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STRUCTURAL CHANGES IN THE RAT'S THYMUS IN CASE OF DEVELOPMENT OF DIFFERENT EXPERIMENTAL SOLID SARCOMAS

It is known that the thymus is an organ regulating immunomorphologic processes in the organism. Reactive changes in the thymus occur in case of oncological diseases. Information that we discovered in the available literature concerns mainly structural changes in thymus in case of spontaneous and chemically induced tumors. We tried to determine structural changes in the rat's thymus in case of development of different experimental solid sarcomas.

Keywords: tumor, rat, cell.

Actuality. It is known that the thymus is an organ regulating immunomorphologic processes in the organism. Reactive changes in the thymus occur in case of oncological diseases. Information that we discovered in the available literature concerns mainly structural changes in thymus in case of spontaneous and chemically induced tumors. Information about structural features of experimental sarcomas is also scanty. We tried to determine structural changes in the rat's thymus in case of development of different experimental solid sarcomas.

Methods. For our investigation we used three groups of laboratory rat's males at the age of three months. Each of the groups included five animals. Rats of the group number one (control) were intact. Rats of the group number two were subjected to the subcutaneous transplantation of tumor cells of experimental solid lymphosarcoma. Rats of the group number three were subjected to the intraperitoneal transplantation of tumor cells of experimental solid sarcoma 45.

Rats of the groups number one and number two were killed on the fifteenth day of the experiment. Rats of the group number three were killed on the twentieth day (by the time of full development of tumors). The thymus and the tissue of the tumors were extracted and fixed in solution of formalin. Paraffin sections were stained with haematoxylin-eosin. Histologic specimens were observed under light microscope.

Discussion. Microscopically it was estimated that on the outside the thymus of the control rats (animals of the group number one) is surrounded by connective tissue capsule that consists of numerous cells, and thin wavy fibres lying parallel to the surface of the organ. The connective tissue cells contain rounded and oval nuclei that are poorly stained, and are characterized by presence of distinct karyolemma and masses of chromatin. Within some zones of the capsule its structural elements are loosely arranged, and among them there are lymphoid cells. Thickness of the capsule is $19,03 \pm 0,62$ micrometers.

Trabeculae arising from the capsule extend deeply into the substance of the thymus and partially separate lobules from each other. The trabeculae are penetrated by thin-walled vessels filled with formed elements of blood. Inner surfaces of the blood vessels are lined by thin endotheliocytes containing elongated poorly stained nuclei.

Each thymic lobule has an outer cortex and an inner medulla that differ from one another by density of the lymphoid cell arrangement. The medulla of the adjoining lobules is continuous.

Thickness of the cortex is $213,33 \pm 10,04$ micrometers. The lymphoid cells in it are very densely arranged, their boundaries are not prominent. Rounded and oval nuclei of the cells are densely stained and are $3,86 \pm 0,14$ micrometers in diameter.

The epithelial reticular cells are sometimes found between the cortical thymocytes. The epithelial reticular cells contain rounded and oval poorly stained nuclei that have distinct karyolemma and masses of chromatin. The nuclei are $5,62 \pm 0,21$ micrometers in diameter. The thymic cortex is penetrated by thin-walled vessels filled with formed elements of blood.

Thymic medulla is $260,0 \pm 7,6$ micrometers in thickness. It is penetrated by numerous small blood vessels. Thymocytes of the medulla are arranged looser, and their nuclei are bigger in size than those of the cortex, the diameter of the nuclei is $4,45 \pm 0,14$ micrometers.

Epithelial reticular cells of the medulla are found more often, and some of them are arranged in groups including two to twelve cells. Nuclei of the cells are $6,9 \pm 0,3$ micrometers in diameter. Among the medullary epithelial reticular cells there are degenerative ones, this fact obviously is the result of the beginning of formation of Hassall's corpuscles.

Completely formed Hassall's corpuscles are found in the cortex of the lobules. The corpuscles are rounded or irregular in shape, they are composed of concentrically arranged epithelial cells. Some of them contain centrally located cavities. Average diameter of the Hassall's corpuscles is $10,3 \pm 0,4$ micrometers.

In different parts of the thymus of the control rats there are singly present large oval cells ($11,4 \pm 0,2$ micrometers in diameter). Their cytoplasm is eosinophilic, and their nuclei are centrally situated and densely stained. Those cells resemble plasma cells.

Thymic parenchyma in the rats of the group number two is characterized by dense arrangement of the lymphoid elements within all parts of the organ. Hence the lobular structure and differentiation of cortex and medulla are not conspicuous. Epithelial reticular cells are not visible.

Some of the lymphocytes ($7,53 \pm 0,3$ micrometers in diameter) have distinct boundaries, their nuclei ($5,19 \pm 0,2$ micrometers in diameter) are characterized by well visible karyolemma and nucleoli. In other lymphocytes the boundaries are not prominent, and their hyperchromatic nuclei are $3,4 \pm 0,1$ micrometers in diameter.

Numerous Hassall's corpuscles are rounded, oval, or irregular in shape. Some of the thymic corpuscles represent unstructured eosinophilic mass, the other corpuscles contain clusters of nuclei.

Between the lymphoid cells there are some thin-walled vessels containing formed elements of blood. There are also small cavities filled with homogeneous eosinophilic substance.

Tumor tissue is made up of densely arranged cells boundaries of which are well visible. Cytoplasm of the cells is granular. Nuclei are rounded, oval, or bean-shaped, they are characterized by distinct karyolemma and nucleoli. Diameter of the tumor cells is $6,51 \pm 0,2$ micrometers, and diameter of their nuclei is $3,86 \pm 0,14$ micrometers.

The tumor tissue contains cavities that may be empty and may be filled by unstructured eosinophilic mass containing singly arranged tumor cells. The cavities may be rounded in shape and may represent fissures.

In the rats of the group number three the thymus is surrounded by connective tissue capsule infiltrated by lymphoid cells. Capsular vessels are dilated and filled with formed elements of blood.

Within the lobules of the thymic parenchyma the structural difference between cortex and medulla isn't conspicuous: in all zones the lymphoid cells are arranged very densely. Boundaries of the thymocytes are not prominent.

In some zones of the lobules the nuclei of the lymphoid cells are densely stained; the diameter of the nuclei is $3,67 \pm 0,16$ micrometers. In other zones the thymocytes contain poorly stained nuclei that are $4,56 \pm 0,1$ micrometers in diameter; within those zones there are small cavities that remain in places of the entirely destroyed lymphoid cells. Some zones are made up of homogeneous eosinophilic substance containing fragments of thymocytes.

In the rats of the group number two the thymus is enlarged. Microscopically it is estimated that on the outside the gland is covered by thin connective tissue capsule infiltrated by lymphoid cells. Within the capsule one can also find large singly arranged oval cells that have distinct boundaries, granular cytoplasm, and centrally situated nucleus. Those cells resemble plasmocytes.

Septa arising from the capsule are small in numbers hence the lobular structure of parenchyma isn't prominent. Parenchymal cortex and medulla are not differentiated. Within all zones of the thymic parenchyma the lymphoid cells are densely arranged, and the epithelial reticular cells between them are not visible. There are zones made up of degenerative lymphoid cells. There are also small cavities filled by vacuolated colloidal substance.

Blood vessels and thymic corpuscles are found very seldom.

We also investigated the tumor tissue. Microscopically it was determined that the tumor is surrounded by connective tissue capsule which consists of numerous cells and thin fibres. The thickness of the capsule is varies in different regions. In the regions where the capsule is thinnest (its thickness is less than thirteen micrometers) its structural elements are arranged densely and are directed along the surface of the tumor. The nuclei of the cells are small, elongated, hyperchromatic. Average diameter of the nuclei is $3,94 \pm 0,16$ micrometers. As the thickness of the capsule increases its structural elements gradually become wavy and then they become directed in different directions. In regions where the capsule is thickest (its thickness achieves one hundred and eighty micrometers) its connective tissue cells contain both small hyperchromatic nuclei and bigger nuclei containing distinct masses of chromatin. Those nuclei are rounded, oval, and elongated in shape, their diameter is $6,98 \pm 0,3$ micrometers.

The capsule is well vascularized. In those zones where the capsule is thinnest the vessels in it are discovered very seldom. As the capsule becomes thicker, the number and size of its vessels increases. From the capsule the vessels penetrate deeply into the tumor where they form dense network.

In the peripheral parts of the tumor the cells are densely packed, their boundaries are indistinct. Cytoplasm of many of the cells is vacuolated. Nuclei are hyperchromatic, their diameter is $8,35 \pm 0,2$ micrometers. Shapes of the nuclei are rounded, oval, polygonal.

Within the internal parts of the tumor the cells are arranged more loosely. Cytoplasm in many of the cells is vacuolated. Nuclei of the cells are $10,18 \pm 0,4$ micrometers in diameter, they are rounded, oval, or bean-shaped. They are characterized by distinct karyolemma and masses of chromatin. Each nucleus contains one to six nucleoli which are different in size. There is tendency to decrease of the size of the nucleoli within a nucleus while increasing their number. Though there are some nuclei that contain nucleoli which considerably differ from each other in size.

Towards the centre of the tumor the number of destroyed cells increases. Nuclei of such cells are wrinkled, and their cytoplasm is brightly eosinophilic. There are also small cavities that were formed in the places of the entirely destroyed tumor cells.

Central parts of the tumor are necrotic.

Conclusions. Subcutaneous development of experimental solid lymphosarcoma and intraperitoneal development of experimental sarcoma 45 cause conspicuous structural changes in the thymus of rats.

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ЕГЕУҚҰЙРЫҚТАРҒА ЕГІЛГЕН СОЛИДТІ САРКОМАНЫҢ ДАМУЫ КЕЗІНДЕ ТИМУСТА БАЙҚАЛАТЫН ҚҰРЫЛЫМДЫҚ ӨЗГЕРІСТЕР

Түйін: Егеуқұйрықтарға тері астына енгізілген солидті Плисс лимфосаркоманың және тәжірибелік саркома 45 ісігінің дамуы кезінде тимуста байқалатын морфологиялық өзгерістерге сипаттама берілген. Зерттеу нәтижесінде тимус бөлікшелерінің паренхимасында лимфоидты жасушалардың тығыз орналасуына байланысты қыртыстық және боз заттарының шекаралары анықталмайтыны белгілі болды. Тимус денешіктерінің саны да күрт артқан.
Түйінді сөздер: ісік, егеуқұйрық, жасуша.

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СТРУКТУРНЫЕ ИЗМЕНЕНИЯ В ТИМУСЕ КРЫС ПРИ РАЗВИТИИ РАЗЛИЧНЫХ ПЕРЕВИВНЫХ СОЛИДНЫХ САРКОМ

Резюме: Описаны морфологические изменения в тимусе крыс при подкожном развитии перевивной солидной опухоли лимфосаркома Плисса и внутрибрюшинном развитии экспериментальной опухоли саркома 45. Было установлено, что в долях паренхимы тимуса отсутствует выраженная дифференциация на корковое и мозговое вещество в виду плотного расположения лимфоидных клеток во всех участках. Количество тимусных телец при развитии лимфосаркомы Плисса значительно увеличивается.
Ключевые слова: опухоль, крыса, клетка.