

MORPHOMETRIC CHANGES OF KIDNEYS IN JUVENILE WHITE RATS**J. J. Bakhronov^{*1} and G. Sh. Rakhimova²**^{1,2}Assistant of the Department of Pathological Physiology, Bukhara State Medical Institute.***Corresponding Author: J. J. Bakhronov**

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ANNOTATION

This article discusses the morphometric changes in the kidneys in juvenile white rats, and also analyzes the dynamics of organometric indicators.

KEYWORDS: weight gain, pathological change, cytoplasm.**INTRODUCTION**

In order to be able to correctly evaluate the results obtained, first of all, the dynamics of all the studied indicators in immature control group rats was studied.

During the observation period, the body weight of juvenile rats increased from 154.00 ± 2.32 g to 222.51 ± 2.69 g.

Kidneys in juvenile animals were bean-shaped organs covered with a smooth, shiny capsule without visible pathological macroscopic disorders, with clearly defined gates on the medial surface. At the same time, the mass and size of the right kidney were unreliably greater than the similar parameters of the left kidney. Therefore, in the future, the right kidneys were used for organometric research.

RESEARCH MATERIALS AND METHODS

The dynamics of organometric parameters of kidneys in juvenile rats was as follows: as the body weight increased during the observation period, the studied organometric parameters of kidneys also increased. Thus, the absolute mass of the kidneys increased from 847.00 ± 13.62 mg to 1180.23 ± 15.23 mg, the length of the right kidney-from 16.30 ± 0.16 mm to 18.70 ± 0.21 mm, the width-from 8.20 ± 0.13 mm to 9.87 ± 0.14 mm, the thickness-from 7.30 ± 0.11 mm to 8.94 ± 0.12 mm; the volume of the right kidney increased from 521.36 ± 7.57 mm³ to 862.97 ± 17.04 mm³.

At the same time, the relative kidney weight decreased from 54.93% to 53.03%, which indicates that the rate of body weight gain prevailed over the rate of kidney weight gain.

Histologically, the cortical substance of the kidneys of juvenile animals corresponded to the described age norms, without signs of pathological changes. In the

cortical substance, the parenchyma, represented by various generations of nephrons, and the stroma, represented by vascular and connective tissue elements, were distinguished.

Nephrons (subcapsular, cortical and juxtaglomerular) had a typical structural organization, were represented by renal corpuscles, as well as convoluted and straight tubules.

Since it is proved that all populations of nephrons have a parallelism of age changes^[1], for a detailed description here and further, we have stopped at the most numerous population of nephrons - cortical.

The renal body of the nephron is represented by a vascular glomerulus, which is surrounded by a glomerular capsule (shumlyansky-Bowman capsule).

The capillary glomerulus in juvenile animals of the experiment has a monomorphic structure without visible signs of edema, dystrophy or hemorrhage at the light-optical level. The glomerular capsule is located around the vascular glomerulus and consists of visceral and parietal leaflets. A space free of cellular elements is visualized between the capsule leaves.

When studying the parameters of the renal corpuscle in juvenile rats, an increase in its total area was observed mainly due to an increase in the area of the vascular glomerulus. Thus, the area of the renal body increased from 2496.31 ± 25.72 mm² to 3496.58 ± 45.34 mm², the area of the vascular glomerulus increased from 1583.89 ± 2065 mm² to 2740.39 ± 43.25 mm², and the area of the capsule lumen decreased from 912.42 ± 15.01 mm² to 756.19 ± 13.30 mm². This dynamics of histomorphometric parameters of the renal corpuscle in control Nile rats coincides with the one described in the literature^[2] and indicates a high activity of filtration

processes, which gradually fades with increasing age of animals.

When describing other structural elements of the nephron-proximal and distal convoluted tubules in our study, their functional segments were not differentiated, based on the fact that the morphological features of the structure of a particular Department of the nephron as a whole are due to the functional processes of formation and excretion of urine.

In juvenile rats, the proximal convoluted tubules are represented by a high cylindrical epithelium lying in a single row on the basal membrane, with clearly defined apical and basal poles. The lumen of the tubule is well visualized, and its shape and diameter depend on the plane of the histological section. In the lumen of the tubules, in some cases, single cell elements were determined. With a large increase in the apical surface of epithelial cells, the brush border is determined, and in their basal part - a section of turbidity of the cytoplasm.

Distal convoluted tubules were represented by a set of cubic epithelial cells, without a brush border on the apical surface, which lie on the basement membrane. Due to the absence of a brush border and a lower epithelial height, the lumen of the distal convoluted tubules exceeds the similar lumen of the proximal convoluted tubules.

The histomorphometric study showed that in juvenile rats, the diameters of the proximal convoluted tubules gradually increased from 30.50 ± 0.10 microns to 35.36 ± 0.15 microns, the diameters of their lumen – from 13.12 ± 0.05 microns to 14.68 ± 0.07 microns, and the height of the epithelium - from 8.69 ± 0.05 microns to 10.34 ± 0.08 microns.

In the morphometric study of the parameters of distal convoluted tubules of the kidneys in juvenile rats, an increase in all the studied parameters was also observed with an increase in their age. Thus, the diameters of distal convoluted tubules also gradually increased from 27.17 ± 0.09 microns to 30.16 ± 0.13 microns, the diameter of the lumen of distal convoluted tubules - from 15.14 ± 0.06 microns to 16.28 ± 0.09 microns, and the height of the epithelium - from 6.01 ± 0.05 microns to 6.94 ± 0.08 microns.

At the ultrastructural level, it is established that the vascular glomerulus is enclosed in a two-layer capsule with an outer and inner parts. The outer part of the capsule is lined from the inside with a single layer of flat epithelial cells.

The inner part of the glomerular capsule is represented by podocytes, which are provided with a large number of branching processes that have the form of legs. The podocytes are located on the basement membrane of the glomerular capillaries and in contact with each other. A

large cell body contains an oval-shaped nucleus with small-granular chromatin, which protrudes into the lumen of the capsule. The cytoplasm of podocytes is electron-transparent. The granular endoplasmic network contains a large number of ribosomes, a well-developed Golgi complex, and a small number of small mitochondria. From the cytoplasm depart several large processes-cytotrabeules containing electron-dense material with fibrils and microtubules. The processes stretch along the nearby capillaries and give rise to a large number of secondary small and thin leg-like outgrowths-cytopodia. The cytoplasm of the cytopodia is more electron-dense. It shows long fibrils that go to the basement membrane. The inner leaf of the capsule and the wall of the glomerular blood capillaries share a three-layer basement membrane and form a filtration barrier. Between cytodine there are filtration slits. Slits communicate with soboliferum narrow space, located between the capillaries and the bodies of podocytes and cytochemically.

Epithelial cells of the proximal convoluted tubule have a brush border in the apical part of the cells, which is represented by a large number of cytoplasmic microvilli, densely adjacent to each other. At the base of the microvilli, small invaginations were detected, penetrating to different depths into the cytoplasm, containing a medium electron density substance.

Spherical apical vacuoles with structureless contents and small bubbles are located near the recesses. The nuclei of epithelial cells are mostly oval in shape, located in the center, closer to the base, with diffuse chromatin, and contain one or more electron-dense nuclei. In the cytoplasm, small tubules and cisterns of the granular endoplasmic network, the Golgi lamellar complex are detected.

In the basal part of the epithelial cells of the proximal tubule of the nephron, numerous mitochondria were identified, located in a special way - in the recesses of the basement membrane, parallel to each other and perpendicular to the basal cell membrane.

When examining the epithelial cells of the distal tubule of the nephron, it was found that the tubule is lined from the inside with cubic cells that do not have a brush border. The apical surface of the cells is uneven, with slightly wavy contours. Numerous invaginations, small vesicles and vacuoles are detected in the apical part of epithelial cells. The number of large electron-dense granules, micro bodies, vacuoles in comparison with cells of the proximal tubule is reduced. The nuclei of epithelial cells are round or oval in shape, often protruding along with a narrow rim of the cytoplasm into the lumen of the tubule. In the basal part of the cells under the nucleus is a lot of mitochondria mainly oblong, slightly curved shape, oriented in the longitudinal direction.

Thus, kidneys in juvenile rats are characterized by an increase in linear size and volume, as well as a gradual decrease in their relative mass at the organ level of structural organization and signs of high morpho-functional activity at the tissue, cellular and subcellular levels.

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