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MORPHOLOGICAL CHANGES IN REGIONAL LYMPH NODES IN ASEPTIC INFLAMMATION

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Abstract: Since changes in tissues and organs in aseptic inflammation have not been sufficiently studied, the purpose of this study was to determine the specific morphological changes that develop in the lymph nodes of the human body in aseptic inflammation. In aseptic inflammation, swelling increases around the lymph nodes, their sinusoids expand, and their parenchyma atrophies. In the parenchyma of the lymph nodes, morphofunctional zones are not distinguishable, and the stroma atrophies with collapse, sclerosis, and reticulosis.
Key words: aseptic inflammation, lymph node, pathomorphology, edema, atrophy, sclerosis, reticulosis.

Introduction.

The lymphatic system (Latin: systema lymphaticum) is the lymphatic system of the human body, consisting of a network of lymphatic capillaries, a network of lymphatic vessels, lymph nodes and two lymphatic ducts. The lymphatic system is involved in the removal of excess interstitial fluid and its return to the venous system, as well as in the absorption of protein substances and colloidal solutions that have not been absorbed from the tissues into the capillary blood vessels. The lymphatic system is part of the cardiovascular system. The main part of the lymphatic capillaries consists of tubes of various shapes that form dense connections and protrusions. They are present in all organs, with the exception of the brain and spinal cord, spleen, fibrous layer and lens of the eye, and placenta. The diameter of the lymphatic capillaries is several times larger than the diameter of the blood capillaries. Their walls are highly permeable. Lymphatic vessels are formed by a network of lymphatic capillaries, which contain valves that direct the flow of lymph. Lymphatic vessels form tangles of fibers. These tangles form lymphatic vessels inside organs, which then become lymphatic vessels exiting the organ. In each internal organ, there are superficial and deep lymphatic vessels. The human body also has superficial lymphatic capillaries that originate in the skin, subcutaneous fat, and fascia. Deep lymphatic vessels originate from capillaries in the bones, periosteum, joints, muscles, nerves, and blood vessels. Lymphatic vessels thicken in appropriate places and form lymph nodes. Due to the pressure of tissue fluid, accumulation of lymph, and muscle contraction, lymphatic fluid moves through the lymphatic system. Parietal lymphatic vessels drain into nearby regional lymph nodes. Cellular elements of lymph consist of lymphocytes, monocytes and a small number of granular leukocytes. Lymphoid elements of the blood are produced in the organs of the lymphatic system and perform a barrier function, that is, they neutralize foreign bacteria that have entered the body. Cancerous tumors spread through the lymphatic system. The thoracic lymphatic duct enters the aortic arch, turns left and flows into the left venous angle.

Objective of the work. In the scientific literature known to us, it has been established that very

few morphological changes can develop in the lymph nodes during aseptic inflammation. Therefore, the main objective of this work was to determine the characteristics of morphological changes developing in the lymph nodes of the human body during aseptic inflammation.

Materials and methods. The material of the work was the study of changes in the structure of regional lymphatic vessels during aseptic inflammation, analysis of the literature.

Results and discussion. Aseptic inflammation is an inflammatory process that occurs without the participation of infectious factors, i.e. without the participation of microorganisms. This type of inflammation is often caused by trauma, autoimmune reactions, allergic reactions, or exposure to chemicals (1,2,5). During this inflammatory process, the immune system reacts immediately. The lymphatic system plays a crucial role in the immune system. They work together to produce immune responses that protect the body from toxic substances, tumor cells, and various infections. Aseptic inflammation is a change that develops in the human body, and the causes of this disease are studied better than any other. With aseptic inflammation, the following morphological changes are observed in the regional lymph nodes: 1. Edema and hyperemia. Under the influence of inflammation, edema and swelling of the blood vessels (hyperemia) develop in the lymph nodes. This condition is aimed at enhancing the protective function of the lymph nodes. 2. Sinusoidal dilation: The sinusoids in the lymph nodes dilate, allowing for increased lymph flow. 3. Parenchymal atrophy: As a result of long-term inflammation, the parenchyma of the lymph nodes may atrophy, meaning the tissue decreases in size and loses function. 4. Stromal changes: The stroma (tissue matrix) of the lymph nodes may undergo changes such as collapse, sclerosis, and reticulosis. These conditions affect the structural stability of the nodes. 5. Decreased lymphoid cell count: Aseptic inflammation may cause a decrease in the number of lymphoid cells in the lymph nodes, leading to a weakened immune response. 6. Proliferation of reticular stromal structures: In response to the decrease in lymphoid cells, the reticular stromal structures may proliferate and increase in size. These changes can lead to disruption of the protective and filtering functions of the lymph nodes, which affects the duration and severity of the inflammatory process. As a result, the work of the heart slows down, the blood supply to tissues and organs is disrupted, dystrophic and destructive changes develop in organs sensitive to ischemia: kidneys, liver, lungs, brain (3,4,8). Undoubtedly, such changes as circulatory disorders, edema, dystrophy and destruction also develop in other organs and tissues, including the lymphatic system, which is part of the immune system. As is known, depending on the stages of development of aseptic inflammation, edema first occurs in all tissues and organs, then the edema increases due to hypoproteinemia, and ultimately arterial hypertension develops, leading to stasis in the veins and lymphatic vessels. Lymph nodes and lymphatic vessels play an important role in these changes, acting as a drainage system. The results of the morphological study showed that in aseptic inflammation, the peribronchial, mesenteric, subhepatic, subsplenic and paraaortic lymph nodes of the body are enlarged compared to the norm, with some of the mesenteric lymph nodes enlarged to 1.5-2 cm in diameter. In this case, it was noted that the color of the lymph nodes differed from the surrounding tissue and became bluish-red (2,7).

Microscopic examination revealed that the tissues around almost all the lymph nodes were severely swollen, with increased interstitial fluid and lymphostasis. It turned out that although the soft tissues around the lymph nodes were severely swollen, the lymph node membrane itself was not swollen, and only the lymphatic vessels connected to it were dilated. It was noted that the lymph node membrane itself consisted mainly of dense fibrous structures, with elongated nuclear connective tissue cells located on the outer and inner surfaces. It should be noted that fibrocytes were found on the outer surface of the lymph node membrane itself, and reticular cells on the inner surface. The fibrous structures between them formed a dense membrane, which was found to be completely

devoid of pores, blood vessels, and even interstitial fluid. Beneath the proper tunica of the lymph node is a large peripheral sinusoidal space, the reticular cells of the tunica forming separate bundles that extend through the sinusoidal space, covering the parenchyma of the lymph node as a thin internal membrane. Probably due to aseptic inflammation, this network of reticular cells and fibers was disrupted, and the spaces between them were dilated and filled with lymphatic fluid. The fluid was found to contain mainly lymphocytes, macrophages, and tissue cell fragments (6,8). These cells were found to have a diverse structure in terms of shape and staining, with macrophages in particular having an ill-defined shape, a protruding nucleus, and the presence of small and numerous dark-stained phagosomes in their cytoplasm. This condition is indicative of an increase in the amount of metabolites, tissue secretions, and tissue fluid that appear in the tissues as a result of aseptic inflammation.

Each lymph node is externally surrounded by a connective tissue membrane. Trabeculae extend from this membrane into the lymph node, and within the lymph node they anastomose with each other and connect with the reticular tissue stroma in both the cortex and medulla. The cortex is a B-lymphocyte zone, and its stroma contains a network of poorly differentiated dendritic and typical reticular cells. However, under the influence of aseptic inflammation, the lymph node usually atrophies, the peripheral and medullary sinusoids become enlarged, and the three normal areas in the lymph node parenchyma, namely, the cortical lymphoid follicles, the paracortical area, and the interstitial bundles of the medullary sinusoids, are not determined (Fig. 2). The reticular tissue stroma of the lymph nodes is open due to a lack of lymphocytes and has an increased number of macrophages. In the B-field, typical dendritic macrophages predominated, whereas in the T-field, interdigital macrophages predominated. zone, the medulla is the B-lymphocyte zone. In the parenchyma, there should be round lymphoid nodes, 0.5-1.0 mm in diameter. Depending on the structure, lymphoid nodes are divided into primary, that is, without a cell proliferation zone, and secondary, with a cell proliferation zone area in the center. Primary lymphoid nodes consist of evenly distributed lymphocytes and are characteristic of resting lymph nodes. Secondary lymphoid nodules can also appear, including in aseptic inflammation, and in histological preparations should consist of a focus of proliferation of palely stained cells and an accumulation of densely stained lymphocytes in the form of a crown around it. The cell proliferation center contains intensively proliferating B-lymphocytes, lymphoblasts, macrophages, dendritic cells and lymphocytes. A lymph node with such a structure is considered an antigen-induced node, and this state can change every 2-3 days depending on the antigens entering the body. However, it was noted that most of the examined lymph nodes are atrophied, morphofunctional zones are not distinguished in the parenchyma of the lymph nodes, and the boundaries between them are completely disrupted. In fact, the lymph nodes should have a sinus system consisting of widespread channels. Lymphatic vessels from the surrounding tissue penetrate the outer membrane of the lymph node, flow into the peripheral sinus and through the cortical and medullary sinuses become lymphatic vessels that exit the lymph node. In the sinus system, the lymphatic fluid is cleared of various harmful substances, microorganisms, metabolites and other pathogenic particles that have entered from the tissues, enriched with lymphocytes and drained into the common lymphatic duct. The medulla of the lymph nodes that have undergone changes due to aseptic inflammation is also not distinguishable; instead, sharply enlarged sinus cavities with sclerotic walls are determined.

Normally, the paracortical region is located between the cortex and medulla of the lymph nodes and consists mainly of T-lymphocytes. In this region, T-lymphocytes undergo blastotransformation and become functional effector T-lymphocytes. However, when studying regional lymph nodes in the human body during aseptic inflammation, it was found that in most cases the paracortical zone atrophied, lymphocytes in these areas completely disappeared, the reticular stroma and blood

vessels did not fold, but turned into a single whole. tissue, forming sclerosis and reticular formations.

Conclusions.

1. During aseptic inflammation, edema increases around the lymph nodes, their sinusoids expand, cells and tissue fragments multiply in them, and their parenchyma atrophies. 2. Sinusoids of the medulla and peripheral layers of regional lymph nodes expand and transform into cystic spaces with sclerotic walls.

3. In the parenchyma of regional lymph nodes, morphofunctional zones are not distinguished, and due to the disintegration of the stroma, they turn into a single cluster of mixed cells.

4. Atrophy of regional lymph nodes is characterized by loss of parenchyma, sclerosis and reticulosis of the stroma.

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