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NEW SIGHTS ON THE ASSESSMENT OF ADHESIVE DISEASE SEVERITY

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ABSTRACT

The paper describes a new classification of the adhesive process in the abdominal cavity, depending on the severity of the adhesive process and the possibility of influencing them surgically. According to this classification, 5 degrees are distinguished. At grade 1, single viscerovisceral or visceroparietal planar adhesions were detected, easily dissected in a blunt way. At grade 2 - viscerovisceral and visceroparietal adhesions, the dissection of which must be performed in an acute way, while the integrity of the intestinal walls is maintained. At grade 3, there were visceroparietal adhesions, the dissection of which requires excision of the walls of the abdominal wall in order to preserve the integrity of the intestinal walls, or viscerovisceral adhesions, the dissection of which contributes to single areas of deserosis of the intestinal walls. At grade 4, there were viscerovisceral or visceroparietal adhesions with intimate adhesions between intestinal loops; attempts to dissect them in an acute way lead to severe violations of the integrity of the intestinal walls. At grade 5, detected an adhesive conglomerate of the abdominal cavity, while the isolation of intestinal loops is not possible.

The results of treatment of 148 patients were analyzed. The frequency of postoperative complications was 20.3%, and the mortality rate was 6.1%. The analysis performed showed the dependence of the frequency of postoperative complications and mortality on the severity of the adhesive process.

Key words: classification, severity, adhesive process.

INTRODUCTION

The problem of diagnosis and treatment of acute intestinal obstruction (AIO) has been actual for many decades [1, 2]. At any level of development of medicine, AIO was a disease that created "extremely complex in diagnostic and tactical terms, and sometimes dramatic situations" [3]. In the 20-30s of the last century, Rene Leriche interpreted adhesive disease as a "terrible scourge of abdominal surgery", and in the 60s of the last century, N.I. Blinov considered the adhesive process to be a marriage of a surgeon. Historically, there was an opinion that

adhesive disease is a “magic wand” when the diagnosis is unclear in patients who have previously undergone surgical interventions on the abdominal organs [4].

The frequency of AIO diseases is relatively low and, according to various data, ranges from 4 to 20 cases per 100,000 population [5–7]. At the same time, among all urgent surgical diseases, AIO ranges from 1.2 to 9.4% [6, 8]. At the same time, it must be emphasized that AIO retains its leading position as the cause of death in patients with "acute abdomen". Thus, mortality with it remains high, ranging from 4.3 to 11.9%, reaching 26% in patients older than 60 years [1, 4, 5].

The ongoing interest in the problem of adhesive disease (AD) is evidenced by regularly published scientific reports on the diagnosis, treatment and prevention of this disease. According to the International Adhesion Society, postoperative adhesions in the abdominal cavity are the most common complication of surgical interventions. For AD, about 1% of previously operated patients are treated in surgical hospitals every year, 50–75% of whom develop acute adhesive intestinal obstruction (AAIO), the mortality from which ranges from 13–25% [3]. Surgical treatment of AAIO in almost every second person leads to recurrence of the disease [4]. All these facts testify to the relevance of this problem, which does not cease to interest practical surgeons.

In our opinion, one of the reasons for the unsatisfactory results of the treatment of AAIO is the underestimation of the severity of the pathological process, and, accordingly, the lack of specific indications for the choice of the volume of surgical intervention. Given the above, the aim of the study was to develop a system for intraoperative assessment of the severity of acute adhesive intestinal obstruction based on an analysis of the nature of the adhesive process in the abdominal cavity.

Results. The critical analysis of the existing classifications of acute intestinal obstruction and systems for assessing the severity of the adhesive process allowed us to propose an optimal system in terms of assessment and a practical system for assessing the severity of the adhesive process in the abdominal cavity in terms of the choice of surgical tactics. The main criteria for grading on the degree were the nature of the adhesive process, the degree of involvement of the intestinal walls in the adhesive process, the possibility of their dissection with or without violating the integrity of the intestinal walls. According to the system developed by us for assessing the severity of the adhesive process, there are 5 degrees of severity:

At grade 1, there were single viscerovisceral or visceroparietal planar adhesions, easily dissected in a blunt way (Fig. 1).

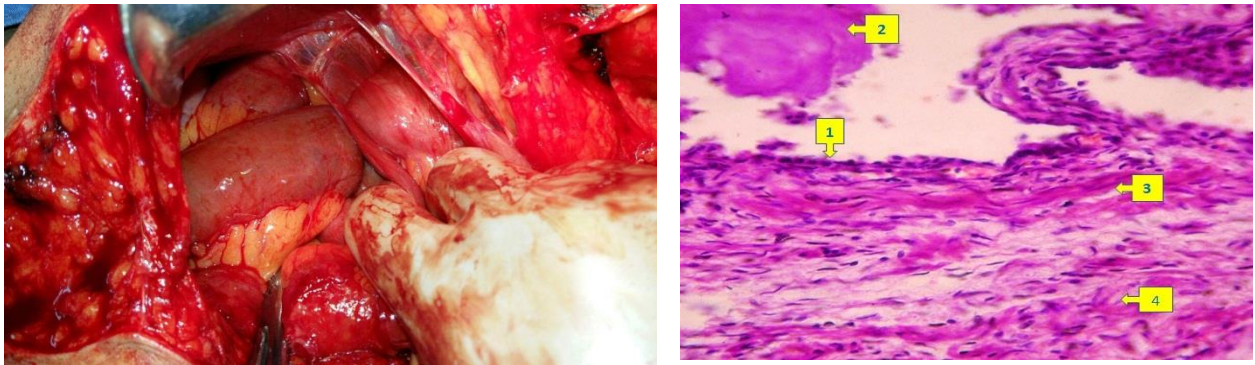


Figure 1. Macro- and microscopic (hematoxylin-eosin staining, magnified: ocular 10, objective 20) picture at 1 severity of the adhesive process

Histological examination of peritoneal adhesions revealed that both sheets of the peritoneum were smooth, even, but there was some swelling with the presence of some focal hemorrhage and superficial erosion. The mesothelial cover was completely absent for a considerable extent. The surviving mesothelial cells contained sharply deformed nuclei. The surface of the serous membrane of both the parietal peritoneum and the intestines were saturated with serosa; no adhesions and dense adhesions were noted. The serous membrane of the intestine was not involved in the process.

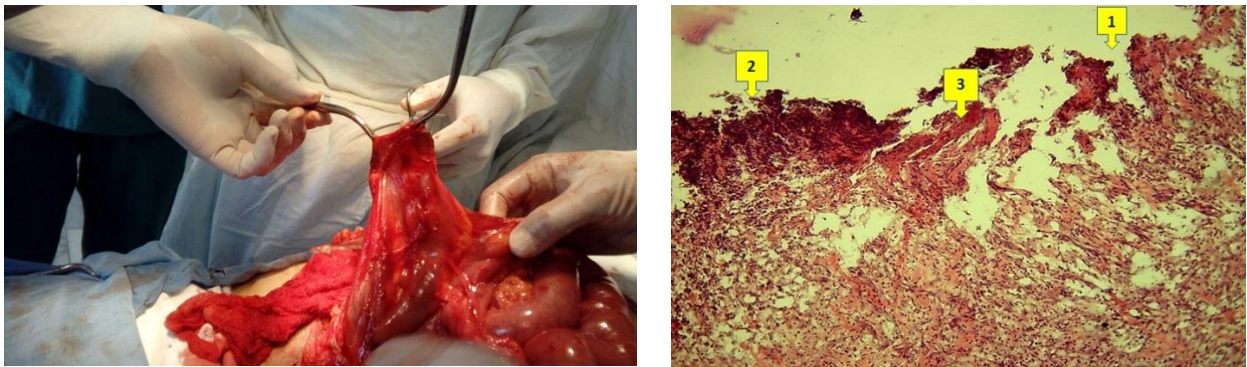


Figure 2. Macro- and microscopic (hematoxylin-eosin staining, magnified: ocular 10, objective 20) picture at 2 severity of adhesive process

At grade 2, there were viscerovisceral and visceroparietal adhesions, the dissection of which must be performed in an acute way, while the integrity of the intestinal walls is preserved (Fig. 2).

At grade 2 adhesions, a morphological study showed that the processes of organizing fibrinous exudate were also observed in the area of the defect of the parietal peritoneum, where the masses of fibrin were populated by young fibroblasts, which led to its fibrosis. The formation of granulation tissue near the necrotically altered tissues was also noted (Fig. 2). On the part of the visceral peritoneum, edema, turbidity, and foci of hemorrhage were noted. Erosion foci

were found on the surface of the serous membrane of the intestine, but without fibrin overlays and fibrous adhesions.

At grade 3, viscero-parietal adhesions are noted, the dissection of which requires excision of the walls of the abdominal wall in order to preserve the integrity of the intestinal walls, or viscero-visceral adhesions, the dissection of which contributes to single areas of deserosis of the intestinal walls (Fig. 3; Fig. 4).

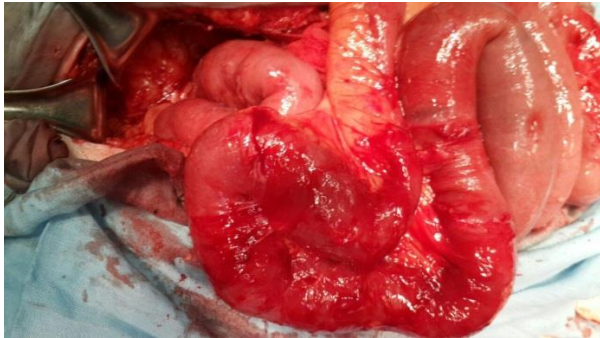


Figure 3. Macroscopic picture at 3rd severity of adhesive process (viscero-visceral adhesions).

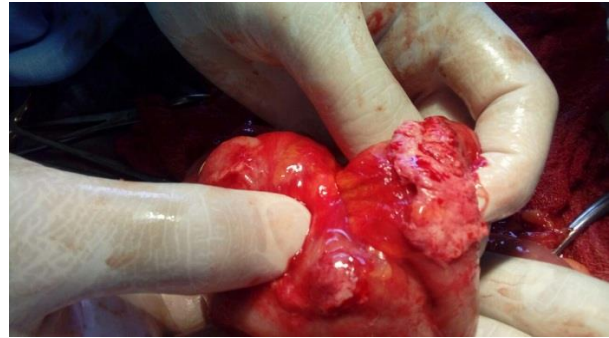


Figure 4. Macroscopic picture at 3rd severity of adhesive process (viscero-parietal adhesions).

At grade III, the study of the morphology of the formation of adhesions showed that the processes of organization of fibrinous exudate were observed both in the area of the defect of the parietal peritoneum, and in some places on the surface of the serous membrane of the intestine, where the fibrin masses were populated by young fibroblasts, which led to its fibrosis. It was also noted the formation of granulation tissue near necrotically altered tissues. Areas of growth of granulation tissue from deserized sections of the intestine were found (Fig. 5).

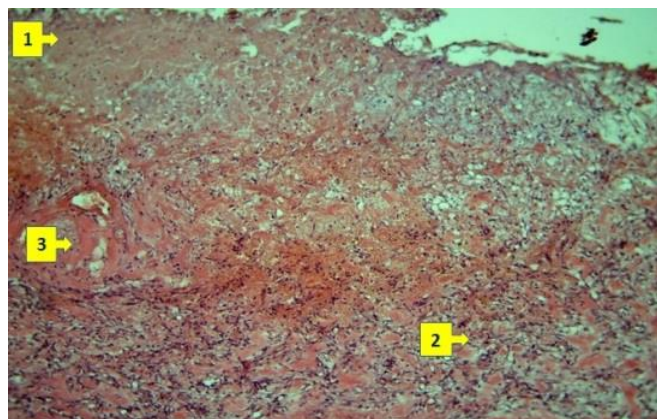


Figure 5. Microscopic (hematoxylin-eosin staining, magnified: ocular 10, objective 20) picture at 3rd level of severity of the adhesive process.

At grade 4, there are viscero-visceral or viscero-parietal adhesions with intimate adhesions between intestinal loops, attempts to dissect them in a sharp way lead to severe violations of the integrity of the intestinal walls (Fig. 6.).

At grade IV, a morphological study of the formation of the adhesive process showed that the overgrown granulation tissue formed adhesions both between the

intestinal loops and between them and the region of the parietal peritoneum defect. If we describe the morphogenesis of the adhesive process, it can be noted that the exudative manifestations of the inflammatory reaction, which reflected the severity of the process, were replaced by productive changes that began to dominate in the morphological picture of the adhesive process. Thus, in the interintestinal adhesions, the granulation tissue was transformed into a multicellular maturing and mature fibrous connective tissue, represented by fibroblasts and fibrocytes with parallel oriented bundles of collagen fibers (Fig. 6).

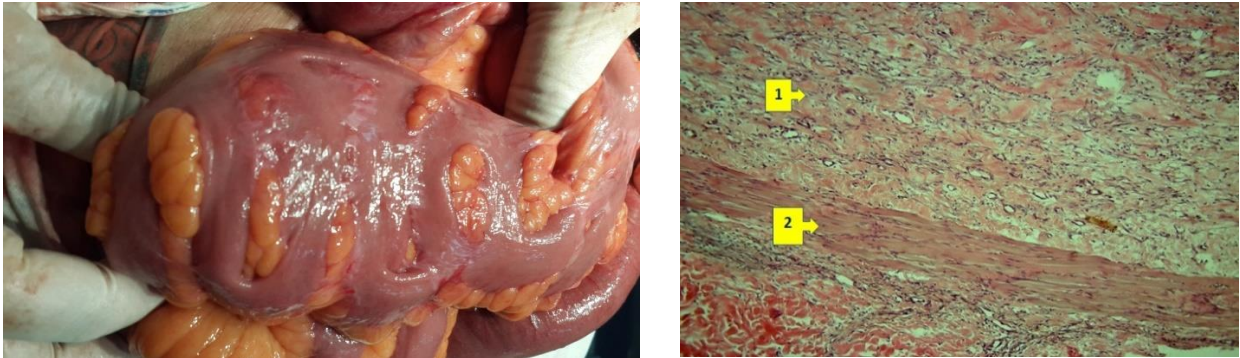


Figure 6. Microscopic (hematoxylin-eosin staining, magnified: ocular 10, objective 20) picture at 4th level of severity of the adhesive process.

Intensive collagen formation was accompanied by a pronounced proliferation of fibroblasts with a significant increase in fibrous tissue bundles. In the newly formed connective tissue, many capillaries looked empty. With the elimination of their lumen, they turned into thin strands of fibrous connective tissue. The number of macrophages in mature granulation tissue decreased markedly. On the surface of the serous cover of the intestines, free from fibrin deposits and adhesions, the mesothelial cover was restored. Signs of proliferation of mesothelial cells were revealed in the form of their focal accumulations.

At grade 5, an adhesive conglomerate of the abdominal cavity is determined, the isolation of intestinal loops is not possible (Fig. 7).

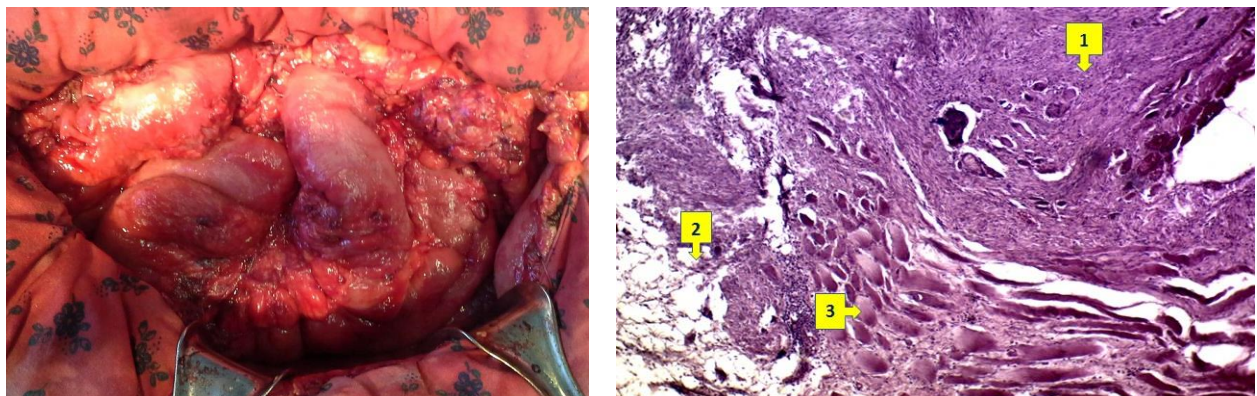


Figure 7. Microscopic (hematoxylin-eosin staining, magnified: ocular 10, objective 20) picture at 5th level of severity of the adhesive process.

At grade 5, microscopic examination of the formation of the adhesive process showed that fragments of destroyed elements of the intestinal walls, fragments of inflamed, deformed adipose tissue and thickened parietal peritoneum with tissue rearrangements were found in tissue conglomerates. Between these tissues, the boundaries are not defined. The defect areas in the parietal peritoneum were filled mainly with fibrous fibrous connective tissue. It contained numerous newly formed thin-walled vessels of the capillary type, undifferentiated connective tissue cells. Macrophages were detected in the areas of preservation of edematous granulation tissue; their cytoplasm contained small vacuoles and phagocytosed material. Dense polymorphocellular inflammatory infiltrates formed around the dead tissues. During demarcation inflammation, necrotic detritus melted or dead tissues were encapsulated. Closer to the surface of the tissue defect, the connective tissue became more mature and fibrotic. The number of fibroblasts increased in it, the process of fibril formation proceeded briskly. On the surface of the granulations facing the abdominal cavity, the mesothelial lining was restored and was in the form of a single-layer, multi-row cover (Fig. 7).

We analyzed the results of treatment of 148 patients with AAI0 who underwent surgical treatment. In 8 (5.4%) patients, 1st degree of adhesive process severity was diagnosed, in 91 (61.5%) – 2nd degree, in 39 (26.4%) – 3rd degree, in 9 (6.1%) – 4th degree and 1 (0.7%) – 5th degree. The frequency of postoperative complications was 20.3% (30 cases), and mortality was 6.1% (9 cases).

The statistical analysis performed showed the dependence of the frequency of postoperative complications and mortality on the severity of the adhesive process. With an increase in the severity of the adhesive process, the number of complications and mortality increased. So, if at the 1st degree of severity the frequency of complications was 12.5%, and the lethality was zero, then at the 4th degree these figures were 44.4% and 22.2%, respectively (table 1.).

Table 1.

Rate of postoperative complications and mortality depending on the severity of the adhesive process

Severity	Amount	Complications in %	Mortality in %
1st.	8	1 (12,5%)	0 (0%)
2nd	91	12 (13,2%)	2 (2,2%)
3rd	39	13 (33,3%)	4 (10,3%)
4th	9	4 (44,4%)	2 (22,2%)
5th	1	0 (0%)	1 (100%)

Thus, in tissue fragments of the adhesive process in the abdominal cavity, we studied the main manifestations of the morphogenesis of the formation of

adhesions. The study showed that in the dynamics of the formation of adhesions on the surface of the parietal peritoneum and intestinal surface, exudative inflammation initially develops with the presence of fibrin filaments. At the first degree, an inflammatory process is only detected on the surface of the serous membrane, in the subsequent degrees of formation of the adhesive process, instead of fibrous inflammation, granulation tissue develops with a transition to fibrous connective tissue and a chaotic arrangement of fibrous structures occurs in it with the formation of fibrous tissue. The obtained results of the study expand and deepen our understanding of the regenerative morphogenesis of the peritoneal cover and its features during the formation of the adhesive process. The clinical evaluation of the severity of the adhesive process showed the dependence of the frequency of postoperative complications and mortality on the severity of the nature of changes in the abdominal cavity.

Discussion. Currently, there are many discussions in the literature on assessing the severity of the adhesive process in the abdominal cavity. In the publications of Lalountas M.A. (2010), the Nair S.K. scale is given, which proposed a 4-point system for assessing the severity of the adhesive process, according to which 1 point is a single non-vascularized adhesion between internal organs or an organ and the abdominal wall; 2 - 2 adhesions of limited blood supply and moderate thickness; 3 - more than 2 well-vascularized and thick adhesions; 4 - internal organs are represented by a conglomerate or tightly soldered to the abdominal wall [7].

There are more complex ways for the assessment of the severity of the adhesive process. So, in the scale developed by F. Coccolini (2013) based on the PAI (peritoneal adhesion index), the severity of the adhesive process is calculated from 0 to 3 points in 9 quadrants of the abdominal cavity, the presence of an interintestinal conglomerate is 3 points. The maximum score is 30 [8].

Based on these assessment systems, Ayushinova N.I. (2014) developed and tested in clinical conditions his own scale for assessing the adhesive process. Each criterion was evaluated from 0 (absence of a sign) to 4 points (maximum severity of a sign), the scores obtained for all categories were summed up. The author identified the following criteria: I. Number of adhesions (single, 2 adhesions, more than 2 adhesions, conglomerate); II. The structure of adhesions (membraneous; loose, avascular; dense, avascular, dense, vascularized); III. The prevalence of adhesions (1 anatomical region; 1 floor of the abdominal cavity; 2 floors of the abdominal cavity; more than 2 floors); IV. The presence of deformation of the intestinal tube (mild; moderate without narrowing of the lumen; narrowing to 1/2; narrowing of more than 1/2 of the intestinal lumen). The analysis made it possible

to distinguish three degrees of severity of the adhesive process: 0-4 points: 1st degree (insignificant adhesive process); 5–10 points: 2nd degree (moderate adhesive process); 10 points and above: 3rd degree (pronounced adhesive process) [9].

The main disadvantage of the existing classifications is the fact that they do not allow to fully assess the severity of the adhesive process in the abdominal cavity and choose the appropriate amount of surgical intervention and carry out the necessary prevention of recurrence of adhesive AAIIO, which was the subject of our research.

Conclusions

1. To assess the severity of the adhesive process in the abdominal cavity, the most convenient and practical to use is the system proposed by us, according to which five degrees of severity of the pathological process are distinguished, the gradation of which is justified by morphological studies.

2. The conducted morphological studies make it possible to determine the most optimal amount of surgical intervention (from dissection of adhesions with intestinal resection to the imposition of interintestinal anastomoses) and a more effective method of intraoperative prevention of adhesion formation (using hydrocortisone or mesogel) depending on the severity of the pathological process in the abdominal cavity.

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