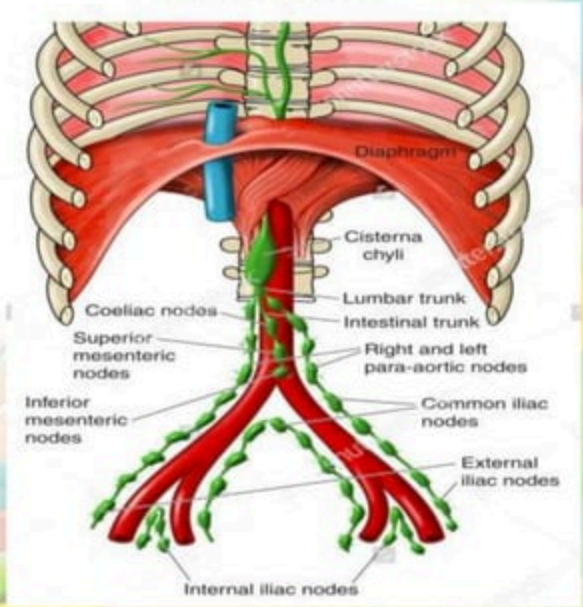
Supratrochlear nodes

- These nodes are locate near elbow and medial epicondyle of humerus.
- Also known as Cubital lymph nodes.
- They drain from,
  - Fingers
  - Ulnar side of the arm
  - Superficial areas of the forearm
- Drains into axillary lymph nodes.



Abdominal nodes

- Right and left para aortic nodes
- External illiac nodes
- Common illiac nodes
- Internal illiac nodes
- Epigastric nodes
- Lumbar glands



Mesentric nodes

- Distributed in the lower abdomen, they lie close to the small intestine.
- They drain cecum, jejunum, ileum, colon and upper part of rectum.

Inguinal nodes

- Located in the groin area.
- They may be superficial or deep.
- They receive lymph from the genital areas, buttock, anus, abdominal wall and legs.

Femoral nodes

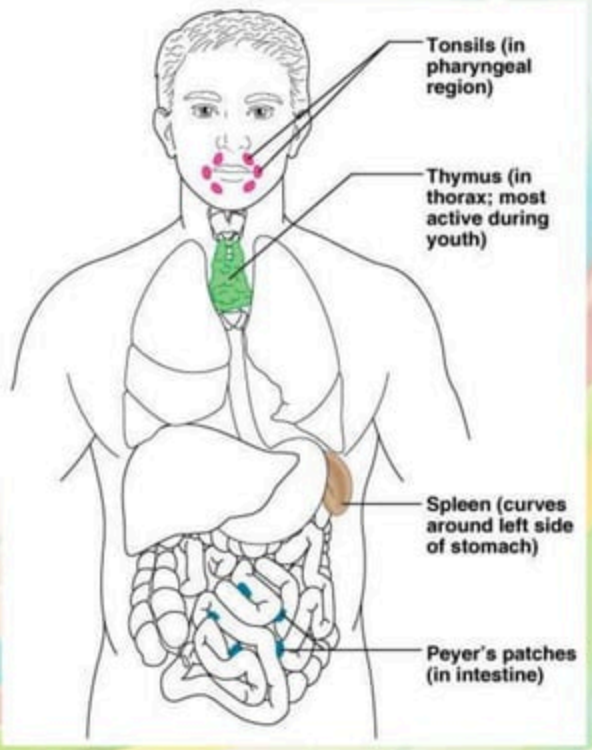
- Located in the upper thigh portion along the femoral veins.
- They drain from some of the genital parts, buttock, thigh and the medial side of the leg.

Popliteal nodes

- Present in the knee area called popliteal fossa.
- There are two sets of popliteal lymph nodes some are present beneath the popliteal fascia and some are found between the popliteal artery and the posterior surface of the knee joint.
- They drain from the knee, thigh, calf and feet.

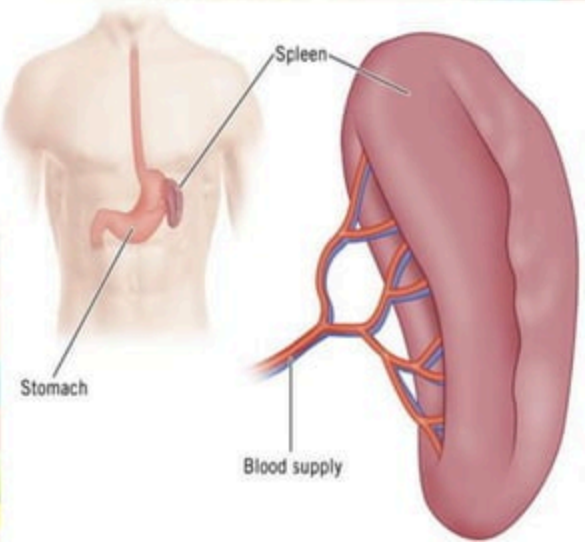
LYMPHOID ORGANS

- Spleen
- Thymus
- Tonsils
- Peyer's patches

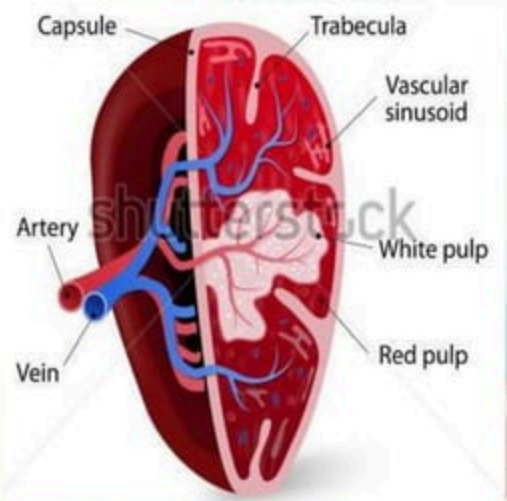


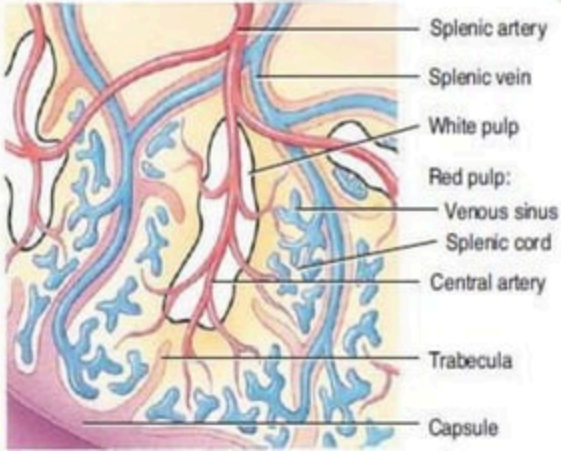
Spleen

- Spleen is the largest lymph organ.
- **Location**: In the left hypochondrium of abdominal cavity, directly below the diaphragm, above the left kidney & descending colon, & behind the fundus of the stomach.
- **Structure:**
  - Oval in shape.
  - Purplish in colour.
  - Soft and highly vascular.
  - About 12 cm long.
  - It weighs about 200 g.
  - The anterior surface is covered with peritoneum.
  - Structure is similar to lymph node.
  - Spleen is covered by fibrous capsule.



- Trabeculae are inward capsular extensions that divide spleen into compatments.
- The spleen parenchyma consists of two different kinds of tissue called white pulp and red pulp.
  - **White pulp** involved in immune functions. It consist of lymphocytes and macrophages. It is arranged arround central arteries (branches of splenic artery).
  - **Red pulp** consists of blood filled venous sinuses called splenic sinusoids and splenic (Billroth's) cords. Splenic cords are regions of reticular connective tissue, that separate splenic sinusoids. Splenic cords consist of RBC, macrophages, lymphocytes, plasma cells, and granulocytes. It destroy damaged RBCs and blood borne pathogens.





- Spleen has a hilum through which the splenic artery, splenic vein, nerves and efferent lymphatic vessels passes.
- **Arterial supply**: splenic artery. Branches of splenic arteries are called central arteries.
- **Venous drainage**: splenic vein
- **Lymphatic drainage**:
  - No proper lymphatics.
  - Few lymphatics arise from capsule and trabeculae drain into pancreatic splenic lymph nodes.
- **Nerve supply**: sympathetic fibers derived from coeliac plexus.

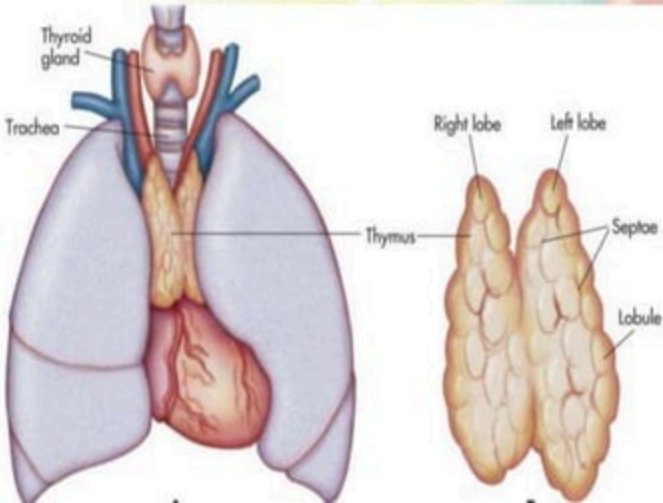
Thymus

Location:

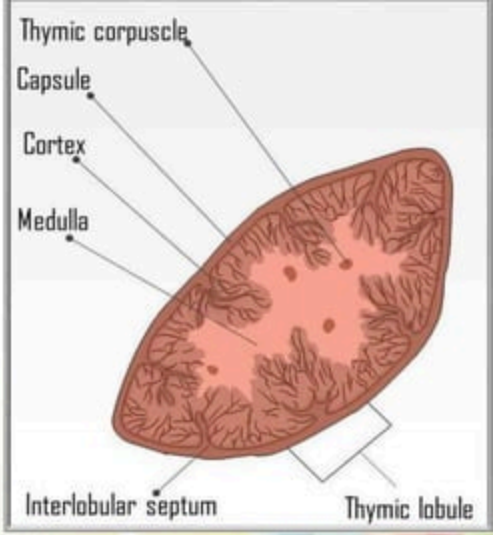
- In the mediastinum between the sternum and the aorta.

Structure:

- Reddish appearance.
- Weighs about 10 to 15 g at birth and grows till puberty (30-40 g). After puberty its atrophy begins, at old age it weighs about 3 g.
- Consists of two lobes joined by connective tissue.

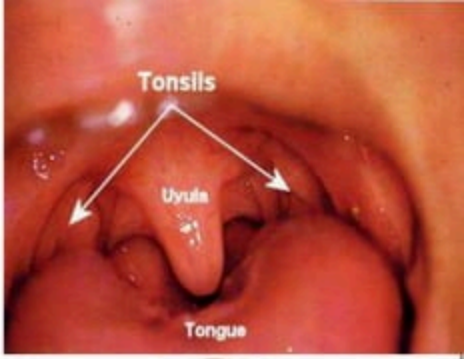


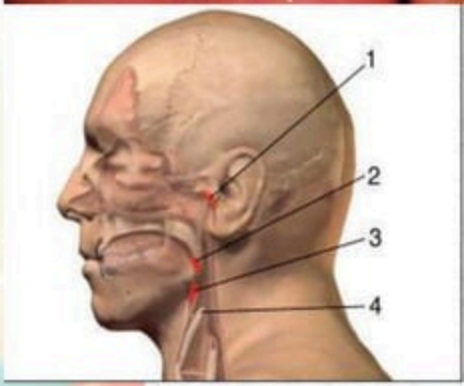
- The lobes are enclosed by a fibrous capsule.
- Extensions of the capsule, called trabeculae divide each lobe into lobules.
- Each lobule is separated by interlobular septa.
- Each lobule contain an outer cortex & inner medulla.
- The cortex is composed of large numbers of immature T cells and scattered dendritic cells, epithelial cells and macrophages.
- Medulla contain fewer mature lymphocytes, epithelial cells, dendritic cells and macrophages and structures called thymic corpuscles.
- Thymic corpuscles are concentric cluster of keratinized epithelial cells.
- Stroma is composed of dendritic cells, epithelial cells and macrophages.



Tonsils

- The tonsils form a ring of lymphoid tissue around the entrance to the pharynx (throat).
- Tonsils include;
- Single pharyngeal tonsil or adenoid embedded in the posterior wall of the nasopharynx.
- Two palatine tonsils lie at the posterior region of the oral cavity, one on either side.
- Paired lingual tonsils located at the base of the tongue.
- Tubal tonsils surround the openings of the auditory tubes into the pharynx.





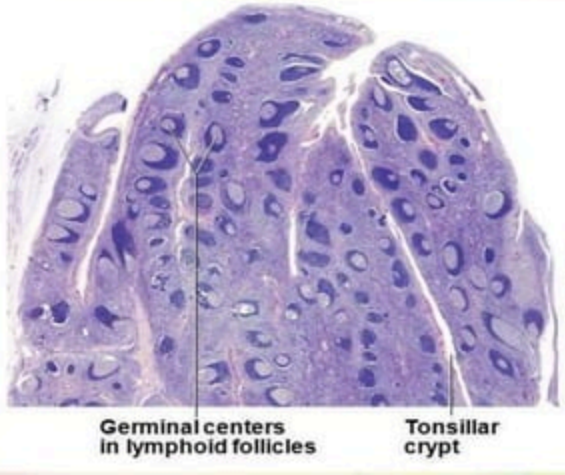
i). Palatine tonsils

ii). Lingual tonsils

iii). Pharyngeal tonsils

iv). Tubal tonsils

- The tonsils gather and remove many of the pathogens entering the pharynx in food or in inhaled air.
- The tonsils are not fully encapsulated.
- The exterior surface of the tonsil is covered by stratified squamous epithelium.
- The epithelium extend inwards to form tonsillar crypts.
- The lymphoid tissue of the tonsils contains follicles with obvious germinal centers surrounded by diffusely scattered lymphocytes.



Peyer's Patches

- Found in the wall of the small intestine.
- Peyer's patches or aggregated lymphoid nodules, are large clusters of lymphoid follicles.
- Resemble tonsils in structure.
- Capture and destroy bacteria in the intestine

