

Comparative Description of Morphological Characteristics of Kidneys with Mild Brain Injury and After Medical Treatment

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Summary:

This article presents information about the results of scientific studies that allow us to evaluate and study the morphological features of the kidneys of 3-month-old rats after mild traumatic brain injury. Morphological analysis of rat kidneys was carried out on the 1st and 3rd days after brain injury.

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

In our country, many targeted measures are being implemented to fundamentally improve the health care system and improve the quality of prompt and qualified medical care provided to the population.[4,5,6,7,10,11,12,34,40.]. At the same time, today's day and night, it is necessary to study kidney complications, especially extra and intracranial complications after brain injury [24,29,32,33,39,41.], early diagnosis, prevention and treatment of the disease. , the issue of measures aimed at reducing the mortality rate remains an urgent problem [1,18,19, 20, 21,25,38,42]. Unfortunately, there is very little information in the available literature about the effect of different stages of brain injury on kidney morphology and function [2,16,17, 26,32,35,43]. This situation requires further research to determine the role of morphological changes in the kidneys caused by brain injury [23,27,30,36,37,44.].

Materials and methods: Three-month-old white rats with an average weight of 150 g were taken 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, that is, the first group

included animals without spinal cord injury (control, n=10), and the second group (experimental n=10) had mild brain injury and treated animals. In the study, mild spinal cord injury was induced in white rats in a specially designed model using the "traffic accident" technique.

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

Medicinal drug treatment was performed one day after brain injury, with drugs administered intramuscularly based on the average weight of the animals. Piracetam 5 ml solution was dissolved in 45 ml isotonic sodium chloride solution and 0.3 ml of the resulting mixture was injected intramuscularly, 5 ml of 25% magnesium sulfate solution was dissolved in 45 ml isotonic sodium chloride solution and 0.6 ml of the resulting mixture was injected intramuscularly, 4 ml of neuraxon solution was dissolved in 196 ml of an isotonic solution of sodium chloride, and the resulting mixture was injected intramuscularly in 0.4 ml. Magnesium sulfate, neuroxon drug was administered intramuscularly from the 1st day after brain injury, and piracetam was administered intramuscularly from the 3rd day for 10 days. In this case, on the 1st and 3rd days after the use of drugs, the kidneys of white rats were examined in order to determine the morphological changes that occur in the kidney tissue after treatment with drugs.

For the histopathological comparison of the control and experimental groups, white rat kidneys were isolated on days 1 and 3 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: From the macroscopic point of view, the kidneys of 3-month-old white rats of the experimental group were red-brown bean-shaped, located in the lumbar region, covered with a smooth and shiny capsule on the outside, and no pathological changes visible from the macroscopic point of view were observed.

Histological examination showed that on the 1st and 3rd days after a mild brain injury, a number of specific changes were detected in the structure of nephrons of rat kidneys.

The following data were obtained in a study of the kidney in 3-month-old purebred rats following mild brain injury by drug treatment:

When the morphological and morphometric parameters of the kidneys of rats were studied one day after the start of treatment in case of mild brain damage, the absolute weight of the kidneys was from 708.14 mg to 1009.82 mg, the average weight was 845.82 ± 31.5 mg; kidney length - from 14.5 mm to 20 mm, average length - 17.51 ± 0.5 mm; width - from 5.2 mm to 8.7 mm, average - 7.28 ± 0.3 mm; thickness - from 6.3 mm to 9.2 mm, average thickness - 7.87 ± 0.2 mm; kidney volume ranged from 322.91 mm³ to 745.31 mm³, the average was 528.61 ± 34.7 mm³.

The area of the renal corpuscles is from 1920.8 μm^2 to 2313 μm^2 , on average - 2063.17 ± 36.7 μm^2 ; the area of the vascular ball - from 1612.82 μm^2 to 1889.2 μm^2 , on average - 1711.56 ± 28.2 μm^2 ; the area of the capsule cavity ranged from 285.32 to 345.67 μm^2 , the average was equal to 314.91 ± 6.6 μm^2 .

The diameter of the proximal convoluted tubules is from 28.47 μm to 33.9 μm , on average - 31.4 ± 0.5 μm , the diameter of the tubular cavity is from 15.1 μm to 19.33 μm , on average - 17, It was equal to 19 ± 0.4 μm .

The diameter of distal convoluted tubules is from 26.8 μm to 30.4 μm , on average - 28.24 ± 0.3 μm , the diameter of the tubule cavity is from 14.5 μm to 16.9 μm , on average - 15, It was equal to 33 ± 0.2 μm .

The absolute weight of the kidneys when studying the morphological and morphometric parameters of the kidney of rats three days after the start of treatment in mild brain injury 656.9 from mg 1005.38 up to mg, average weight -838.05 ± 31.4 mg, kidney length - from 14.41 mm to 20.31 mm, average length - 17.42 ± 0.6 mm; width – from 5.94 mm to 8.5 mm, average – 6.99 ± 0.3 mm; thickness - from 7.26 mm to 8.64 mm, average thickness - 8.06 ± 0.1 mm; the volume of the kidney ranged from 343.81 mm³ to 648.71 mm³, the average was 518.01 ± 31.9 mm³.

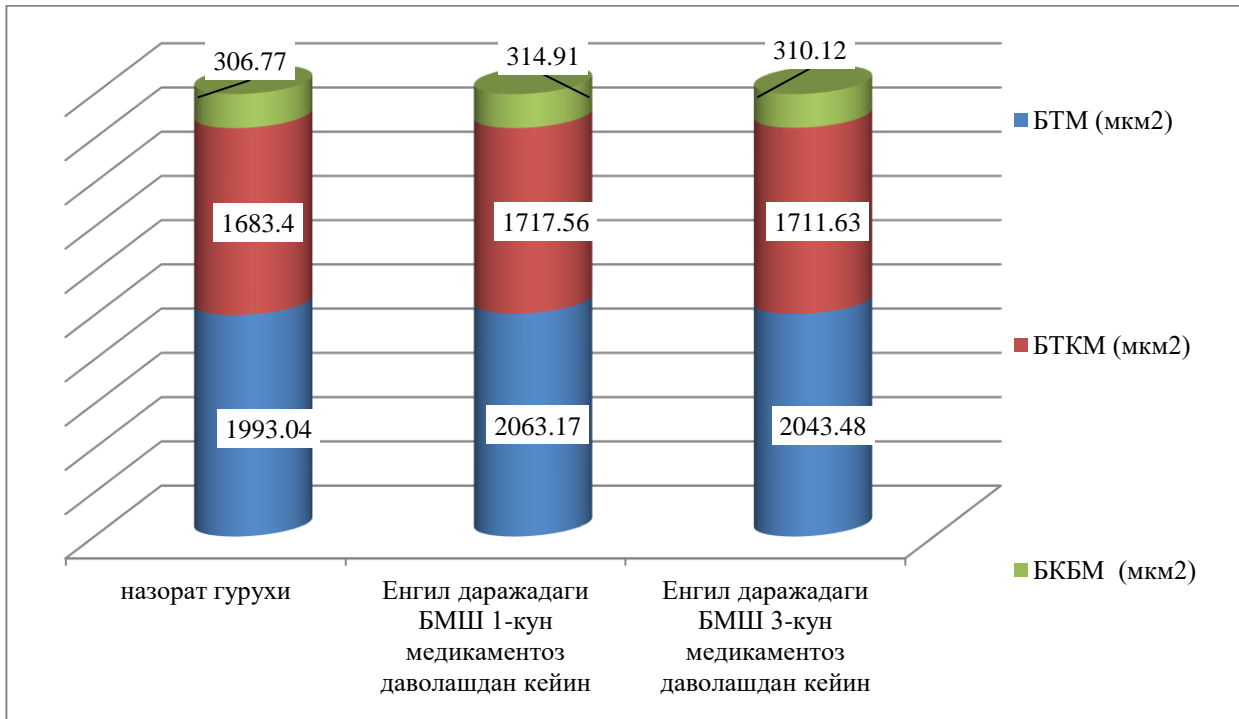


Fig 1. 1- ,3- , in mild brain injury Comparative description of histomorphometric indicators of kidney nephron elements after drug treatment on the 7th and 14th day.

The area of the kidney body is 1922.6 from μm^2 22287.67 up to μm^2 , average -2043.48 ± 32.5 μm^2 ; the area of the vascular ball - 1608.7 from μm^2 21789.18 up to μm^2 , average -1711.63 ± 18.9 μm^2 ; the area of the capsule cavity -267.34 from μm^2 2336.2 up to μm^2 , average -310.12 It was equal to ± 5.4 μm^2 .

The diameter of the proximal convoluted tubules -27.5 from μm 37.76 to μm , the average -31.36 ± 0.8 μm , the diameter of the canal space - from 15.43 μm to 19.46 μm , the average -17.17 ± 0.4 μm .

The diameter of the distal convoluted tubules -19.8 from μm 29.76 up to μm , average -28.13 ± 0.8 μm , the diameter of the canal space -13 from μm 17.5 up to μm , average -15.31 It was ± 0.4 μm .

Thus, in the macroscopic, histological and morphometric studies conducted after drug treatment, there was no obvious macroscopic change in the kidneys of 3-month-old rats under the influence of mild brain injury of the experimental group.

Histologically, kidney bodies of nephrons, vascular balls, Shumlyansky-Bowman capsule retain their structure. From the 1st day of treatment, a decrease in interstitial swelling, a decrease in venous blood vessels, a narrowing of the enlarged capsule space, a decrease in the areas of focal bleeding between the preserved ball and the proximal and distal convoluted tubules were found.

The results of the histomorphometric examination showed that the diameter of the Shumlyansky-Bowman capsule, the diameter of the distal convoluted tubules, and the diameter of their cavity in the rats treated with medicinal preparations after a mild brain injury in the experimental group from the 3rd day to the 1st day of the experiment. was seen to approach the parameters of the control

group. The reduction of the bleeding zones is a clear evidence of the recovery processes in the nephron elements.

Summary: Thus, treatment measures from the acute period of mild brain injury showed their effectiveness, and control group animals approached the morphometric parameters of renal nephron elements. So these pharmacological preparations can be successfully used as an effective tool for the treatment of kidney complications after mild, moderately severe head injury.

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