

# Prediction and prevention of adhesion formation of the abdominal cavity

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## INTRODUCTION

The existence of adhesive disease was known in the middle of the XIX century, N.N. Blinov in the middle of the XX century in his monograph “Adhesive disease”, wrote that post-surgical adhesions in the abdominal cavity – is a defect of surgeon [1].

At present time, it is known that adhesive disease - is the adhesions of connective tissue between adjacent organs or the peritoneal surface resulting from damage of their walls (more often during a surgical intervention) [2]. With the growing number of operations on the abdominal organs and the expansion of their volume, naturally increases the number of patients with adhesive disease of the peritoneum (ADP) and its complications - acute adhesive small bowel obstruction (ASBO) accompanying adhesive disease of the peritoneum (ADP) from 30 to 67% [3].

Connection of adhesive disease of the peritoneum with the amount of conducted operations is caused by damaging of peritoneum during the execution of laparotomy, thereby damages an inhibitor of tissue plasminogen activator (the enzyme responsible for fibrinolysis) and the formed due to inflammation fibrin turns into the adhesions between the peritoneum and the adjacent organs or else between organs [4].

Despite the long-term study of the issues in prevention and treatment of adhesive disease of the peritoneum (ADP), frequency of acute adhesive small bowel obstruction (ASBO) has no tendency to reduction, and the postoperative mortality ranges from 8.1% to 22% [5].

## METHODS

The experimental works were carried out on 40 laboratory male rats of the Wistar line, which were kept in quarantine in accordance with the Order of MoH of the RK №697 dated November 12, 2009.

All the animals were divided into 2 groups:

**1<sup>st</sup> group** (18 animals) – study group, mainly with the intraoperative and postoperative application of

## ABSTRACT

### BACKGROUND

The existence of adhesive disease was known in the middle of the XIX century, N.N. Blinov in the middle of the XX century in his monograph “Adhesive disease”, wrote that post-surgical adhesions in the abdominal cavity – is a defect of surgeon. At present time, it is known that adhesive disease - is the adhesions of connective tissue between adjacent organs or the peritoneal surface resulting from damage of their walls (more often during a surgical intervention). As of today, there are no effective methods for solving this relevant problem.

### METHODS

In carrying out this work, we applied Pershin’s reaction to determine the tendency to adhesion formation in the abdominal cavity. In the conditions of surgical experiment, we created a model of adhesive disease in the abdominal cavity of an animal. We conducted clinical and morphological evaluation of the effectiveness of medicamental prevention (intra- and postoperative) in adhesion formation of an abdominal cavity in the experiment. We developed methodological recommendations on forecasting and prevention of adhesion formation of the abdominal cavity for practical public health based on the results of experimental studies.

### RESULTS

As a result of Pershin’s reaction conducted on animals were allocated 2 options of type of acetylation: fast (with a tendency to adhesion formation) - Group 1 and slow (there was no tendency to adhesion formation) – group 2. In the application of anti-inflammatory drug (“Artozan”) in the first group on the 15th day of our experiment on histological examination the adhesions were not observed, and in second group of animals - were revealed conglomerates of adhesions.

### CONCLUSION

“Artozan” is a nonsteroidal anti-inflammatory drug with a powerful anti-inflammatory effects. Anti-inflammatory effect of “Artozan” caused by the decrease of capillary permeability, stabilisation of lysosomal membranes, inhibition of synthesis or inactivation of inflammatory mediators.

medicamental prevention of adhesion formation;

**2<sup>nd</sup> group** (22 animals) – control.

The experimental work was conducted in three steps:

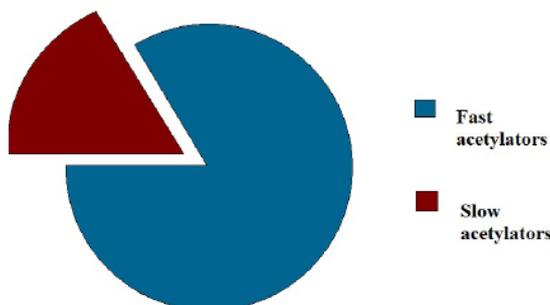
**Step 1:** carrying out the Pershin's reaction to determine the propensity to adhesion formation: 40 animals;  
**Step 2:** laparotomy modeling of adhesion formation in the abdominal cavity of the animals of both groups;  
**Step 3:** relaparotomy at different terms after the operation, with a view of taking tissue (intestinal wall and peritoneum involved in the adhesive process) for histological examination.

The prognostication of peritoneal adhesions was carried out by dint of pre-operative study of the process of sulfadimesine acetylation in the urine of animals by the method of G.N. Pershin. The method is based on the determination of acetylating ability of the organism in which secrete slow acetylators (less than 75% ) and fast (over 75%).

For determining the type of acetylation, we investigated urine gathered by 6 hours after an injection of sulfadimesine via gastric gavage. Conducts photolorimetric registration of concentration of the colored product formed by the reaction of free sulfadimesine with sodium nitrate and acid on photolorimeter.

In consequence of laboratory study, we have identified two groups of animals: fast (the acetylation of sulfadimesine > 75%) was observed in 18 animals, and slow acetylators (with acetylation <75%) - in 22 rats. All the animals (18) with fast acetylation, i.e., prone to pronounced adhesion formation, were determined to primary group.

Results of Pershin's reaction



After determining the type of acetylation (tendency to adhesion formation), all the animals were operated.

Operations were performed under general anesthesia (intrapleural instillation of Nembutal Sodium),

complying with all the rules of asepsis and antisepsis. In all animals were modeled the process of adhesion formation in the abdominal cavity.

Mid-median laparotomy, traumatization of the serous membrane of small and large intestines, parietal peritoneum by means of their scarification before the appearance of “bloody dew.” Operating wound sutured in layers, tightly.

In the first, study group of animals (18 rats) after the sanitation, was injected Artoxan solution into the abdominal cavity, the introduction of which continued in the postoperative period daily intramuscular injection of 0.1 mg per 1 kg of body weight.

In the second, the control group (22) the operation was finished with a typical sanitation of the abdominal cavity with furacilin solution and chlorhexidine bigluconate.

In the third step were performed relaparotomy at 5<sup>th</sup>, 7<sup>th</sup>, 15<sup>th</sup> and 30<sup>th</sup> days on animals. For histological study was performed tissue sampling of modelled adhesions, areas of serous membrane of the intestine and parietal peritoneum. The histological picture varied depending on the timing of their research.

## RESULTS

On the 5th day in the main group detected insignificant inflammatory process of an aseptic character as compared with the control group where detected the signs of pronounced inflammation with formation of adhesions.

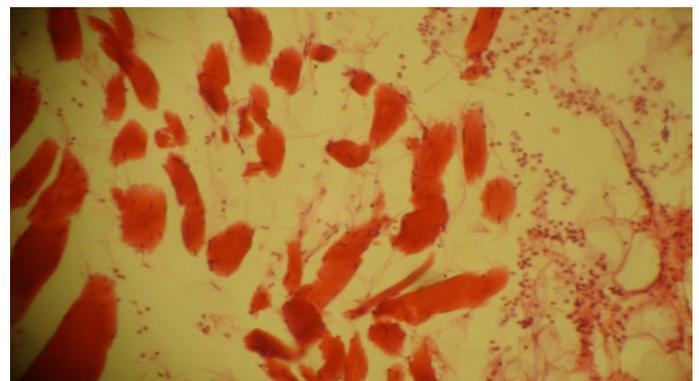


Fig. 1. The inflammatory process with the formation of adhesions on 5th day (control group)

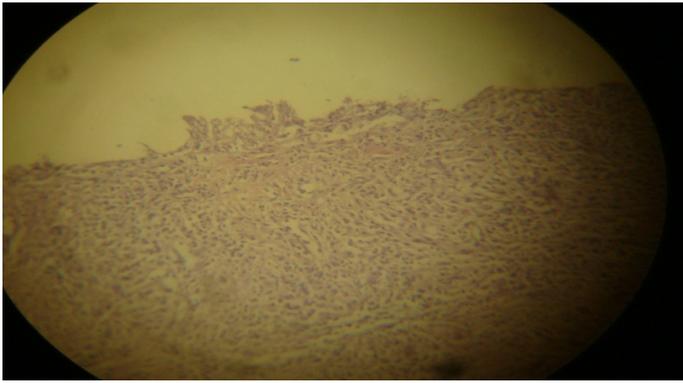


Fig. 2. Inflammation with the formation of adhesions on the 5th day (study group)

At relaparotomy in the control group (22 rats), in the abdominal cavity observed pronounced adhesive process. The most pronounced adhesive process observed in the early postoperative period, on 3-5 days. Over these terms, in all rats in the abdominal cavity was expressed infiltration of the bowel loops and parietal peritoneum with loose adnations here with at 6 rats (28%) were observed the sites of purulent inflammation.

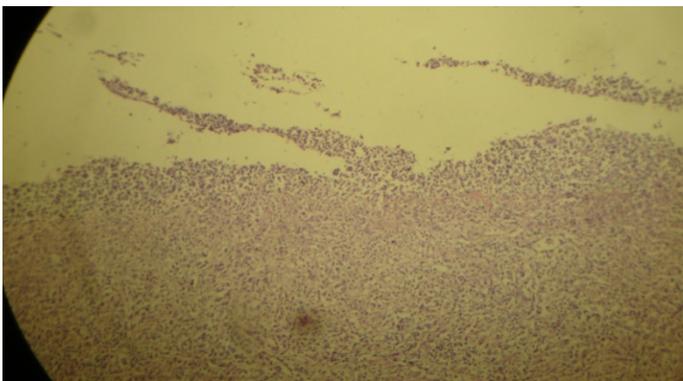


Fig. 3. Pronounced purulent inflammation in the parietal peritoneum and in the soft tissues beneath it.

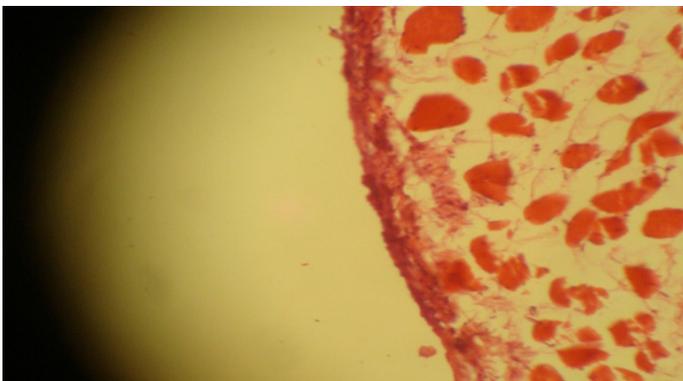


Fig. 4. At the 15th day. Signs of inflammation, adhesions and fibromatosis are absent (study group)

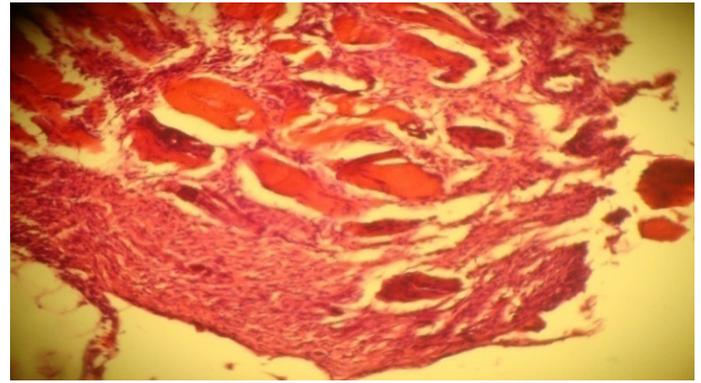


Fig. 5. 15th day. Fibromatosis (thickening) of parietal peritoneum and adhesions (control group)

In the study group in 16 rats (89%) on 15th days morphological studies showed the absence of adhesive process in abdominal cavity. In the control group - loose adnations between the loops of intestine and parietal peritoneum were organised into dense connective tissue structures, i.e., were formed visceroparietal adhesions.

## DISCUSSION AND CONCLUSION

1. To determine a tendency to adhesion formation is most expedient to carry out the Pershin's reaction, based on the determination of sulfadimesine acetylation.
2. In the application of NSAIDs, clinicomorphological in 89% (16) of animals there was an abcent of adhesive process in the abdominal cavity.
3. In the preoperative period for planned patients recommended forecasting of tendency to adhesion formation by means of carrying out the Pershin's reaction. At a high probability of adhesive process development in abdominal cavity it is necessary to conduct intra- and postoperative prevention of an adhesion formation. Medicamental prophylaxis of an adhesion formation should include the administration of drugs from the group of non-steroidal anti-inflammatory drugs in the intra- and postoperative periods.

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