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MEDICAL FIELD MORPHOLOGICAL FEATURES OF HUMAN AND MAMMALIAN SPLEEN IN POSTNATAL ONTOGENY

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ABSTARCT:

Journals, scientific conference proceedings, and other sources of information have been studied to gather reliable information on the morphological features of human and mammalian spleen.

Keywords: postnatal ontogeny, spleen, morphology, periarterial lymphoid cortex (PALC)

INTRODUCTION:

The immune system plays an important role in ensuring that the body adapts and protects itself from various harmful factors.

The spleen is the largest peripheral organ of immunogenesis. The quality and quantity of lymphoid cells in humans and animals, innate and acquired immunity, the condition of its humoral and cellular joints are directly related to the spleen [15, 21].

The spleen of vertebrates is a permanent organ, an alternative found in some invertebrates: in scorpions - in the abdominal cavity in the form of a long rope located on a nerve chain, the cells have phagocytic activity; in some naked mollusks, at the junction of the aorta and in the form of two glandular glands consisting of a collection of cells around the vessels. In invertebrates, the role of phagocytosis is played by blood cells or small and numerous glands [10].

In postnatal ontogeny in mammals, there are juvenile, adult, and involutional ages [8].

In early postnatal ontogeny, spleen immunoarchitectonics is reconstructed with age. The spleen of animals of lactating age is morphologically immature. It consists of red pulp with foci of myelopoiesis, mainly periarterial lymphoid cortex (PALC), a small volume of white pulp consisting of small, medium, and forming lymphoid nodules surrounded by an indeterminate marginal area. In animals of the age corresponding to the period of independent feeding, the volume of the white pulp of the spleen increases significantly [7].

The percentage of white pulp in newborn rats is very low. This is due to the fact that in the first month of their lives the spleen pulp is filled with lymphocytes, the lymph nodes are small, it is difficult to distinguish zones in them. Focal foci of erythropoiesis persist in the organ pulp because rats continue to perform hematopoietic function until they reach lactating age [22].

On the 3rd day after birth, foci of myelopoiesis in the form of thrombocytopoiesis persist. From then on, concentric lymphoid structures, simple periarterial lymphoid shells (PALC) containing mainly medium and small lymphocytes, begin to form around some small arteries [14, 27].

On day 10 of postnatal ontogeny, marginal area boundaries begin to appear in the white pulp of the spleen, and by day 15, individual primary lymph nodes are formed [6, 26].

Thirty days after birth, secondary lymph nodes with reproductive centers are formed in the spleen of rats [6, 29].

During the lactation period in rats there is a gradual increase in the morphofunctional development of the spleen, organometric and

white morphometric parameters of the organ. By the end of the lactation period (21 days after birth), mature secondary lymph nodes and areas of periarterial lymph nodes are formed, which is a sign that the organ immune system has reached functional maturity [9].

During adolescence, the size of the lymph nodes decreases slightly, while that of the reproductive centers, on the contrary, increases slightly. At 4 to 6 months, the total number of lymphoid nodes decreases, and they often remain in the subcapsular area. At 6-7 months, the number and size of red pulp sinusoids increase. During puberty, the relative amount of lymphoid structures in the spleen decreases [20,30].

From puberty, immunological changes in the spleen are of an involutional nature, affecting the PALQ, lymph nodes, and marginal areas, and are manifested by hypoplasia and delimfatization of the white pulp. The relative area of the V-areas of the white pulp of the spleen increases, indicating an activation of the migration of T- and V-lymphocytes. This ensures that the body's immune system is stable during the onset of old age [13, 14].

With age, the number and size of lymphoid nodes with a center of proliferation gradually decrease. In the spleen, the amount of stroma, which is made up of connective tissue, increases, a process that is exacerbated in old age, especially in old age [23,31].

In animals, in pre-aging and old age, as a result of involutional changes in the lymphoid structures of the spleen, the body's immune defenses are weakened. The rat spleen has a histotrophic structure similar to that of a human organ.

Although the fetal spleen does not play an important role in hematopoiesis, it is an important secondary organ of immunogenesis [16, 25].

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In early pregnancy, the edges of the spleen become round. The consistency of the spleen is soft to the touch and dark brown in color. The fetal spleen is covered on the outside with a loose capsule that is loosely attached to the organ parenchyma [4].

The study of spleen morphogenesis in the early stages of ontogeny is important due to the complexity of the mechanisms of cell interaction during embryonic development, organogenesis and histogenesis of this organ [11].

In humans, the spleen is formed from the dorsal mesentery at 5-6 weeks of embryonic development. Initially, the spleen is made up of primary blood vessels and mesenchymal cells. Some of the cells are then differentiated into reticular tissue composed of stem cells [18, 24].

At 3 to 4 months of embryogenesis, a T-zone of the spleen is formed, and at the end of 4 months and at 5 months, a V-zone is formed. Later, periarterial lymphoid clots and lymph nodes are formed from lymphocytes.

The processes of myelopoiesis in the human spleen reach their maximum at 5 months of embryonic development, after which their activity decreases and stops at birth. Simultaneously with the development of lymph nodes, the formation of red pulp occurs, which is morphologically different at 6 months of embryogenesis. At 9 months of embryonic development, the lymph nodes develop centers of immune cell proliferation, which means that the process of lymphopoiesis in the spleen intensifies at birth [28, 30].

Histogenesis of the spleen is incomplete at birth. The trabeculae and capsule, which are made up of reticular cells, are loose, the number of primary lymph nodes is small, and the secondary nodes are absent [32].

In newborns, the specific gravity of the white pulp of the spleen averages 1/7 of the organ volume. In infancy, periarterial lymphoid clots and lymph nodes can be distinguished in the white pulp. Lymph nodes are unevenly distributed in different parts of the body. They are more common in the peripheral part of the spleen and less common in the central part, where periarterial lymph nodes are more common.

Newborns' spleen lymph nodes do not have reproductive centers. They are formed by the end of 1 year. Then the number of lymph nodes increases and reaches a maximum at the age of 10 years [12].

In the cross-sectional area of the spleen, from birth to 4 years of age, there is an increase in the proportion of lymph nodes, a decrease in the amount of red pulp and connective tissue. By the age of 8-10 years, the proportion of lymphoid tissue decreases. Signs of aging are diagnosed from the age of 18. At this age, there is an increase in connective tissue volume, destruction of elastic and reticular fibers, a decrease in the number of fibroblasts, smooth muscle cells, fibrocytes, and collagenization of connective tissue stroma [1].

In the spleen, during the physiological aging of the organism, significant morphological and functional changes are observed [3,12].

In old age, atrophy of the white and red pulp is observed in the spleen, the number of lymph nodes and the size of their reproductive centers decreases. The reticular fibers of the white and red pulp thicken and become more curved, forming nodules of fibers. In the spleen pulp, the number of macrophages and lymphocytes decreases, the number of granular leukocytes and fat cells increases, and giant multinucleated cells - megacocytes - appear. The breakdown of erythrocytes increases, and iron-retaining pigments appear in the interstitial tissue [33]

However, the degree of age-related manifestation of splenic stromal sclerosis is directly related to the level of immunofunctional activity of the organ [17].

Thus, in postnatal ontogeny, the decline in the overall immune function of the spleen is largely due to a decrease in the humoral type, i.e., the V-cell immune response. It is also important to note that there is a decrease in the cellular immune response associated with a decrease in T-lymphocytes in the spleen. In general, the decline in spleen immune activity is due to the state of V- and T-cell immunity and age-related scleral processes [2,3,5]

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