



## FUNCTIONAL AND CLINICAL ANATOMY OF THE LYMPHATIC SYSTEM. SUPERFICIAL AND DEEP LYMPH NODES LOCATION AND PROJECTION, MAIN LYMPHATIC FLOWS.

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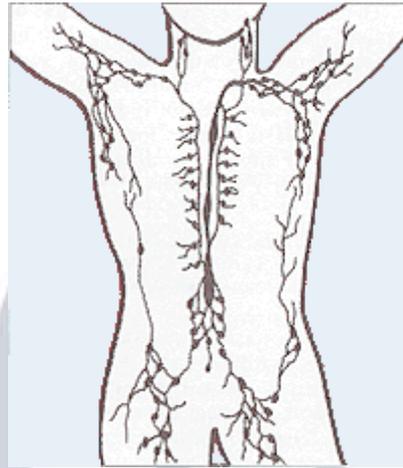
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### ABSTRACT

*This article is about functional and clinical anatomy of the lymphatic system. Superficial and deep lymph nodes location and projection, main lymphatic flows. The lymphatic system consists of lymphatic vessels and lymphoid organs such as the thymus, tonsils, lymph nodes and spleen. They contribute to acquired and innate immunity, filtration and drainage of interstitial fluid, and recycling of cells at the end of their life cycle. The fluid that leaks from the end-stage capillaries returns to the vascular system through the superficial and deep lymphatic vessels, which in turn empty into the right lymphatic duct and the thoracic duct. The right lymphatic duct runs along the medial border of the anterior scalene muscle and drains lymph from the right upper quadrant of the body. The thoracic duct starts from the cisterna chyli and has a very diverse anatomy. The right lymphatic duct and the thoracic duct enter the right and left subclavian arteries, respectively, at the jugular venous angle.*

The lymphatic system (Latin: *systema lymphaticum*) is the capillaries and other vessels and structures that carry lymph from tissues and organs and pour it into the venous system in humans and vertebrates. The human lymphatic system consists of a type of lymphatic capillaries, a network of lymphatic vessels, lymph nodes, and two lymphatic ducts. The lymphatic system takes part in removing the excess of interstitial fluid and returning it to the venous flow, in the assimilation of unabsorbed protein substances and colloid solutions from tissues to capillary blood vessels. The lymphatic system is part of the cardiovascular system. The head of the lymph capillaries consists of tubes of various shapes that form a closed ridge and bulges. They are present in all organs except the brain and spinal cord, spleen, spleen, sclera, and placenta. The diameter of lymphatic capillaries is several times greater than that of vascular capillaries. Their wall has high permeability. From the network of lymphatic

capillaries, lymphatic vessels are formed, and they have valves (valves) that direct the flow of lymph. Lymphatic vessels form a tortuous tangle. From these tangles, lymphatic vessels inside the organs are formed, and they turn into lymphatic vessels leaving the organ. Superficial and deep lymph vessels are distinguished in each internal organ. The human body also has superficial lymphatic capillaries that originate from the skin, subcutaneous fat, and fascia. Deep lymphatic vessels begin with capillaries from bone, periosteum, joints, muscles, nerves, and blood vessels. Lymph vessels thicken in appropriate places and form lymph nodes. Lymph moves through the lymphatic system due to tissue fluid pressure, lymph accumulation, and body muscle contractions. Lymph vessels outside the organ drain into nearby lymph nodes.[1]



Lymph nodes, lymph glands are structures of the lymphatic system of humans and higher vertebrates. Lymph nodes are a blood-forming organ and act as a barrier to disease-causing microbes, their toxins, and toxic substances in general. Thus, it is a biological filter of lymph. Lymph nodes are pinkish-gray, covered with a thick capsule, and consist of round or oval-shaped structures; they are also called lymphoid organs because lymphocytes are formed in them. Lymph nodes regulate immunobiological processes and lymph flow (movement). Leaving the "gate" of the lymph node, the lymphatic vessels join together to form a lymphatic trunk, which turns into two large lymphatic vessels, and the large vessels that arise from them connect to the great vena cava in the neck. Pathogens that flow with the lymph are partially or completely swallowed by the cells of the lymph nodes (see Phagocytosis). In some diseases (angina, epidemic parotitis, etc.), lymph nodes become swollen and enlarged. [2]

The lymphatic system is part of the cardiovascular system. Lymph the head part of the capillaries consists of tubes of different shapes that form a closed ridge and bulges. They are present in all organs except the brain and spinal cord, spleen, spleen, sclera, and placenta. Diameter of lymphatic capillaries blood vessel several times more than that of capillaries. Their wall has high permeability. Lymphatic vessels are formed from the network of lymphatic capillaries and direct the flow of lymph in them there will be valves (caps). Lymphatic vessels form a tortuous tangle. From these tangles, lymphatic vessels inside the organs are formed, and they turn into lymphatic vessels leaving the organ. There are superficial and deep lymph vessels in each internal organ will be done. The human body also has superficial lymphatic capillaries that originate from the skin, subcutaneous fat, and fascia. Deep lymphatic vessels bone, periosteum, joints, begins with capillaries from muscles, nerves and blood vessels. Lymph vessels thicken in appropriate places and form lymph nodes. Tissue fluid pressure, lymph Due

to accumulation and contraction of body muscles, lymph moves along the lymphatic system. Lymph vessels outside the organ to nearby lymph nodes is poured. The cellular elements of the lymph consist of lymphocytes, monocytes and a few granular leukocytes. In the organs of the lymphatic system, lymphoid elements of the blood are formed and perform the function of a barrier, that is, a foreign body that has entered the body neutralizes bacteria. Cancer tumors spread through lymph nodes. Chest lymph nodes after reaching the aortic arch, it turns to the left and flows into the left venous corner. The left bronchomediastinal lymphatic trunk (the left thoracic outlet) collects lymph from the left arm) and the joint the lymphatic trunk (which collects lymph from the left half of the head and neck) comes and joins. Right lymph node from the right half of the head and neck, from the right arm and chest (lymph from the right half). This way is the right jugular lymphatic trunk and the right subumbilical lymphatic trunk, right it is caused by the addition of bronchomediastinal lymph. [3]

The lymphatic system has the following components:

- 1) lymphatic capillaries;
- 2) network of lymphatic capillaries;
- 3) lymphatic vessels;
- 4) lymph nodes;
- 5) main lymphatic arcs.

Lymph capillaries - in the form of a loop from the tissues, in a state of closed expansion consists of a system of starting tubes. Vascular capillaries, on the other hand, are arterioles and It is a two-sided open tube connected with venules. Like vascular capillaries, lymph the wall of the capillaries is also composed of a number of endothelial cells. But lymph the diameter of the capillaries is larger. They are not found in the following areas: 1) brain and in the spinal cord; 2) in primary substances; 3) in the epidermal layer of the skin; 4) internal organs in the epithelial layer. Lymphatic capillaries begin in a closed state and form a network of lymphatic capillaries does.

Lymph node structure [4]

Capsule

The lymph node capsule is a dense connective tissue stroma and collagen fibers. The capsule sends trabeculae into the lymph node, which penetrate inside and flow towards the center.

Subcapsular sinus

The subcapsular sinus is the space between the capsule and the cerebral cortex that provides transport of lymphatic fluid.; it is also called lymphatic tract, lymphatic sinuses or marginal sinuses. Beneath the capsule is the subcapsular sinus, through which both reticular fibers and cells pass. It takes afferent vessels, continues into the trabecular sinuses and joins the medullary sinus in the medulla of the lymph node.

Cortex

The lymph node cortex is the layer underneath the subcapsular sinus. The cortex consists of an outer cortex and an inner part, like the paracortex. The outer layer of the cortex is also called the B cell layer, it is rich in CXCR5 chemokines and consists mainly of B cells organized in follicles. Immature B cells develop in the germinal center when exposed to antigen. After this, resting B cells and dendritic cells surround the germinal center, forming the mantle zone. The paracortical layer, also known as the T cell layer, consists of T cells that interact with dendritic cells and are rich in CCR7 chemokines.[5]

#### Medulla

The medulla oblongata is the main shell of the lymph node and contains large blood vessels, sinuses and medullary tension. Medullary cords contain antibody-secreting plasma cells, B cells and macrophages. The medullary sinuses (or sinusoids) are vessel-like spaces that separate the medullary tensions. The medullary sinuses receive lymph from the trabecular and cortical sinuses and contain reticular cells and histocytes. The medullary sinus drains lymph into the efferent lymphatic vessels.

#### Lymph node function

The main function of the lymph nodes is to filter interstitial fluid, a collection system of soft tissues, and ultimately return it to the vascular system. Filtration of this exudative fluid allows T and B cells to be exposed to a wide range of antigens. To activate antigen-specific B and T cells, they must first be exposed to the antigens of tomorrow via antigen-presenting cells, dendritic cells, and follicular dendritic cells. They are part of the innate immune response and therefore play a role in adaptive immunity.

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