

Morphological Characteristics of the Kidneys Days 1 and 3 After Spinal Injury of the Thoraco-Lumbar Region of Easy Degree

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ABSTRACT

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 injuries of the thoracic and lumbar spinal cord. Morphological analysis of rat kidneys was performed on the 1st and 3rd days after brain injury.

Today, ensuring the safety of people around the world, providing high-quality, fast medical care in emergency situations is one of the urgent problems of combating natural disasters [4,5,6,7,10,11,12,21]. Statistical analyzes show that in most countries the number of deaths due to traffic accidents is second only to cardiovascular diseases and remains one of the main causes of death and disability in most countries [3,8,9,13,14,15,22]. According to scientific sources, 30-50% of deaths after all types of injuries are related to injuries of the spinal cord, and most of the victims are of working age from 20 to 50 years old [1,2,16,17,18,19].

In this direction, secondary extraspinal complications after traumatic brain injury, in particular, in modern nephrology, rarely achieve positive results in the treatment and improvement of the quality of kidney diseases, which in turn requires the development of new evidence-based methods of treatment for specialists in this field.

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 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.

Results of the study: Morphological and morphometric parameters of the kidneys of rats one day after moderate spinal cord injury:

Absolute kidney weight - from 722.08 mg to 1100.1 mg, average weight - 896.3 ± 25.3 mg; kidney length - from 17.98 mm to 210.76 mm, average length - 17.58 ± 0.45 mm; width - from 7.3 mm to 8.7 mm, average - 7.09 ± 0.2 mm; thickness - from 7.13 mm to 9.07 mm, average thickness - 8.17 ± 0.21 mm; kidney volume ranges from 412.62 mm^3 to 713.73 mm^3 , with an average of $543.74 \pm 24.5 \text{ mm}^3$.

The area of the kidney corpuscle ranges from $1987.2 \text{ }\mu\text{m}^2$ to $2332.2 \text{ }\mu\text{m}^2$, with an average of $2111.7 \pm 36.8 \text{ }\mu\text{m}^2$; the area of the vascular ball - from $1676.2 \text{ }\mu\text{m}^2$ to $1876.8 \text{ }\mu\text{m}^2$, on average - $1777.57 \pm 20.9 \text{ }\mu\text{m}^2$; of the capsule cavity



Figure 1 . of the control group Renal morphometry in 3-month-old white rats .

the area was found to be from $298.78 \text{ }\mu\text{m}^2$ to $354.2 \text{ }\mu\text{m}^2$, with an average of $374.62 \pm 6.9 \text{ }\mu\text{m}^2$.

The diameter of the proximal tubules is from 32.65 to 35.82 μm , on average - $34.34 \pm 0.21 \text{ }\mu\text{m}$, the diameter of the canal space is from 16.58 to 21.68 μm , on average - $18.87 \pm 0.32 \text{ }\mu\text{m}$ equal to

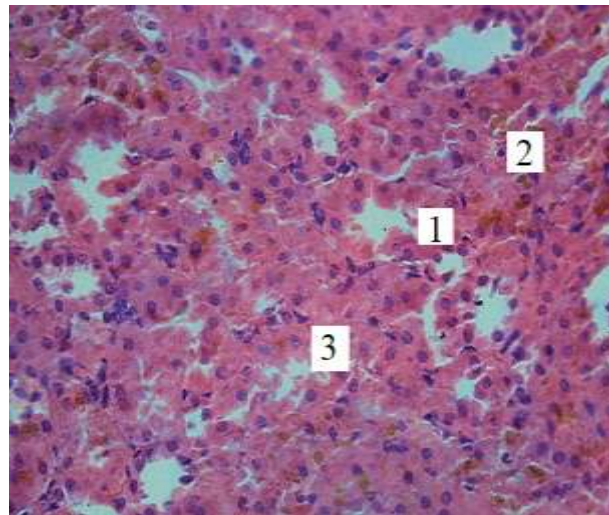


Figure 2. Cortical material of the kidneys of 3-month-old white rats with mild spinal cord injury of the experimental group. Stained with hematoxylin-eosin. OK 10 x OB 40. 1- distal convoluted tubule, 2-distal convoluted tubule, hemorrhage zone, 3-proximal convoluted tubule.

The diameter of the distal calcareous tubules is from 28.68 μm to 33.85 μm , the average is 28.66 \pm 0.42 μm , the diameter of the canal space is from 14.08 μm to 17.76 μm , the average is 15.76 μm .

Characteristics of the morphological and morphometric parameters of the kidneys of rats three days after mild spinal cord injury:

Kidney weight - from 743.4 mg to 998.52 mg, average weight - 853.87 \pm 24.2 mg; kidney length - from 15.38 mm to 21.68 mm, average length - 16.65 \pm 0.73 mm; width - from 6.68 mm to 9.11 mm, average - 8.33 \pm 0.32 mm; thickness - from 6.6 mm to 9.82 mm, average thickness - 7.85 \pm 0.31 mm; kidney volume ranged from 376.4 mm³ to 698.2 mm³, the average was 508.32 \pm 52.9 mm³.

The area of the renal corpuscle ranges from 1801.5 μm^2 to 2211.76 μm^2 , with an average of 2077.03 \pm 36.2 μm^2 ; the area of the vascular ball - from 1633.2 μm^2 to 1766.2 μm^2 , on average - 1790.56 \pm 17.8 μm^2 ; the area of the capsule cavity ranges from 302.87 μm^2 to 329.88 μm^2 , the average is 332.87 \pm 2.4 μm^2 .

The diameter of the proximal tubules is from 27.44 to 36.79 μm , the average is 31.63 \pm 0.9 μm , the diameter of the tubular cavity is from 15.42 to 21 μm , the average is 17.22 \pm 0.5 μm .

Conclusion: Thus, macroscopic, histological and morphometric studies revealed that under the influence of mild traumatic spinal cord injury, the kidneys of experimental group 3-month-old rats were macroscopically slightly swollen.

The results of the histological study showed that a number of characteristic changes in the structure of rat kidney nephrons were detected after mild brain injury (Fig. 1, 2). At the same time, kidney bodies of nephrons, vascular ball, Shumlyansky-Bowman capsule retain their structure. From the 3rd day after the spinal cord injury, there was a decrease in interstitial swelling, a reduction in venous vessels, a narrowing of the enlarged capsule space, preservation of the internal structural parts of the kidney body, and a decrease in focal hemorrhage zones between the proximal and distal convoluted tubules.

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