

## MORPHOLOGICAL STRUCTURE OF ADHESIONS UNDER THE INFLUENCE OF OZONE IN THE EXPERIMENT

**Shukhrat Abdurasulovich Yusupov\***

\*Head of the Department of Pediatric Surgery,  
Samarkand State Medical University,  
Samarkand, UZBEKISTAN

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### ABSTRACT

*Severe complications that may develop due to the formation of adhesions, the low effectiveness of repeated surgical interventions in preventing the development of the postoperative adhesive process, determined the preventive orientation in relation to adhesions. However, none of the currently existing methods of preventing the postoperative adhesive process can reliably prevent the formation of adhesions in the abdominal cavity. In this regard, an important direction is the search for new, more effective, pathogenetically justified ways to prevent postoperative intra-abdominal adhesion. The primary basis of this search is an experiment that allows you to identify the anti-adhesive activity of new methods of prevention. At the same time, the leading role in substantiating and proving their anti-adhesive effect should belong to a comprehensive morphological study.*

**KEYWORDS:** *Adhesive Disease, Ozone, Morphology, Experiment, Appendectomy.*

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### INTRODUCTION

Purulent infection continues to be one of the urgent problems of medical science. In abdominal surgery of childhood, it is often necessary to deal with the most severe forms of purulent infection, one of which is appendicular peritonitis. They account for 50-90% of all purulent peritonitis in children [1, 2, 3, 4]. The mortality rate, according to various authors, remains very high and reaches 1.6-20% [5, 6, 7]. In addition, purulent peritonitis causes a large number of severe intra-abdominal complications. At the same time, the course of complicated purulent peritonitis is much more severe and the mortality rate reaches 20-35% [8, 9, 10]. One of the formidable postoperative complications is adhesive intestinal obstruction, which is the reason for repeated surgical interventions.

**The purpose of the research:** studying the features of the morphological pattern of adhesions under the influence of ozone in an experiment.

**Material and methods of the research.** We conducted experimental studies on 36 Chinchilla rabbits with a body weight of 0.7-1.2 kg, of which 12 animals were included in the control group, which did not undergo abdominal ozonation.

The main group of animals consisted of 24 rabbits, which were divided into two subgroups (12 animals in each subgroup). Rabbits of subgroup "A" after appendectomy and deserosing underwent sanitation of the abdominal cavity, the stump of the vermiform process and the

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deserized areas of the peritoneum with an ozone-oxygen mixture using the OTRI-1 apparatus - for 5 minutes with an ozone concentration of 5-8 mg/l.

Rabbits of subgroup "B" were additionally injected with 20 cm<sup>3</sup> (100 mcg) of ozone per parietal peritoneum in order to create a depot of the drug.

Animals of both groups were kept in the vivarium under the same conditions, under constant supervision, were removed from the experiment after 7.14, 21 and 30 days (three rabbits for each term). After opening the abdominal cavity, the relative position of the intestinal loops, the condition of the process stump, as well as the presence of adhesions between the stump, visceral and parietal peritoneum were evaluated. Samples of the peritoneum and adhesions were subjected to histological examination.

### **Results and their discussion**

In animals of the control group, on the 7th day after the operation, the presence of a pronounced adhesive process was noted. The adhesions were located mainly between the dome of the cecum and the parietal peritoneum, as well as in the area of the stump of the process. The spikes were of various lengths (from 0.2 to 1 cm) and shapes (planar, ribbon-like and heavy-like).

Histological examination revealed that the basis of adhesions is loose connective tissue consisting of thin bundles of collagen fibers, between which fibroblasts and a few capillaries are located. From the side of the visceral peritoneum, smooth muscle cells grow into the thickness of the adhesions, the source of which is the middle shell of the cecum and the stump of the process. The spikes reveal a few lymphocytes, macrophages, and neutrophilic leukocytes. The surface of the adhesions is lined with mesothelial cells.

In some cases, leukocyte infiltration of the mucous membrane in the stump area is noted.

On the 14th day after the operation, the adhesive process in the abdominal cavity increases, the length of the adhesions reaches 3-4 cm. In some cases, adhesions squeeze the intestines, as a result, swollen and collapsed areas are formed. The content of collagen fibers increases, their bundles become thick and coarse. There is the presence of tissue detritus, leukocyte and macrophage infiltration.

During the study on the 21st day of the experiment, the process of spike formation progressively increases. The basis of adhesions is coarse-fibrous connective tissue with few fibroblasts, macrophages and lymphocytes. The presence of smooth muscle cells is characteristic. On the 30th day of the experiment, violations of the topographic-anatomical relationships between the intestinal loops are noted due to a large number of adhesions. Most of them have a dense consistency. The basis of the adhesions are coarse bundles of collagen fibers compactly adjacent to each other. Cellular elements are insignificant.

7 days after appendectomy, single thin (2-3) adhesions up to 1 cm long are observed in rabbits of subgroup "A". The basis of adhesions is loose connective tissue. The number of fibroblasts and capillaries is significantly lower than in the control. Infiltration by neutrophilic leukocytes and macrophages around the stump of the process.

On the 14th day after the operation, the number and size of adhesions increased slightly, they easily tear. There are signs indicating a decrease in the synthetic activity of fibroblasts: their number is reduced, the size is reduced, the content of collagen fibers is also reduced. Unlike

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animals of the control group, there is no germination of smooth muscle cells in the thickness of adhesions. In the area of the stump of the process, the maturation of connective tissue is slowed down, at the same time intensive processes of detritus resorption to macrophages are observed.

On the 21st day of the experiment, single thin loose adhesions were observed in the abdominal cavity of animals of this group. The stump lies freely in the thickness of the adhesions, there are few fibroblasts and capillaries, as well as collagen fibers.

After 30 days of observation, the loops of the small intestine in the abdominal cavity lie freely. Individual flat spikes are noted, they are fragile and easily torn. The basis of adhesions is mature connective tissue from compactly arranged bundles of collagen fibers. The number of fibroblasts and capillaries is less than in the control.

In animals of both subgroups of the main group, no significant differences in the process of spike formation have been established.

The results of the experimental studies showed that the control group animals had the formation of massive adhesions in the appendectomy zone between both sheets of the peritoneum. The basis of adhesions is connective tissue with a significant number of fibroblasts, blood vessels and collagen fibers. Gross violations of topographic-anatomical relationships between intestinal loops are noted.

In the animals of the main group, a sharp inhibition of adhesion formation, a delay in differentiation of fibroblasts and inhibition of their synthetic function were revealed. The number of fibroblasts in the conditional field of vision was significantly reduced in all the studied periods (7,14,21 days) compared with the control ( $P < 0,001$ ).

**TABLE 1 THE NUMBER OF FIBROBLASTS IN THE CONNECTIVE TISSUE OF ADHESIONS FORMED AFTER APPENDECTOMY AND DESEROSIS OF THE PERITONEUM. THE FIBROBLAST COUNT WAS PERFORMED IN A CONDITIONAL FIELD OF VIEW AT A MAGNIFICATION OF 40X10**

Animal groups	Terms of the research (days)			
	1	14	21	30
1. Control group	15,5±0,54	13,0±0,51	5,7±0,32	4,0±0,54
2. Main group: subgroup «A»	6,7±1,45*	3,6±0,42*	2,0±0,17*	2,6±0,43
subgroup «B»	5,6±0,27*	2,6±0,32*	3,0±0,52*	2,1 ±0,3 8

**Note:** \* - the differences are statistically significant compared to the control group ( $P < 0,001$ ).

In addition, it was found that ozone affects the process of vasculogenesis, which is due to the smaller number of blood vessels in the thickness of adhesions. There was also no germination of nerve fibers and smooth muscle cells.

Thus, experimental morphological studies have shown that the use of irrigation of the abdominal cavity with an ozone-oxygen mixture with an ozone concentration of 5-8 mg/l led to a more favorable course of the postoperative period. After ozone therapy, the severity and structure of intestinal adhesions differed significantly from those observed in the control group. At the same time, signs indicating a decrease in the synthetic activity of fibroblasts, leading to a decrease in

the process of adhesion formation, were revealed. Ozone can be recommended for use in clinical practice of complex surgical treatment of appendicular peritonitis in children.

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