

VISWASS SCHOOL & COLLEGE OF NURSING

GNM 1ST YEAR

ANATOMY AND PHYSIOLOGY

UNIT-5

THE LYMPHATIC SYSTEM

SHORT QUESTIONS AND ANSWERS

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1) Write down the structure of lymph vessels & its circulation?(5)

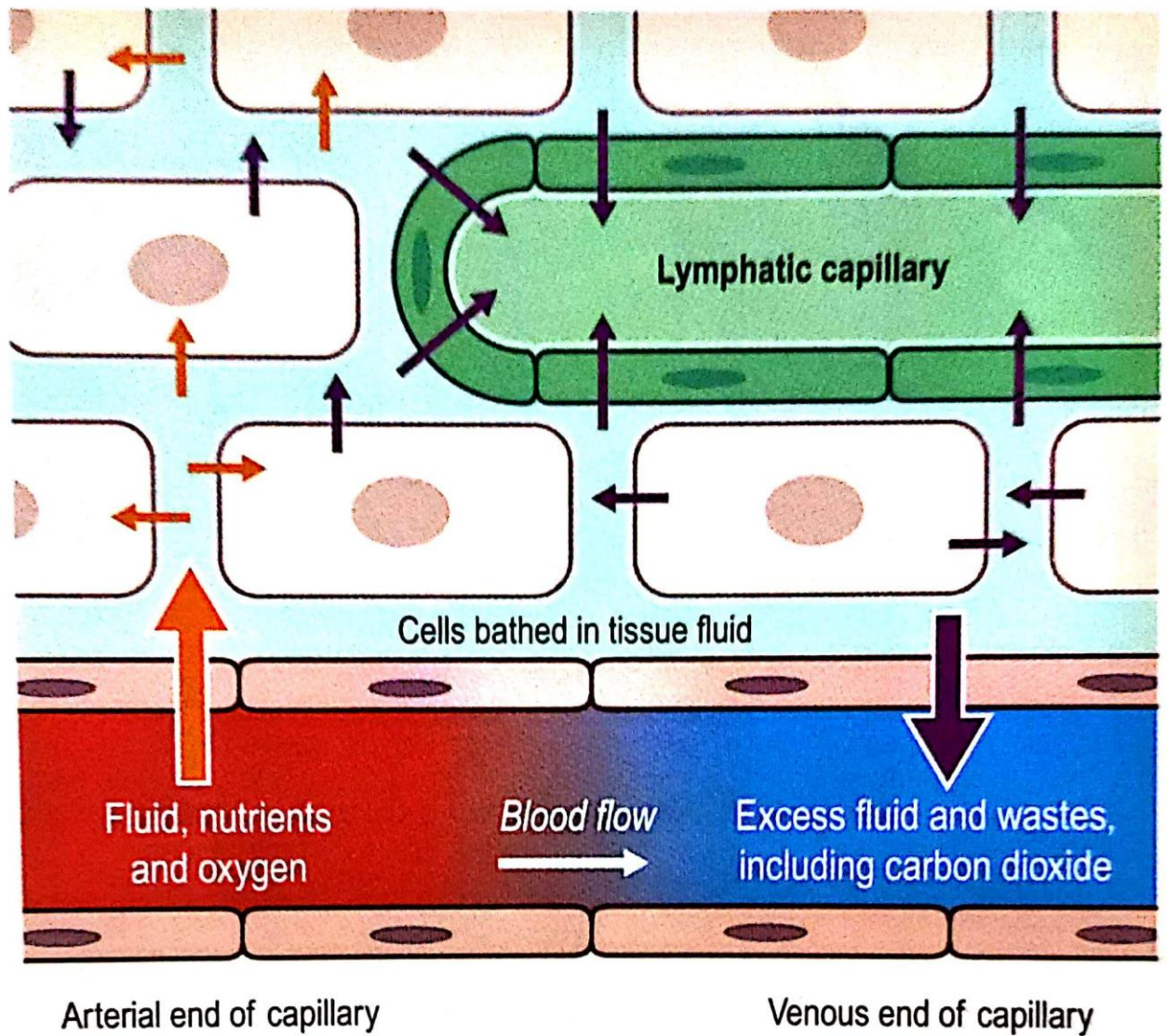
Lymph:

- Lymph is a clear fluid, identical in composition to intestinal fluid and similar in composition to plasma, although it contains much less protein.
- Lymph transports the plasma proteins that seep out of the capillary beds back to the blood stream.
- It also carries away larger particles, e.g. bacteria and cell debris from damaged tissues, which can then be filtered out and destroyed in the lymph nodes.
- Lymph contains lymphocytes, which circulate in the lymphatic system, allowing them to patrol the different regions of the body.
- In the lacteal of the small intestine, fats absorbed into the lymphatics give the lymph there a milky appearance.

Lymph capillaries:

- these originate as blind- ended tubes in the interstitial spaces.
- They have the same structure as blood capillaries, i.e. a single layer of endothelial cells, but their walls are more permeable to all interstitial fluid constituents, including protein and cell debris.
- The tiny capillaries join up to form larger lymph vessels.

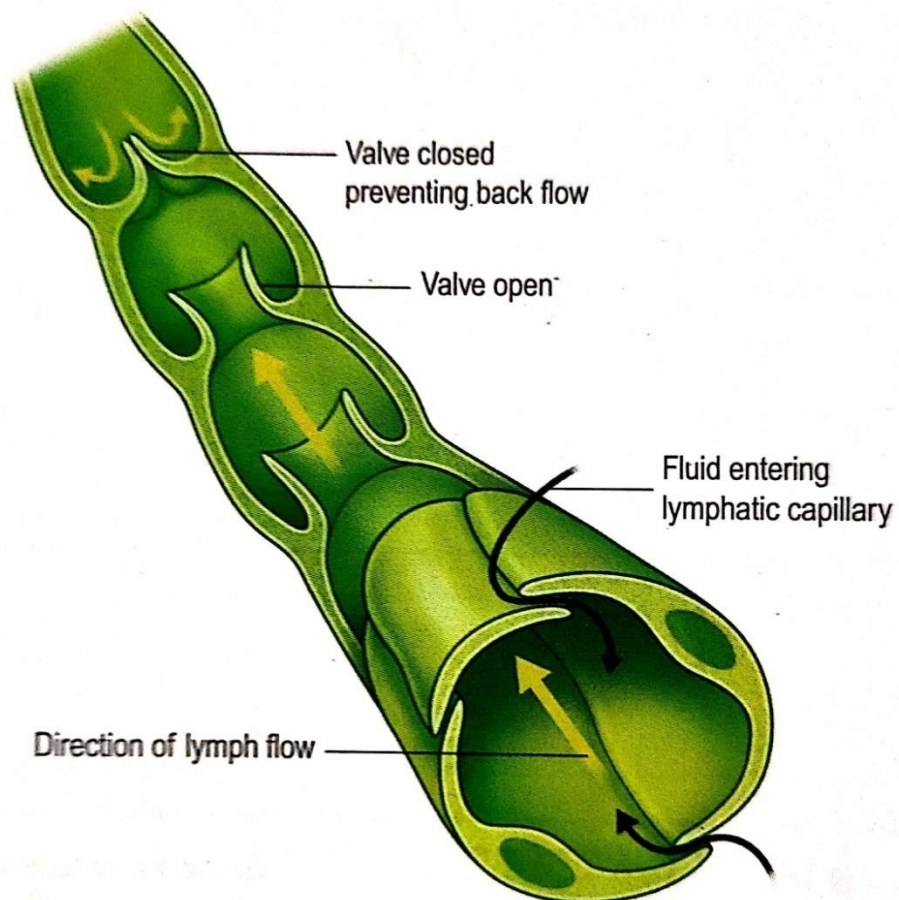
- Nearly all tissues have a network of lymphatic vessels, important exceptions being the central nervous system, the cornea of the eye, the bones and the most superficial layers of the skin.



Structure of Lymph vessels:

- Lymph vessels are often found running alongside the arteries and veins serving the area.
- Their walls are about the same thickness as those of small veins and have the same layer of tissue, i.e. a fibrous covering, a middle layer of smooth muscle and elastic tissue, and an inner lining of endothelium.

- Like veins, lymph vessels have numerous cup-shaped valves to ensure that lymph flows in a one-way system towards the thorax.
- Lymph vessels become larger as they join together, eventually forming two large ducts, which empty lymph into the subclavian veins.
 - ❖ **Thoracic duct:** this duct at the cisterna chyli, which is a dilated lymph channel situated in front of the bodies of the first two lumbar vertebrae. The duct is about 40cm long and opens into the left subclavian veins in the root of the neck. It drains lymph from both legs, the pelvic and abdominal cavities, the left half of the thorax, head and neck, and the left arm.
 - ❖ **Right lymphatic duct:** this is dilated lymph vessel about 1cm long. It lies in the root of the neck and opens into the right subclavian veins. It drains lymph from the right half of the thorax, head and neck and the right arm.



Circulation of lymph:

- There is no `pump`, like the heart, involved in the onward movement of lymph, but the muscle layer in the walls of the large lymph vessels has an intrinsic ability to contract rhythmically .
- In addition, lymph vessels are compressed by activity in adjacent structures, such as contraction of muscles and the regular pulsation of large arteries.
- This milking action on the lymph vessel wall helps to push lymph along.
- Changes in thoracic pressure associated with the respiratory cycle also assist lymph movement.
- At the peak of inspiration, when the pressure in the chest is at its lowest, lymph is sucked along the right lymphatic duct and so increases lymph flow into the subclavian vein.

2) Explain the structure and function of lymph nodes?(5)

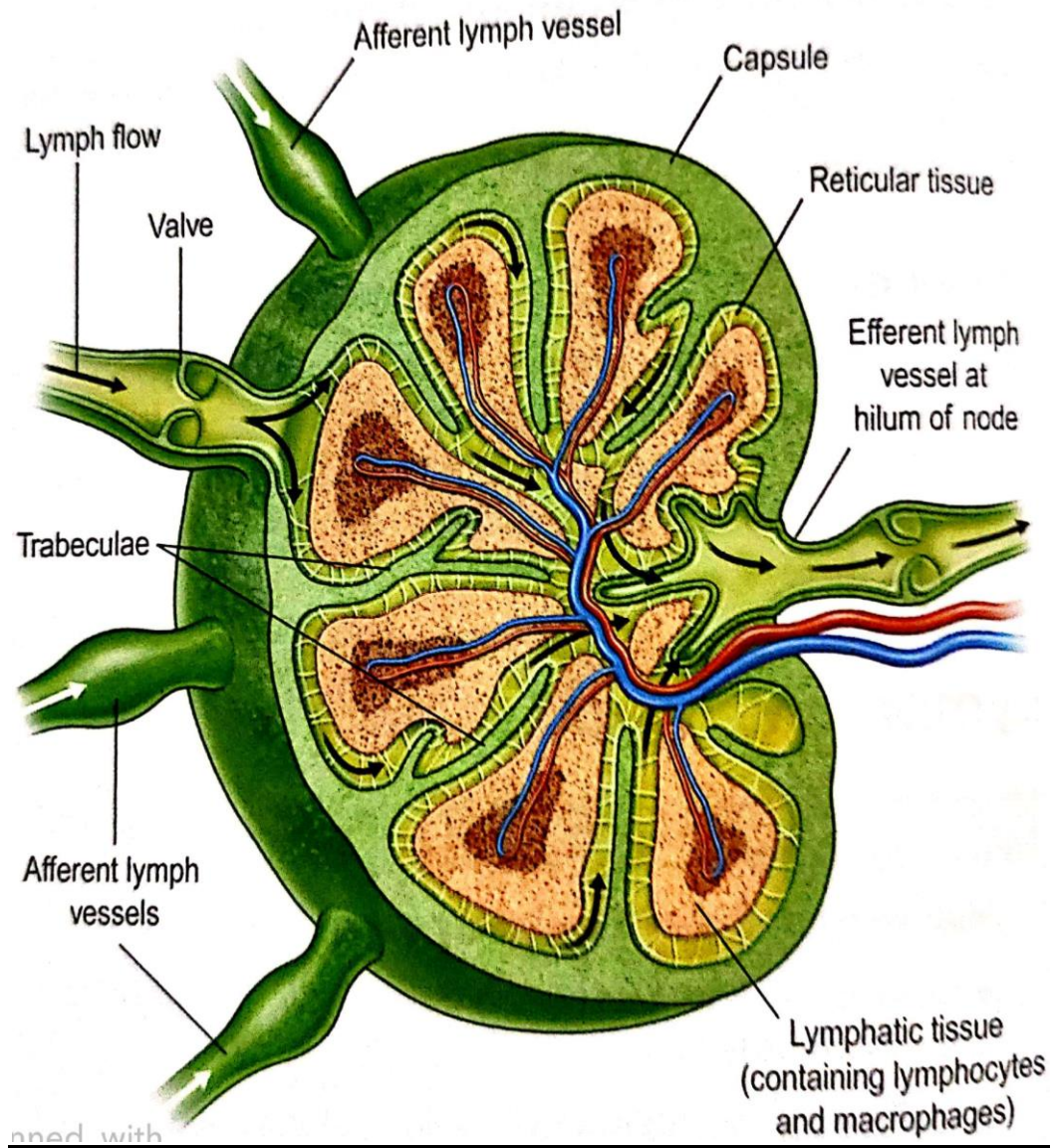
Lymph nodes

- Lymph nodes are oval or bean-shaped organs that lie along the length of lymph vessels, often in groups, the lymph drains through a number of nodes, usually 8-10, before returning to the venous circulation.
- These nodes vary considerably in size: some are as small as a pinhead and the largest are about the size of an almond.

Structure:

- lymph nodes have an outer capsule of fibrous tissue that dips down into the node substance, forming partitions or trabeculae.
- The main substance of the node consists of reticular and lymphatic tissue.

- Reticular cells produce the network of the fibres that provide internal structure within the lymph node.
- The lymphatic tissue is packed with immune and defence cells, including lymphocytes and macrophages.
- As many as four or five afferent lymph vessels may enter a lymph node, but only one efferent vessel carries lymph away from the node, but only one efferent vessel carries lymph away from the node.
- Each node has a concave surface called the hilum, where its artery enters and its vein and the efferent lymph vessel leave.
- The large numbers of lymph nodes situated in strategic positions throughout the body are arranged in deep and superficial groups.
- Lymph from the head and neck passes through deep and superficial cervical nodes.
- Lymph from the upper limbs passes through nodes situated in the elbow region, then through the deep and superficial axillary nodes.
- Lymph from organs and tissues in the thoracic cavity drains through groups of nodes situated close to the mediastinum, large airways, oesophagus and chest wall. Most of the lymph from the breast passes through the axillary nodes.
- Lymph from the pelvic and abdominal cavities passes through many lymph nodes before entering the cistern chyli. The abdominal and pelvic nodes are mainly situated close to the blood vessels supplying the organs and also to the main arteries, i. e. the aorta and the external and internal iliac arteries.
- The lymph from the lower limbs drains through deep and superficial nodes, including groups of nodes behind the knee (popliteal nodes) and in the groin (inguinal nodes).



Functions:

- Defence
 - Lymph flows slowly through lymph nodes and is filtered by the reticular and lymphatic tissue as it passes.
 - Particulate matter may include bacteria, dead and live phagocytes containing ingested microbes, cells from malignant tumours worn-out and damaged tissue cells and inhaled particles.
 - Organic material is destroyed in lymph nodes by macrophages and antibodies.
 - Some inorganic inhaled particles cannot be destroyed by phagocytes.
 - These remain inside the macrophages, either causing no damage or killing the cell.

- Material not filtered out and dealt with in one lymph node passes on to successive nodes, and by the time lymph enters the blood it has usually been cleared of foreign matter and cell debris.
- In some cases where phagocytosis of bacteria is incomplete, they may stimulate inflammation and enlargement of the node(lymphadenopathy).
- Maturation and proliferation of lymphocytes:
 - Some lymphocyte finish their maturation process in lymph nodes and activated T- and B- lymphocytes multiply here.
 - Antibodies produced by sensitised B- lymphocytes enter lymph and blood draining the node.

3)Describe the structure & function of spleen?(5)

Spleen:

- The spleen contains reticular and lymphatic tissue, and is the largest lymph organ.
- It lies in the left hypochondriac region of the abdominal cavity between the fundus of the stomach and the diaphragm.
- It is purplish in colour and varies in size in different individuals, but is usually about 12cm long, 7cm wide and 2.5 cm thick, it weighs about 200 g.

Organs associated with the spleen:

Superiorly & posteriorly- diaphragm

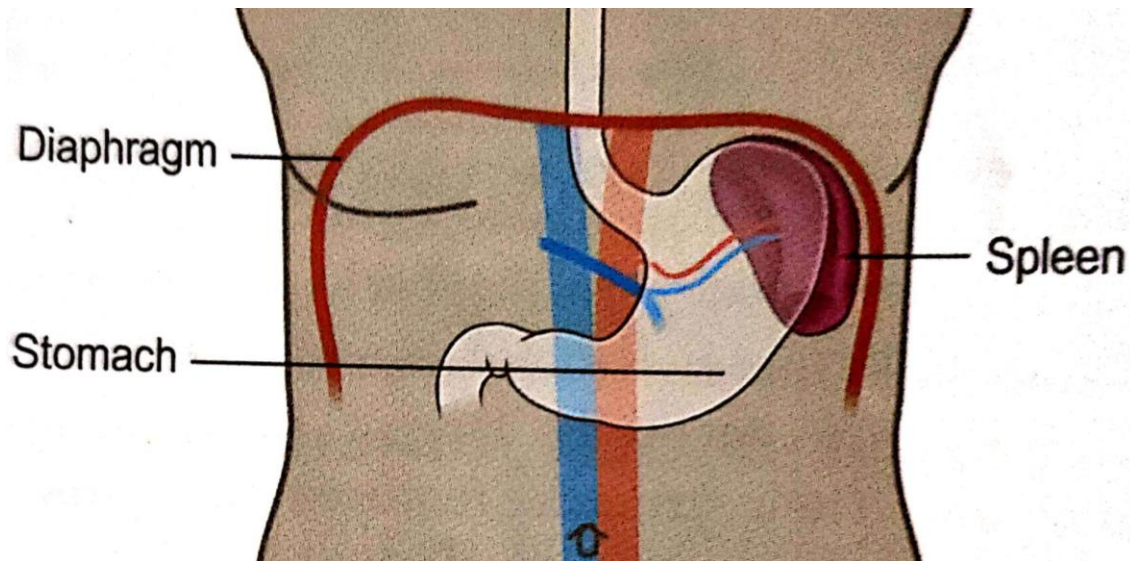
Inferiorly - left colic flexure of the large intestine.

Anteriorly - fundus of the stomach

Medially - pancreas & left kidney

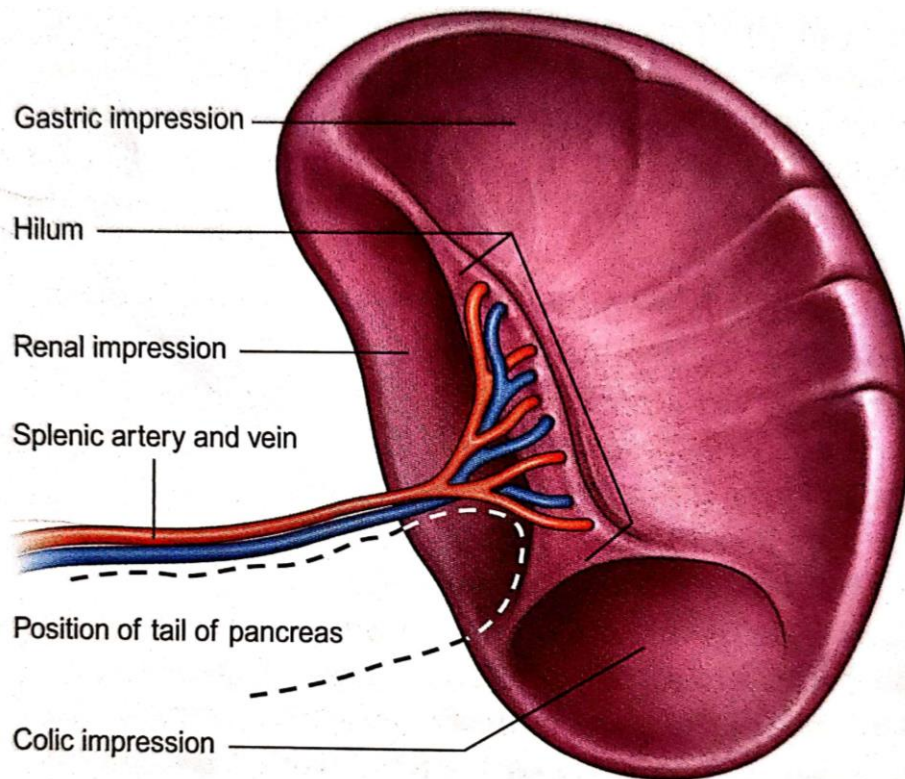
Laterally - diaphragm, which separates the spleen from the 9th,10th

And 11th ribs and the intercostals muscles.



Structure:

- The spleen is slightly oval in shape with the hilum on the lower medial border.
- The anterior surface is concaved with peritoneum.
- It is enclosed in a fibroelastic capsule that dips into the organ, forming trabeculae.
- The cellular material, consisting of lymphocytes and macrophages, is called splenic pulp, and lies between the trabeculae.
- Red pulp is the part suffused with blood, and white pulp consists of areas of lymphatic tissue where there are sleeves of lymphocytes and macrophages around blood vessels.
- The structure entering and leaving the spleen at the hilum are:
 - The splenic artery, a branch of the celiac artery
 - The splenic vein, a branch of the portal vein
 - Lymph vessels(efferent only)
 - Nerves
- Blood passing through the spleen flows in sinusoids which have distinct pores between the endothelial cells, allowing it to come into close association with splenic pulp.
- This is essential for removing ageing or damaged cells from the blood stream, one of the spleen`s functions.



Functions:

- Phagocytosis
 - Old and abnormal erythrocytes are destroyed mainly in the spleen, and the breakdown products, bilirubin and iron, are transported to the liver via the splenic and portal veins.
 - Other cellular material, e.g. leukocytes, platelets and bacteria, is phagocytosed in the spleen.
 - Unlike lymph nodes, the spleen has no afferent lymphatics entering it, so it is not exposed to disease spread by lymph.
- Storage of blood
 - The spleen contains up to 350ml of blood, and in response to sympathetic stimulation can rapidly return most of this volume to the circulation.
- Immune response
 - The spleen contains T- and B-lymphocytes, which are activated by the presence of antigens.
 - Lymphocytes proliferation during serious infection can cause enlargement of the spleen.

- Erythropoiesis
- The spleen and liver are important sites of fetal blood cell production, and the spleen can also fulfil this function in adults in times of great need.

