

MORPHOLOGICAL CRITERIA OF THE THYMUS IN CONGENITAL HEART DISEASE

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The thymus is the central organ of immunogenesis, determining the state of the immune system of any subject, especially in childhood. Consequently, morphological shifts in the structure of the thymus are the basis for solving the problem of a defect in the immune system. In children with congenital heart disease, pronounced morphological changes in the structure of the thymus were noted, affecting the differentiation of T lymphocytes and disrupting their subpopulation ratio.

Keywords: congenital heart disease, thymus, accidental involution

It is known that the function of any organ, and the thymus is no exception, is closely dependent on its structure. Various diseases of both infectious and non-infectious nature can cause a violation of the structure of the organ, which is the reason for the development of accidental involution. The purpose of this study was to study the morphological and phenotypic features of the state of the thymus and its cells in children with congenital heart defects. The thymus for the study was obtained from children of the first year of life during surgery for congenital heart disease. A part of the organ was taken away for histological examination.

The material was treated by the conventional method: pouring into paraffin, staining the sections with hematoxylin-eosin and van Gieson. The remaining part of the organ was crushed and cells were isolated by pipetting. The phenotype of thymocytes (CD3⁻/CD3^{lo}/CD3^{hi}; CD4⁺CD8⁻; CD4⁻CD8⁺) was evaluated. In children with congenital heart disease, structural changes of varying severity were noted in the histological picture of the thymus.

In this regard, 2 groups were identified. In the first group (n=15), slight stromal edema and vascular fullness were observed in the thymus. A picture of the "starry sky" is formed in the cortical substance of the thymus lobule, as a result of an increase in the number of macrophages. It is possible that the influx of macrophages into the cortical substance is associated with apoptosis of T lymphocytes. Macrophages are densely surrounded by lymphocytes, zones of moderate emptying of the cortex with areas of focal clusters of lymphocytes are formed. Small corpuscles of Ghassal were detected in the brain substance, throughout its entire area.

In children of the second group (n=20), the vascular reaction in the thymus was more pronounced. All the vessels are dilated and filled with blood. The formation of cysts and partial emptying of the cortical substance were observed in the structure of the stromal component. Coarse collagen fibers formed around the vessels. Areas of lymphocyte death and the appearance of thymic bodies were observed in the cortical zone. The total number of them in the organ was increasing. Wide connective tissue layers with thick collagen fibers were noted between the lobules. The layers contain tissue basophils and leukocyte cells (neutrophils, eosinophils).

Thus, early involutive changes in the thymus were noted in both groups. In the thymus, due to a specialized microenvironment, T lymphocytes undergo stages of maturation and differentiation. Changes in the structure of the organ were reflected in the process of differentiation of T-lymphocytes. Our studies showed that the initial level of thymocyte expression was also heterogeneous.

Thus, in children of group 1, the number of CD3hi thymocytes was higher than the average (23.7+3.94%) and amounted to only 38.5%. In group 2, in 61.5% of the examined children, the number of thymocytes expressing CD3hi was below average. The analysis of the redistribution of the two main subpopulations of thymocytes – CD4- CD8+ and CD4+ CD8- revealed that in the 2nd group with an initially low level of thymocytes - CD4- CD8+ was 59.5% higher, and the level of CD4+ CD8 was 40%.

Our studies have shown that children with congenital heart disease have a morphological picture of premature "aging" of the thymus with signs of its functional dysfunction. Activation of apoptosis, imbalance between proliferative and apoptic processes, violation of the subpopulation ratio of lymphocytes are prerequisites for an immunodeficiency condition.

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