



COMPARATIVE CHARACTERISTICS OF THE SPLEEN OF WHITE RATS IN NORMAL AND CHRONIC RADIATION SICKNESS

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ABSTRACT

In an experimental study, morphofunctional features of the spleen of 3-month-old white rats in normal and chronic radiation sickness were studied. As a result of the study, it was found that in chronic radiation sickness, the structural parameters of the spleen of white rats undergo quantitative changes. This is manifested by a decrease in the relative area of the white pulp, the diameter of the periarterial lymphatic couplings, lymph nodes, as well as a decrease in the width of the mantle, marginal and periarterial zone. As a result, the functional activity of the spleen's lymphoid tissue decreases.

KEYWORDS: *immune system, spleen, lymphoid follicles, chronic radiation sickness.*

INTRODUCTION

One of the most dynamic systems of the body is the immune system of humans and animals, which quickly reacts to the impact of external adverse factors. Immune organs provide protection from various pathogenic influences [2,3,8].

Among the peripheral organs of the immune system, the largest and most complex organ is the spleen, which performs filtration, cleansing, immune, hematopoietic and depositing functions [6, 9,10.].

According to researchers from various countries, the immune system disease associated with environmental pollution is currently increasing in the world. [7,11].

To date, radiation remains one of the most adverse factors that affect the human body. Radiation has the most destructive effect on the human body and causes profound changes in all organs and systems. [1,4,5].

Today, the study of the health status of a person exposed to radiation from various sources of ionizing radiation is an urgent and important problem in science and health. Taking into account the above we set the task of studying the morphological parameters of the spleen of white rats in normal and chronic radiation sickness.

PURPOSE

To study morphofunctional features of spleen lymphoid structures in 3-month-old white rats in normal and chronic radiation sickness.

MATERIAL AND METHODS OF RESEARCH

The study was conducted in 22 mongrel white male rats with a weight of 90 to 130 g, which were kept in standard vivarium conditions. The rats were divided into 2 groups: control group (n=12), 1-experimental group (n=10). Irradiation of rats was performed using the device "AGAT P1 "(Baltiys plant" Narva, Estonia, 1991 year of manufacture, operation since 1994, recharge 2007) with a capacity of 25,006 SGR/ min for 20 days at a dose of 0.2 G. The total radiation dose for rats up to 90 days of age was 4.0 GR. All experimental studies on animals were conducted in accordance with the "Rules for conducting work using experimental animals".

The animals were weighed and removed from the experiment at 90 days of age by instant decapitation under ether anesthesia.

The spleen was removed from the abdominal cavity. To conduct morphological and morphometric studies of the study, spleen fragments



were fixed in a 10% formalin solution, passed through a battery of alcohols and poured into paraffin blocks according to generally accepted methods. Paraffin sections with a thickness of 5-8 microns were stained with hematoxylin-eosin. The sections were examined morphometrically using an eyepiece-micrometer DN-107T/ Model NLCD-307B (Novel, China) measured the diameter of the periarterial lymphatic couplings, lymph nodes and their germinal centers, the width of the mantle, marginal and periarterial zones, the relative area of the white pulp and connective tissue elements of the spleen to the total area of the cut. Measurements were made in five fields of view of each histological section. The fields of view were chosen randomly.

In order to study the cytoarchitectonics of the spleen's lymphoid structures, cells were counted using a NOVEL Model NLCD-307 microscope, at 10x90 magnification, under oil immersion. The cells were counted using a morphometric grid embedded in the eyepiece (10x) of a microscope.

We calculated the total number of lymphocytes, the number of large, medium and small lymphocytes per unit area of the cut in the PALM, in lymphoid nodules without a breeding center.

Using directly from the General data matrix "Excel 7.0" on a Pentium-IV personal computer, mathematical processing was performed, and the standard deviation and representativeness errors were determined.

THE RESULTS OF THE STUDY AND THEIR DISCUSSION

When examining the spleen of 3-month-old intact rats, it was found that the relative area of the white pulp ranges from 19.8% to 26.2%, on average $22.2 \pm 0.59\%$. The relative area of connective tissue elements varied from 5.0% to 6.1%, on average $5.52 \pm 0.1\%$ (to the total area of the spleen section)

The diameter of the PALC ranges from 122.6 microns to 139.6 microns, with an average of 132.14 ± 1.56 microns. The diameter of the lymph nodes ranges from 341.8 microns to 486.05 microns, with an average of 466.05 ± 13.27 microns. The percentage of primary and secondary LN is 32% and 68%, respectively. The diameter of the germinal centers ranges from 94.6 microns to 167.8 microns, with an average of 147.8 ± 6.73 microns. They are large AND often merge. The LN of the white spleen pulp is generally round, oval, and elongated.

In micro-preparations, you can visually distinguish all the zones of LN. The width of the mantle zone ranges from 39.7 microns to 49.45 microns, with an average of 45.32 ± 0.89 microns. The width of the marginal zone ranges from 70.3 microns to 84.7 microns, with an average of 77.14 ± 1.32 microns. The width of the periarterial zone ranges from 81.9 microns to 89.4 microns, with an average of 85.04 ± 0.69 microns. (Fig 1).

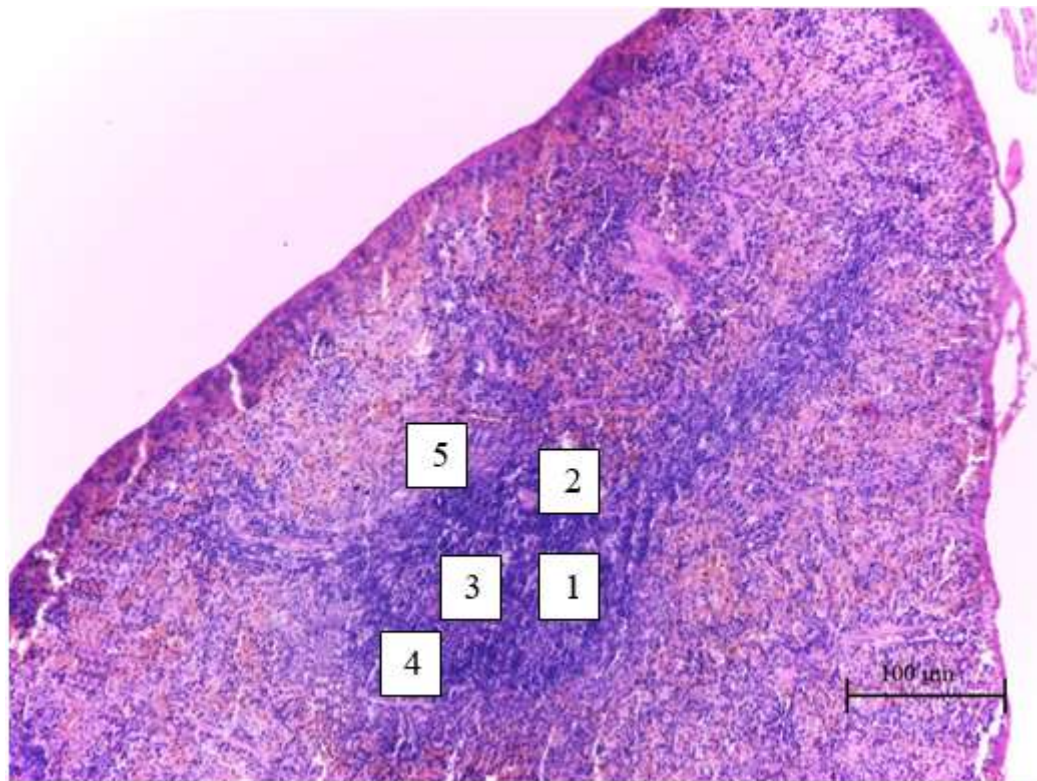


Fig 1. Spleen of a 3-month-old control rat. Painting with hematoxylin – eosin. Oc. 10 x Ob. 20. 1 - lymph node, 2 -periarterial zone, 3-germinal center, 4-mantle zone, 5-marginal zone.



It was found that the total number of lymphocytes in the LN without breeding centers is 42-53, with an average of 47.3 ± 1.01 cells. Lymphoid nodules without centers of reproduction contain (per unit area) small lymphocytes-30-38, on average - 34.0 ± 0.74 cells, medium lymphocytes-10-12, on average - 11.0 ± 0.18 cells, large lymphocytes-2-3, on average- 2.3 ± 0.1 cells.

The total number of lymphocytes in the periarterial lymphoid couplings of the white spleen pulp is 41-53, with an average of 47.2 ± 1.1 cells. Periarterial lymphoid couplings contain (per unit area) small lymphocytes-29-37, on average- 33.0 ± 0.74 cells, medium lymphocytes-9-11, on average - 10.25 ± 0.18 cells and large lymphocytes-3-4, on average- 3.5 ± 0.1 cells.

When studying the spleen of 3 month old rats with chronic radiation diseases the following data were obtained:

The relative area of the white pulp varies from 12.8% to 16.4%, with an average of

$14.6 \pm 0.39\%$. The relative area of connective tissue elements varied from 5.2% to 6.3%, on average- $5.73 \pm 0.84\%$ (to the total area of the spleen section)

The diameter of the PALC ranges from 95.2 microns to 104.3 microns, with an average of 99.35 ± 0.98 microns. The diameter of the lymph nodes is in the range from 160.4 microns to 240.2 microns, on average 195.81 ± 8.62 microns in the LN there are no germinal centers. Lymphoid nodules generally take a rounded-oval, elongated (67.6%) and irregular (32.4%) shape.

In micro-preparations, you can visually distinguish all the zones of LN. The width of the mantle zone ranges from 32.3 microns to 40.4 microns, with an average of 36.54 ± 0.87 microns. The width of the marginal zone ranges from 56.8 microns to 65.7 microns, with an average of 60.26 ± 0.96 microns. The width of the periarterial zone ranges from 57.2 microns to 65.4 microns, with an average of 59.88 ± 0.88 microns (Fig. 2).

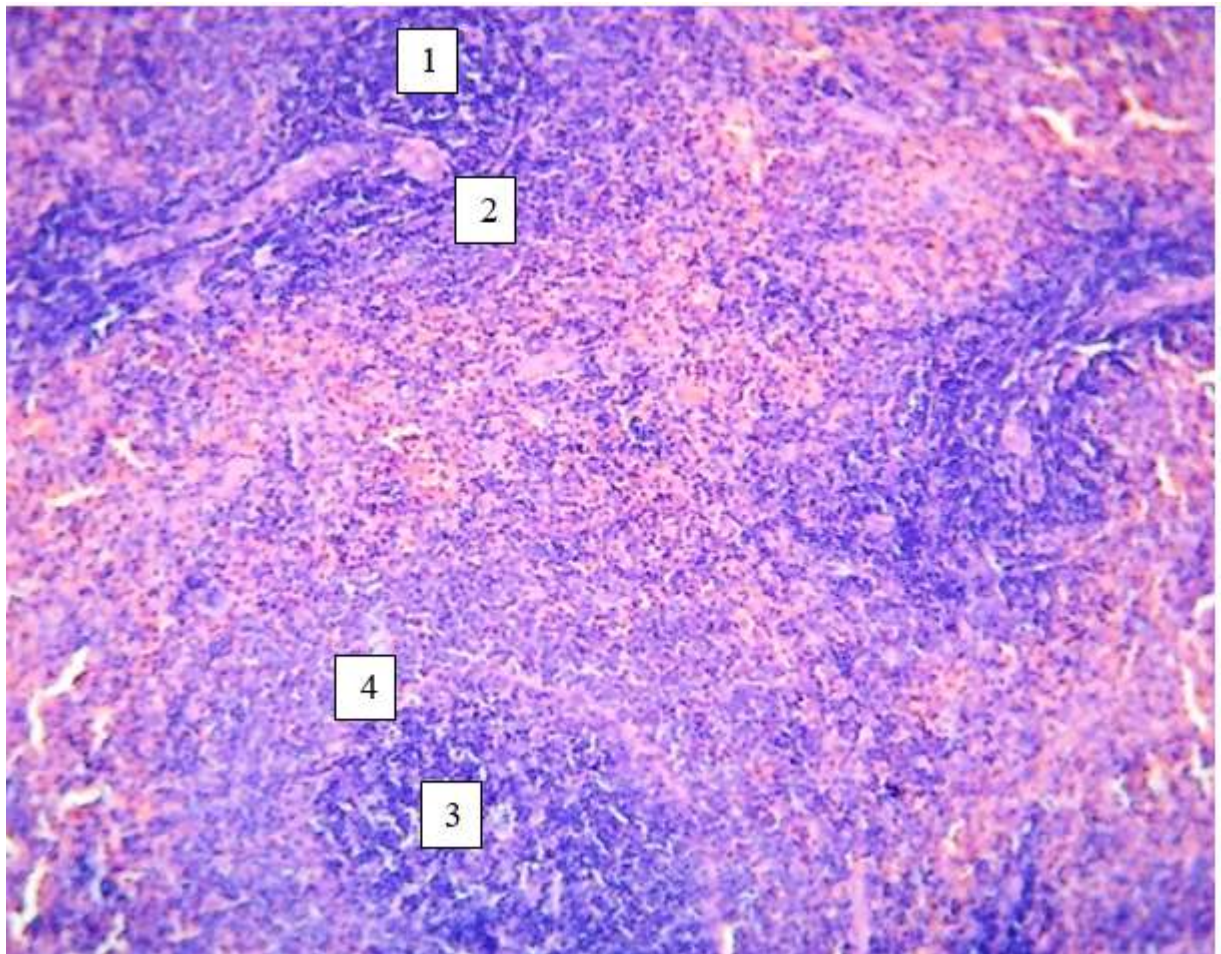


Fig.2. Spleen of a 3-month-old rat with chronic radiation sickness. Stained with hematoxylin-eosin. Oc. 10 x Ob. 20. 1-lymph node, 2-periarterial zone, 3-mantle zone, 4-marginal zone.



It was found that the total number of lymphocytes in the LN without breeding centers is 30-38, on average - 35.1 ± 0.86 cells. In micropreparations as part of lymphoid nodules without a breeding center, large lymphocytes are not detected. Lymphoid nodules without centers of reproduction contain (per unit area) small lymphocytes-22-28 on average- 26.0 ± 0.65 cells, average lymphocytes-8-10, on average - 9.1 ± 0.22 cells.

The total number of lymphocytes in the periarterial lymphoid couplings of the white spleen pulp is 31-40, on average - 35.2 ± 0.97 cells. The PALC does not contain large lymphocytes. Periarterial lymphoid couplings contain (per unit area) small lymphocytes-24-31, on average- 26.8 ± 0.76 cells, average lymphocytes-7-9, on average - 8.4 ± 0.22 cells.

Thus, the relative area of the white spleen pulp in white rats of the intact group is on average $22.2 \pm 0.59\%$, and in rats with chronic radiation sickness, this indicator decreases by 1.52 times and is equal to $14.6 \pm 0.39\%$. The relative area of connective tissue elements in control group rats is on average - $5.52 \pm 0.1\%$, and in rats with chronic radiation sickness there is an increase in this indicator by 1.04 times and is equal to $5.73 \pm 0.84\%$ (to the total area of the spleen section).

The diameter of the PALC and lymph nodes of the spleen of irradiated rats in comparison with healthy rats is reduced by 1.33 and 2.38 times, respectively, and is on average 99.35 ± 0.98 and 195.81 ± 8.62 microns, respectively. The lymphoid nodules of the spleen of the control group of rats were mostly rounded-oval and elongated, and in rats with chronic irradiation, irregular shapes were determined (32.4%). The diameter of the spleen germinal centers in rats of the intact group is on average 147.8 ± 6.73 microns, and in rats with chronic radiation sickness, no breeding centers are detected in histopreparations. The width of the mantle, marginal and periarterial zone in healthy rats is 45.32 ± 0.89 μm , 77.14 ± 1.32 μm and 85.04 ± 0.69 μm , respectively, and in irradiated rats 36.54 ± 0.87 μm , 60.26 ± 0.96 and 59.88 ± 0.88 μm , respectively.

The total number of lymphocytes in the LU without reproduction centers and periarterial lymphoid couplings of the spleen in control group rats is on average 47.3 ± 1.01 and 47.2 ± 1.1 cells, respectively, and in rats with chronic irradiation 35.1 ± 0.86 and 35.2 ± 0.97 , respectively.

CONCLUSIONS

1. In the lymphoid structures of the spleen of white rats with chronic radiation diseases observed quantitative changes, which are expressed by the

relative reduction in area WP, diameter of the PALC, LN.

2. In the lymph nodes of the spleen of irradiated rats, the disappearance of germinative centers is observed. Irregular forms (32.4%) of LN are detected, which are not detected in the spleen of healthy rats. The width of the mantle, marginal, and periarterial zones decreases, as well as the total number of lymphocytes in the LN without a breeding center and PALC by 1.35 and 1.34 times, respectively.

3. These data indicate that radioactive radiation has a negative effect on the lymphoid formations of the spleen, causing the development and formation of immunodeficiency

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