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## Evaluation of the effectiveness of treatment of experimental postoperative peritonitis

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### Abstract

**Purpose:** to develop a new method of lavage of the abdominal cavity in the experimental conditions.

**Materials and methods.** In the experiment we use 40 rats Wistar line weighing 160-240 g, kept in a vivarium in compliance with all standards.

**Research results and their discussion.** During relaparotomy, we performed mechanical cleaning of the abdominal cavity from fecal masses, layers of fibrin, the abdominal cavity was washed twice with 100 ml of 0.02% decamethoxine solution at a temperature of 30-35 ° C. After removing the drug residues from the abdominal cavity, we pour 50 ml of Extranil peritoneal dialysis solution at a temperature of 37°C, the active substance of which is icodextrin, not glucose, ie it is not a nutrient medium for microorganisms, but has antimicrobial action due to hyperosmolarity and increases its adsorption properties.

**Key words:** Postoperative peritonitis; experiment; sanitation of the abdominal cavity.

**Problem statement and analysis of recent research and publications.** Despite the great achievements of anesthesiology and intensive care, the introduction of the latest methods of diagnosis and treatment, successful surgical interventions, including videolaparoscopic

technology, types of complications in the postoperative period on the abdominal cavity and their long-term consequences have not changed. [4; 7; 10]. Abdominal abscesses are diagnosed in 3-10% of patients operated on various surgical diseases of the abdominal cavity and retroperitoneal space. During surgery for urgent indications, especially in diffuse peritonitis, the frequency of purulent complications increases to 15–25% [6; 5; 9]. The most common of the intraperitoneal complications that require repeated surgery are purulent-septic, especially postoperative peritonitis. Mortality after repeated surgery due to postoperative peritonitis is quite high, reaching 23-34%, and in severe cases - even 70-90%. Poor results of surgical treatment are caused primarily by untimely diagnosis due to latent manifestations of complications and, as a consequence, due to late performance of repeated surgical interventions [3; 8]. In recent years, there have been reports of the use of various antiseptic solutions in patients with postoperative peritonitis for abdominal lavage. Their use provides versatility in a single system, which determines both therapeutic and prophylactic effects. However, in clinical settings it is not always possible to study the effect of mediators on the human body, so it is important that clinical application is preceded by the study of their effectiveness in the experiment [1; 2].

**Purpose:** to develop a new method of lavage of the abdominal cavity in the experimental conditions.

**Materials and methods.** In the experiment we use 60 rats Vistar line, weighing 160-240 g, kept in a vivarium in compliance with all standards. General clinical and biochemical studies were conducted in the laboratory of the Department of Biological and Medical Chemistry of Ivano-Frankivsk National Medical University. According to the objectives of the study, animals are divided into two groups, control (n = 20) and main (n = 40), each of which in turn was divided into subgroups depending on the timing of relaparotomy:

Cp - control group, after modeling of postoperative peritonitis (n = 3).

Cr - control group, operated at 6 h after simulation of peritonitis in the reactive phase (n = 3).

Ctox - control group, operated at 24 h after simulation of peritonitis in the toxic phase of peritonitis (n = 3).

Cter - control group, operated at 72 h after simulation of peritonitis in the terminal phase of peritonitis (n = 3).

C3 - control group of rats on the 3rd day after relaparotomy, intestinal suturing, lavage of peritonitis (n = 3.)

C7 - control group of rats on day 7 after relaparotomy, intestinal suturing, lavage of peritonitis (n = 3).

C14 - control group of rats on the 14th day after relaparotomy, intestinal suturing, lavage of peritonitis (n = 2).

Mp - the main group, after modeling postoperative peritonitis n = 3.

Mr is the main group operated at 6 h after simulation of peritonitis in the reactive phase (n = 3).

Mtox is the main group operated at 24 h after simulation of peritonitis in the toxic phase of peritonitis (n = 3).

Mter is the main group operated at 72 h after simulation of peritonitis in the terminal phase of peritonitis (n = 3).

M3 - the main group of rats on the 3rd day after relaparotomy, intestinal suturing, lavage of peritonitis (n = 10)

M7 - the main group of rats on the 7th day after relaparotomy, intestinal suturing, lavage of peritonitis (n = 10)

M14 - the main group of rats on the 14th day after relaparotomy, intestinal suturing, lavage of peritonitis (n = 8).

**Research results and their discussion.** During relaparotomy we perform mechanical cleaning of the abdominal cavity from fecal masses, layers of fibrin and to wash the abdominal cavity with 100 ml of 0.02% solution of decamethoxine at a temperature of 30-35°C twice during relaparotomy. After removing the drug residues from the abdominal cavity, 50 ml of Extranil peritoneal dialysis solution, the active substance of which is icodextrin, not glucose, ie it is not a nutrient medium for microorganisms, but has antimicrobial action due to hyperosmolarity and increases its adsorption properties, was poured at a temperature of 37°C. This was followed by drainage of the abdominal cavity from four points with PVC tubes, which were intimately fixed to the skin and covered for 6 hours. The experiments were performed on white rats weighing 180 - 200 g (following the principles of humanity treatment of laboratory animals), which were divided into three groups. The first group - control - intact animals. The second group - with postoperative peritonitis, in which isotonic sodium chloride solution was used for abdominal lavage. The third group was with postoperative peritonitis, in which 0.02% decamethoxine solution and Extranil peritoneal dialysis solution were used for abdominal lavage.

In the study of clinical and laboratory blood parameters in animals with experimental postoperative peritonitis on the second day there was an increase in the number of leukocytes, ESR and a decrease in the content of lymphocytes, hemoglobin and erythrocytes (Table 1).

Table 1 - Dynamics of endogenous intoxication and antioxidant protection indexes in animals with experimental postoperative peritonitis during treatment.

Indexes	Norm (n=30)	Before treatment (n=10)	After treatment	
			7 days (n=10)	14 days (n=10)
LII (CU)	0,72±0,03	7,02±1,02 p<0,001	2,86±0,12 p<0,001	1,08±0,02 p<0,05
MSM (CU.)	0,214±0,002	0,704±0,018 p<0,001	0,300±0,004 p<0,001	0,228±0,009 p<0,05
MA (nmol/0.1 ml)	3,518±0,097	5,72±0,192 p<0,001	4,082±0,182 p<0,02	3,515±0,16 p>0,05
DC (CU/in 1 ml.)	1,45±0,025	2,23±0,097 p<0,001	1,82±0,08 p<0,01	1,56±0,057 p>0,05
<b>Antioxidant system</b>				
CP (CU)	29,60±0,73	20,18±0,65 p<0,001	24,6±0,82 p<0,01	28,2±0,75 p>0,05
Tr. (CU)	0,188±0,003	0,143±0,007 p<0,001	0,152±0,005 p<0,001	0,179±0,004 p>0,05
Catalase (mg H2O2/ml)	12,0±0,26	7,25±0,51 p<0,001	9,44±0,36 p<0,001	11,56±0,65 p>0,05
CP/Tr	157,4	141,1	161,8	157,5

The development of the inflammatory process in the abdominal cavity caused a significant increase in endotoxycosis - medium weight molecules (MSM), leukocyte intoxication index (LII), malonic aldehyde (MA) and diene conjugates (DC) (Table 1). Thus, the content of MSM increased 1.5 times, LII almost 10 times, MA - 1.6 times and DC - 1.5 times.

Along with this, the indicators of antioxidant protection changed in the opposite direction. Thus, the activity of ceruloplasmin before treatment on the second day of the study was  $20.18 \pm 0.65$  ( $p < 0.001$ ) at a rate of  $29.60 \pm 0.73$  CU (67.5%), transferrin iron saturation -  $0.143 \pm 0.007$  CU at a rate of  $0.188 \pm 0.003$  CU (60.1%) and catalase 60% of normal ( $12.0 \pm 0.26$  mg H<sub>2</sub>O<sub>2</sub> / ml). Under the influence of our treatment by lavage of the abdominal cavity with 0.02% decamethoxine solution and solution for peritoneal dialysis with Extranil, the level of the studied parameters changed in the direction of normalization and on 7 day and 14 day LII

was, respectively,  $2.86 \pm 0.012$  CU ( $p < 0.05$ ) at a rate of  $0.72 \pm 0.03$  CU. A similar direction of the dynamics of indicators was observed for the content of MSM on 7 and 14 days, respectively  $0.300 \pm 0.004$  ( $p < 0.001$ ) and  $0.228 \pm 0.004$  CU ( $p < 0.05$ ) at a rate of  $0.214 \pm 0.002$  but still did not reach the level content in the serum of intact animals. Whereas the level of MA and DC under the influence of treatment was significantly reduced and on day 14 corresponded to the content in intact animals ( $p < 0.05$ ). In addition, there was activation of AOS, which was manifested by a gradual increase in the activity of ceruloplasmin, catalase and iron saturation of transferrin, which on the seventh day was, respectively,  $24.6 \pm 0.82$  CU and  $0.152 \pm 0.005$  CU. On 14 day level of these AOS in the blood of animals with experimental postoperative peritonitis was normalized ( $p > 0.05$ ).

Morphological examination of the liver in animals with experimental postoperative peritonitis, against the background of endotoxemia, revealed characteristic differences before and after treatment.

Thus, for 2-3 days of the inflammatory process in the liver tissue there is a combination of inflammatory-dystrophic processes. In particular, dystrophic changes of hepatocytes from moderate to pronounced are revealed. In most cases, there is granular and vacuolar dystrophy with edema in the perisinusoidal space (Figure 1).

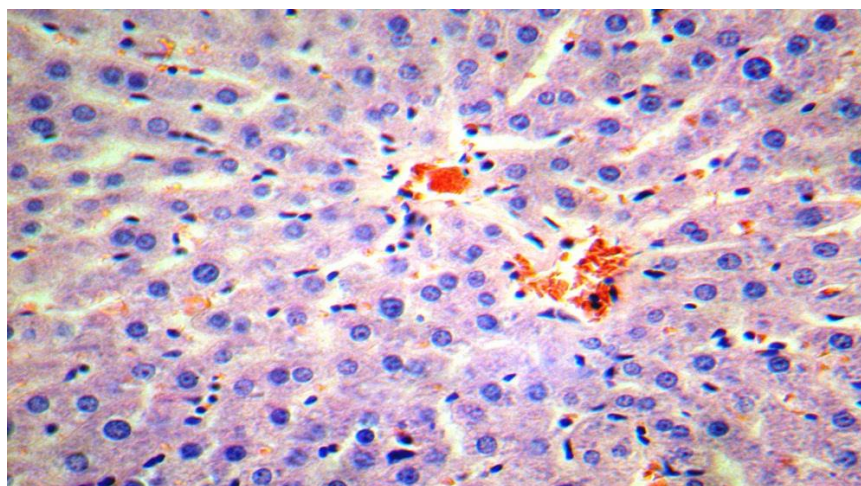


Figure 1. - Structural disorders in liver tissue with experimental postoperative peritonitis before treatment. Full blood of the central vein. Swelling in the perisinusoidal space. Inflammatory-dystrophic changes in hepatocytes. Swelling of the beams. Hematoxylin-eosin staining. Magnification  $10 \times 20$ .

After the treatment of animals, there was an improvement in the functional state of the liver both in terms of biochemical parameters and morphological data.

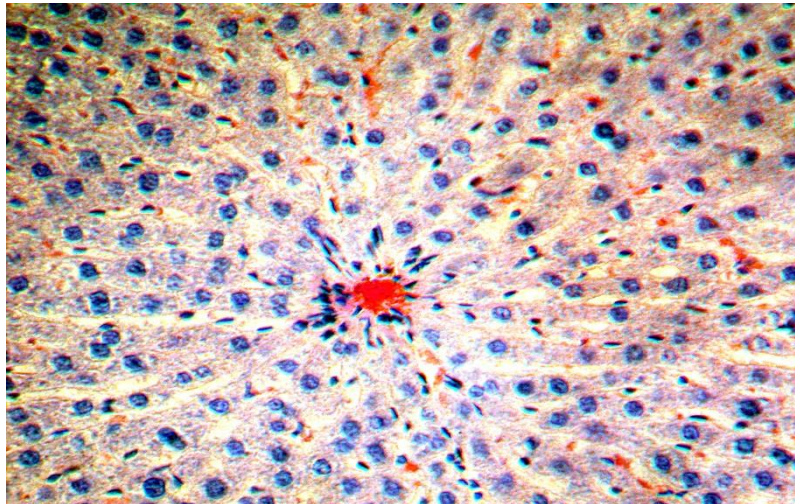


Figure 2. - The structure of the liver after treatment of postoperative experimental peritonitis. Morphohistological structure of liver tissue is normal. Hematoxylin-eosin staining. Magnification  $10 \times 20$ .

**Conclusion.** Thus, the results show that the use of our proposed new method of rehabilitation of the abdominal cavity caused both a positive therapeutic effect and contributed to the preventive prevention of exudate in the abdominal cavity, against the background of normalization of endotoxemia, which led to survival of treated animals with experimental postoperative in 80% of cases.

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