ISSN: 2309-5288 (Print)
ISSN: 2309-6152 (Online)
CODEN: JCLMC4

Journal of Coastal Life Medicine

Morphological Features of Lymphoid Structures of the Small Intestine of Rats in Norm and Chronic Radiation Sickness

Received: 24 October 2022, **Revised:** 20 November 2022, **Accepted:** 22 December 2022

Khasanova Dilnoza Ahrorovna,
Associate Professor of the Department of Anatomy, Clinical Anatomy (OSTA) of the Bukhara State Medical Institute Bukhara, Uzbekistan
E-mail: akwamarin80@gmail.com

Keywords:
small intestine, immune system, grouped lymphoid nodes, nodule form, chronic radiation disease.

Abstract

The amount of Grouped Lymph Nodes (GLN) in irradiated rats decreases, the number of nodules in them and the size of the GLN increase relatively from the initial part of the small intestine to the final. The shape of the GLN after irradiation varies from oval to round and irregular. The number of single nodules increases. GLN covers an average of 2.1% of the small intestine of irradiated rats, as opposed to a healthy 2.8% of the small intestine. These facts indicate a decrease in the functional activity of intestinal lymphoid tissue after exposure to chronic radiation.

HLB is a common disease of the body as a result of prolonged exposure to ionizing radiation in small doses, but exceeding the maximum permissible dose. Chronic radiation sickness (HLB) is caused by exposure to ionizing radiation (X–rays, gamma rays, neutrons) on the human body for a long period of time [1,3].

Factors causing the development of HLB Wave radiation with a wavelength comparable to cellular structures (X-ray and gamma). Streams of charged particles with high energy (electrons – beta radiation, protons, neutrons and alpha particles). Most often, people working with radioactive substances (at reactors, accelerators, X-ray installations) are affected by HLB [4,5].

The basis of pathogenesis is the ionization of atoms in the molecules of the body. Direct exposure (large doses of ionizing radiation expose DNA, RNA and structural proteins of the cell to damage) with cell destruction. Indirect effects occur through radiolysis – due to the formation of radicals and lipid peroxidation (POL). Further, radiolysis products interact with enzymes (mainly with the c–SH group) – thiol enzymes and products of disturbed metabolism appear, which leads to disruption of the functions of other systems [2,10].

Lymphoid cells are an operational subsystem that provides opportunities for tissue variability and adaptation to environmental conditions [5]. Complex carbohydrates participate in different ways in the processes of regulation of immune reactivity and immune tolerance – both indirectly through the intestinal microbiota, and providing a direct immunomodulating effect, which are also able to bind to receptors of intestinal–associated immune tissue [1,7]. Due to its proximity to the microbiome and direct contact with food, it is constantly exposed to both “normal” and potentially dangerous antigens. From the moment of colonization of the intestine, symbiotic connections between the microflora, epithelium and lymphoid tissue begin to form [6]. As a result of the effects on the body of various adverse environmental factors, the body’s defenses weaken and immunity decreases [2,8]. One such adverse factor is radiation. Affecting the body as a whole and its individual functions, irradiation causes persistent changes in the immune system, blood system, etc. [4,11]. Ionizing irradiation causes subtle complex mechanisms of disorders in lymphoid organs that require further detailed study for the prediction and possible correction of immunological and biochemical changes [3,9,12,13]. The purpose of the work: to study the

ISSN: 2309-5288 (Print)
ISSN: 2309-6152 (Online)
CODEN: JCLMC4
Journal of Coastal Life Medicine

quantitative content of lymphoid structures of the rat small intestine (SI) of 8 months of age in the norm and on the background of radiation diseases (RD).

1. Materials and methods.

Studies were conducted on 40 rats, which were kept under normal conditions. Animals were divided into 2 groups: I – control group (n = 20); II – group of animals (n = 20), receiving chronic irradiation for 20 days at a dose of 0.2 Gy (total dose was 4.0 Gy) to 90 days of age. Irradiation of rats produced apparatus "AGAT R1" with power 25.006 sGy / min (Estonia). After 5 months (240 days of age), the rats were GLN slaughtered under ether anesthesia. The SI of rats was separated and opened along the mesenteric margin along the entire length with micro–scissors. We measured the length of the intestine, width in the initial, middle and final part of the intestine. After rinsing with running water and total the drug of the small intestine were stained Harris' hematoxylin. After enlightenment of the drug with 3% acetic acid, the intestine was washed with distilled water and lymphoid structures were studied under the MBS-9 microscope. We calculated the number of GLN, the number of nodes in them, the size of GLN and the size of lymphoid nodes (LN) in them. We calculated the total area of LN and the percentage of the total area of the intestine.

2. Results and discussion.

The length of the SI in the control group (CG) ranged from 94 to 109 cm, on average, 102 ± ± 0.93 cm. The perimeter of the initial division of the mesenteric part of the SI ranges from 0.78 to 0.9 cm, with an average of 0.84 ± 0.01 cm, the perimeter of the middle section of the SI is 0.69 to 0.81 cm, with an average of 0.75 ± 0.01 cm, and the perimeter of the end of the division ranged from 0.63 cm to 0.75 cm, with an average of 0.69 ± 0.01 cm. The total area of the SI is in the range from 64.9cm^2 to 88.3 cm^2, average of 76.5 ± 1.45 cm2.In the CG, the amount of GLN throughout the SI varies from 9 to 17, on average – 13.3 ± 0.50. At a distance of 3.5–6 cm, an average of 4.9 ± 0.15 cm from the pyloric sphincter of the stomach is the first GLN. This GLN basically has a rounded shape. The diameter of the first GLN ranges from 0.2 to 0.5 cm, with an average of 0.38 ± 0.019 cm. The size of this GLN ranged from 0.031 cm^2 to 0.20 cm^2, with an average of 0.11 ± 0.01 cm^2. In the initial part of the mesenteric part of the SI of the CG of animals, the number of lymphoid plaques ranges from 2 to 5, on average – 3.3 ± 0.19. Form of GLN mostly round and oval, single found GLN of irregular shape. The sizes of GLN of the round form had the sizes from 0.4 × 0.4 cm to 0.6 × 0.6 cm, and the sizes of oval GLN were within from 0.37 × 0.41 to 0.52 × 0.58cm. The distance of interstitial zones ranges from 0.005 cm to 0.01 cm. The nodules in the GLN are mostly round, isolated nodules are oval-shaped. The number of nodules varies from 5 to 9, on average-7.5 ± 0.25. The diameter of the nodules in the GLN is from 0.05 cm to 0.1 cm. The number of lymphoid plaques in the middle part of the mesenteric part of the SI ranges from 3 to 6. GLN mainly had an oval shape, single GLN occurs rounded or irregular shape. The sizes of GLN of the rounded form had the sizes from 0.4 × 0.4 cm to 0.7 × 0.7cm, and the sizes of oval GLN were in the range from 0.4 × 0.55 to 0.72 × 0.81 cm. The diameters of the nodules in GLN is from 0.05 cm to 0.1 cm. Distance between nodular zones is in the range of 0.005–0.01 cm. In the final department of the mesenteric part of the SI, the number of lymphoid plaques increases slightly, their number ranges from 4 to 8, on average 6.0 ± 0.25. GLN mainly had an oval shape, single round shape GLN occurs. The dimensions of the oval GLN ranged from 0.4 × 0.6 to 0.6 × 0.9 cm. Nodules in the GLN are mainly oval-rounded. The number of nodules in each GLN is in the range of 5–18, on average –11.5 ± 0.8. The total area of the SI of irradiated rats was in the range of from 68.7 to 87.5 cm average 74.8 ± 1.2 cm^2. The number of GLN throughout the SI in the irradiated rats in the range of 8 to 16. The nodules in the GLN are mostly round and irregular, isolated nodules are oval-shaped. The number of nodules varies from 6 to 8, on average – 7.1 ± 0.34. The diameters of the nodules in the GLN is from 0.06 cm to 0.15 cm, on average 0.099 ± 0.002 cm. The number of lymphoid plaques in the middle part of the mesenteric part of the small intestine ranges from 3 to 5, on average – 3.8 ± 0.12. GLN were mainly rounded and irregularly shaped, sparsely found GLN oval. Distance between nodular zones is in the range of 0.007–0.01 cm. In the final part of the mesenteric part of the SI, the number of single and irregular lymphoid plaques increases significantly, their number ranges from 5 to 7, on average 6.2 ± 0.12. GLN were mostly of round shape, found a single

GLN oval form. The sizes of round GLN were in the range from 0.4 × 0.4 to 0.9 × 0.9 cm, the sizes of oval GLN varies from 0.3 × 0.5cm to 0.5 × 0.7cm. Knots in the GLN of mainly round shape. The number of nodes in each GLN is in the range of 8–22, with an average of 16.25 ± 1.86. The diameters of the nodules in GLN is from 0.98 cm to 1.9 cm, with an average of 1.02 ± 0.122 cm. Distance between nodular zones is in the range of 0.06–0.03 refer to the diameters of isolated nodules from 0.7 × 1.0 cm to 2.0 × 2.5cm.

3. Conclusions

The amount of GLN in irradiated rats decreases, the number of nodules in them and the size of the GLN increase relatively from the initial part of the SI to the final. The form of GLN after irradiation, in contrast to the control to move from the initial part to the final part of the SI, varies from oval to rounded and irregular. The number of single nodules increases, which was not observed in a healthy group. With services covered in an average of 2.1% of the area of the SI of irradiated rats, in contrast to the healthy (to 2.8%). These facts indicate a decrease in the functional activity of the lymphoid tissue of the intestine after exposure to chronic radiation.

References:

1. Ahrorovna, K. D., & Rustamovna, U. R. (2021, August). GENMODIFIZIERTE PRODUKTE SEIN EINFLUSS AUF DIE MORPHOLOGIE von MILZ UND THYMUSDRÜSE BEI VERSUCHTIEREN. In INTERNATIONAL CONFERENCE ON MULTIDISCIPLINARY RESEARCH AND INNOVATIVE TECHNOLOGIES (Vol. 1, pp. 10-13).
2. 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.
3. 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.
4. Akhrorovna, K. D. (2021). ANATOMICAL CHARACTERISTICS OF THE RAT SPLEEN DURING THE INTRODUCTION OF A NON-GENETICALLY MODIFIED PRODUCT. Conferencea, 7-8.
5. Akhrorovna, K. D. (2021). MACROANATOMIC CHARACTERISTICS OF THE THYMUS GLAND IN RATS IN EARLY POSTNATAL ONTOGENESIS. Conferencea, 22-23.
6. AKHROROVNA, K. D. Medical Field Morphological Features of Human and Mammalian Spleen in Postnatal Ontogeny. Journal NX, 7(1), 252-256.
7. Cummings J.H., Macfarlane G.T. Gastrointestinal effects of prebiotics // Br J Nutr. 2002; 87 (Suppl 2): 145c-51. DOI: 10.1079/ bjn/2002530.
8. Guseynov T., Guseynov S.T. Morphology of Peyer's patches in the dehydration // Makhachkala. Ed. Pome "Science plus". 2010.– 75 p.
9. Madieva M.R., Asainova A.K., Zhetpisbayev B.A. et al. Changes of lymphoid organs of immunogenesis in the late period after fractionated doses of gamma radiation // Science & Health Care. 2014; 2; 3137.
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.
11. Koveshnikov V.G., Berest A. Yu. Effect of chronic exposure to ionizing radiation and of monosodium glutamate on the morphogenesis of the thymus in the experiment // Ukrainian medicine almanac. 2012; 15 (5): 91–3.
12. Takemura N., Uematsu S. Isolation and Functional Analysis of Lamina Propria Dendritic Cells from the Mouse Small Intestine // Methods in molecular biology (Clifton N.J.). 2016; 1422: 181–8. DOI:10.1007/978-1-4939-3603-8_17.
13. Weng M., Walker W.A. The role of gut microbiota in programming the immune phenotype // J. Dev Orig Health Dis. 2013; 4 (3): 203–14. DOI:10.1017/s204017441200712