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Morphological Characteristics of the Kidneys on the 14th and 21th Days during the Prolonged Period of Moderate Brain Injury

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Abstarct: This article presents information about the results of scientific studies that allow to evaluate and study the morphological features of the kidneys of 3-month-old rats after moderately severe brain injuries. Morphological analysis of rat kidneys was performed on days 14 and 21 after brain injury.

Key points: traumatic brain injury, kidneys, nephron, biopsy, Shumlyansky-Bowman's capsule, vascular glomerulus.

Abstract: In our country, many targeted measures are being implemented to fundamentally improve the healthcare system and improve the quality of prompt and qualified medical care provided to the population [11,12,21,23,24,31,39,44,45]. At the same time, the issue of taking measures aimed at reducing the mortality rate [1,4,5, 28,29,30,33,42,46], early diagnosis, prevention and treatment of the disease, the study of kidney complications, especially extra and intracranial complications after brain damage [6,7,10,37,38,40,41,43,47] which are considered to be problems of modern nephrology, remains an urgent problem [3,8,9,13,14,15,22,25,36]. Unfortunately, there is very little information in the available literature about the effect of different stages of brain damage on kidney morphology and function [2,16,17,18,19,26,27,32,34,35]. This situation calls for further research to determine the role of morphological changes in the kidneys as a result of brain injury.

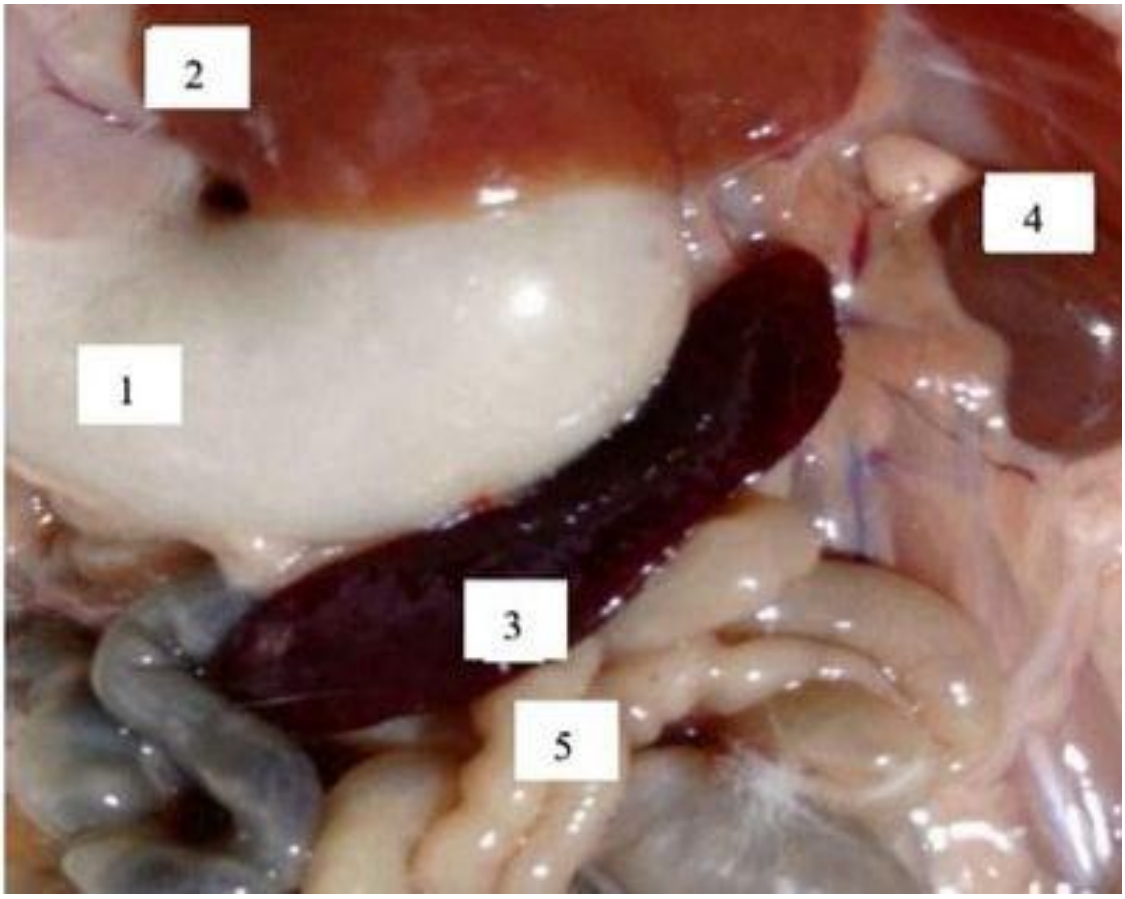
Materials and methods: Three-month-old white rats with an average weight of 150 g were obtained for this study. All laboratory animals were housed in a vivarium in plastic cages lined with wood chips at room temperature with a 12-h light-dark cycle, in accordance with laboratory animal care standards. The animals of the experimental group were divided into 2 groups, i.e., the first group included animals without spinal cord injury (control, n=5), and the second group (experimental n=5) included animals with mild spinal cord injury. In the study, mild spinal cord injury was induced in white rats in a specially designed model using the "traffic accident" method.

During this experiment, all animals suffered mild to severe injuries. After the injury, the surviving animals were transferred to a special plastic cage and observed until recovery of the post-traumatic condition.

For histopathological comparison between the control and experimental groups, white rat kidneys were isolated on days 7, 14 and 21 after spinal cord injury, and samples were taken and preparations were made to determine the morphological changes occurring in the kidney tissues. All preparations prepared using standard histological techniques were stained with hematoxylin and eosin.

Research results: Macroscopically, the kidneys of 3-month-old white rats of the experimental group are red-brown and bean-shaped . located in the lumbar region, covered with a smooth and

shiny capsule from the outside, no pathological changes visible from the macroscopic side were observed . Only a slight swelling was found.



1 - picture. Topographical distribution of the kidney of rats 3 months after moderate-severe brain injury . 1-kidney, 2-small intestine, 3-large intestine, 4-spleen, 5-liver.

Histological examination showed that a number of specific changes in the structure of nephrons of rat kidneys were revealed on the 7th and 14th days after moderate brain injury. In this case, the basal layer of the kidney has retained its structure in the nephrons and is enlarged due to the expansion of the renal corpuscle, the vascular ball of the kidney , and the Shumlyansky-Bowman capsule. was determined. This situation indicates that the filtration processes in it have decreased.

The same time, changes were observed in the proximal and distal e - gray tubules of nephrons under the influence of moderately severe brain injury .

The experimental group received moderate brain damage Karyolysis of proximal and distal convoluted tubule cells in 3-month-old white rat kidneys and medullary nephrons, the presence of erythrocytes in the tubules, the presence of focal hemorrhage zones between the tubules, dimming of the venous blood vessels due to the erythrocyte mass , interstitial swelling between the tissues presence was noted.

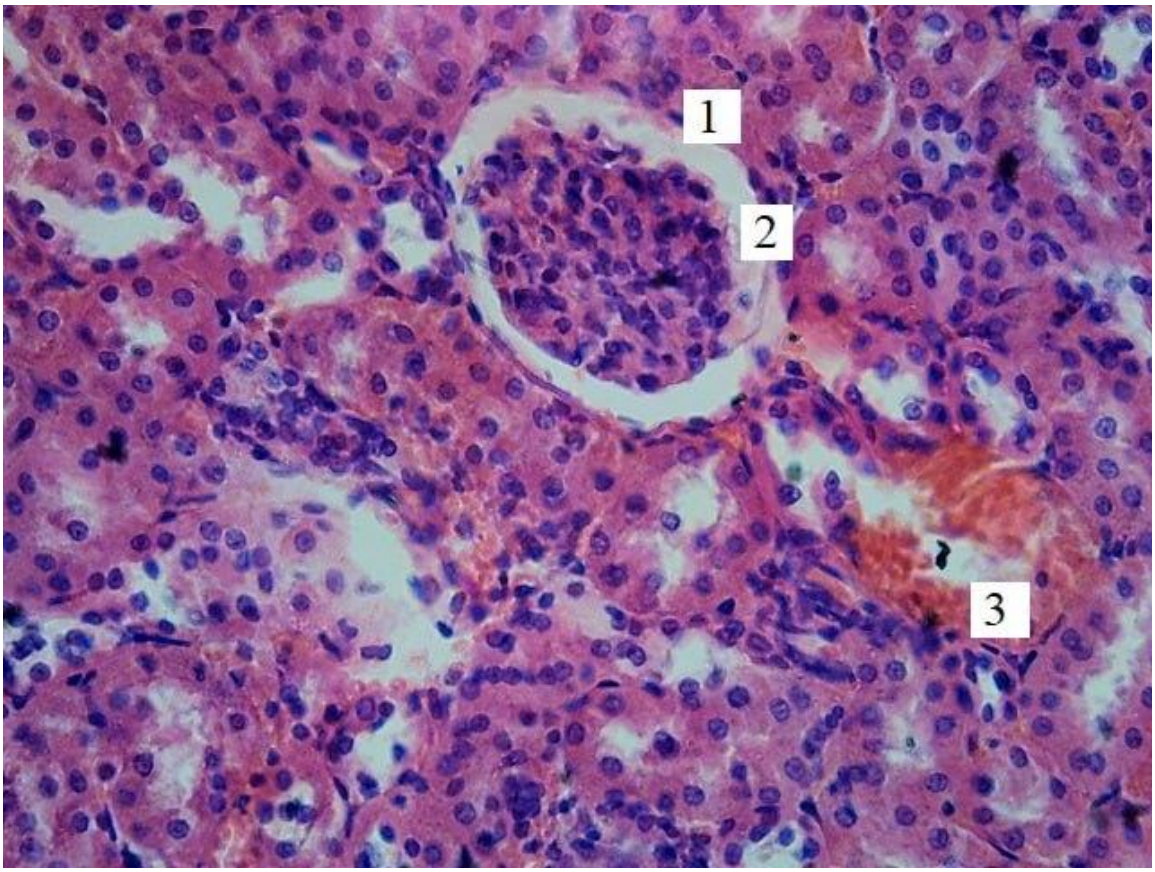
The morphological and morphometric parameters of the kidneys of rats seven days after the moderately severe head injury were as follows: the absolute weight of the kidneys - from 714.12 mg to 1208.28 mg, the average weight - 920.78 ± 44.9 mg; kidney length - from 15.5 mm to 20.02 mm, average length - 17.79 ±0.5 mm; width - from 6.24 mm to 10.9 mm, average width - 7.77 ±0.5 mm; thickness - from 6.1 mm to 9.243 mm, average thickness - 7.74 ±0.3 mm; it was noted that the volume of the kidney ranges from 383.89 mm^3 to 803.46 mm^3, the average is 554.1 ±34.89 mm^3.

The area of kidney bodies is from 2179.3 μm^2 to 2400.2 μm^2, the average is 2294.19 ±21.1 μm^2; the area of the vascular ball - from 1776.4 μm^2 to 2094.6 μm^2, on average - 1915.28 ±24.0 μm^2; the area of the capsule cavity ranged from 315.41 μm^2 to 379.35 μm^2, the average value was equal to 351.53 ±5.5 μm^2.

The diameter of the proximal convoluted tubules is from 26.51 µm to 39.27 µm, the average is 34.105±1.2 µm, the diameter of the tubular space is from 16.98 µm to 19.75 µm, the average is 18.33± It was 0.3 µm.

The diameter of the distal convoluted tubular tubules is from 26.54 µm to 34.87 µm, the average is 31.96±0.8 µm, the diameter of the tubule cavity is from 15.56 µm to 19.57 µm, the average is 17, 03±0.4 µm.

Fourteen days after moderately severe head injury, changes in the morphological and morphometric parameters of the kidneys of rats were as follows: the absolute weight of the kidneys - from 789.8 mg to 965.2 mg, the average weight - 865.58±16.6 mg; kidney length - from 16.08 to 21.33 mm, average length - 18.31±0.4 mm; width - from 6.24 mm to 8.55 mm, average - 7.42±0.2 mm; thickness - from 6.19 mm to 8.78 mm, average thickness - 7.44±0.2 mm; the volume of the kidney was from 421.03 mm ^{3} to 726.25 mm ^{3}, the average was 531.34±29.7 mm ^{3}.

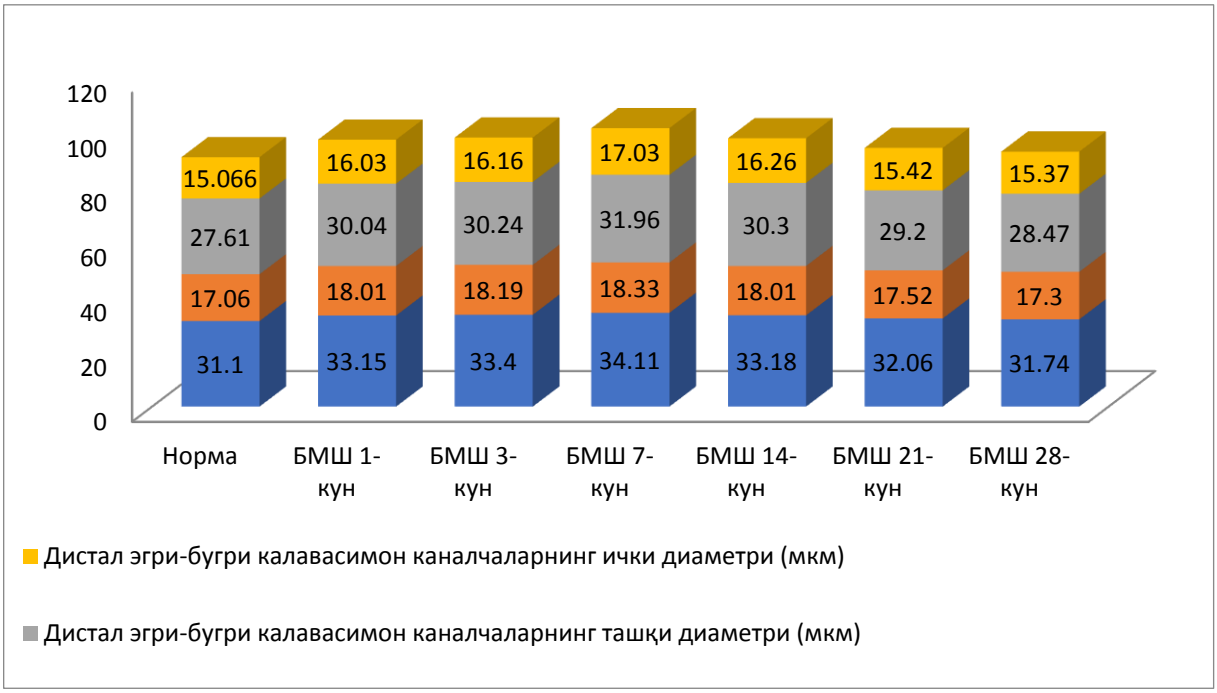


2 - picture. Cortical material of the kidneys of 3-month-old white rats with moderate brain injury of the study group (Stained with Hematoxylin-eosin. OK 10 x OB 40. 1-kidney ball, 2-Shumlyansky-Bowman capsule expansion, 3-focal hemorrhage zone)

The area of the kidney body is from 2018.2 µm ^{2} to 2316.83 µm ^{2}, the average is 2178.32±23.0 µm ^{2}; the area of the vascular ball is from 1719 µm ^{2} to 1978 µm ^{2}, the average value is 1831.62±24.1 µm ^{2}; it was determined that the area of the capsule cavity is 324.2 µm ^{2} to 345.2 µm ^{2}, the average is 333.76±1.6 µm ^{2}.

The diameter of the proximal convoluted tubules is from 29.4 µm to 39.6 µm, the average is 33.18±0.8 µm, the diameter of the tubular space is from 14.2 µm to 24.5 µm, the average is 18, 01±0.7 µm.

The diameter of the distal convoluted tubules is from 25.1 to 34.8 µm, the average is 30.3 ± 0.8 µm, the diameter of the tubular cavity is from 13.1 to 18.9 µm, the average is 16 was 26±0.5 µm.



3 - picture. Comparative description of morphometric parameters of proximal and distal convoluted tubules in renal nephrons on the 1st, 3rd, 7th, 14th, 21st, 28th day after moderate brain injury.

Morphometric the results of the analysis showed that on the 14th day after moderate brain damage, the area of the renal corpuscle, the area of the kidney ball, the area of the Shumlyansky-Bowman capsule, the diameter of the proximal and distal convoluted tubules, and the diameter of the tubule cavity in the kidney nephrons were found to have increased to a critical level, and this It was confirmed by histo - morphometric parameters.

Thus, as a result of macroscopic , histological and histomorphometric studies, moderate-severe brain damage of the experimental group received A number of morphological changes were detected in the kidneys of 3- month-old white rats . especially Maximal changes were obtained in the experimental group with moderately severe head injury significant changes were observed in the structure of kidney nephrons of white rats , and statistically significant differences were found in all studied indicators compared to the indicators of the control group of animals .

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