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Morphological Changes in the Adrenal Gland in Experimental Rheumatoid Arthritis

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Annotation. In recent years, the widespread prevalence of rheumatoid arthritis among diseases of the connective tissue system and the development of disability in patients indicate the relevance of this disease. The development of disability in patients means that this disease is not only a medical, but also a social problem. In some cases, damage to internal organs may also occur, and many complications may develop. Approximately half of patients develop disability 3-5 years after the onset of the disease. Therefore, early diagnosis of this disease is very important. The article presents morphological changes in adrenal tissue during modeling of adjuvant arthritis in 30 white laboratory outbred rats. Under experimental conditions, dystrophic and destructive changes in the cellular elements of adrenal tissue were revealed.

Key words: adjuvant arthritis, experiment, adrenal glands, rats, morphology.

Relevance. Rheumatoid arthritis (RA) is a chronic inflammatory autoimmune disease of connective tissue, which primarily affects peripheral joints with the development of erosive and destructive changes in them. Inflammation in RA affects the synovium of the joint, leading to hyperplasia of synovial tissue that destroys articular cartilage and underlying subchondral bone. According to modern concepts, the development of RA is based on a generalized defect in immunoregulatory mechanisms that determine the development of cellular and humoral reactions. This leads to chronic, progressive inflammation, affecting not only the joints, but also various organs and systems.

The purpose of our work was to study changes in adrenal tissue in experimental animals with simulated rheumatoid arthritis.

Materials and methods of research. The study was conducted on 30 three-month-old bisexual white laboratory outbred rats with an average weight of 80–120 g. The rats were kept in vivarium conditions. The experimental model was close to human childhood, for which purpose white rats aged 14–18 days and weighing 16–20 g were introduced into the experiment. Arthritis modeling was performed as follows: after 2 weeks of the experimental animal's life, under the skin of the rat's hind paw (subplantar) For 1 month, Freund's complete adjuvant (0.01 ml), which contained 0.01 mg BCG, was administered 2 times a week. The autoimmune process was modeled by sensitizing the animal's body for 28–30 days. The animals whose adrenal tissue was supposed to be studied were divided into 2 groups of 15 rats (n = 15): group 1 – healthy animals (control group); The 2nd group consisted of animals with a model of adjuvant arthritis that did not receive treatment. 10 days after the end of the experiment, the animals were removed from it under ether anesthesia [12]. The work was carried out in accordance with the rules approved by the Ethics Committee of the Bukhara State Institute of Medicine, based on the principles of humanism in

relation to animals, provided for by the "Rules for carrying out work with experimental animals" under the name of Abu Ali ibn Sino.

Research results. In the studied control group of healthy experimental animals, the adrenal tissue was not changed and had a physiological structure. The adrenal gland consisted of a cortex and medulla. In turn, the cortex included three zones: glomerular, fascicular and reticular. Cortical endocrinocytes formed epithelial strands perpendicular to the surface of the adrenal gland. The spaces between the epithelial strands were filled with loose connective tissue, in which blood capillaries and nerve fibers passed. The superficial zona glomerulosa was formed by small cortical endocrinocytes, forming rounded arches - "glomeruli". Cortical endocrinocytes of the zona fasciculata were larger, had a cubic or prismatic shape, as well as a round or slightly irregular nucleus, the same for all endocrinocytes, with a moderate content of chromatin, more or less evenly distributed throughout the karyoplasm in the form of eu- or heteroform. The cytoplasm of the cells contained a large number of lipid inclusions, a smooth cytoplasmic reticulum was well developed, mitochondria had characteristic tubular cristae, and clusters of ribosomes were quite dense. In the reticular zone of the adrenal cortex, epithelial cells were loosened, forming a loose network. The medulla was separated from the cortex by a thin, discontinuous layer of connective tissue. This part of the adrenal gland was formed by a cluster of relatively large round-shaped cells - chromaffinocytes, or pheochromocytes, between which there were special blood vessels - sinusoids. Among the medulla cells, light epinephrocytes secreting adrenaline and dark norepinephrocytes secreting noradrenaline were distinguished. The cytoplasm of both cells was densely filled with electron-dense secretory granules, the core of which, in turn, was filled with a protein that accumulated secreted catecholamines. In addition, the medulla contained multipolar neurons of the autonomic nervous system, as well as supporting process cells of a glial nature.

Analysis of data from an electron microscopic study of the adrenal glands of animals of the second group with simulated adjuvant arthritis (experimental group) indicated that similar changes, without fundamental differences, developed in the cells of the cortex and medulla. Thus, in cell nuclei there was a sharp decrease in the level of chromatin content, due to which the central part of the nuclei became cleared, and a small amount of chromatin in the form of a heteroform was concentrated near the karyolemma.

In addition, significant changes occurred in the structure of intracellular organelles and the cytoplasm itself, the cytosol of which lost its usual electron-optical density and became loose, giving the impression that the cells had lost structure. Mitochondria appeared swollen, with a clear matrix of low electron-optical density and destructured and disoriented cristae. At the same time, lipid granules retained their amorphous contents of medium or high osmiophilicity.

At the same time, in the cells of the medulla, especially in dark norepinephrocytes, the changes were of a slightly different nature. In particular, the swelling of mitochondria was much less pronounced in them, practically without disturbing the structure of the cristae, and no pronounced changes were noted in the tubules of the cytoplasmic reticulum and the Golgi complex. The most important change in the cells of the medulla was a pronounced depletion of granules characteristic of epinephrocytes with highly osmiophilic material, as a result of which the cytoplasm of the cells acquired a "foamy" appearance. It should be noted that some of the vessels of the sinusoids were full-blooded, while in the other part the vessels looked anemic and spasmic, as evidenced by pronounced folding of the endothelium. Thus, the experimental data obtained indicate that the changes found in the cells of both the cortex and medulla can be attributed to changes of a dystrophic and even destructive nature. These changes are accompanied by a decrease in the energy reserves of the cell due to damage to mitochondria, which, in turn, could negatively affect

the synthesis of mineralocorticoids, primarily aldosterone, as well as glucocorticoids produced by cells of the zona fasciculata. Depletion of highly osmiophilic material in the granules of epinephrocytes of the medulla may indicate a decrease in the synthesis of adrenaline and norepinephrine.

Conclusions Analysis of data from microscopic examination of adrenal tissue in conditions of adjuvant arthritis indicated the presence of signs of simulated chronic inflammation characteristic of juvenile rheumatoid arthritis. The results of the study in reproduced adjuvant arthritis indicated the development of dystrophic and destructive changes in the cellular elements of the adrenal tissue. It can be assumed that these changes have a negative impact on the neuro-immune-endocrine status of the body in this pathology, which requires appropriate drug correction.

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