BRITISH MEDICAL JOURNAL

10.5281/zenodo.6874698

British Medical Journal
Volume 2, No 1., 2022
Internet address: http://ejournals.id/index.php/bmj
E-mail: info@ejournals.id
Published by British Medical Journal
Issued Bimonthly
3 knoll drive. London. N14 5LU United Kingdom
+44 7542 987055
Chief Editor
Dr. Fiona Egea

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British Medical Journal Volume-2, No 4
10.5281/zenodo.6874698

Morphometric characteristics of the walls of the stomach after modeling mild traumatic brain injury in white rats

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Abstract: The article states that the study of scientific literature data revealed a lack of information about changes in the morphometric parameters of the walls of the stomach at different periods of traumatic brain injury. It is noted that there are serious deviations in the morphometric parameters of the walls of the stomach in the syndrome of "acute damage to the stomach" after a traumatic brain injury.

Purpose of the research: To conduct a morphometric study of the walls of the stomach in white rats with acute damage to the stomach in different periods of traumatic brain injury.

Materials and research methods. The work was carried out on 135 white outbred rats of 3 months of age of both sexes, weighing about 150-170 grams. A traumatic brain injury was caused by the TBI model "traffic accident". Morphometric changes in the walls of white rats were studied in all periods of traumatic brain injury.

Results of the research: The article states that the syndrome of "acute injury to the stomach" in the acute period of TBI was characterized by an increase in the total thickness of the stomach wall and its mucous membrane, submucosa, height of the gastric glands, smoothing of gastric folds and dimples due to edema and impaired microcirculation in the walls stomach of white rats. These changes persisted in the pyloric part of the stomach until the middle of the intermediate period of TBI. In the third period, a decrease in the thickness of the mucous membrane, the height of the gastric glands, which can be thought of, about the secretory dysfunction of the stomach, was determined. The article describes the correlation of morphometric parameters with periods of TBI. The consequences of morphometric deviations of the walls of the stomach and the timing of their recovery are indicated.

Conclusions: It was found that morphometric changes in the stomach wall are typical in all periods of traumatic brain injury. These morphometric changes occur as a result of a violation of the nervous regulation of the stomach against the background of spasm and a violation of microcirculation in the stomach wall of white rats in response to traumatic brain injury.

Keywords: modeling of traumatic brain injury, white rat, acute injury of the stomach, morphometry of the walls of the stomach.

Relevance of the problem: The function of the gastrointestinal tract is seriously impaired in victims with traumatic brain injury in proportion to the severity of the injury. A specific complication of the acute period of TBI is the syndrome of "acute damage to the stomach". [2,3,4,12]

Violation of microcirculation in the walls of the stomach and a violation of the secretory and motor function of the stomach against the background of autonomic

10.5281/zenodo.6874698
nervous dysregulation contributes to a real risk of ulceration and bleeding from the upper gastrointestinal tract.

Restoration of the function of the gastrointestinal tract in traumatic brain injury occurs last after the clarification of the consciousness of patients, correction of respiratory, hemodynamic and volemic disorders [1,7,8,9,10,17]

The study of the available literature data revealed a lack of information about changes in the morphometric parameters of the stomach in different periods of traumatic brain injury. Morphometric changes in the walls of the stomach in the syndrome of "acute gastric injury" require in-depth study to improve the methods of protection of the stomach in traumatic brain injury [5,6,13,14,15,16,17,18]

Purpose of the research: To conduct a morphometric study of the walls of the stomach in white rats with acute damage to the stomach in different periods of traumatic brain injury.

Examination method: We induced a craniocerebral injury in white rats with a horizontal frontal shock model of TBI by simulating a road injury. (Fig. 1)

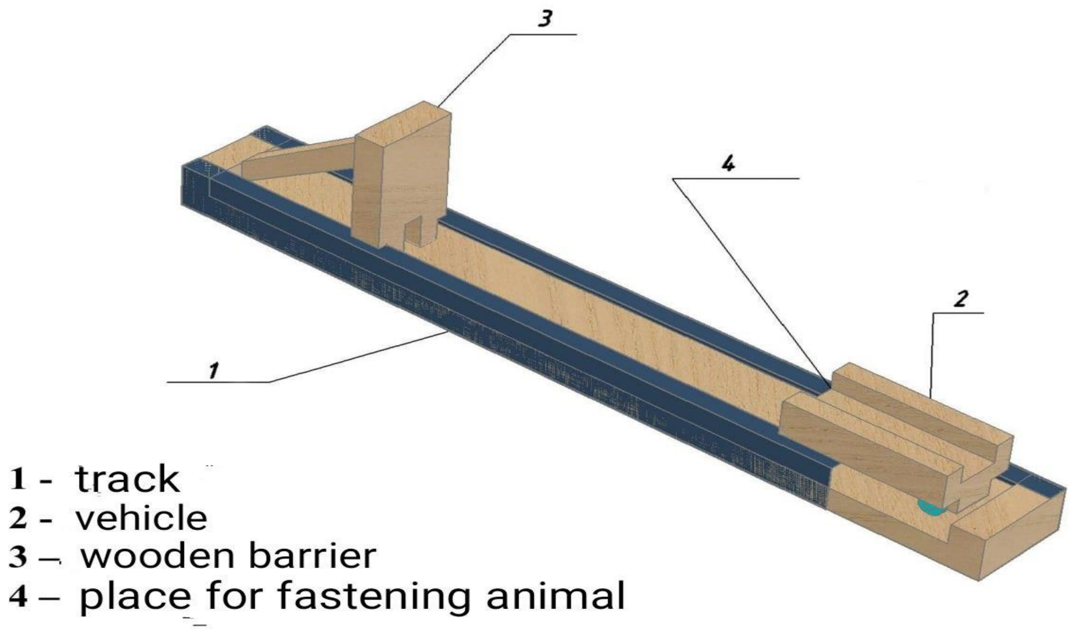

Figure No. 1 Model "Road traffic accident".

This method simulates a traumatic brain injury and all the necessary details of a traffic accident - a head-on collision, acceleration of a car, acceleration of an experimental animal, inertial movement of body parts. This model is comfortable, stable to use, and close to the conditions of a traffic accident. A wheeled transport device consists of a wooden track, a vehicle moving on it, on which an animal is attached, and a wooden barrier where the animal hits with its head end. The wooden track was 130 cm long and 15 cm wide, and the vehicle was 20 cm long, 13 cm wide and 5 cm high. With a 45-degree inclination of the track, the vehicle's speed reached up to 16 km/h at the end of the track before hitting the obstacle. Reproduction of a mild craniocerebral injury was performed against the background of inhaled general anesthesia with isoflurane in appropriate doses depending on the body weight of the animal. The rat was placed prone on the cart, with the animal's head not fixed on the headrest. The cart with the rat moved along a lowered wooden path, on the way of which an obstacle was created for the collision of the animal's head. At the same time, the angle of the descent of the track is 45 degrees and the mass of the cart without a rat is 500 gr., The length of the track is 1.3 meters. Thus, we caused mild traumatic brain injury in white rats.

Object of examination: The work was carried out on 135 white outbred rats of 3 months of age of both sexes, weighing about 150-170 grams. 10 white outbred rats were included in the control group, which was not caused by TBI, their morphometric parameters of the stomach sections were studied to compare the results with the experimental group. All other experimental animals received a mild craniocerebral wound. They were slaughtered on the 3rd, 7th, 14th, 21st, 28th days corresponding to the periods of TBI. Histological material was stained with hematoxylin and eosin. Morphometry of various sections was carried out - the cardiac and pyloric parts, the body of the stomach using (DN-107T / Model NLCD-307B (Nobel, China), ocular micrometer. The total thickness of the stomach wall and the thickness of the mucosa, submucosa, muscle membranes, the height of the gastric folds, the depth of the gastric pits, the height of the gastric glands in the cardial part, the body and the pyloric part of the stomach, the number of main, parietal, accessory cells.

Results of the research and discussion: In the acute period of mild traumatic brain injury, a morphometric study of the walls of the stomach of white rats revealed a thickening of all its departments. The total thickness of the stomach walls increases towards the pyloric part. The thickness of the mucous membrane is; in the cardial part 397.5±2.9 μm, in the body area 497.5±3.4 μm, in the pyloric part 445.9±5.2 μm. The inner surface of the mucous membrane is not smooth and very diverse. It has gastric folds, gastric fields and gastric dimples, which create a kind of relief of the inner surface. During the study, we measured the height of the gastric folds. It is 205.4±1.8 μm in the cardial part, 215.3±2.2 μm in the body region, and 221.5±3.1 μm in the pyloric part. Gastric folds and gastric fields are visible to the naked eye, in the region of lesser curvature they are located longitudinally, as if a continuation of the folds of the esophagus. In other areas, the folds have a different direction. Between the folds are gastric fields. There are gastric dimples on the fields. The ducts of the gastric glands open into each dimple. Gastric dimples are microscopic in size. Their depth is not lonely in different parts of the stomach. In our study, we measured their depth in the cardiac region, which is 92.6 ± 0.6 μm, in the body of the stomach 102.3 ± 0.8 μm, in the pyloric region 224.5 ± 1.1 μm. The deepest gastric pits are in the pyloric region, which are almost half the size of the thickness of the gastric mucosa of this part. The depth of the gastric pits in the pyloric part is higher than in the rest of the stomach. The size of the gastric folds and dimples decreases in the acute period and this indicator remains until the middle of the intermediate period Fig. 2.

We have studied the structure and height of the gastric glands, which are located in the lamina propria of the mucous membrane. Fundic or own glands of the stomach are found mainly in the fundus and body of the stomach. Cardiac and pyloric glands

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are found in the same parts of the stomach. The fundic glands are unbranched long tubular glands. Cardiac - unbranched simple tubular glands. The pyloric glands of the stomach are short branched glands. They are rare. The height of the glands of the gastric mucosa is 19.1±0.2 μm in the cardial part, 16.4±0.3 μm in the body region, and 21.3±0.4 μm in the pyloric part. In the glands of the stomach, the main, parietal and additional exocrine cells are distinguished. Chief cells synthesize pepsinogen (pepsin precursor), parietal cells produce hydrochloric acid, and accessory cells produce mucus. The submucosa consists of a loose connective tissue in which the neurovascular plexus is located. The thickness of the submucosa varies in the cardial part 30.3±0.2 μm, in the body area 38.3±0.5 μm, in the pyloric part 41.5±0.3 μm.

The muscular coat consists of 3 layers of smooth muscle cells: outer longitudinal, middle circular, inner oblique. The thickness of the muscular membrane varies in the cardial part 230.2±2.3, in the body area 234.8±2.4 μm, in the pyloric part 296.4±2.8 μm. The muscular membrane of the fundus of the stomach has the smallest thickness 186.3 ± 1.4 microns. This membrane is well developed in the pyloric part of the stomach.

Morphometry of the wall of the cardial part of the stomach after TBI. Figure 3

Sections of the stomach	**Before injury**	**3-day**	**7-day**	**14-day**	**21-day**	**28-day**
Total wall thickness, mkm	498,8±14,3	585,7 ±13,8	572,2 ±11,3	496, 6±11,4	489 ,2±10,1	423, 4±11,8
Mucosal thickness, mkm	303,5±8,4	376,4 ±8,9	372,3 ±7,8	301, 6±6,8	288 ,4±5,6	254, 8±6,7
The height of the gastric folds, microns	258,5±6,5	202,3 ±4,6	203,1 ±5,7	254, 2±5,2	253 ,7±6,4	241, 4±6,2
Depth of gastric dimples, microns	75,9±1,1	54,3 ±1,4	55,3± 1,2	76,3 ±1,4	70, 3±1,5	65,3 ±1,6
The height of the stomach glands, microns	18,4±0,7	32,3 ±0,6	31,4± 0,4	17,3 ±0,5	16, 7±0,5	14,6 ±0,3
Submucosal thickness, microns	31,0±0,9	43,2 ±0,5	42,4± 0,6	32,6 ±0,7	31, 7±0,9	31,5 ±0,8
The thickness of the muscle membrane, microns	162,5±2,8	171,2 ±2,1	167,6 ±2,7	160, 2±2,3	161 ,4±2,4	159, 8±2,8

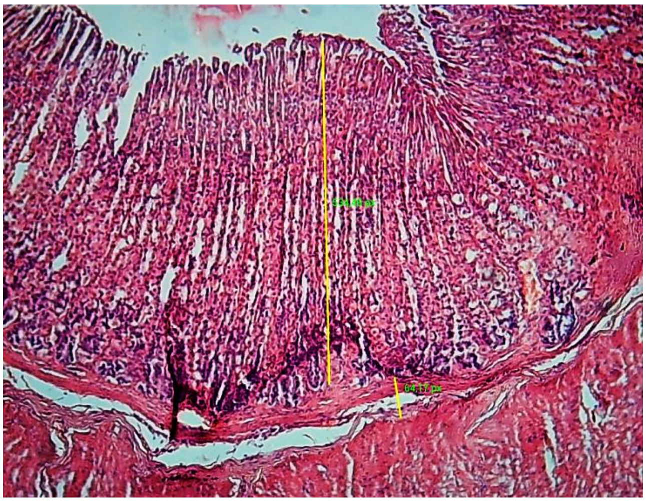

Figure No. 2 Morphometry of the wall of the cardial part of the stomach after trauma after TBI on the 3rd day. There is swelling of the mucous membrane, submucosa, smoothness of the gastric folds.

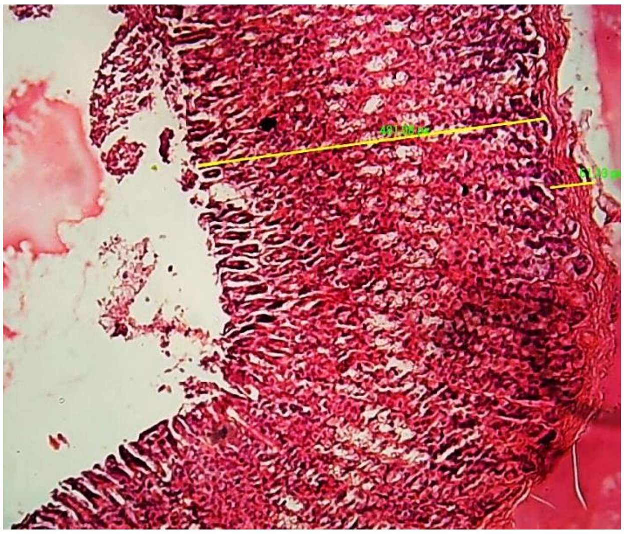

Figure No. 3 Morphometry of the wall of the cardial part of the stomach on the 7th day after injury after TBI. There is a regression of edema of the mucous membrane, submucosa, restoration of the relief of gastric folds.

Morphometry of the wall of the pyloric part of the stomach after TBI. Figure 4

Sections of the stomach	**Before injury**	**3-day**	**7-day**	**14-day**	**21-day**	**28-day**
Total wall thickness, mkm	683,8 ±16,7	798,5 ±15,2	803,4 ±14,7	783, 9±15,3	684 ,9±16,8	603 ±14,3
Mucosal thickness, mkm	443,6±9,4	583,8 ±10,4	612,8 ±9,7	578, 4±8,9	445 ,2±8,7	401, 6±6,9
The height of the		335,9	328,9	345,	382	380,

gastric folds, microns	381,4±3,7	±3,4	±3,8	8±4,3	,4±3,2	4±4,6
Depth of gastric dimples, microns	187,5±1,8	134,3 ±2,1	123,6 ±1,9	143, 7±2,3	186 ,2±1,7	175, 2±1,6
The height of the stomach glands, microns	25,4±1,0	44,2 ±1,1	52,3± 1,2	42,3 ±1,0	24, 5±0,9	21,3 ±1,1
Submucosal thickness, microns	45,6±1,0	60,1 ±1,1	71,2± 0,8	58,2 ±1,3	43, 2±1,4	44,2 ±1,2
The thickness of the muscle membrane, microns	297,5±3,6	301,2 ±3,2	304,3 ±2,8	295, 3±2,4	294 ,3±2,9	298, 3±3,1

Figure No. 4 Morphometry of the mucous membrane of the pyloric part of the stomach before injury. Normal branched glands of the stomach are visible.

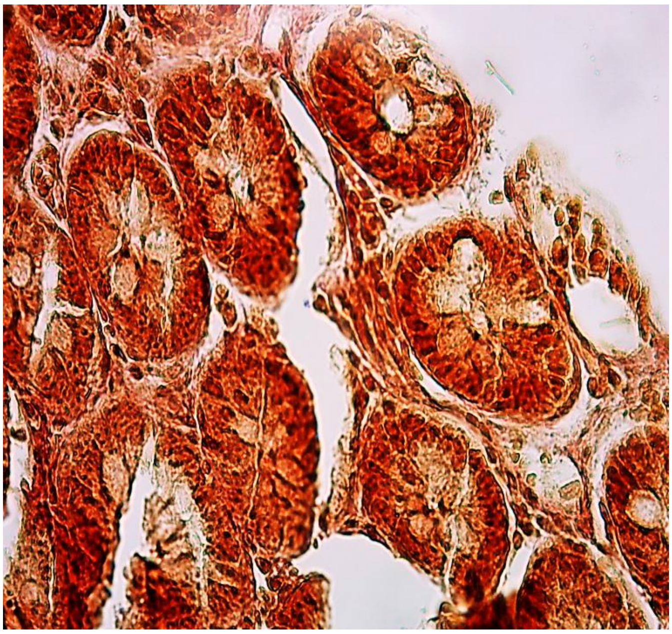

Figure No. 5 Morphometry of the mucous membrane of the pyloric part of the stomach 3 days after TBI. Edema of the glandular tissue of the stomach, an increase in the height of the glands, closure of the ducts of the glands.

Conclusion: Thus, the results of the study show that in the process of developing a traumatic disease, edema and a violation of the microcirculatory bed in the microvessels of the stomach walls are caused. Morphometric changes in the walls of the stomach are typical in all periods of TBI. In the acute period, capillary dilatation, diapedetic hemorrhages, pronounced edema and subsequent thrombosis of small vessels are characteristic. These deviations are expressed by an increase in the thickness of the mucous membrane, the height of the gastric glands and the submucosa, where the neurovascular formations are located. In the second period of TBI, there was a regression of the above morphometric changes, but they persisted in the pyloric part of the stomach until the beginning of the long-term period. The remote period is characterized by a decrease in the thickness of the mucous membrane and the height of the gastric glands, indicating a violation of the secretory function of the stomach. In this period, lymphocytic infiltration and subatrophic processes in the walls of the stomach are noted. This requires the improvement of methods for protecting the stomach in traumatic brain injury with the use of new drugs in the experiment and in practice.

References

1. Aliev F.I. The role of the vagoinsular and enterin systems in the formation of acute ulcers and erosions of the gastroduodenal zone in concomitant craniocerebral injuries, depending on the combination of injuries. Journal of Anesthesiology and Intensive Care 2016. 61(2)
2. Autenschlus A. I. et al. The content of some cytokines in children with lesions of the central nervous system. // Journal of Neurology and Psychiatry. S.S.Korsakov. 2003. - T. 103, No. 3. - P. 52-54).
3. Badmaeva L.N. Laboratory methods for establishing prescription of craniocerebral trauma in forensic medicine // Sud.-med. expertise. - 2003. 1. - P. 37-39)
4. Beloshitsky V.V. Principles of modeling traumatic brain injury in the experiment. Ukrainian neurosurgical journal, №4 2008
5. Boyarintsev V.V. Acute erosions and ulcers of the gastrointestinal tract in patients with polytrauma / V.V. Boyarintsev, C.B. Gavrilin, Ya.V. Gavrishchuk // Ambulance. - 2007. - V.8, No. 3. - P. 55-56.
6. Vereshchagina E.I., Vereshchagin I.P. Intensive care of severe and combined traumatic brain injury. Novosibirsk; 2007.
7. Gavrilin C.B. Damage to the mucous membrane of the gastrointestinal tract in patients with multiple and concomitant injuries. Gavrilin S.V., Gavrishchuk Ya.V. // Bulletin of the Russian Military Medical Academy. - 2007., No. 1 (17). - part 2. P. 12.)
8. Gelfand B.R. Prevention of stress damage to the gastrointestinal tract in critically ill patients. / B.R. Gelfand, A.V. Guryanov, A.N. Martynov // Consiliummedicum 2005; 7:6:464-467.
9. Gelfand, B. R. Prevention of stress injuries of the upper gastrointestinal tract in critically ill patients /
10. Ermolov A.S. [and others] Gastroduodenal bleeding in critical conditions. / // Surgery 2004; 8:41-45).
11. Karpenko, S. N. Syndrome of acute damage to the stomach and duodenum in patients with severe concomitant trauma// Complicated cholelithiasis: materials of a scientific-practical conference with international participation. Krasnodar-Anapa 2012 - P. 311).
12. Konovalova A. N., Likhterman L. B., Potapov A. A. Clinical guide to traumatic brain injury. - M.: Antidor, 2002. - V.1. - 550 p.
13. Krylov V.V. [et al.] Secondary factors of brain damage in traumatic brain injury / Russian Medical Journal, - 2009. - No. 3. - P. 23-28.
14. Pirov U. M. Prevention and treatment of acute injuries of the stomach in traumatic brain injury _ Abstract of the thesis. diss. ... candidate of medical sciences - Dushenbe, 2018).
15. Salamov V.B., Teshaev Sh.Zh., Bafoev U.V. p.214
16. Salomov V.B., Teshaev Sh.Zh., Bafoev U.V. Features of the anatomical parameters and topography of the stomach of white rats. 2021 №1(125) P.146

17. Teshaev Sh.Zh., Salomov V.B. Acute gastrointestinal complications after traumatic brain injury. New day in medicine 2 (30) 2020 P.224

18. Fursov I.V., Grave V.V. Extracranial complications of severe craniocerebral injury Tauride Medical and Biological Bulletin 2013, volume 16, No. 3, part 3 (63)

19. Tsarenko C.B. Neuroreanimatology. Intensive care of traumatic brain injury / C.B. Tsarenko. Moscow: Medicine, 2006).

20. Tsymbalyuk V.I., Kochin O.V. Experimental modeling of traumatic brain injury Ukrainian neurosurgical journal №2 2008