CLINICAL AND MORPHOLOGICAL CHARACTERISTICS OF THE INFLAMMATORY PROCESS DURING PERITONITIS IN A COMPARATIVE ASPECT

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Abstract*. The study aims to determine the optimal extent and enhance the efficacy of surgical interventions for peritonitis by comparing the outcomes based on the prevalence and duration of the inflammatory process. Additionally, this research investigates the response of the peritoneal morphological structures in relation to the extent and duration of peritonitis. Through a comparative analysis, the study seeks to provide insights that will inform surgical practice and improve patient outcomes.*

Materials and methods: this article presents an analysis of 3607 patients treated in the surgical department of Tashkent City 4th Clinical Hospital named after I. Irgashev, Tashkent over the past two years (2022 - 1777 and 2023 - 1830 patients). The study used clinical, instrumental, morphological diagnostic methods, surgical and conservative treatment methods and statistical processing methods.

Results: in 2022, 115 (6.5%) and in 2023, 126 (6.9%) patients were admitted with peritonitis. The most common cause of peritonitis was acute appendicitis (35.6% and 43.6%, respectively, in 2022 and 2023). In the group with general peritonitis, the mortality rate was high - in 2022 it was 13%, and in 2023 - 21.7%. In peritonitis, the worsening of morphological changes in the fiber and cellular structures of the peritoneum is associated with the duration and prevalence of the inflammatory process.

Conclusions: the choice of the method and volume of surgical intervention for peritonitis, taking into account its clinical course, the duration and prevalence of the inflammatory process, as well as the corresponding reaction of the morphological structures of the peritoneum, leads to increased treatment efficiency.

Keywords*: acute peritonitis, surgical treatment, degranulation, mast cells.*

Acute diffuse peritonitis is one of the most severe and fairly common diseases of the abdominal organs; in most cases it occurs as a complication of a number of surgical diseases and injuries of the abdominal cavity (including acute appendicitis, perforated gastric and duodenal ulcers, acute gangrenous cholecystitis, pancreatic necrosis, perforation organ cavities, their damage, acute intestinal obstruction, etc.) [1].

The main cause of death in acute diseases of the abdominal organs is generalized purulent peritonitis. Its rate depends on the form of peritonitis, cause, state of the body's defenses and other factors and is 20-50% [2, 3], however, with hospital-infected peritonitis, mortality can reach 90% [4, 5]. Both the development of antibacterial therapy achieved over the past decades and the introduction of new treatment methods (peritoneal dialysis, controlled laparostomy, programmed relaparotomy, laparoscopic examination of the abdominal cavity, etc.), modern advances in

intensive care also do not give the desired result [5, 6, 7]. The highest mortality rates are observed in postoperative peritonitis and in its terminal stage [4, 5, 6, 7, 8].

Purpose. Comparative analysis of the therapeutic approach, treatment method, indications for surgical interventions, their type, volume, and morphological characteristics of peritonitis in patients with widespread peritonitis caused by various reasons.

Materials and methods. Scientific studies during 2022 and 2023 were conducted on 1777 and 1830 patients, respectively, who were treated in the surgical department of the Tashkent City 4th Clinical Hospital 4 named after Irgashev (total 3607 patients). In this study, clinical, instrumental, morphological diagnostic methods, surgical and conservative treatment methods, as well as statistical analysis were used.

The medical records of 3607 patients (patient records, surgical logs, etc.) were reviewed retrospectively and divided into two groups (Table-1). Of patients treated in 2022 376 (21.2%) had acute appendicitis, 361 (20.3%) had acute cholecystitis, 76 (4.3%) had pancreatitis, 98 (5.5%) had acute intestinal obstruction, 247 (13.9%) had a strangulated hernia, and 43 (2.4%) had perforation of a hollow organ, while the remaining 576 (32.4%) patients were treated for other types of surgical diseases. Of these patients, 1169 underwent surgical intervention and 608 underwent conservative treatment. Peritonitis was diagnosed in 115 (6.5%) patients. Of these, 56% had diffuse peritonitis and 44% had diffuse peritonitis. 41.7% of patients (48 people) were women, and 58.3% (67 patients) were men. The age of the patients ranged from 18 to 94 years (18-30 years – 40; 31-40 years – 18; 41-50 years – 16; 51-60 years – 22; 61-85 years – 18; 86-100 years – 1 patient).

Of the patients treated in 2023, 488 (26.7%) had acute appendicitis, 452 (24.7%) had acute cholecystitis, 90 (4.9%) had pancreatitis, 121 (6.6%) had %) - acute intestinal obstruction, 122 (6.7%) had a strangulated hernia, and 44 (2.4%) had perforation of a hollow organ, while the remaining 513 (28%) patients had other surgical diseases. 1190 (65%) of these patients underwent surgery, while 640 (35%) received conservative treatment. The number of patients with peritonitis was 126 (6.9%). Of these, 61% are diffuse peritonitis, and 39% are diffuse peritonitis. 33.3% (42 people) of patients with peritonitis are women, 66.7% (84 patients) are men. The age of the patients ranged from 18 to 82 years (18-30 years - 44; 31-40 years - 11; 41-50 years - 20; 51-60 years - 28; 61-82 years - 23 patients).

Table 1. Diseases Detected in Studied Patients

The Pathology name	2022 year Abs (%)	2023 year Abs (%)
Acute appendicitis	376 (21,2%)	488 (26,7%)
Acute cholecystitis	361 (20,3%)	452 (24,7%)
Acute pancreatitis	76 (4,3%)	90 (4,9%)
Acute intestinal obstruction	98 (5,5%)	121 (6,6%)
Strangulated hernia	247 (13,9%)	122 (6,7%)
Perforation of a hollow organ	43 (2,4%)	44 (2,4%)
Other diseases	576 (32,4%)	513 (28%)
Total	1777	1830

Result and discussion. In the periods studied (2022 and 2023), peritonitis was complicated mainly by well-known nosological forms of diseases (115 in 2022 and 126 in 2023, respectively): acute appendicitis - 35.6% and 43.6%; perforation of gastric ulcer and 12pc, respectively - 37.4% and 34.9%; pancreatic necrosis - 2.6% and 2.4%; damage to the abdominal organs and

retroperitoneal space - 6.1% and 3.2%; GSD (acute destructive cholecystitis, choledocholithiasis, empyema of the gallbladder) - 8.7% and 3.9%; strangulated hernia (inguinal, femoral, postoperative) - 0.9% and 3.2%; acute intestinal obstruction (adhesions, volvulus) - 3.5% and 2.4%; pancreatic tumor - 0% and 0.8%; mesenteric thrombosis - 5.2% and 2.4%; primary bacterial peritonitis (ascites-peritonitis) – 0% and 3.2% (diagrams 1 and 2).

Diagram -1 Diseases leading to peritonitis in 2022

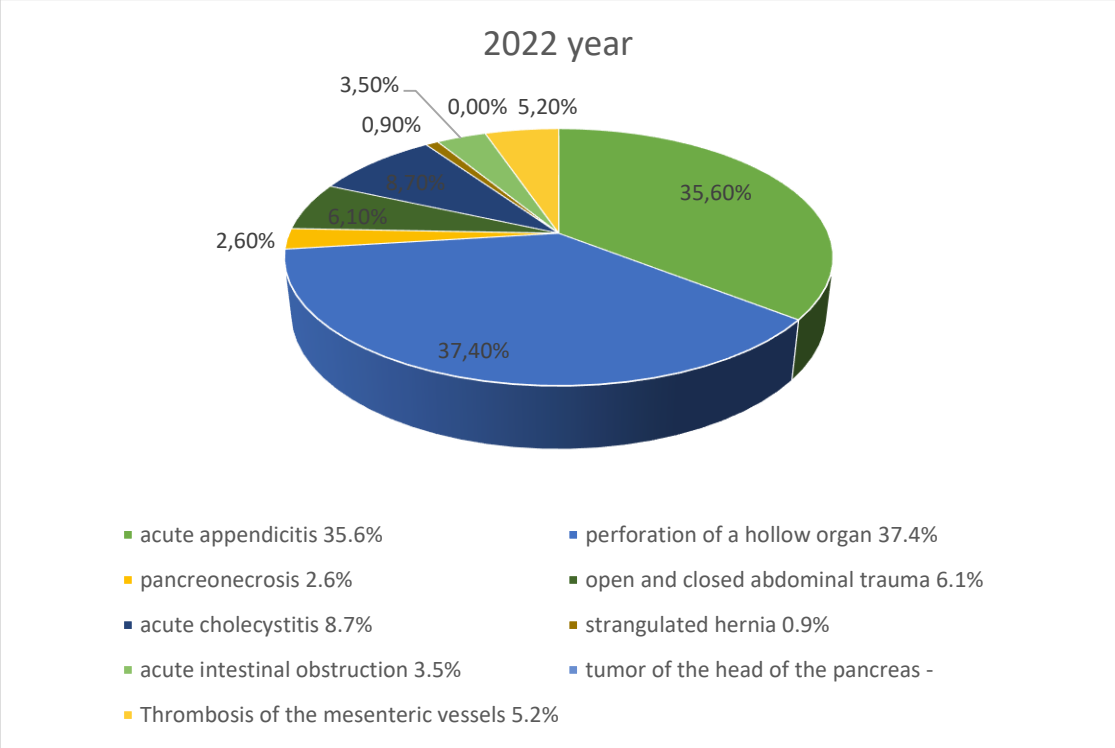
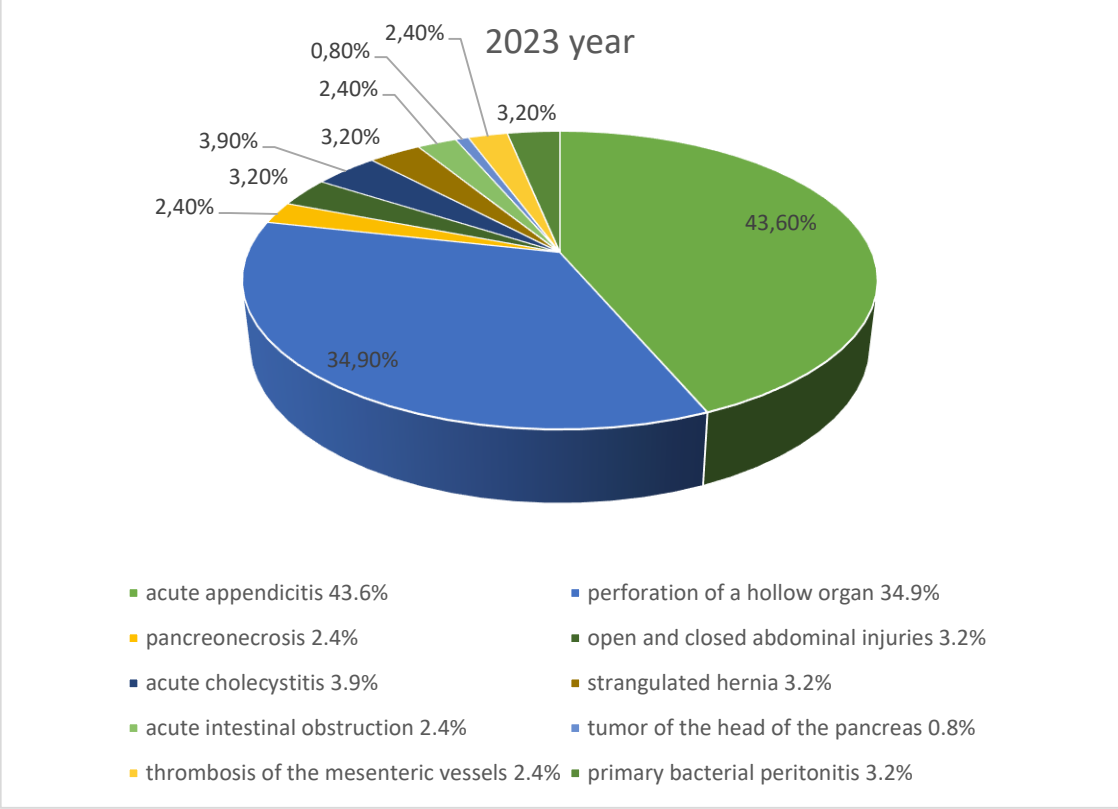


Diagram -2 Diseases leading to peritonitis in 2023



The results of treatment of various forms of peritonitis were analyzed. Depending on treatment tactics, patients were divided into 2 groups:

1. Those treated with a semi-closed method who had diffuse and widespread peritonitis. The patients underwent one operation, during which the source of peritonitis was completely eliminated, the abdominal cavity was sanitized and drained. The effectiveness of such treatment among patients treated in 2022-2023. amounted to 100%.

2. The second group included patients with diffuse peritonitis; they received treatment using a semi-open method. Based on the following criteria, this tactical option was chosen: high bacterial contamination of the abdominal cavity, the inability to fully eliminate the source of peritonitis or the factors of its progression, the presence of multiple organ failure syndrome. Staged relaparotomies were performed within 24 to 36 hours after the initial surgery.

The effectiveness of treatment in this group depended on a number of factors: the period of development of peritonitis and the time elapsed before surgery, the initial severity of the patient's condition, the extent of surgery, the effectiveness of resuscitation measures and detoxification methods. For this group, the mortality rate was 13% in 2022 and 21.7% in 2023 (Diagram 3 and 4).

It should be noted here that in 2023, high-tech operations were used to a greater extent and in a wider range than in 2022 (table-2 and diagram-5).

The use of laparoscopy in emergency surgery, especially in acute diseases of the abdominal organs accompanied by peritonitis, has shown a number of positive effects.

Among them are a reduction in the patient's length of stay in the hospital, a high probability of early activation of patients in the postoperative period and, ultimately, early restoration of patients' work activity.

Diagram-3 Diseases complicated by peritonitis and ending in death in 2022.

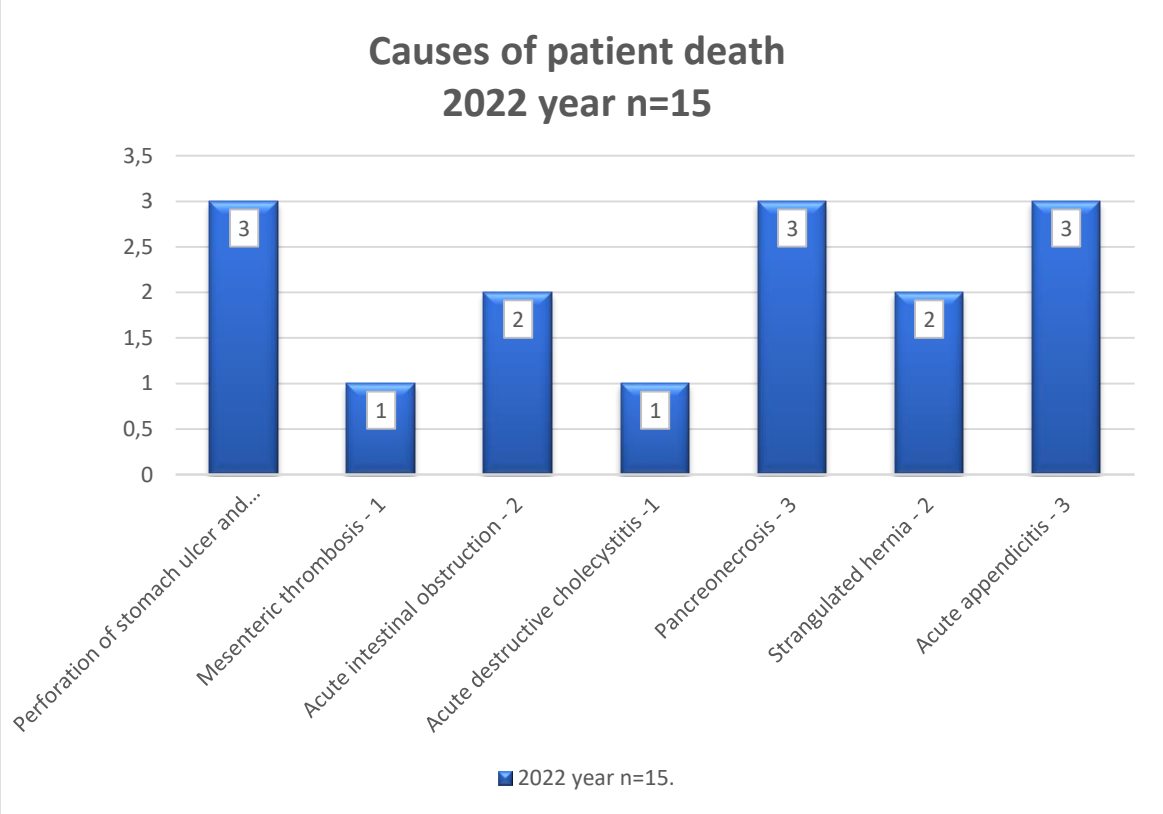


Diagram-4 Diseases complicated by peritonitis and ending in death in 2023.

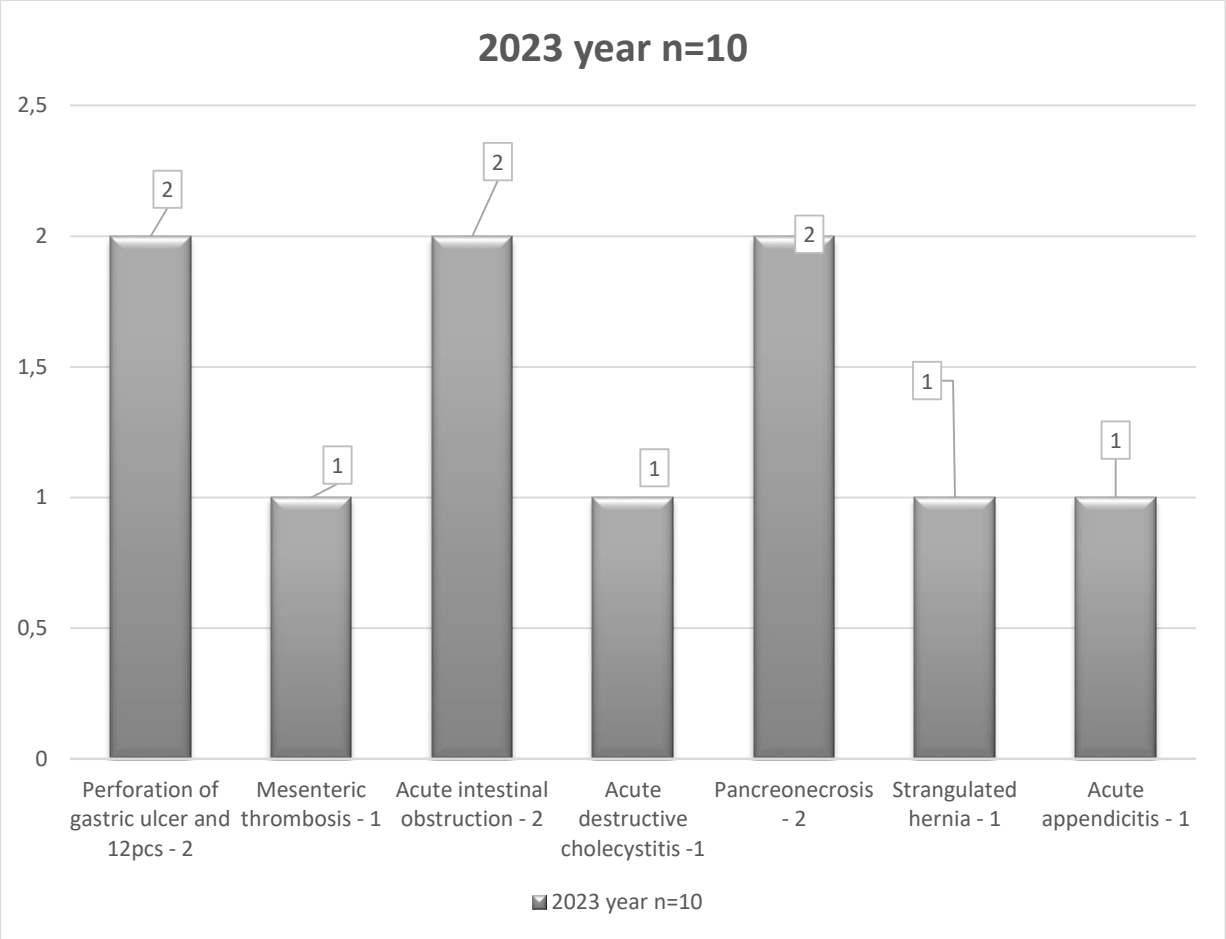
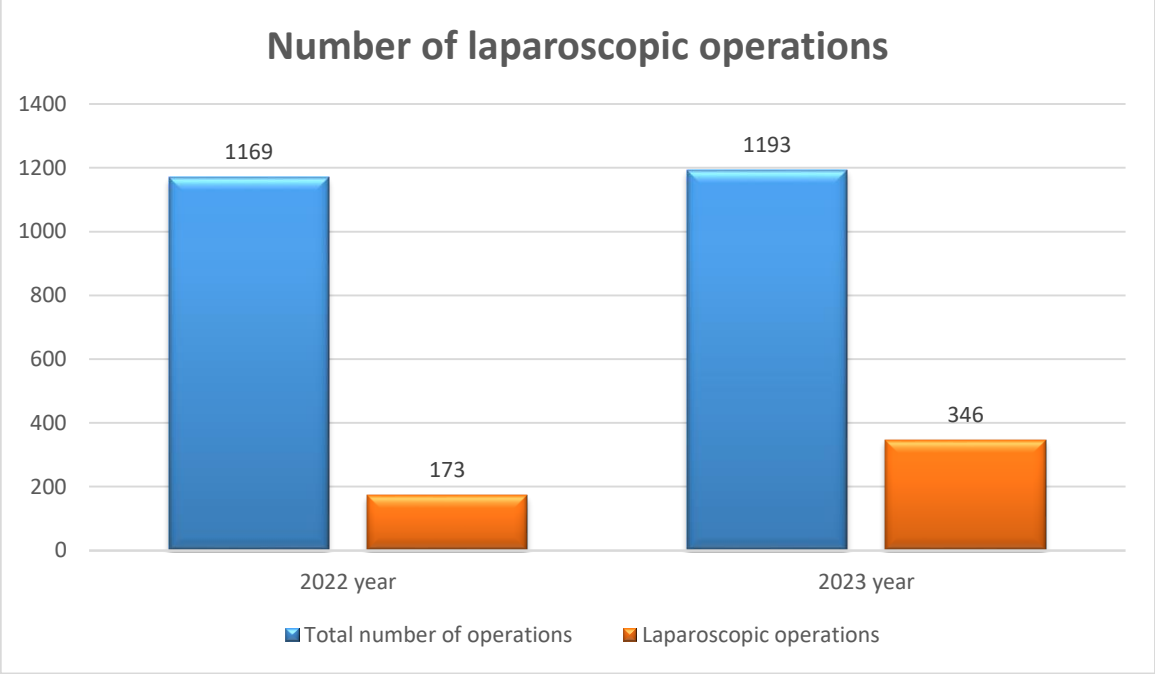


Table 2. Minimally invasive surgeries

	The Pathology name	2022 year Abs (%)	2023 year Abs (%)
1	Laparoscopic cholecystectomy (including in complicated forms with diffuse peritonitis)	104 (60%)	193 (93,7%)
2	Laparoscopic appendectomy (including in complicated forms with diffuse peritonitis)	13 (7,5%)	77 (17%)
3	Diagnostic laparoscopy for various forms of peritonitis of unknown etiology	25 (14,5%)	40 (7,8%)
4	Laparoscopic drainage of extrahepatic bile ducts in cases of pancreatitis and pancreatic necrosis, sanitation of the abdominal cavity	5 (2,9%)	6 (4,9%)
5	Laparoscopic removal of a foreign body	1 (0,6%)	-
6	Laparoscopic herniotomy	25 (14,5)	30 (24,6%)
	Total	*173*	*346*

Diagram-5 Ratios of laparoscopic operations in 2022 and 2023



In the next part of the study, the morphological characteristics of biopsy samples from the peritoneum obtained during surgery were analyzed.

In the early stages of peritonitis, in preparations made from peritoneum biopsies, protrusion from the surface of the mesothelial layer indicates its edema, and in some preparations thin fibrin networks were found. In its deep layers, thinning of collagen and elastic fibers is observed, swelling and hemorrhages between the fibers are noted. Neutrophils are present in the edematous fluid. In venules and capillaries, plethora and migration of red and white blood cells occur, adhering to their walls.

Due to the swelling of endothelial cells in the intima of arterioles, their lumen narrows. As peritonitis persists, platelets also appear and thrombosis is observed. By this time, neutrophils in the form of cell rings extended beyond the basement membrane and accumulated in the subendothelial region.

In some fields of view, a state of degranulation in the form of exocytosis of neutrophilic leukocytes was detected. The most characteristic aspect was the outflow of neutrophilic leukocytes beyond the basement membrane.

With increasing duration of peritonitis, a further deepening of morphological changes was observed. In almost all preparations, the surface of the peritoneum is covered with a thin and coarse fibrin film. Disruption of microcirculation manifested itself in the form of stasis in the venules. Symptoms of edema were observed at all levels, but they were generally more pronounced in the dense fibrous layer. The walls of the arterial vessels also underwent gross morphological changes: significant narrowing, and in some places blood clots. The lymphatic vessels of the abdominal cavity are dilated, and red blood cells are also found in them. The accumulation of exudate in the peritoneum and an increase in the cell population in it indicate destruction of the vessel wall, indicating the migration of plasma and even formed elements, in particular, neutrophilic leukocytes. Most of these cells underwent degranulation (Figures 1 and 2). The detection of a small number of macrophages and cells of dead microorganisms in some preparations corresponds to literature sources [9, 10, 11].

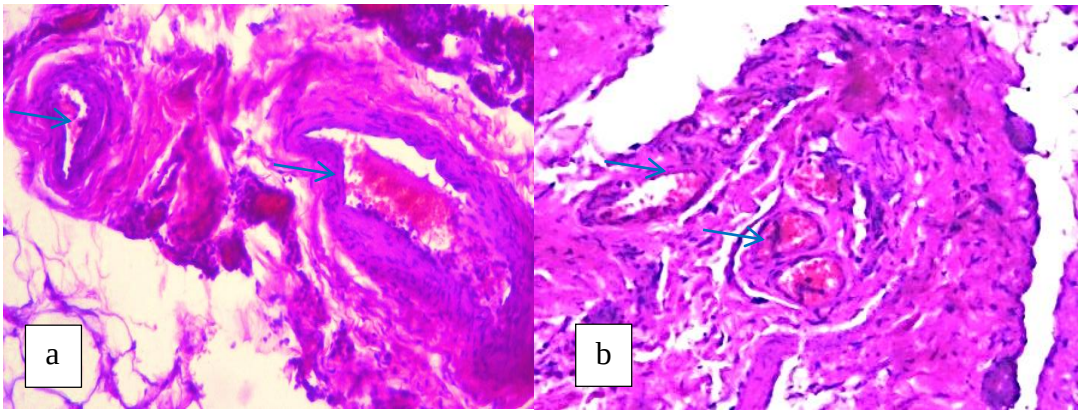


Figure 1 (a, b). Stasis observed in venules, microcirculation disturbances, signs of edema, vessels of the dense layer, GE., K.400.

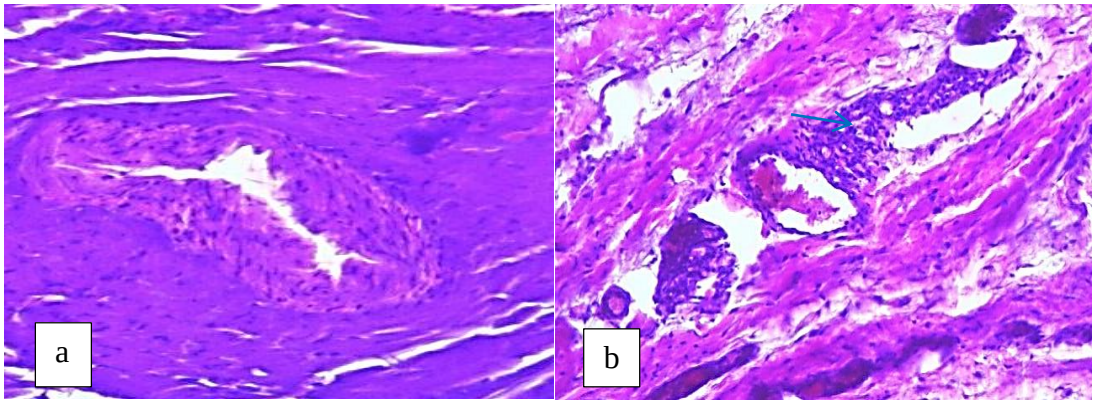


Figure 2 (a, b). Degranulated neutrophilic leukocytes, visible macrophages, fat droplets, as well as shadows of cells, GE., K.400.

With diffuse peritonitis, drops of fat, neutrophils and macrophages are often found in the abdominal cavity. The narrowing of microvessels and the accumulation of leukocytes throughout the wall are pronounced. Neutrophilic leukocytes are concentrated almost outside the basement membrane. In most vessels, areas of necrosis are found in the endothelium, and degranulated neutrophils, macrophages, fat droplets and cellular shadows are visible on the surface of the peritoneum. It is here that total granulation occurs, uneven deposition of collagen fibers and fibrinous coagulation in the peritoneum, i.e. a web of coarse fibrin bundles is formed. Mast cell degranulation was observed.

Thus, depending on the duration and prevalence of peritonitis, morphological changes in the fiber and cellular structures of the peritoneum are aggravated. When symptoms of edema between elastic and collagen fibers are observed in the early stages, subsequent periods accordingly change in the direction of disruption of the order of the fibers and edema. The dynamics of cellular changes, on the other hand, initially begin with accumulation in the vessel walls, causing damage to vascular endothelial cells, subendothelial migration as a result of increased basement membrane permeability, and later degranulation of neutrophil leukocytes leads to an increase in the inflammatory response.

This means that the problem of effective treatment of diffuse peritonitis remains relevant. Today we see the following ways to improve the results of treatment of peritonitis:

1. Introduction of new, less invasive methods of sanitation of the abdominal cavity.

2. Development of express methods that allow diagnosing the microbiological etiology of peritonitis, identifying the dominant pathogen, and also predicting their changes in dynamics.

3. To study the possibilities of preventing intestinal anastomotic insufficiency.

4. Correction of deficiencies in immunogenesis and systemic metabolic disorders using replacement therapy.

5. Conduct research on the development of enteral and nutritional mixtures that the body can absorb in the early stages of the postoperative period.

Conclusion

Among the examined patients in 2022, 115 (6.5%) patients were diagnosed with peritonitis, of which 56% had diffuse peritonitis and 44% had widespread peritonitis. And in 2023, 126 people (6.9%) were hospitalized with peritonitis, of which 61% had diffuse peritonitis and 39% had widespread peritonitis. The most common cause of peritonitis was destructive appendicitis - 35.6% (2022) and 43.6% (2023). The group with widespread peritonitis had a high mortality rate of 13% in 2022 and 21.7% in 2023.

With peritonitis, the deepening of morphological changes in the fibrous and cellular structures of the peritoneum will depend on the duration and extent of the inflammatory process. First, swelling of the fibrous structures is observed, and then hemorrhage, and over a longer period - a violation of the order of the fibers and swelling.

The dynamics of the cell population was first expressed by accumulation in the vascular wall, then, due to endothelial dysfunction, subendothelial migration occurred, which ultimately led to degranulation of neutrophil leukocytes.

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