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Morphology of the Thymus Gland in the Early Antenatal Period of Development

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Abstract

In the study of materials thymus of embryos and fetuses in the seventh week there were found out the formation of the epithelial bud. 8-9 week showed the population of epithelial cords lymphocytes. By 11-12 weeks of development there were determined by prostate lobes with all their characteristic components. In terms of 18-20 and 27-28 weeks of embryogenesis, the peaks were set to increase the number of thymic cells, was likely to result in an increase of cortical cancer due to proliferation of lymphoblasts subcapsular zone.

Key words: thymus, antenatal period, thymic cells.

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The relevance of the topic. Knowledge of the processes of development of the human immunogenesis system during embryonic development will help to establish the timing of the morphofunctional formation of the immune status, as well as shed light on the etiology of human immunodeficiency conditions and determine methods for their correction. In the embryological aspect, the thymus gland is one of the first endocrine organs and the first lymphoid organ [2,4]. It is a regulator and at the same time a producer of lymphoid cells, as well as the primary regulator of immune processes in the organs of lymphogenesis (lymph nodes, spleen, mucosal lymphoid formations) [2,3]. Along with this, the lymphatic system plays a key role in the body's homeostasis and contributes to maintaining the balance between mother and fetus during pregnancy and the birth of a healthy and viable fetus [3, 4]. Hence, the thymo-lymphatic system of the fetus is a criterion of the adaptation constant for the "mother – placenta– fetus" system [1,3,6]. The above indicates that the study of morphofunctional changes in the lymphatic system is one of the urgent problems of general biological and medical importance.

The purpose of the study: to study the dynamics of morphological changes in the thymus gland in the

early antenatal period of development, solving the problem of determining the timing of morphofunctional formation of the thymus gland.

Materials and methods. The research material was the thymus gland of 8 fetuses after medical abortion and 14 stillborn fetuses that developed under physiological conditions of pregnancy and died as a result of birth trauma. The age of the fetus was determined by the date of the woman's last menstruation and by the length of the fetal body using special tables. After histological wiring, the paraffin sections of the organ were stained with hematoxylin-eosin, azur II-eosin. The microanatomic organization of the thymus lobules was studied, the cerebral cortical index and the total area of the thymic bodies were determined. Statistical processing of the research results was carried out using the Material Vision program, the analysis of the results was carried out using the arithmetic mean, the error of the mean and the Student's criterion (t). The differences between the averages at $p < 0.05$ were considered significant.

The results and their discussion. It is well known that the human thymus gland is laid in the second month of embryonic development in the form of small protrusions in the area of the third and partially fourth gill pockets. At week 7 of intrauterine development, its rudiment had a pronounced epithelial character and consisted of weakly branching epithelial strands. From week 7, during embryogenesis, the mass of the thymus gland increases. The organ grows mainly due to the epithelial cells of the subcapsular zone. Cells with the highest proliferative potentials are concentrated in this area, as evidenced by the presence of a large number of mitotically dividing cells. Already at the 8th week of development, compared with the 7th week, the thymus gland acquires sharp differences. The cells of the subcapsular zone grow in the form of wide outgrowths in the surrounding mesenchyme and seal up areas of the mesenchyme along with blood vessels. Thus, the blood vessels are also surrounded by young epithelial cells. At 8-9 weeks, there is a noticeable proliferation of the epithelium and lymphocytes are found (populated) in the epithelial network. At week 10 of embryogenesis, the thymus gland begins to divide into lobules. By 11-12 weeks of development, as a result of the cleavage of primary epithelial outgrowths in the thymus gland, lobules are clearly defined, with all their characteristic components – cortical and cerebral matter and small bodies of the thymus. During the period of 11-12 weeks, an increase in organ size occurs not only through proliferation of the initial epithelial cord, but mainly through epithelial overgrowth in the surrounding mesenchyme with the obligatory preservation of mitotic activity of epitheliocytes over the entire surface of the subcapsular zone. At the 12th week of development, blood vessels are well defined in the cortical substance of the thymus gland. A rapid increase in organ mass after 12 weeks occurs, on the one hand, due to the fact that there are two growth zones in the thymus from this period. The first of them is located on the periphery – the subcapsular zone. The second growth zone of the reticuloepithelial stroma is located inside the organ. On the other hand, during these periods of development, increased proliferation of lymphoblasts occurs in the circumference of blood vessels, mainly in the medulla. Subsequently, from the age of 14 weeks, the area of the thymus gland's medulla increases rapidly. Along with this, the number and size of thymic bodies in the thymus gland increases. Two peaks of an increase in the number of thymic bodies have been established. The first occurs at 18-20 weeks, and the second at 27-28 weeks of embryogenesis. The most significant period is the 27-28 weeks of development. During this period, there is a sharp slowdown in the increase in the area of the medulla. After 27-28 weeks of development, the content of the thymic bodies of the thymus gland of the fetus stabilizes.

If at the time of 19-22 weeks of gestation the cerebral cortical index was 0.82, then at the time of 27-28 weeks of intrauterine development it increased to 1.07. At 27-28 weeks of gestation, there was a sharp increase in the area of thymic bodies to 12.6%, whereas at 19-22 weeks their area was 5.2 %.

Conclusion. The period of 7-12 weeks of gestation can be characterized as a critical stage of thymus gland development. Its criticality lies in the fact that at this time lobules with cortical and cerebral matter with small single bodies of the thymus are formed in the organ, blood vessels such as postcapillary venules with high prismatic epithelium are well defined. During these periods, the epithelial strands of the organ are populated by lymphocytes. And the established peaks of an increase in the number of

thymic bodies (18-20 and 27-28 weeks of embryogenesis) apparently lead to a sharp increase in the area of the cortical substance of the gland due to increased proliferation of lymphoblasts of the subcapsular zone and, accordingly, a decrease in the area of the medulla.

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