

**THE EFFECT OF OZONE ON THE COURSE AND DEVELOPMENT
OF COMPLICATIONS OF PERITONITIS IN CHILDREN**
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Abstract: *purulent peritonitis is a severe complication of various diseases of the abdominal organs. The legality of peritonitis is still quite high and ranges between 2.5 and 23.8%. Experimental studies were carried out on 38 white rats of the Wistar breed, weighing 140-160 g. Modeling of acute diffuse peritonitis was carried out according to the method of I.M. Baibekov and V.A. Khoroshaev. Our morphological studies on the effect of ozone on the course of experimental peritonitis indicate the effectiveness and prospects of this method in the treatment of peritonitis.*

Keywords: *ozone therapy, peritonitis, multiple organ failure syndrome, immunomodulation, phagocytosis activation.*

**ВЛИЯНИЕ ОЗОНА НА ТЕЧЕНИЕ И РАЗВИТИЕ ОСЛОЖНЕНИЙ
ПЕРИТОНИТА У ДЕТЕЙ**

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Аннотация: *гнойный перитонит является тяжелым осложнением различных заболеваний органов брюшной полости. Развитие перитонита все еще довольно высока и колеблется от 2,5 до 23,8%. Экспериментальные исследования проводились на 38 белых крысах породы Вистар, массой 140-160 гр. Моделирование острого разлитого перитонита проводилось по методике И.М. Байбекова и В.А. Хорошаева.*

Наши морфологические исследования влияния озона на течение экспериментального перитонита указывают на эффективность и перспективы применения этого метода при лечении перитонита.

Ключевые слова: *озонотерапия, перитонит, синдром полиорганной недостаточности, иммуномодуляция, активация фагоцитоза.*

Introduction. Purulent peritonitis is a severe complication of various diseases of the abdominal organs. The lethality of peritonitis is still quite high and ranges between 2.5 and 23.8% [1-7, 16-20]. The appearance of antibiotic-resistant strains of microorganisms reduces the effectiveness of treatment. Therefore, the search for new bactericidal agents is one of the urgent problems. Recently, thanks to its bactericidal property, ozone has become widely used in medicine [6-13; 19-25]. In the literature available to us, we did not find information on the use of ozone for the treatment of peritonitis [12-16; 24-29].

Ozone in therapeutic concentrations, both with local and systemic use, stimulates the phagocytic activity of polynuclears. Intravascular infusion of solutions containing ozone in a concentration of 4-6 mg/l led to the mobilization of the humoral anti-infective protection unit - an increase in neutrophil phagocytic activity, an increase in the absorptive capacity of test microbes by phagocytes, and an increase in the phagocytosis completeness index [26-29]. It has been suggested that parenteral use of ozone at the level of intracellular mechanisms stimulates the activity of the antibacterial protection enzymes of neutrophilic leukocytes [2-7].

According to some authors when ozonating blood, the number of neutrophils involved in phagocytosis, within 10 minutes increases from 14% to 24% and by 15 min. reaches 26%, remaining at this level for 3 days. Absorption capacity increases, respectively, from 0.3 to 0.7 and further to 2.7 to 15 minutes [25]. The index of completion of phagocytosis is increased from 0.72 to 1.20. This paper presents the results of a morphological study of the ovum of the bruise under the influence of ozone during experimental peritonitis.

Materials and methods. Experimental studies were carried out on 38 white rats of the Wistar breed, weighing 140-160 g. Modeling of acute diffuse peritonitis was carried out according to the method of I.M. Baibekov and V.A. Khoroshaev (1991) [5,6]. Rats were divided into 2 groups of 19 each. Animals of first group, after developing diffuse peritonitis in them, produced a midline laparotomy and drainage of the abdominal cavity from pus with sterile wipes. In the lower corner of the wound, a PVC tube was left and the abdominal cavity was sutured. Animals of second group, after draining the abdominal cavity from pus, it was blown off with a dry ozone-oxygen mixture for 3 minutes. Ozone-oxygen mixture was obtained using the apparatus OTRI-01. ozone concentration of 5.8 mg / l. The rats of this group were also left in the lower corner of the laparotomy wound drainage tube and the abdominal cavity was sutured.

On the 2nd and 3rd day after the operation, 10 cm³ of dry ozone-silica mixture with the same ozone concentration was injected into the abdominal cavity through a drainage tube into the abdominal cavity, after which the drainage tubes were removed from both groups.

On 3rd, 7th, and 14th days after the operation, the animals were removed from the experiment by instantaneous decapitation. Various fragments of the visceral and parietal peritoneum were subjected to light-optical and electron-microscopic examination. 3 days after surgery, animals of group 1 macroscopically in the abdominal cavity showed a cloudy effusion with flakes and an unpleasant odor. The intestinal loops are swollen, the surface of the peritoneum is dull with purulent-fibrinous overlays. Peritoneum edematous with injected vessels. At histopathologic examination, edema and pronounced polymorphous cell infiltration were revealed in the greater omentum. Moreover, among the infiltrate cells, polymorphonuclear neutrophilic leukocytes are supplemented. Vessels are dilated; blood clots are detected in the lumen of many of them. A similar pattern is found in the mesentery of the small intestine. Pronounced edema of the mucous membrane of the small intestine leads to an increase in intercryptal spaces. The diaphragmatic part of the peritoneum is sharply thickened. In many areas, the integrity of the mesothelial lining is determined. Vessels are injected.

Transmission electron microscopy (TEM) shows a pronounced expansion of the lumen of microvessels. The cytoplasm of endotheliocytes is thinned, vacuolized. Under mesotheliocytes is determined by the accumulation of transudate. After 7 days after surgery, animals of the first group had a cloudy effusion in the abdominal cavity, its amount was less than 3 days after surgery. Intestinal loops in some places were soldered together. Peritoneal edema persisted, inter-intestinal abscesses were noted. Light-optical studies of the peritoneum showed that inflammatory changes have decreased somewhat, rarely there are dilated vessels with blood clots. Plots of the peritoneum with an impaired mesothelial lining are detected.

SEM and TEM studies show that in areas with impaired mesothelial lining, mesotheliocytes have a flattened shape with rather large nuclei and nucleoli. On their surface there are almost no microvilli. In the cytoplasm of cells there are few mitochondria and profiles of the granular endoplasmic reticulum. For 14 days in the abdominal cavity there is effusion in small quantities, in some cases inter-intestinal abscesses are found. Microscopic mesothelial lining of the peritoneum restores its integrity. However, the cells remain swollen, dome-shaped, altered. The endoplasmic reticulum is grainy and vacuinated. Capillary dilatation, stasis phenomena and red blood cell sludging are less pronounced.

In the first group of animals, the death rate was 42.1%. In the second group of animals that used ozone, for a day after the operation in the abdominal cavity, there is a macroscopic translucent effusion in a small amount. The peritoneum is slightly thickened, with a few strands of fibrin on its surface.

Light-optical studies have shown that as a result of ozone therapy, changes due to bacterial peritonitis are less pronounced. The integrity of the mesothelial lining is not broken.

On the 7th day macroscopically the peritoneum is clean, shiny, there is no effusion. During the light-optical study of various parts of the peritoneum, a slight degree of infiltration with polymorphonuclear elements dominated by lymphocytes is noted. Minor perivascular infiltrates and moderate thickening of the vessel walls without blood clots are detected. In the wall of the small intestine moderate infiltration is found only in the stroma of the villi and between them. On villi and crypts, cell desquamation is not observed. In the epithelial lining of the villi prismatic cells predominate.

The serous membrane of the small intestine without marked signs of inflammation and damage. Blood vessels have a normal structure.

SEM shows that the peritoneum has a characteristic mesothelial cover with somewhat expanded intercellular spaces. On the surface of mesotheliocytes are defined numerous outgrowths.

TEM also shows that ozone therapy leads to a significant reduction of pathological changes in ultrastructures caused by experimental peritonitis. Long and thin microvilli are determined on the surface of mesotheliocytes. In the cytoplasm of mesotheliocytes are quite numerous mitochondria and single profiles of the granular endoplasmic reticulum. Subject vessels moderately dilated. Endotheliocytes with a flat luminal surface and a narrow cytoplasm.

For 14 days macroscopically in the abdominal cavity, pathological changes are not detected. Light-optical, SEM and TEM studies have shown that the peritoneum has the usual structure.

Conducted morphological studies have shown that inflammatory changes in the peritoneum are characterized by severe edema, infiltration and impaired microcirculation. A characteristic feature of the peritoneum in peritonitis is pronounced desquamation of mesotheliocytes. This leads to significant violations of the barrier-resorption function of the peritoneum.

Our morphological studies on the effect of ozone on the course of experimental peritonitis indicate the effectiveness and prospects of this method in the treatment of peritonitis.

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