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THE INFLUENCE OF THE BIOLOGICAL AND CHEMICAL COMPOSITION OF CONSUMED DRINKING WATER ON THE ORGANS AND SYSTEMS OF THE BODY.

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Abstract

The blood supply to the thymus comes from the thymic or thymic branches of the internal thoracic artery (rami thymici arteriae thoracicae internae), the thymic branches of the aortic arch and brachiocephalic trunk, and the branches of the superior and inferior thyroid arteries. Venous outflow is carried out through the branches of the internal thoracic and brachiocephalic veins.

Keywords

compensator-adaptation, seasonal waters, underground and interstratal waters, active sulfhydryl.

The thymus gland is a small organ of a pinkish-gray color, soft consistency, its surface is lobed. In newborns, its dimensions are on average 5 cm in length, 4 cm in width and 6 mm in thickness, weight is about 15 grams. The organ continues to grow until the onset of puberty (at this time its dimensions are maximum - up to 7.5-16 cm in length, and the weight reaches 20-37 grams). With age, the thymus undergoes atrophy and in old age is barely distinguishable from the surrounding fatty tissue of the mediastinum; at 75 years old, the average weight of the thymus is only 6 grams. As it involution occurs, it loses its white color and, due to an increase in the proportion of stroma and fat cells, becomes more yellow.

In females, the gland is larger, which is due to the different effects of sex hormones on it. The thymus is located in the upper part of the chest, immediately behind the sternum (superior mediastinum). In front, it is adjacent to the manubrium and body of the sternum up to the level of the IV costal cartilage; behind it is the upper part of the pericardium, covering the initial sections of the aorta and pulmonary trunk, the aortic arch, the left brachiocephalic vein; on the sides is the mediastinal pleura.

Individual groups of thymus lobules are found around or in the thickness of the thyroid gland tissue, in the soft tissues of the neck, in the tonsil area, in the fatty tissue of the anterior, and less often posterior mediastinum. The frequency of

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detection of aberrant thymus reaches 25%. Such anomalies are more often observed in women, mainly on the left side of the neck and mediastinum. There are isolated reports in the literature on thymus tissue ectopia in infants. Such pathology was accompanied by shortness of breath, dysphagia, and respiratory failure. According to P. Nowak et al., out of 91 cases of thymus ectopia, cervical localization is determined in 76, mainly in males and on the left. A connection between thymus ectopia and congenital heart defects is also noted in 71% of cases.

In humans, the thymus consists of two lobes, which may be fused or simply tightly adjacent to each other. The lower part of each lobe is wide, and the upper is narrow; thus, the upper pole may resemble a two-pronged fork (hence the name). The organ is covered with a capsule of dense connective tissue, from which bridges extend into the depths, dividing it into lobes. In animals (thymus gland) is developed in fetuses and young animals. It consists of an unpaired thoracic section, lying in front of the heart, and a paired cervical section, passing in the form of outgrowths on the sides of the trachea. With age, the gland begins to dissolve and then disappears.

The blood supply to the thymus comes from the thymic, or thymic branches of the internal thoracic artery (rami thymici arteriae thoracicae internae), the thymic branches of the aortic arch and brachiocephalic trunk, and the branches of the superior and inferior thyroid arteries. Venous outflow comes from the branches of the internal thoracic and brachiocephalic veins. The thymus gland is innervated by branches of the right and left vagus nerves, spinal nerves C4-C7, and sympathetic nerves originating from the superior thoracic and stellate ganglia of the sympathetic trunk, which are part of the nerve plexuses that surround the vessels that supply the organ. The thymus capsule is innervated by branches of the phrenic nerves.

The thymus gland has a lobular structure, in the tissue of the lobule, the cortex and medulla are distinguished. The cortex is located on the periphery of the lobule and in the histological micropreparation looks dark (it contains many lymphocytes - cells with large nuclei). In the cortex are located arterioles and blood capillaries, which have a hematothymus barrier, preventing the introduction of antigens from the blood. The cortex contains cells:

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Directly under the capsule, the cellular composition is dominated by dividing T-lymphoblasts. Deeper are maturing T-lymphocytes, gradually migrating to the medulla. The maturation process takes about 20 days. During their maturation, gene rearrangement occurs and the gene encoding TCR (T-cell receptor) is formed.

Then they undergo positive selection: in interaction with epithelial cells, "functionally suitable" lymphocytes are selected that are capable of interacting with HLA; during development, the lymphocyte differentiates into a helper or killer, i.e. either CD4 or CD8 remains on its surface. Then, in contact with epithelial cells of the stroma, cells capable of functional interaction are selected: CD8+ lymphocytes capable of receiving HLA I, and CD4+ lymphocytes capable of receiving HLA II.

The next stage, negative selection of lymphocytes, occurs at the border with the medulla. Dendritic and interdigitating cells, cells of monocytic origin, select lymphocytes capable of interacting with the body's own antigens and initiate their apoptosis. The medulla mainly contains maturing T-lymphocytes. From here, they migrate into the bloodstream of high-endothelial venules and disperse throughout the body. The presence of mature recirculating T-lymphocytes is also assumed here.

The cellular composition of the medulla is represented by supporting epithelial cells, stellate cells, and macrophages. There are also efferent lymphatic vessels and Hassall's corpuscles. The main role of the thymus is the differentiation and cloning of T-lymphocytes. In the thymus, T-lymphocytes undergo selection, as a result of which cells that can be involved in the immune response against certain foreign antigens, but not against the body itself, are released into the bloodstream and tissues. It produces hormones: thymosin, thymulin, thymopoietin, insulin-like growth factor-1 (IGF-1), thymus humoral factor - all of them are proteins (polypeptides). With thymus hypofunction, immunity decreases, since the number of T-lymphocytes in the blood decreases.

A number of studies have demonstrated the mnemotropic effect of thymus peptides: the activating effect of intranasal administration of taktivin and thymosin fraction 5 on the process of forming a conditioned reflex of active avoidance, their stress-protective properties and nootropic effect from administration in experiments on rats have been shown. The effect of thymus peptides on the functional activity of the central nervous system also consists in reducing anxiety and increasing the exploratory activity of rats. Interesting results have been obtained on the relationship between the state of the thymus and human longevity: during the use of drugs to prolong the activity of the thymus gland, the biological age of nine subjects decreased.

Secretion of thymic hormones and thymus function are regulated by glucocorticoids, hormones of the adrenal cortex, as well as soluble immune factors, such as interferons, lymphokines, and interleukins, which are produced by other cells of the immune system. Glucocorticoids suppress immunity, as well as many functions of the thymus, and lead to its atrophy.

Pineal gland peptides slow down thymus involution [14]. Its hormone melatonin acts in a similar way, and can even cause "rejuvenation" of the organ [15]. Lymphopoietic growth factor interleukin 7 [16] can also contribute to "rejuvenation" of the thymus, which in the future can be used to develop methods for restoring immune function in the elderly using recombinant interleukin 7 treatment.

In the human embryo, the thymus is laid down in the 6th week of development in the endoderm of the third gill pocket. In a newborn, the thymus is developed to 15 g, increasing to 40 g by the age of 15. Later, by the age of 30, the weight is about 25 g, by the age of 70 - only about 6 g. In exceptional cases, an adult may not experience pronounced involution of the thymus gland, a condition called status thymicolymphaticus[10]. Involution of the gland is also delayed in castrated animals.

The thymus stroma is of epithelial origin and originates from the epithelium of the anterior part of the primary intestine. Two strands (diverticula) originate from the third branchial arch and grow into the anterior mediastinum. Sometimes the thymus stroma is also formed by additional strands from the fourth pair of branchial arches. Lymphocytes originate from blood stem cells migrating to the thymus from the liver in the early stages of intrauterine development. Initially, proliferation of various blood cells occurs in the thymus tissue, but soon its function is reduced to the formation of T-lymphocytes.

The thymus is at its largest in childhood, but after puberty, the thymus undergoes significant atrophy and involution. An additional decrease in the size of the thymus occurs with aging, which is partly associated with a decrease in immunity in the elderly.

- Thymoma - from the epithelial cells of the thymus gland, malignant,
- T-cell lymphoma - from lymphocytes and their precursors, pheochromocytoma
- Pre-T-lymphoblastic tumors in some cases have primary localization in the thymus and are detected as a massive infiltrate in the mediastinum with subsequent rapid transformation into leukemia.
- neuroendocrine tumors
- rarer tumors (vascular and neural origin)

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