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PHYSIOLOGICAL AND PATHOLOGICAL CHARACTERISTICS OF THE THYMUS

Akhmedova Shahlo Malikovna
Bukhara State Medical Institute

Abstract:

The formation of the immune system in the process of ontogenesis, in particular, the formation of the thymus as an organ responsible for central immunity, is determined by the relationship between the mother and the fetus and the period of early adaptation of the child to the conditions of life after birth. As a rule, in early postnatal ontogenesis, the immune system is in a temporary state and continues to form under the influence of various external factors.

Keywords: immunity, ontogeny, thymus, lymphocyte.

Introduction

Over the past thirty years, important changes have been observed in the field of immunology and immunomorphology. The role of the thymus in the processes of immunogenesis and regulation of immunity in the body occupies a leading place. The thymus is the main organ that produces subpopulations of T-lymphocytes necessary for the human body, as well as thymic immune cells that regulate immune processes in the body. A number of scientific articles, reviews and monographs devoted to the physiology and pathology of the thymus have been published in specialized journals. The immune system is a multifunctional mechanism that has been disrupted during the course of evolution, ensuring the body's immune response to atrophic omyllary. Lymphocytes are immune associated elements. T lymphocytes are in constant flux within organs and tissues, playing a central role in all immunological reactions. The thymus, the main organ of the immune system, ceases its function in the body during the embryonic period and soon after birth. In the human body, the thymus reaches its maximum mass at 1 year of age, after which the involution of the thymus is released. The snow year faol thymus tugmasining encountered a partial involution of approximately 3%.[1,2,3]

Functions of the thymus. The thymus is one of the central organs of the immune system. Due to the large number of apoptotic lymphocytes, it was initially assigned the function of a lymphocyte

"graveyard". The role of the thymus in the immune system was demonstrated only in 1961 by Jacques Miller. He showed that in the thymus, T-cell precursors that migrated from the bone marrow undergo selection and maturation with subsequent migration to T-cell-dependent areas of the peripheral organs of the lymphoid system - the spleen, lymph nodes, Peyer's patches and tonsils [4,5]. The differentiation process includes the expression of various membrane markers and the reorganization of T-cell receptors. It should be noted that although the activity of thymocyte proliferation and differentiation decreases with age, the TG ensures the maturation and migration of T-lymphocytes to the peripheral organs of the immune system throughout life [6]. Various inductive, hormonal and proliferative signals from epithelial cells promote the maturation of thymocytes.

The role of the thymus in maintaining the body's homeostasis, in addition to the immune function, became known after obtaining a population of thymectomized experimental mice. In addition to immunodeficiency, they were characterized by a complete lack of hair, a significant decrease in body weight and length, hypotrophic changes in organs and tissues, and disruption of the skeletal bone structure. It should be noted that removal of the thymus in adult mice does not lead to the formation of immunodeficiency, but is associated only with a decrease in the lymphocyte population in the blood, lymphoma of the thoracic duct, lymph nodes, and spleen. Based on these data, it was first suggested that at an early age the thymus is necessary for the complete and normal development of some immunological reactions. The thymus in adults is apparently necessary for the correction of specific immunological defects [7,8].

The thymus produces a number of neuroendocrine immune signaling molecules, which include the thymus hormones themselves, biogenic amines, and peptide hormones of APUD cells, lymphocytes, and microenvironment cells. The thymus also synthesizes various lymphokines and neuropeptides (neurotensin, substance P, VIP, cholecystokinin, somatostatin, oxytocin, vasopressin, neurotensins, met-enkephalin, ACTH, and atrial natriuretic peptide). Cytokines and thymic hormones act in an autocrine and paracrine manner, influencing the differentiation of T lymphocytes and hematopoietic cells. The main hormones of the thymus include thymosin, thymopoietin, and thymulin. Thymopoietin primarily controls the differentiation of T lymphocytes. It also enhances the expression of proopiomelanocortin, the secretion of its processing products - ACTH,-endorphin and lipotropin, as well as STH and cortisol. Thymosin directly affects cells with immune reactivity. The mechanism of thymosin action is based on the stimulation of lymphopoiesis. The absence of immune reactivity of lymphocytes directly in the thymus can be explained by the fact that the cells leave the thymus before the stage of complete maturation. Cells become functionally complete outside the organ also under the influence of thymosin [9]. In experiments, when introduced into the ventricles of the brain, th0mosin enhances the production of hypothalamic releasing factors. Receptors of 1-thymosin have been found on the synaptic membranes of neurons. Thymulin enhances the production of STH and prolactin. In vitro, it enhances the secretion of progesterone and estradiol by granulosa cells, exhibiting gonadotropin-releasing factor activity.The thymus is a central lymphoid organ involved in the process of thymopoiesis in the body. The thymus plays an important role in the formation, development and proliferation of T cells responsible for immunity.

The thymus, together with epithelial and other cells, has developed a microstructure that protects the body from harmful foreign microorganisms, which is associated with the development of thymus-associated lymphocytes. In many parts of the thymus lobular lobes, hypoplasia of parenchymal cells occurs. The stromal part is infiltrating, and with age, thymus atrophy occurs. As the body ages, regression of the thymus and thymopoiesis occurs, which reduces the immune status of the body and increases the risk of developing autoimmune diseases. Aging is a continuous process that causes numerous changes in the cytoarchitecture of various organs and systems in humans and animals. In addition, it is associated with increased susceptibility to infectious, autoimmune, and neoplastic processes. The thymus is the main organ responsible for the production

of lymphocytes. The occurrence of thymic involution in all species, including humans, indicates that it is a long-term evolutionary event. Although there are many factors that are associated with age, little is known about the mechanisms that cause thymic involution.

At different stages of thymic development (natal, postnatal, adult, and senescence), we describe the morphological changes of the gland chronologically. We know that thymic morphology and cell types are evolutionarily conserved in several vertebrate species. This organ is important in understanding the complications caused by the rapid aging process and other diseases. [10]

Over the past decades, scientists have been conducting a number of scientific and practical works to improve the functioning of the thymus.

This unique organ is constantly changing morphologically with age and after diseases of the body. However, this microarchitectural change and its possible modulations are still unclear. Therefore, the main goal of this chapter is to study the microstructural components of the thymus and its age-related physiological modifications.

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