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Morphofunctional Features of Intestinal-Associated Lymphoid Tissue

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Abstract: In mammals, one of the main systems that protect the body from pathogenic influences is the immune system. One of the large peripheral sections is the gut-associated lymphoid tissue (GALT). About 80% of all immunocompetent cells in the body are associated with the intestinal mucosa. GALT is an important part of the mucosa-associated lymphoid tissue (MALT).

Keywords: lymphoid tissue, intestine, morphology, mucous membrane.

Relevance: The protection of all internal and external epithelial integuments of the body is carried out with the help of MALT, which consists of lymphoid tissues and organs located directly under the epithelium of the mucous membrane [1]. GALT plays a huge role in the functioning of the gastrointestinal tract, as it prevents the entry of foreign agents into the body, but at the same time allows the passage of nutrients from the intestinal lumen [2]. Also, intestinal lymphatic tissue performs vital functions in regulating tissue fluid homeostasis [6].

Among the lymphoid formations of the intestine, group lymphoid nodules (Peyer's patches) are distinguished. Currently, their significant role in the formation of the immune response, participation in lymphocytopoiesis and lymphocyte recycling has been determined [7]. Peyer's patches are structurally organized and formed accumulations of lymphoid cells in the submucosal layer of the intestine. In addition to plaques, gut-associated lymphoid tissue includes solitary lymphoid follicles, which are contained in the mucous membrane and submucosa of the intestine, but do not have a close connection with the epithelium. They are accumulations of diffuse lymphoid tissue, formed by reticular tissue and many medium and small lymphocytes, poorly differentiated cells and macrophages [11]. The main task of studying the effect of drugs on the immune system is to prove or refute the possibility of developing an immunotoxic effect. This is especially important when testing new pharmacological agents, as well as already known agents for which there is no data regarding their immunotoxicity [1].

The gastrointestinal tract is a complex system of mutual arrangement and interaction of the digestive organs. They are all inextricably linked with each other. Malfunction of one organ can lead to failure of the entire system. They all perform their tasks and ensure the normal functioning of the body. All parts of the small intestine are interconnected, and pathological processes in one of the sections cannot but affect the rest. Like any other organ, the small intestine performs several important functions at once [2].

The absorptive functions of the organ are that the small intestine, more precisely its mucous membrane, absorbs the products of the breakdown of chyme, medications and many other substances that promote the secretion of hormones and strengthen the body’s immunological defense. Note that during the absorption process, the small intestine supplies organic compounds, vitamins, salts and water to the most distant organs through blood and lymphatic capillaries [15].

The protective function of the organ is represented by organized structures (Peyer's patches, appendix, mesenteric nodes) and lymphocytes located outside the lymphoid tissue. Peyer's patches are subepithelial group lymphatic follicles located in the small intestine, primarily in the ileum. “Acquaintance” of the macroorganism with the antigen occurs precisely through the epithelium of Peyer’s patch. These cells are capable of “passing” the antigen through themselves by pinocytosis, thereby presenting it to lymphocytes [16]. Another feature of the intestinal immune system is lymphocytes located inside the epithelium. They make up one third of the lymphocytes located outside

the lymphoid tissue, and the vast majority are represented by CD8+ cells (cytotoxic T lymphocytes) and single NK cells [18].

The result of the joint symbiotic activity of epithelial cells and physiological microflora is the formation of a complex, specific epithelial structure - the epithelial mucous barrier. It is necessary to note the main functions of the mucous epithelial barrier, which it performs for the entire body. Synthesis of amino acids, proteins, vitamins B (B1, B2, B6, B12), K, nicotinic, pantothenic, folic acids, which are absorbed in the intestine, and the production of other biologically active metabolites, a pronounced stimulating effect on the local immune system, binding of viral antigens and bacteria, blockade of adhesion of viruses and bacteria to mucous membranes, stimulation of the antibacterial activity of phagocytes, lymphocytes against pathogenic bacteria, binding of food antigens and allergens that can provoke allergic reactions [3].

The lymphatic system is one of the most important and little-studied systems of the human and animal body, which is explained, first of all, by its complex structure and the difficulties of experimental research. Lymph nodes, as part of the lymphatic and immune systems, are of great functional importance for the body, both normally and during various reactive and pathological processes. Recently, interest in their study has increased significantly, which is explained by the expansion of the range of research methods and the practically unlimited number of pathological conditions and experimental models that require careful analysis [4].

Lymph nodes, being peripheral organs of the lymphatic system, carry out a functional relationship between the lymphatic and circulatory systems. Lymph nodes are the main organs of concentration of effector cells, in which an optimal microenvironment is created for the differentiation and proliferation of antigen-dependent lymphocytes. By cleansing and filtering peripheral lymph, they help maintain homeostasis in the body. Numerous studies have shown an extremely high level of lability of the internal structure of various groups of lymph nodes in response to the influence of specific and nonspecific environmental factors [21].

In the tissue of the lymph node, an outer cortical (B-dependent) zone is distinguished, in which accumulations of predominantly B-lymphocytes form lymphoid nodules (follicles), a paracortical (T-dependent) zone, in which mainly T-lymphocytes accumulate, and the medulla with T- and B-lymphocytes and plasma cells [16].

Lymph nodes are an active “biological filter”, a protective barrier that prevents the spread of infectious agents, toxins and tumor cells during malignant neoplasms throughout the body [17]. In mammals, including humans, the number of lymph nodes is relatively constant and amounts to 600-800 units. They are laid inside the womb and function throughout life.

Due to contact with infectious or other agents, their number and functional activity are constantly changing, and with age the number of functioning lymph nodes decreases (up to 300-600 units). A decrease in the number and functional activity of lymph nodes, and the possibility of their neoplasm, create prerequisites for the development and progression of various diseases, including cancer [34].

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