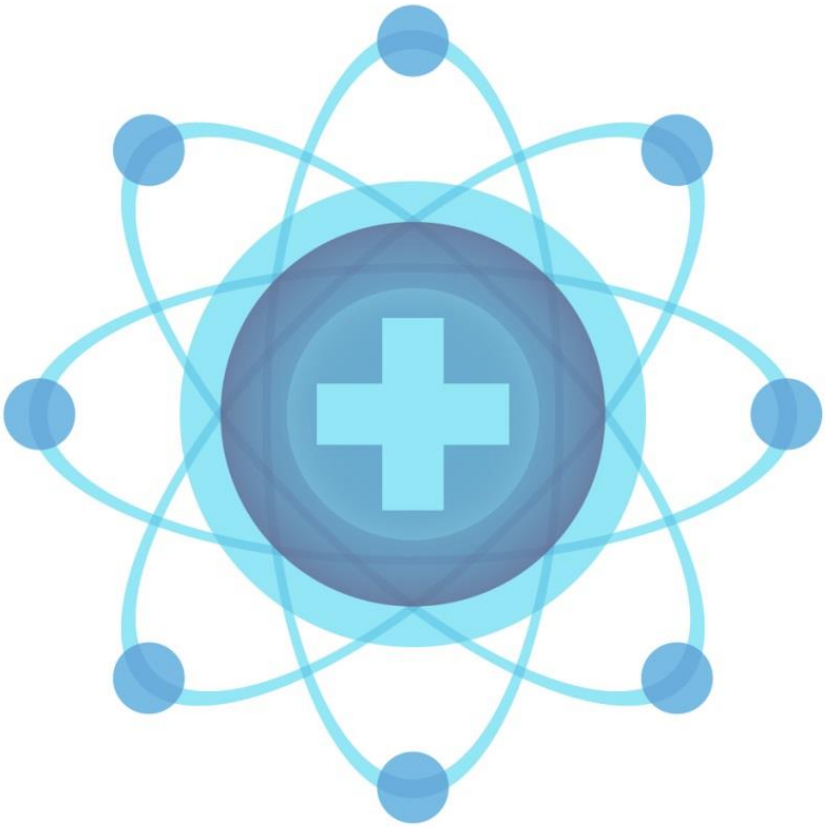

INTERNATIONAL MEDICAL SCIENTIFIC JOURNAL

ART OF MEDICINE

10.5281/zenodo.5558698

Art of Medicine International Medical Scientific journal

Founder and Publisher **Pascual Izquierdo-Egea**

Published science may 2021 year. Issued Quarterly.

Internet address: http://artofmedicineimsj.us

E-mail: info@artofmedicineimsj.us

11931 Barlow Pl Philadelphia, PA 19116, USA +1 (929) 266-0862

Art of Medicine *Volume-1*
International Medical Scientific Journal *Issue-2*
10.5281/zenodo.5558698

HISTOLOGICAL STRUCTURE OF THE RAT SPLEEN IN EARLY POSTNATAL ONTOGENESIS

Dilnoza Akhrorovna Khasanova

PhD, associate professor of the Department of Anatomy, clinical anatomy (OSTA) of Bukhara State Medical Institute named after Abu Ali ibn Sino, Bukhara, Uzbekistan

E-mail: akwamarin80@gmail.com

Abstract: On total sections of the spleen by the 21st day, the area occupied by the white pulp also increases, the absolute number of lymphoid nodules with reproduction centers increases to 31.4 ± 2.1 and the marginal zone of periarterial lymphoid couplings thickens. In the centers of reproduction of lymphoid nodules on an area of 2500 sq. During this period, the number of blasts increases - 15.0 ± 1.1 and average lymphocytes to 16.9± 2.3. On total sections of the spleen, white pulp occupies 49.1± 1.5% of the total area of the histological section. The proportion of lymphoid nodules with breeding centers increases 2.1 times, equal to 34.3 ±1.9 in absolute numbers compared to the control.

Keywords: histology, spleen, early postnatal ontogenesis, lymphoid nodes.

1. Introduction

1.1. The Relevance of the Problem. The spleen is an organ of immunogenesis and lymphopoiesis, in which antigen-dependent differentiation of immunocompetent cells occurs, the formation of effector cells and memory cells, as well as the elimination of obsolete and damaged hematopoietic cells [10].

It has a complex anatomical structure of immunocompetent white pulp, including periarterial lymphoid couplings, lymphoid nodules with germinative centers, periarterial, mantle and marginal zones. This structure creates favorable conditions for effective cooperative interaction of cells involved in the immune response [1,2].

A population of immunocompetent cells usually has distribution mechanisms in specific functional areas of the spleen. Understanding the immunomorphological properties of this organ can be used in the diagnosis of pathological processes of immune genesis [6,8].

10.5281/zenodo.5558698

White and red pulp form reticular tissue, which plays an important role in the stratification of each functional zone [7]. Dendritic cells of the spleen can contribute to the escape of the tumor from immune surveillance [7,9].

The organs of the immune system are the main homeostatic and regulatory organs for the internal environment of the body. The spleen is an important and the largest peripheral organ of the immune system [3,4].

The spleen is the largest secondary lymphoid organ, at the fetal stage it also performs the role of hematopoiesis. It acts as a blood filter, and also acts as a storage place for iron, erythrocytes and platelets [5].

Knowledge of prenatal ontogenesis of the spleen will help to understand the mechanisms of pathology in the organ and create methods of diagnosis and prevention [7,9,10].

2. The Results of the Study.

Outside, the spleen of newborn baby rats is covered with a capsule consisting of thin connective tissue. Trabeculae containing arteries and veins extend from the capsule deep into the spleen.

The study of the cellular composition of the white pulp of newborn baby rats showed the following picture: the width of the germinal center averaged -55.6 ± 0.74 microns. The width of the periarterial zone is on average 27.8 ± 0.18 microns.

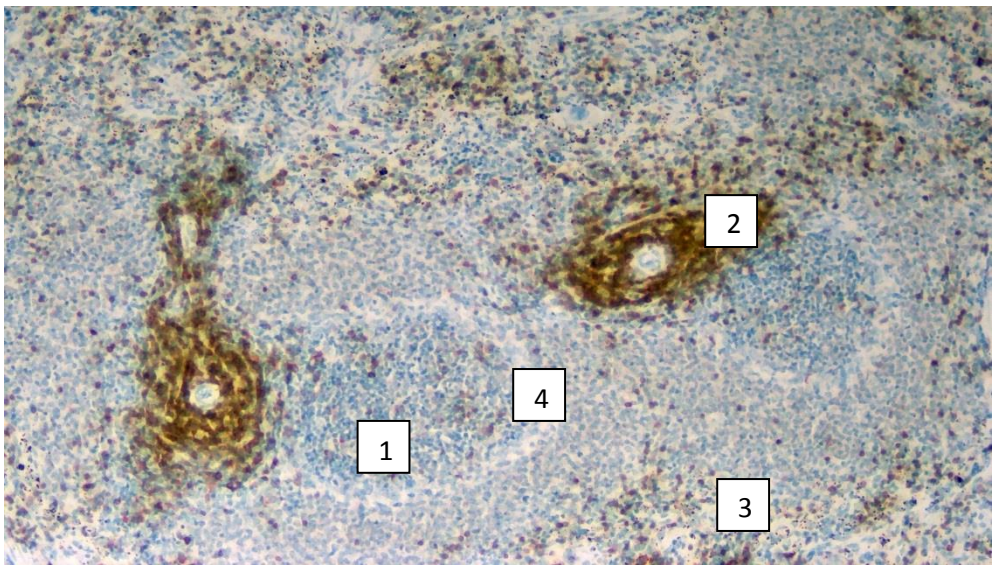

Fig. 1.The spleen of a newborn rat. IHC. 10 x 20. 1- white pulp, 2- lymph node, 3- trabeculae, 4 - spleen capsule.

In a third of the total number of nodules, mantle and marginal zones can be distinguished.

The width of the mantle zone averaged 69.6±1.09 microns. The width of the marginal zone is on average 38.2 ± 1.65 microns.

10.5281/zenodo.5558698

The white pulp is formed mainly from lymphocytes at various stages of maturation. There are small, medium and large lymphocytes.

The thickness of the capsule at the gate averaged -4.70±0.34, at the front end it averaged 6.2±1.15 microns, at the rear end it averaged 5.5±0.14 microns. The diameter of the trabecula in the proximal part averaged 11.8±0.12, and in the distal part it averaged 8.7 microns. The depth of the trabecula averaged 12.1±0.17 microns.

The relative area of the white pulp is on average -24.6 ± 0.6%. The relative area of the red pulp averaged 75.4±0.1%.

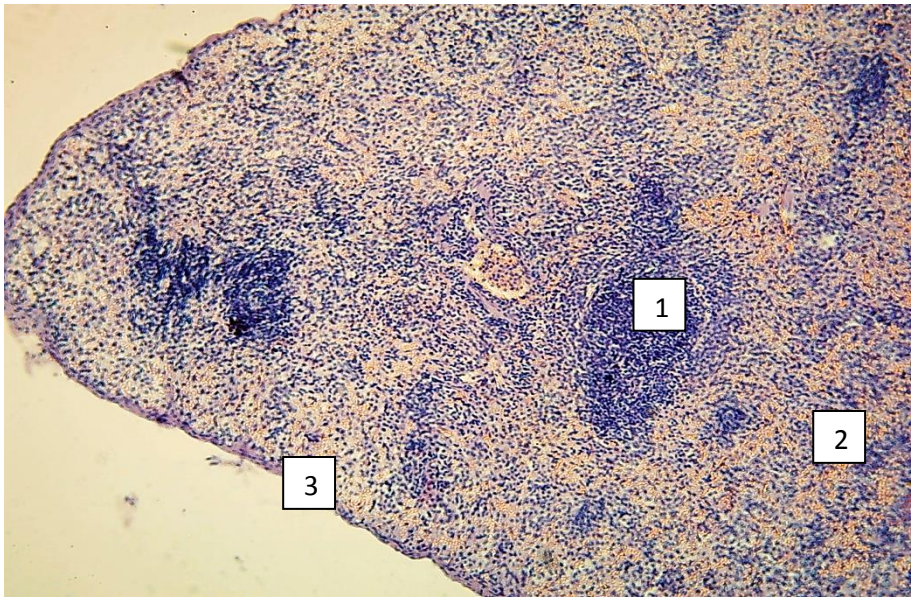

Fig.2. The spleen of a newborn rat. Hematoxylin-eosin staining. 10x10. 1- lymphoid follicle, 2- red pulp, 3- spleen capsule

The number of lymphoid follicles (LF) without breeding centers averaged 2.3± 0.37, and with a breeding center averaged 7.3± 0.1. The size of the LF is on average 40.4± 0.2 microns. The distance between the marginal zone of the LF was on average 24.6 ± 0.15 microns, the distance between the germinal centers is on average 42.1 ± 0.19 microns

The study of the trabecular vessels of newborn rats in the proximal part showed that the thickness of the venous wall averaged 3.13±0.37 microns, the inner diameter of the vein was on average 5.8±0.1 microns, the thickness of the artery wall averaged 4.3±0.07, the inner diameter of the artery was on average -5.0±0.12. The thickness of the venous wall of the trabecular vessel in the distal part was on average 2.5±0.32, the inner diameter of the vein averaged 4.7±0.2 microns, the thickness of the arterial wall averaged 3.4± 0.02, the internal diameter of the artery is on average 3.87 ± 0.04. The wall thickness of the venule of the pulpary vessel was on average 2 ± 0.12 microns, the inner diameter of the venule was on average 3.6 ± 0.7, the wall thickness of the arteriole was on average 2.6± 0.42, and its inner diameter was on average 2.7±

10.5281/zenodo.5558698
0.02 microns. The wall thickness of the lymphoid follicle venule is on average 1.4 ± 0.08, the inner diameter is on average 3.5 ± 0.12. The wall thickness of the lymphoid follicle arteriole was on average 1.3 ± 0.1, and the inner diameter of the LF arteriole is on average 2.7± 0.31 microns.

The study of the cellular composition of the white pulp of 6-day-old baby rats showed the following picture: the width of the germinal center averaged 64.1 ± 0.6 microns. The width of the periarterial zone is on average 32.3 ±0.12 microns.

The width of the mantle zone averages 71.9±1.12 microns. The width of the marginal zone was on average 43.6±1.2 microns.

The thickness of the capsule at the gate was on average -5.54± 0.31, at the front end on average this value was equal to 6.7± 0.12 microns, at the rear end it averaged 5.8± 0.37. The diameter of the trabecula in the proximal part is on average 13.1 ± 0.33, and in the distal part on average 9.7 ± 0.52 microns. The depth of the trabecula averages 15.4±0.72 microns.

The relative area of the white pulp is on average 22.8 ± 0.41%. The relative area of the red pulp averaged 76.81±0.15%.

The number of lymphoid follicles (LF) without breeding centers averaged 3.2 ±0.1, and with a breeding center averaged 8.73. The LF dimensions were equal to an average of 50.0 microns. The distance between the marginal zone of the LF averaged 25.1 microns, the distance between the germinal centers averaged 48.3 microns.

The study of the trabecular vessels in the proximal part showed that the thickness of the venous wall averaged 3.7 microns, the inner diameter of the vein was 6.4 microns on average, the thickness of the artery wall averaged 4.81, and the inner diameter of the artery averaged -5.44. The trabecular vessel in the distal part had the following values: the thickness of the venous wall was on average 2.75, the inner diameter of the vein was on average 4.9 microns, the thickness of the arterial wall was on average 3.7, the inner diameter of the artery was on average 4.1. The wall thickness of the venule of the pulpary vessel is on average 2.38 microns, the inner diameter of the venule was on average 4.1, the wall thickness of the arteriole was on average 2.7, and its inner diameter was on average 2.9 microns. The wall thickness of the lymphoid follicle venule is on average 1.5, the inner diameter is on average 3.4. The wall thickness of the lymphoid follicle arteriole was on average 1.4, and the inner diameter of the LF arteriole is on average 2.8 microns.

The width of the germinal center of 11-day-old rats was on average 68.1±0.2 microns, and the periarterial zone was on average 35.8±0.4 microns.

The width of the mantle zone averages 77.3±2.2 microns. The width of the marginal zone is on average 46.6 ± 1.21 microns.

10.5281/zenodo.5558698

The thickness of the capsule at the gate was on average -6.28 ± 0.14, at the anterior end on average this value was equal to 8.84 microns, at the posterior end it averaged 7.21. The diameter of the trabecula in the proximal part is on average 13.4, and in the distal part on average 10.01 microns. The depth of the trabecula averaged 21.0 microns.

The relative area of the white pulp was on average 22.5±0.2%. The relative area of the red pulp averaged 77.4±0.13%.

The number of lymphoid follicles (LF) without breeding centers averaged 2.5, and with a breeding center averaged 9.2. The size of the LF is 57.6 microns on average. The distance between the marginal zone of the LF averaged 24.3 microns, the distance between the germinal centers was 55.8 microns on average.

The study of the trabecular vessels in the proximal part showed that the thickness of the venous wall averaged 4.3 microns, the inner diameter of the vein was 6.6 microns on average, the thickness of the artery wall averaged 5.1, and the inner diameter of the artery averaged -5.7. The trabecular vessel in the distal part had the following values: the thickness of the venous wall was on average 3.1, the inner diameter of the vein was on average 5.5 microns, the thickness of the arterial wall was on average 4.0, the inner diameter of the artery was on average 4.9. The wall thickness of the venule of the pulp vessel averaged 2.5 microns, the inner diameter of the venule averaged 4.61, the wall thickness of the arteriole was on average 3.1, and its inner diameter was on average 3.3 microns. The wall thickness of the lymphoid follicle venule is on average 1.6, the inner diameter is on average 4.1. The wall thickness of the lymphoid follicle arteriole was on average 1.7, and the inner diameter of the LF arteriole was on average 3.1 microns.

The study of the cellular composition of the white pulp of 16-day-old baby rats showed the following picture: the width of the germinal center is on average 77.0 ± 0.3 microns. The width of the periarterial zone averaged 40.6±0.7 microns.

The width of the mantle zone averages 82.4±4.2 microns. The width of the marginal zone is on average 52.6 ± 1.3 microns.

The thickness of the capsule at the gate was on average -5.9 ± 0.2, at the anterior end on average this value was 11.5 microns, at the posterior end it averaged 9.7. The diameter of the trabecula in the proximal part is on average 14.0, and in the distal part on average 10.6 microns. The depth of the trabecula averaged 21.4 microns.

The relative area of the white pulp is on average 22.8 ± 0.4%. The relative area of the red pulp averaged 77.3±0.2%.

The number of lymphoid follicles (LF) without breeding centers averaged 2.5, and with a breeding center averaged 8.12. The LF dimensions were equal to an

10.5281/zenodo.5558698
average of 63.9 microns. The distance between the marginal zone of the LF averaged 24.3 microns, the distance between the germinative centers averaged 63.5 microns.

The study of the trabecular vessels in the proximal part showed that the thickness of the venous wall averaged 5.2 microns, the inner diameter of the vein was on average 6.8 microns, the thickness of the artery wall was on average 5.5, the inner diameter of the artery was on average -6.4. The trabecular vessel in the distal part had the following values: the thickness of the venous wall was on average 3.4, the inner diameter of the vein was on average 5.8 microns, the thickness of the arterial wall was on average 4.2, the inner diameter of the artery was on average 5.3. The wall thickness of the venule of the pulpary vessel averaged 2.5 microns, the inner diameter of the venule averaged 5.12, the wall thickness of the arteriole is on average 3.1, and its inner diameter was on average 3.7 microns. The wall thickness of the lymphoid follicle venule is on average 1.7, the inner diameter is on average 4.3. The wall thickness of the lymphoid follicle arteriole was on average 1.82, and the inner diameter of the LF arteriole is on average 3.12 microns.

The study of the cellular composition of the white pulp of 21-day-old baby rats showed the following picture: the width of the germinal center was on average 80.4 ± 0.4 microns. The width of the periarterial zone averaged 41.8±0.7 microns.

The width of the mantle zone averaged 85.6±2.7 microns. The width of the marginal zone was on average 54.8±1.4 microns.

The thickness of the capsule at the gate was on average -7.14±0.17, at the front end on average this value was equal to 13.9 microns, at the rear end it averaged 13.2. The diameter of the trabecula in the proximal part is on average 15.5, and in the distal part on average 11.4 microns. The depth of the trabecula averaged 21.8 microns.

The relative area of the white pulp was on average 24.9±0.52%. The relative area of the red pulp averaged 75.2±0.23%.

The number of lymphoid follicles (LF) without breeding centers averaged 2.13, and with a breeding center averaged 8.8. The size of the LF was 77.6 microns on average. The distance between the marginal zone of the LF was on average 24.6 microns, the distance between the germinative centers was on average 66.4 microns

The study of the trabecular vessels in the proximal part showed that the thickness of the venous wall averaged 5.73 microns, the inner diameter of the vein was on average 7.33 microns, the thickness of the artery wall averaged 6.33, and the inner diameter of the artery averaged -7.12. The trabecular vessel in the distal part had the following values: the thickness of the venous wall averaged 3.7, the inner diameter of the vein averaged 6.3 microns, the thickness of the arterial wall averaged 4.6, the inner diameter of the artery averaged 5.6. The wall thickness of the venule

10.5281/zenodo.5558698
of the pulpary vessel averaged 2.9 microns, the inner diameter of the venule averaged 5.13, the wall thickness of the arteriole averaged 3.5, and its inner diameter averaged 4.5 microns. The wall thickness of the lymphoid follicle venule is on average 1.9, the inner diameter is on average 4.3. The wall thickness of the lymphoid follicle arteriole was on average 2.1, and the inner diameter of the arteriole is on average 3.4 microns.

3. Discussion and Conlcusions.

In the early postnatal ontogenesis of the rat spleen, the surface layers develop faster, then the ratio changes and subsequently the growth of the middle and deep layers is observed. The greatest rate of increase in the thickness of trabeculae was observed up to the 21st day of age by 1.3 times. The decrease in the thickness of the capsule and the trabecula of the thymus depends on age. The greatest decrease in the thickness of the capsule is observed on the 11th day, trabeculae - on the 21st day. On total sections of the spleen by the 21st day, the area occupied by the white pulp also increases, the absolute number of lymphoid nodules with reproduction centers increases to 31.4 ± 2.1 and the marginal zone of periarterial lymphoid couplings thickens. In the centers of reproduction of lymphoid nodules on an area of 2500 sq. During this period, the number of blasts increases - 15.0 ± 1.1 and average lymphocytes to 16.9± 2.3. On total sections of the spleen, white pulp occupies 49.1± 1.5% of the total area of the histological section. The proportion of lymphoid nodules with breeding centers increases 2.1 times, equal to 34.3 ±1.9 in absolute numbers compared to the control. In the centers of reproduction of lymphoid nodules on an area of 2500 microns, the number of blasts reaches up to 19.6 ± 0.8, the number of macrophages is 3.4 ± 0.4. In the deep part of the periarterial lymphoid couplings, the number of plasmocytes and small lymphocytes reaches maximum figures. In the splenic cords, the maximum number of plasmocytes, small lymphocytes and macrophages is noted, compared with the control.

10.5281/zenodo.5558698

References

[1] Ahrorova, K. D. (2021). Morphofunctional properties of the lymphoid structures of the spleen in norm and under the influence of various factors. *Academicia: an international multidisciplinary research journal*, *11*(1), 459-465.

[2] Ahrorovna, K. D., &Jumaevich, T. S. (2018). Topografic-anatomical features of lymphoid structures of the small intestine of rats in norm and against the backround of chronic radiation diseases. *European science review*, (9-10-2).

[3] AKHROROVNA, K. D. Medical Field Morphological Features of Human and Mammalian Spleen in Postnatal Ontogeny. *JournalNX*, *7*(1), 252-256.

[4]Ahrorovna, K. D. (2020). Effect of a genetically modified product on the morphological parameters of the rat's spleen and thymus.European Journal of Molecular and Clinical Medicine, 7(1), 3364-3370. Retrieved from www.scopus.com

[5] Ahrorovna, K. D. (2021). Evaluation of the effect of a genetically modified product on the morphological parameters of the spleen of experimental animals. *Academicia: an international multidisciplinary research journal*, *11*(1), 885-888.

[6] Balogh P., Horvath G., Szakal A.K. Immunoarhitecture of distinct reticular fibroblastic domains in the white pulp of mouse spleen. J. Histochem. Cytochem. 2004; 52 (1287): 98.

[7] Khasanova, D. A. (2021). Morphofunctional changes in thymus gland of rats effected by genetically engineered crops. In *advanced research: problems and new approaches* (pp. 120-125).

[8] Khasanova, D. (2020). WIRKUNG EINES GEN-MODIFIZIERTEN PRODUKTS AUF DIE MORPHOLOGISCHEN PARAMETER DER STRUKTUREN DER MILZ WEIßER RATTEN. *InterConf*.

[9] Khasanova, D. A., &Asadova, N. K. (2021). Morpho functional changes in thymus of white rats in acute stress. *Academicia: An international multidisciplinary research journal*, *11*(1), 685-691.

[10] Khasanova, D. A., &Teshaev, S. J. (2018). Topografic-anatomical features of lymphoid structures of the small intestine of rats in norm and against the backround of chronic radiation diseases. *European science review*, (9-10-2), 197-198.