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Morphometric Indications of Rat Liver in Experimental Brain Injury

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Summary: This article describes the morphological changes in the liver in brain injury. The study was conducted on 60 white rats aged 3 months. Pathological processes in liver tissue, fullness of sinusoids of liver lobes, fatty dystrophy of hepatocytes, swelling are observed in rats under the influence of brain damage.

Keywords: rat, liver, traumatic brain injury.

The urgency of the problem. Traumatic brain injury is the most common type of injury, accounting for 40% of all types of injuries. According to statistics from the World Health Organization, the rate of this pathology is increasing by 2% every year. According to the forecasts of this organization, by 2020, as one of the main causes of death and disability, traumatic brain injury can compete with socially important diseases such as cardiovascular diseases and cerebrovascular diseases. Every year, more than 5 million people in the world die from this pathology [O.V. Martinova, 2019].

The most common causes of traumatic brain injury are traffic accidents, criminal, sports and industrial mechanical injuries. The male to female ratio is 3:1 [B. A. Bivaltsev, 2018]. Traumatic brain injury is defined as an attack on the brain due to an external physical force that can cause a reduction or alteration of consciousness and therefore affect cognitive abilities or physical activity [C.C. Leyte et al., 2008]. With a traumatic brain injury, not only a change in the density and diameter of the capillaries, but also a violation of the autoregulation of the stem of the microvessels, but also damage to the blood-brain barrier leads to brain swelling [M.A. Danielyan, 2007]. At the same time, when assessing morphofunctional changes in the liver in traumatic brain injury, the degree of brain damage is often not taken into account, and the characteristics of changes in the microcirculation of the liver are described. With severe brain damage, a violation of the adaptive arterialization of the sinusoidal blood flow and the development of intrahepatic portal hypertension can occur. Severe microcirculation disorders are accompanied by the activation of necrobiotic processes in the liver and serve as a common pathomorphological basis for the development of liver failure in brain injury [I.V. Fursov et al., 2013].

The purpose of the study was to study the morphometric changes in the liver in rats with traumatic brain injury.

Material and methods. The study was conducted on 60 white outbred rats aged 3 months. The animals were mounted on a wheeled vehicle in a hand-made device, the rats were accelerated by the machine and struck with the front of the head against a wooden barrier. As a result of this experiment, 16 white rats died on the spot. All rats that died during the experiment were decapitated. After opening the abdomen, the liver was isolated for further study. All experiments conducted on laboratory animals were carried out in accordance with the Declaration of Helsinki of the International Medical Association of 1964, as well as the declarations adopted in 1975, 1983, 1989, 1996, 2000, 2002, 2004, 2008, 2012.

The isolated liver tissue and its parts were fixed in Bouin's solution and embedded in paraffin. Next, 6-7 μm sections were prepared and stained in hematoxylin-eosin solutions. Morphometric studies were carried out on a NLCD NOVEL-307B microscope (China).

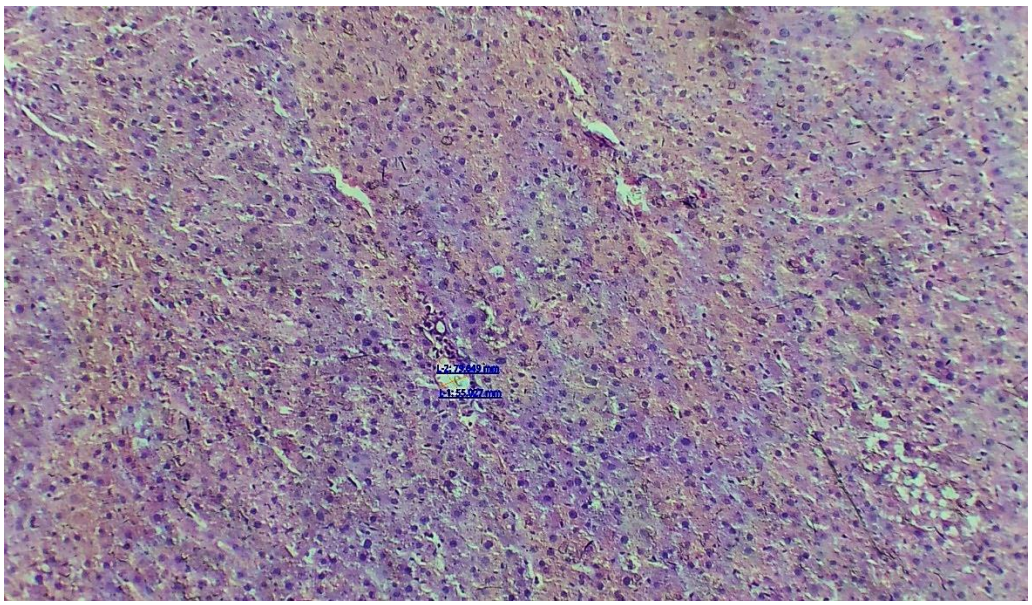

Figure 1. Morphometric parameters of the liver of a normal white breed rat. Dye hemotoxylin-eosin. Size 10x20.

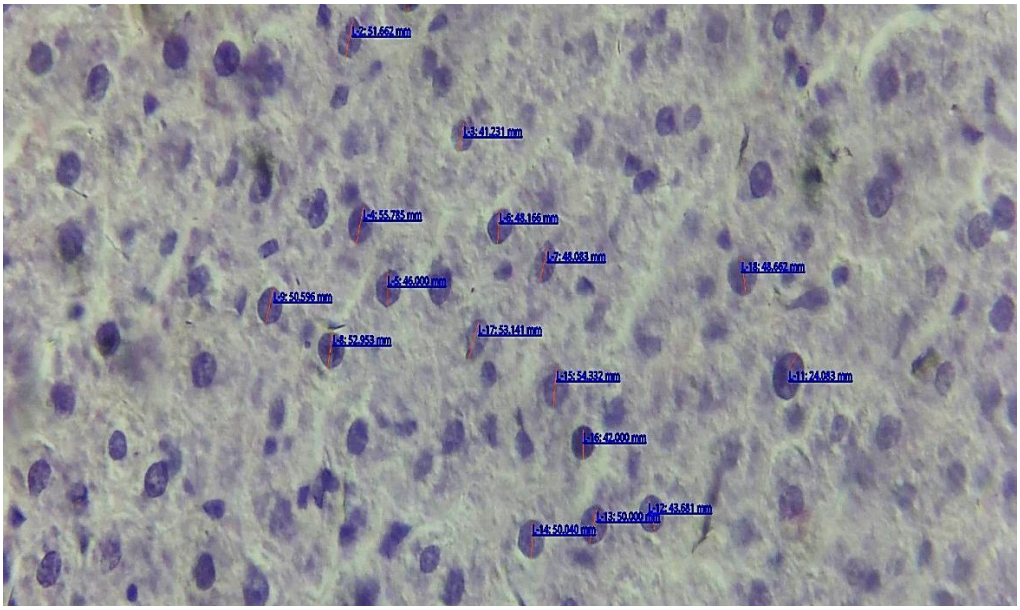

Figure 2. Morphometric parameters of the liver of a normal white breed rat. Stain hematoxylin-eosin. Size 20x40.

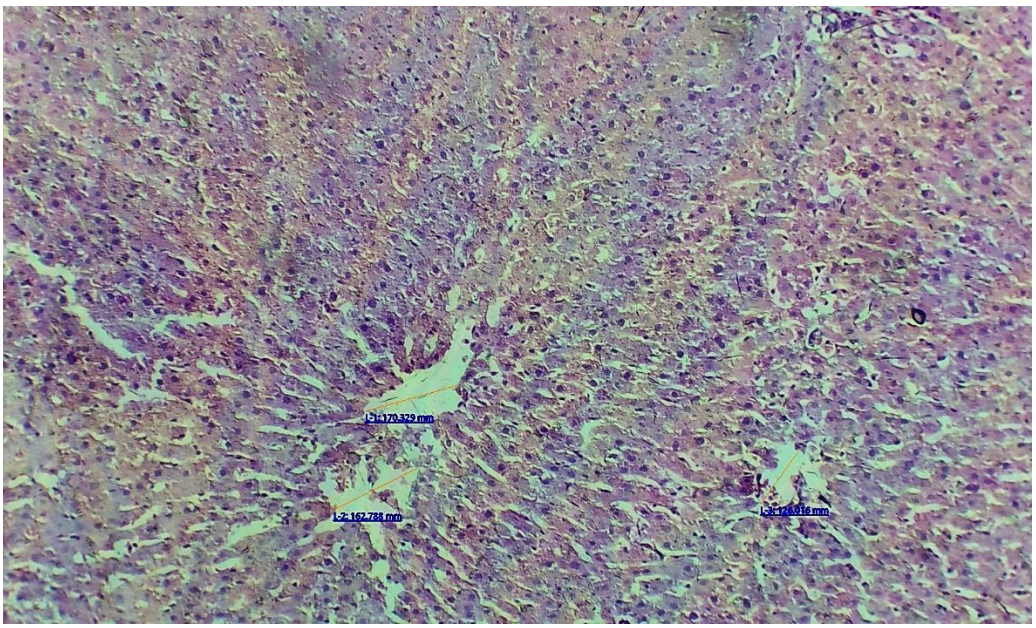

Figure 3. Morphometric parameters of the liver of a purebred rat with brain injury in an experiment. Expansion of sinusoidal spaces and capillaries, expansion of central venous blood vessels, focal dystrophic changes of hepatocytes are observed. Stain hematoxylin-eosin. Size 10x20.

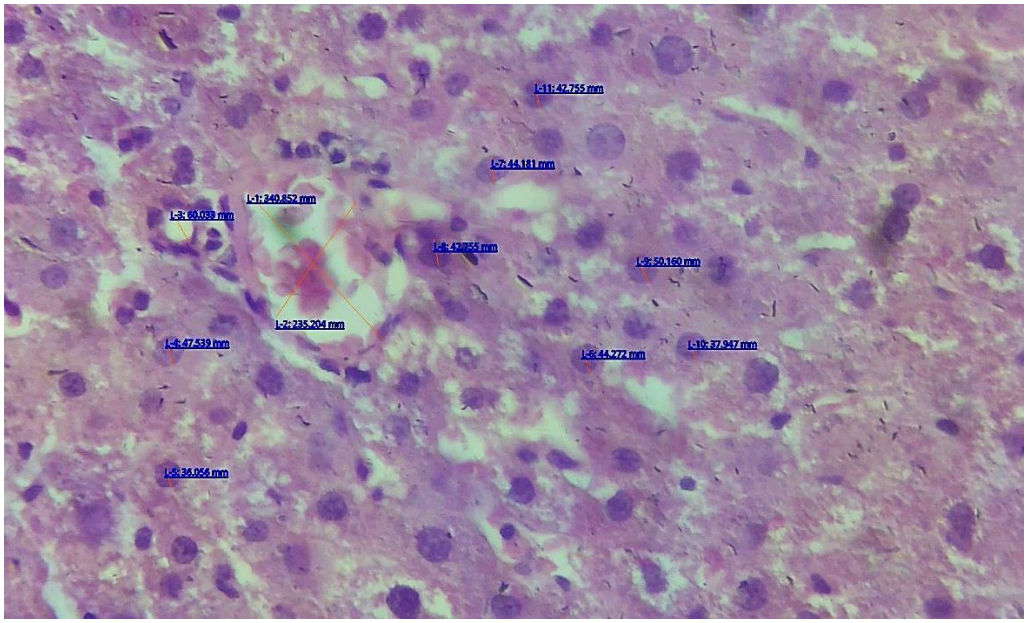

Figure 4. Morphometric parameters of the liver of a non-white breed rat that received a brain injury in the experiment. Expansion of interlobular artery vascular space, expansion of hepatocytes, enlargement of nuclei, expansion of cytoplasm, dystrophic changes in some hepatocytes. Stain hematoxylin-eosin. Size 20x40.

Morphometric parameters of the hemomicrocirculatory system and parenchymatous structures of the liver of white rats with brain injury (n = 60);

Normally			In the experiment	
№	Morphometric index, diameter, μm.	The degree of accuracy of the indicator (M±m)	Morphometric index, diameter, μm.	The degree of accuracy of the indicator (M±m)
1	central vein	54,05 ± 0,88	central vein	56,12± 1,40
2	interlobular vein	87,82 ± 1,85	interlobular vein	90,20± 2,40
3	interlobular artery	25,65 ± 2,43	interlobular artery	27,12± 2,47
4	interlobular bile duct	13,88 ± 0,82	interlobular bile duct	14,10± 1,16
5	sinusoidal capillary	28,38 ± 0,94	sinusoidal capillary	30,46± 1,58
The area is 2 μm				
1	hepatocytes	487,2 ± 11,16	hepatocytes	494,4± 12,20
2	core	58,91 ± 1,88	core	60,10± 2,24
3	cytoplasm	428,02 ± 9,20	cytoplasm	433,06± 1,08

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