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CHANGES IN THE MORPHOFUNCTIONAL PROPERTIES OF THYMUS AND SPLEEN UNDER THE INFLUENCE OF MITES OF DIFFERENT ORIGINS

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✓ ***Resume,***

Present article is devoted to the peculiarities of the structure and function, morphometric parameters of the basic structures of the central and peripheral organs of the immune system. It discloses the patterns of the development of these organs at different stages of postnatal ontogenesis. The data of the domestic and foreign literature on the impact of environmental factors on the structural changes in the thymus and spleen on the organ, tissue and cellular levels was analyzed. Further study of the morphological and functional organization of organs of the immune system will allow to identify and analyze the patterns of their structural and functional changes influenced by the factors of different origin.
Keywords: morphology, organs of the immune system, thymus, spleen, the effect of environmental factors

TURLI XIL FAKTORLAR TA'SIRIDA TIMUS VA TALOQNING MORFOFUNKSIONAL XUSUSIYATLARINING O'ZGARISHI

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Buxoro davlat tibbiyot instituti.

✓ ***Rezyume,***

Ushbu maqolada immunitet tizimining markaziy va periferik organlarining asosiy tuzilmalarining tarkibiy xususiyatlari va funktsiyalari, morfometrik parametrlari, umumiy ontogenez bosqichlarida ushbu organlarning rivojlanish xususiyatlari ko'rsatilgan. Organ, to'qima va hujayra darajasida timus va taloq tarkibiy o'zgarishlariga atrof-muhit omillarining ta'siri haqida mahalliy va xorijiy adabiyotlarning ma'lumotlari tahlil qilinadi. Immun tizimi organlarining morfofunktsional jihatlarining keyingi o'rganish holatlari, turli xil faktorlar ta'siri kuzatilganda ularning tarkibiy va funktsional o'zgarishlarining patofiziologik jihatlarini o'rganish va tahlil qilishga ushbu maqola imkon beradi.
Kalit so'zlar: morfologiya, immun tizimi organlari, timus, taloq, ekologik omillar ta'siri.

ИЗМЕНЕНИЕ МОРФОФУНКЦИОНАЛЬНЫХ ОСОБЕННОСТЕЙ ТИМУСА И СЕЛЕЗЕНКИ ПОД ВЛИЯНИЕМ ФАКТОРОВ РАЗЛИЧНОГО ПРОИСХОЖДЕНИЯ

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✓ ***Резюме,***

В представленной статье, посвященной особенностям строения и функции, морфометрическим параметрам основных структур центральных и периферических органов иммунной системы, раскрываются закономерности развития данных органов на этапах постнотального онтогенеза. Анализируются данные отечественной и зарубежной литературы о влиянии факторов среды на структурные изменения в тимусе и селезенке на органном, тканевом и клеточном уровнях. Дальнейшее исследование морфофункциональной организации органов иммунной системы позволит выявить и проанализировать закономерности их структурно-функциональных изменений при действии на организм факторов различного происхождения.
Ключевые слова: морфология, органы иммунной системы, тимус, селезенка, действие факторов среды.

Relevance

The immune system of humans and animals is one of the most reactive systems of the body, quickly reacting to the effects of damaging factors at the earliest stages. The immune system is formed by a complex of organs and tissues that create protection from foreign endo and exogenous influences [1]. It originated in the early stages of evolution and its activity is based on recognizing foreign antigens, destroying and removing them, which is absolutely necessary for the survival of the organism [2]. Currently, there is strong evidence that the immune system largely determines the body's resistance to chemical factors. The Central organs of mammalian immunogenesis are the thymus, where T-lymphocytes are formed and multiplied, and the red bone marrow, where B-lymphocytes are formed and multiplied. Peripheral lymphoid organs are the lymph nodes, spleen, tonsils, and intestinal lymphoid follicles [7].

The lymphoid tissue, being the main site for the development of specific immunological reactions, contains numerous cell populations involved in ensuring the genetic constancy of the internal environment of the body [3]. In this case, the thymus is considered as an immune organ, in which the acquired and natural immunity is formed with the help of biologically active peptides [12]. The history of the study of the structural organization and functions of the thymus (thymus, lymphatic, goiter, large chest node) goes back many decades [8]. In the structure of the immune system, the thymus provides maturation and differentiation of T-lymphocytes, including in peripheral immune organs, and stimulates the integration of various populations of T-lymphocytes and macrophages for the implementation of immune responses [10].

Until the end of the XX century, the theory of human and animal thymus involution was considered uncontested. According to the theory of thymus involution in adolescents 14-15 years old and animals aged 8-9 months. with the achievement of puberty, the studied organ undergoes complete involution in the body and loses its functional purpose. The founders of this theory believed that the thymus reaches its maximum functional development in newborns. However, there are justifications for the morphofunctional significance of this gland in Northern animals during all periods of individual development and age-related changes in the organ before the onset of biological death. In a 4-week-old embryo, the reticuloendothelial complex and its cellular elements are formed.

The thymus is the Central organ of the immune defense, which is subject to age-related changes, in addition, it is extremely sensitive to stress. It is known that chronic stress causes involution of the thymopoietic component of the gland with subsequent structural restructuring of the organ and its atrophy, while changes in the gland are similar to age-related involution, but occur much faster [14]. Surgical stress also has a short-term but reversible negative effect on the thymus [11].

The thymus is a combination of epithelial and mesenchymal reticules and together with the capillary network form the Reti-coulo-endothelial complex. Epithelial cells are differentiated and various thymocyte generations appear. It is proved that thymus T-lymphocytes regulate cellular immunity in the body and form thymus-dependent organs (spleen, lymph nodes, etc.). the Epithelial Islands of the thymus of young adult animals secrete a secret into the blood that contains hormones of the thymosite family. These hormones regulate humoral immunity in the animal and human bodies [9]. The development of T-lymphocytes is the result of the interaction of progenitor cells and immature thymocytes with components of the thymus stroma, which contains several types of cells that create a supporting framework and form a microenvironment for developing thymocytes [6].

It is known that in the thymus, medullary dendritic cells and some populations of epithelial cells that are part of the perivascular spaces of the medullary zone give a positive reaction with the marker of neuroectodermal differentiation S-100, and with synaptophysin - neuroendocrine cells of the medullary zone, which are classified as APUD cells of the series [6, 17].

As a result of immunohistochemical studies [7], the presence of serotonin was detected in the precursors of T-lymphocytes (CD4-CD8 -), in immature cortical cells (CD4+CD8), in Mature medullary cells (CD4+CD8 -), as well as in epithelial cells that form Gassal corpuscles. Studies of the thymus of people of different age groups, performed during autopsy, allowed us to verify the expression of serotonin in human thymus cells at all stages of ontogenesis. There was a significant increase in the number of cells containing serotonin in elderly people and the preservation of this hormone in senile people and centenarians at the same level as at the initial stages of ontogenesis. The intensity of serotonin synthesis does not change during ontogenesis. The data obtained strongly suggest that the endocrine function of the gland is preserved during aging [13].

The regenerative potential of the thymus was studied in adults (54 people) who underwent chemotherapy for 12 months for lymphoma. The dynamics of thymus activity was analyzed by evaluating structural changes in the thymus using sequential computed tomography, correlating them with the results of the thymus study by simultaneous analysis of T-cell receptor excision circles (sjTREC) and CD3i(+), recently emigrated from the thymus (recent thymic immigrants-RTE) in peripheral blood. In addition, regeneration processes in the thymus were evaluated based on the recovery of peripheral CD4(+) t-cell lymphocytes after chemotherapy. An increase in the test organ after chemotherapy compared to the baseline level, called recurrent thymus hyperplasia, was detected in 20 patients aged 18-53 years (an average of 33 years). Using General linear models of mathematical analysis, it was found that patients with hyperplasia had a faster recovery of sjTREC and CD3i(+) RTE levels after chemotherapy than patients of the same age, gender, diagnosis, disease stage, and thymus function at the initial level, but without hyperplasia. These data indicate that the adult thymus retains the ability to regenerate after chemotherapy, especially in young people. The presence of hyperplasia may contribute to the renewal of thymopoiesis and replenishment of the peripheral CD4 (+) t-cell pool after chemotherapy in adults [15].

The main function of the thymus is to ensure the development of T-lymphocytes. The role of cytokines formed in the thymus is mainly to support the main processes implemented in the thymus, i.e. T-lymphopoiesis. Cytokines also coordinate intercellular relationships.It was found that the main role in the formation of T cells belongs to IL-7, produced by thymus epithelial cells. This process also involves products of the cell stroma (SCF-stem cell factor, cytokines of the IL-6, IL-15 family, proinflammatory cytokines), or thymocytes themselves (cytokines acting through y(C)-containing receptors - IL-4, IL-2, IL-9) [4, 16].

The effects of various immunomodulators on the immune system have been studied. Polyoxidonium-a derivative of heteroceptive polyamines containing high-polar N-oxide groups, leads to an increase in the number of CD4-CD8+ - thymocytes, without changing their ratio to CD4+CD8- -cells [8].

In an experiment on white mongrel male rats [13] who were intramuscularly injected with cyclophosphane, imunophane and their combinations, it was found that the course administration of imunophane leads to changes in the morphology of the thymus and the functioning of its bioamine-containing structures. Imunofan significantly increases the width of the cortical, diameter and area of the thymus medulla with a corresponding increase in the mass of the organ 7 and 14 days after the end of the course of injections. An increase in the number of luminescent granular cells of the cortical-medullary and subcapsular zones is detected after 1 and 14 days. After 14 days, the cells of both the cortical-medullary and subcapsular zones become larger and densely filled with granules. It is shown that the use of Imunofan against the background of cyclophosphane administration increases the mass of the thymus, the size of the cortical and medullary substance of the lobes and accelerates the restoration of the thymus cyto-architectonics. Recovery processes occur as early as 1 day after the combined course. After 7 days, the mass of the thymus and the size of the cortical and cerebral substance in rats with isolated cyclophosphane administration and in the group with combined cyclophosphane and imunophane administration differ little, but there is a tendency to normalize the structure of the thymus. After combined administration of imunophan and cyclophosphane, the structure of the thymus and the bioamine supply of cells differ significantly from those with isolated administration of both drugs. It was found that the increase in the size of the cortical and medullary lobules when Imunofan is administered occurs due to the activation of thymocyte proliferation and differentiation, which can be mediated by the inclusion of various factors that control the growth and development of lymphocytes.

Conclusion

Morphological studies of the Central and peripheral organs of the immune system allow us to assess age-related changes in the functioning of the immune system in response to factors of various nature. Modern immuno-histochemical methods of research create opportunities for elucidating stromal relationships in the studied organs. Further investigation of the morphofunctional organization of the immune system organs will allow us to identify and analyze patterns of structural and functional changes in the immune organs when factors of various Genesis act on the body.

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