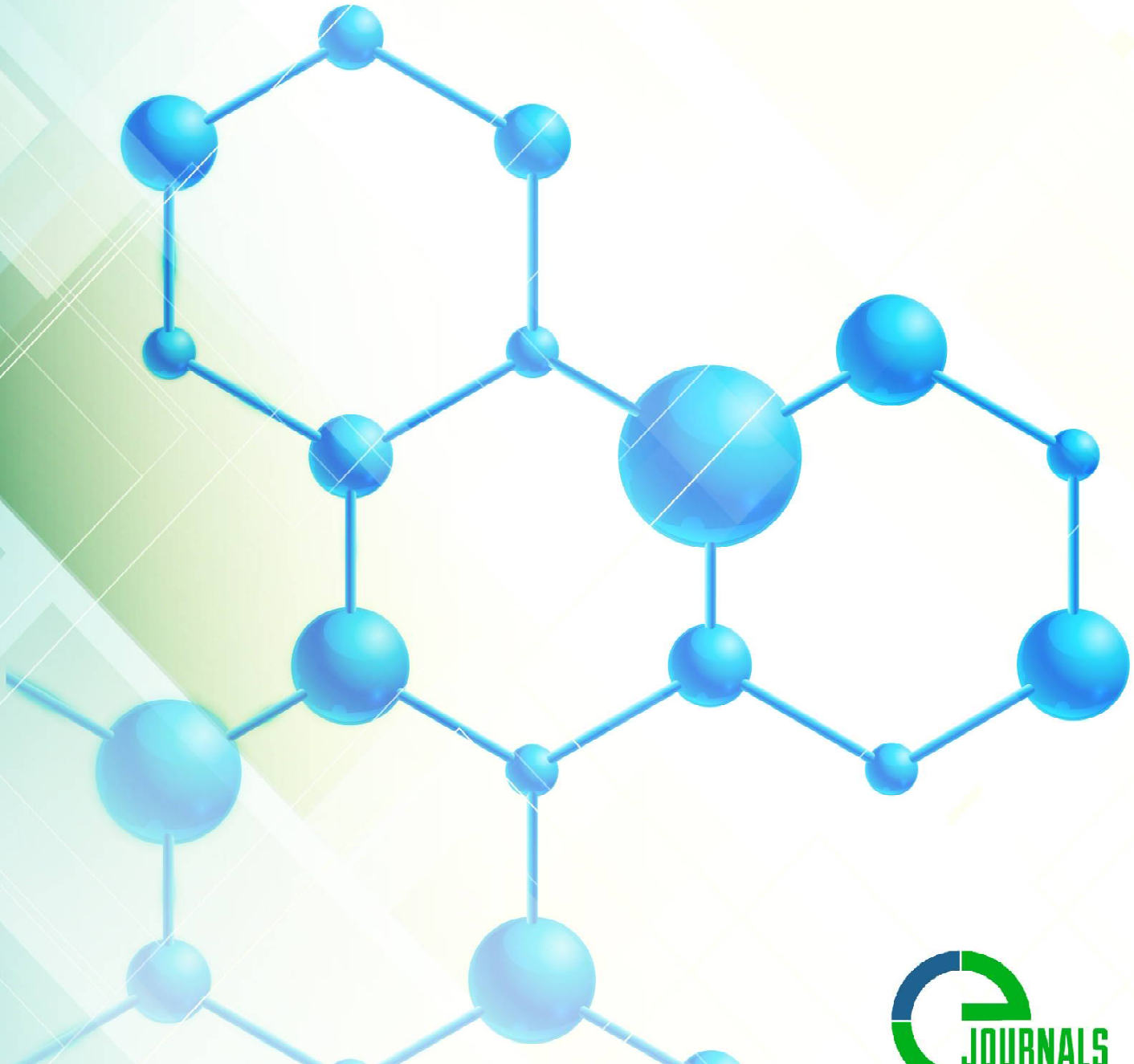
EUROPEAN JOURNAL OF

MOLECULAR MEDICINE



JOURNALS

European Journal of Molecular medicine

Volume 2, No.5, September 2022

Internet address: ttp://ejournals.id/index.php/EJMM/issue/archive
E-mail: info@ejournals.id
Published by ejournals PVT LTD
DOI prefix: 10.52325
Issued Bimonthly
Potsdamer Straße 170, 10784 Berlin, Germany

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EXPERIMENTAL STUDY OF THE INFLUENCE OF MEDICAL OZONE ON THE ADHESIVE PROPERTIES OF THE PERITONE IN PERITONITIS

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Abstract.Many studies have been devoted to the prevention of the postoperative adhesive process o‘1, 3, 4g‘. Based on the analysis of numerous observations, the authors recommend various methods for preventing the formation of adhesions o‘2, 7g‘. In all the proposed methods and methods, the main goal is traced - the reduction and early relief of inflammatory phenomena. Many preparations have been proposed that combine antibacterial, fibrinolytic, peritoneal friction reducing, and other properties. However, there are no universal pharmaceutical preparations that act on all factors and pathological mechanisms of excessive adhesion formation o‘6, 8g‘.

As preparations preventing adhesion formation, a solution of dextran, pertrophan, saline solutions, anti-inflammatory and other drugs are used. There are even publications on the use of honey as an anti-adhesion substrate. Despite the large number of studies on adhesive disease, there are few works devoted to the prevention of adhesion formation in peritonitis. Against the background of a productive inflammatory process of the peritoneum, the mechanism of action of antiadhesion drugs does not work. Therefore, the search for methods to prevent intra-abdominal adhesions in peritonitis is a popular task [3, 9].

Ozone is widely used in modern medical practice [2, 3, 5]. At the same time, questions about the effect of ozone on the course of peritonitis and adhesion formation are not sufficiently covered.

The aim of our study was to study the effect of ozone on the development of peritonitis and adhesion formation in the experiment.

Materials and methods. Experimental studies were carried out on 38 Wistar white rats

weighing 140-160 g. Modeling of acute diffuse peritonitis was carried out according to the method of I.M. Baibekov and V.A. Khoroshaeva (1991).

The rats were divided into 2 groups of 19 each. Animals of the 1st (control) group, after the development of diffuse peritonitis, underwent median laparotomy and drainage of the abdominal cavity from pus with sterile wipes.A PVC tube was left in the lower corner of the wound and the abdominal cavity was sutured.

Animals of the 2nd group, after draining the abdominal cavity from pus, it was blown with a dry ozone-oxygen mixture for 3 minutes. The ozone-oxygen mixture was obtained using an OTRI-01 apparatus, the ozone concentration was 5.8 mg/L. They also left a drainage tube and sutured the abdominal cavity.

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

On the 3rd, 7th and 14th day after the operation, the animals were taken out of the experiment by instantaneous treatment. Samples of the omentum, the diaphragmatic part of the peritoneum, the small intestine with the mesentery, and adhesions were subjected to light-optical and electron microscopic examination.

Preparations for light-optical research were prepared according to the generally accepted method.

For transmission electron microscopy (TEM), the material was fixed in a 2.5% solution of glutaraldehyde in 0.1 M phosphate buffer (pH-7.2) and in a 1% solution of osmium tetroxide, after dehydration and impregnation, it was poured into a mixture of epon and araldite . Semithin and ultrathin sections were made on a Reichert Jung ultramicrotome (Reichert, Austria) and stained, respectively, with methylene blue and basic fuchsin or uranyl acetate and lead citrate (Karupu V.Ya., 1986). Ultrathin sections were examined using an H-600 electron microscope (Hitachi, Japan).

For scanning electron microscopy (SEM), the samples after dehydration were dried by the critical point method in an NSR-2 apparatus (Hitachi, Japan). From a part of the material embedded in the resin, sections were made with a thickness of 6-8 ?m. They were glued to coverslips or aluminum foil, and after removal of the resin in asaturated solution of sodium hydroxide, they were dried in absolute ethanol, sputtered with gold, and examined by SEM.

3 days after the operation, in animals of the control group macroscopically swollen intestinal loops, there is a cloudy effusion, the surface of the peritoneum is dull with purulent-fibrinous deposits. The presence of a pronounced adhesive process is noted. Adhesions are easily torn and are located mainly between the loops of the small intestine.

Histological examination revealed edema and severe polymorphocellular infiltration in the greater omentum, with a predominance of polynuclear neutrophilic leukocytes. The vessels are dilated, in the lumen of many of them there are blood clots. A similar picture takes place in the mesentery of the small intestine and the diaphragmatic part of the peritoneum.

Scanning electron microscopy (SEM) of the peritoneum shows a sharp expansion of intercellular gaps, and even divergence of mesotheliocytes. On the surface of the mesothelium are strands of fibrin, peritoneal macrophages and mast cells. Surface of many mesotheliocytes with slight erosions.

Transmission electron microscopy (TEM) shows a pronounced expansion of the lumen of microvessels. The cytoplasm of endotheliocytes is exuded, vacullated. Under the mesotheliocytes, the accumulation of transudate is determined.

Histological examination of adhesions revealed that they are based on loose connective

tissue, consisting of delicate collagen fibers, between which fibroblasts are located. There are also macrophages and lymphoid cells.

During electron microscopic examination of adhesions, their surface is lined in places with oblong mesotheliocytes, the apical surface of which bulges into the lumen of the abdominal cavity. On the surface of the cytoplasmic membrane of cells there are a large number of microvilli.

7 days after the operation in the abdominal cavity, the amount of effusion decreases. Swelling of the peritoneum is preserved, there are inter-intestinal abscesses. The adhesive process is distributed throughout the abdominal cavity. Adhesions are predominantly located between the loops of the small intestine, they are coarser.

Light-optical studies of the peritoneum showed that inflammatory changes are less pronounced, dilated vessels with blood clots are less common. Areas of the peritoneum with disturbed mesothelial lining are found.

SEM and TEM studies show that in areas with disturbed mesothelial lining, mesotheleocytes have a flattened shape with rather large nuclei and nucleoli. In the cytoplasm of cells, there are few mitochondria and profiles of the granular endoplasmic reticulum.

Histological examination revealed that the adhesions are based on loose connective tissue, consisting of thin bundles of collagen fibers, between which fibroblasts and a few blood capillaries are located. Fibroblasts have an oblong shape, their nuclei are large, hyperchromic. The blood vessels are lined with endothelial cells with oval nuclei. From the side of the visceral peritoneum, smooth muscle cells grow into the thickness of the adhesions, the source of which is the middle lining of the intestine. In addition to the structures described above, a few macrophages, lymphocytes and single neutrophilic leukocytes are detected in the thickness of the adhesions. The surface of adhesions is lined with mesothelial cells.

On the 14th day in the abdominal cavity there is a small amount of lunge, in some cases encapsulated interintestinal abscesses are found. The microscopic mesothelial lining of the peritoneum restores its integrity. However, the cells remain swollen and dome-shaped. The endoplasmic reticulum is granular and vacuolated. Expansion of capillaries, stasis phenomena and erythrocyte slugging are expressed to a lesser extent.

The adhesive process in the abdominal cavity remains pronounced. The adhesions are rough, of various shapes, in some places they pinch the intestinal loops. Histological examination of adhesions shows an increase in the content of collagen fibers, their bundles are thicker and coarser, and the content of fibroblasts is somewhat reduced. The latter take an elongated shape with elongated nuclei. Macrophages, single lymphocytes and smooth muscle cells are detected. The surface of adhesions is lined with flattened mesotheleonites.

In the control group, the death rate of animals was 52.6%

In the second group of animals that received ozone, on the 3rd day after surgery in the abdominal cavity, the location of the intestinal loops was not disturbed macroscopically, the existing effusion was translucent and in a small amount. The peritoneum is slightly thickened, smooth, with a few strands of fibrin on its surface. The presence of only single thin, short adhesions, which are easily torn and do not deform the intestine, is noted.

Light-optical studies have shown that inflammatory changes are expressed to a much lesser extent. The integrity of the mesothelial lining is less disturbed than in the animals of the control group. Single formed adhesions are represented by tender bundles of collagen fibers and fibroblasts. Single formed adhesions are represented by tender bundles of collagen fibers and fibroblastamia. There are no smooth muscle cells.

On the 7th day, macroscopically, the peritoneum is clean, shiny, there is no effusion. There are 1-2 adhesions that are easily torn and do not deform the intestines.

A light-optical study of various parts of the peritoneum shows a slight infiltration of polymorphocellular elements with a predominance of lymphocytes. Minor perivascular infiltrates and moderate thickening of vessel walls without thrombi are found. In the wall of the small intestine, moderate infiltration is found only in the stroma of the villi and between them. Villi of the correct form without desquamation of cells. The epithelial lining of the villi is dominated by prismatic cells.

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

SEM and TEM also indicate that ozone therapy leads to a significant reduction in pathological changes in ultrastructures caused by experimental peritonitis. Long and thin microvilli are defined on the surface of mesotheliocytes. Quite numerous mitochondria and single profiles of the granular endoplasmic reticulum are located in the cytoplasm of mesotheliocytes. The underlying vessels are moderately dilated. Endothelocytes with a smooth luminal surface and narrow cytoplasm.

The basis of adhesions is loose connective tissue, represented by thin, loosely arranged collagen fibers, fibroblasts and blood capillaries. Compared to the same period in the control group, the number of fibroblasts and blood capillaries is significantly lower.

On the 14th day, there is no macroscopic effusion in the abdominal cavity, the peritoneum is clean, the intestinal loops lie freely. Detected single adhesions are short, thin, easily torn. In 78.9% of animals, adhesions were not found. Light-optical, SEM and TEM studies have shown that the peritoneum has a normal structure.

The structure of adhesions significantly differs from that in the control group, there are signs indicating a decrease in the synthetic activity of fibroblasts: the size of the cells is reduced, their number is reduced, the content of collagen fibers is also reduced.

Our studies show that the use of ozone is quite effective in experimental peritonitis and reduces the intensity of the process of adhesion formation. Ozone can be recommended in clinical practice for the treatment and prevention of a similar pathology.

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