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MORPHOLOGICAL CHARACTERISTICS OF THE STOMACH WALL AFTER MODELING TRAUMATIC BRAIN INJURY IN WHITE RATS

Abstract: *Relevance of the problem: The article indicates that with traumatic brain injury, the function of the gastrointestinal system is seriously impaired. The lack of literature data on morphological changes in the stomach wall depending on the periods of traumatic brain injury according to the clinical classification is stated and it is confirmed that the restoration of the function of the gastrointestinal system occurs after stabilization of respiratory and hemodynamic disorders*

Purpose of the research: To study the morphological characteristics of the wall of the stomach in white rats at different periods of traumatic brain injury in the experiment.

Materials and research methods. The work was performed on 24 white outbred rats of both sex, weighing about 250-300 grams, 3 months of age. Craniocerebral trauma was caused in white rats by a horizontal frontal shock model of TBI by simulating a road traffic injury. The morphological changes in the wall in white rats were studied depending on the periods of traumatic brain injury.

Results of the study: In the acute period, diapedetic hemorrhages and pronounced pericellular edema were observed against the background of microcirculation disorders in the gastric mucosa of white rats. In the second subacute period, the above changes worsened and covered the muscular layer of the stomach. In the third long-term period, lymphocytic infiltration, subatrophic processes, signs of proliferation and tissue regeneration in the stomach wall were determined.

Conclusions: It was found that morphological changes in the stomach wall are characteristic in all periods of traumatic brain injury and in proportion to the severity of the injury. These morphological changes occur as a result

of a disturbance in the nervous regulation of the stomach against the background of spasm and disturbance of microcirculation in the wall of the stomach of a white rat in response to a traumatic brain injury.

***Key words**: modeling of traumatic brain injury, white rat, horizontal shock method, morphological changes in the stomach wall.*

***Language**: English*

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Introduction

The function of the gastrointestinal tract is seriously impaired in victims of traumatic brain injury in proportion to the severity of the injury. A specific complication of the acute period is regurgitation and aspiration of gastric contents, later there is a real risk of ulceration and bleeding from the upper gastrointestinal tract. Restoration of the function of the gastrointestinal tract in severe traumatic brain injury occurs last after clarification of the consciousness of patients, correction of respiratory, hemodynamic and mental disorders [1,7,8,9,10,17].

The proposed various methods of gastroprotection: the use of H2-blockers, antacids, the beginning of early enteral nutrition for the prevention of ulceration and ulcerative bleeding, unfortunately, turned out to be ineffective. At the same time, a decrease in the pH of gastric contents, the use of broad-spectrum antibiotics led to contamination of the infection in the respiratory tract and an increase in the frequency of nosocomial pneumonia. [8,9,11,14,17]

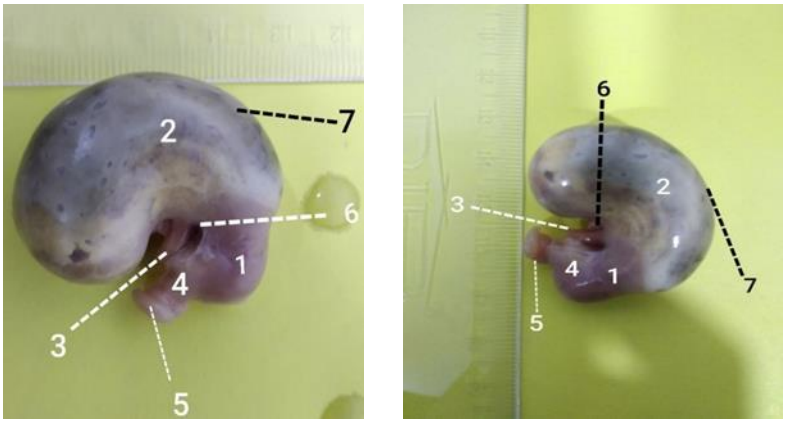
Despite significant advances in studies devoted to the treatment of this complication of traumatic brain injury, morphological changes in the stomach in this pathology require in-depth study. The ongoing search for effective treatments for traumatic brain injury requires a mandatory preliminary assessment in the experiment prior to implementation in practice [4,15,20]. The study of the available literature data revealed a lack of information on changes in the morphometric parameters of the stomach at different periods of traumatic brain injury. In addition, changes in the wall of the stomach in traumatic brain injury and their correction is still an open question. This requires further study and improvement of methods of gastric protection in traumatic brain injury with the use of new drugs in the experiment [5,6,13,14,15,16,17,18].

Purpose of the research: To study the morphological characteristics of the wall of the stomach in white rats at different periods of traumatic brain injury in the experiment.

Methods and examinations: The work was carried out on 24 white outbred rats of both sex, weighing about 250-300 grams, 3 months of age. The keeping of animals and experimental studies carried out with them were carried out in accordance with the regulatory documents and their requirements. We caused a traumatic brain injury in white rats with a horizontal frontal shock model of TBI by simulating a road traffic injury [4,15,20]. In road traffic injuries in humans, TBI often occurs as a result of linear and rotational accelerations or decelerations. This clinical scenario was reproduced by us on a special device in the experiment as follows. The study was carried out against the background of inhaled general anesthesia with isoflurane in appropriate doses by the body weight of the animal. The rat is laid with its stomach on a trolley and the head of the animal is not fixed on the headrest. The cart with the rat moved along a lowered special rail track, on the way of which an obstacle was created for the collision of the animal's head. At the same time, the coal of the descent of the track is 45 degrees and the mass of the cart without a rat is 500 grams, the length of the track is 1.5 meters. Thus, we caused a traumatic brain injury in white rats. [picture№1].

Picture №1. Horizontal impact model of TBI

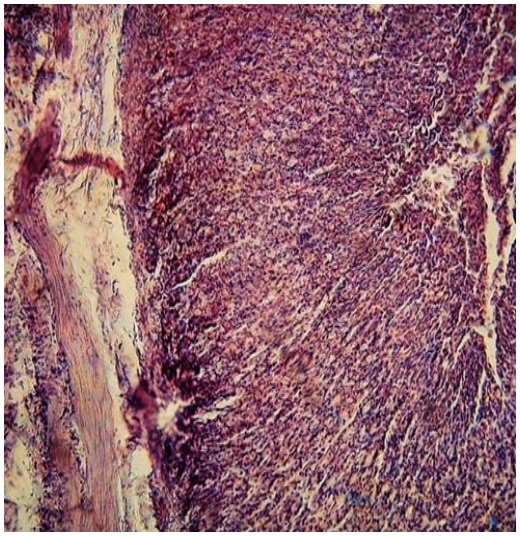
After inflicting a traumatic brain injury, 24 white rats were divided by 8 into 3 groups. All rats were under our supervision in special boxes with free access to water and food. According to the periods of the clinical classification of traumatic brain injury [12,19]. 8 rats were slaughtered on day 3, 8 rats on day 10, and 8 rats on day 22. Against the background of inhalation general anesthesia with isoflurane, rats were decapitated, a median wide laparotomy was performed, and the stomach of white rats was removed (picture №2).



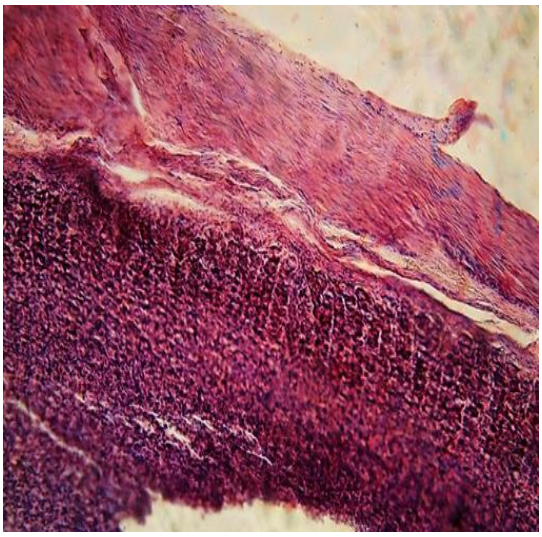
Picture № 2. White rat 12 weeks: 1-fundus of the stomach; 2-esophageal part of the stomach; 3-Abdominal part of the esophagus; 4-pyloric part of the stomach; 5- Transition to the duodenum (pyloric sphincter); 6-lesser curvature; 7- large curvature.

To achieve the goal, the morphological characteristics of the stomach wall of all three groups of white outbred rats were studied. At the same time, a 1.0 cm x 1.0 cm biomaterial was excised from the bottom, body and pyloric section of the stomach for microscopic examination. Made a cut of blocks 5-8 microns. The histological material is stained with hematoxylin and eosin. It was examined with a trinocular light microscope and photographed.

Results and discussion. Light microscopic examination of the stomach wall of a white rat 3 days after the application of TBI showed that most of the capillaries were dilated. Diapedetic hemorrhages and pronounced pericellular edema were determined. When examining the arterioles, pronounced perivascular edema and edema of the vascular endothelium are visible, inside which hyaline thrombi were noted in places. In the venules, a pronounced edema of the endothelium was determined, inside the vessel there were accumulations of erythrocytes and plethora, parietal hyaline thrombi (picture 3,4). These changes indicate a violation of microcirculation in the stomach wall of the white rat.

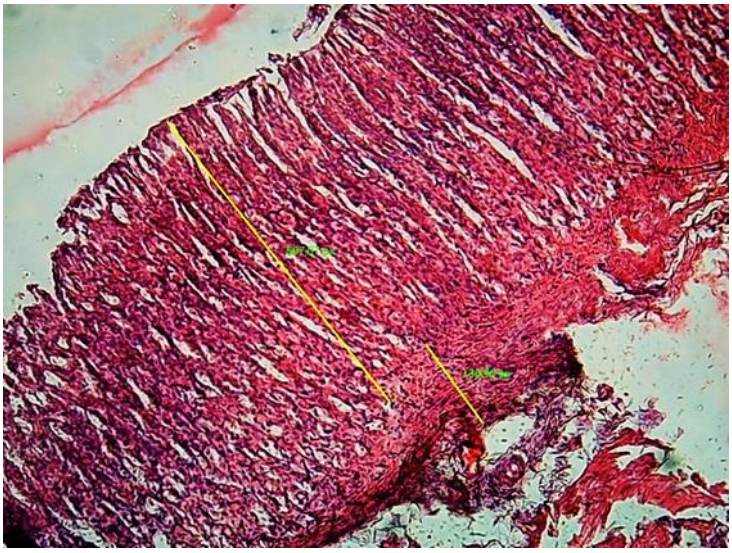


Picture №3. Disturbance of microcirculation in the stomach wall of a white rat swelling and congestion. Staining G-E. 10*10. Acute period of TBI for 3 days.

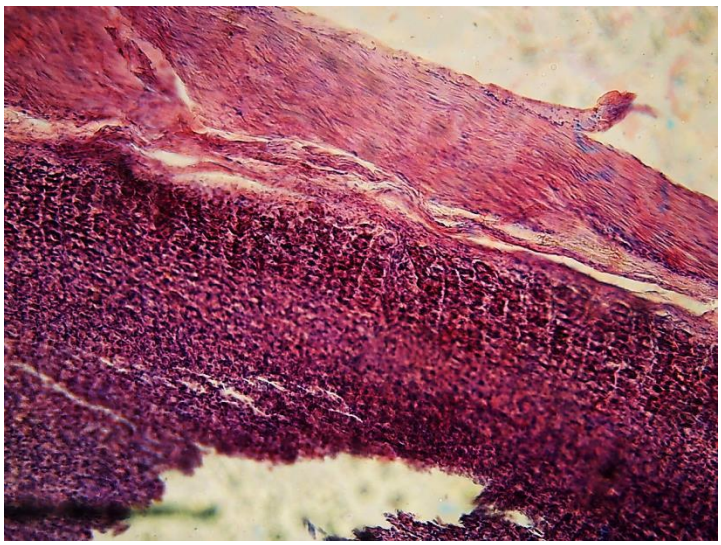


Picture №4. In the serous wall, there is edema, impaired microcirculation in the stomach wall of a white rat with uneven plethora. Coloring GE 4*10. Acute period of TBI on the 3 rd day

On the 10th day after injury, when studying micropreparations of the stomach of a white rat using a light microscope, erythrocyte slides were determined in many capillaries. There was marked endothelial edema and perivascular edema, not only in the serous membrane, but also in the muscle layer. This indicates the transition of the pathological process to the muscular layer of the stomach. (picture 5,6).



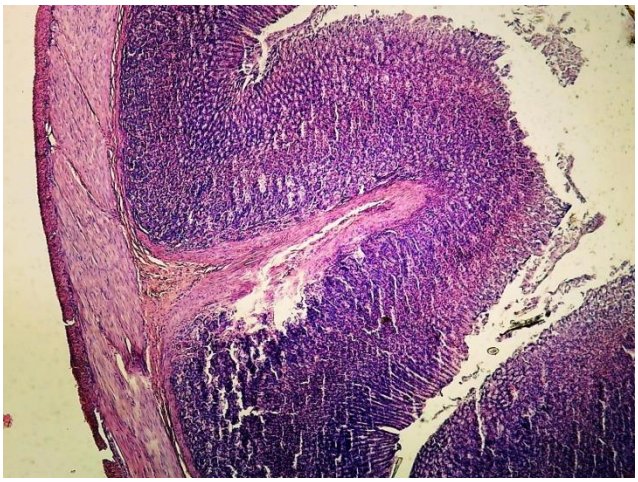
Picture 5. Edema of the muscular wall of the stomach Plethora of small a white rat. 4*10 Subacute period of TBI for 10 days



Picture №6. Blood filling of the vessels of the muscular membrane.Disturbance of microcirculation in the stomach wall of a white rat.Coloring G-E. 4*10. Subacute period of TBI on the 10th day.

The long-term period, 22 days after the traumatic brain injury, morphological changes in the stomach wall of the white outbred rat were characterized mainly by edema, lymphocytic infiltration and subatrophic processes. (picture 7,8).

Picture №7. Gastric mucosa with moderate lymphocytic infiltration. The proprer plate of the mucous membrane is edematous. Coloring G-E 4*10 .Long-term TBI for 22 days.



Picture №8. The muscular plate of the mucous membrane was unremarkable. Partial atrophy of the unilamellar prismatic glandular epithelium. Coloring G-E 4*10 .Long-term TBI for 22 days.

Conclusion: Thus, the results of the study show that in the process of the development of traumatic disease, local brain damage causes a restructuring of the architectonics of the microvasculature not only in the area of brain damage, but also in the microvessels of the stomach. Morphological changes in the stomach wall are characteristic in all periods of TBI and in proportion to the severity of the injury. These morphological changes occur as a result of a disturbance in the nervous regulation of the stomach against the background of spasm and disturbance of microcirculation in the wall of the stomach of a white rat in response to a traumatic brain injury. In the acute period, dilatation of capillaries, diapedetic hemorrhages, pronounced edema and subsequent thrombosis of small vessels are characteristic. In the second period, these changes were aggravated and covered the muscular layer of the stomach. The long-term period differs with lymphocytic infiltration, subatrophic processes, signs of proliferation and regeneration of stomach tissues. Despite these conclusions, morphological changes in the wall of the stomach in traumatic brain injury, taking into account its periods, the severity and correction of these disorders is still an open question. This requires further study and improvement of methods of gastric protection in traumatic brain injury with the use of new drugs in experiment and in practice.

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