Research Article

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Diagnosis and Treatment of the Sigmoid Colon Volvulus as a Form of Colonic Obstruction

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RELEVANCE Intestinal obstruction can occur in all age groups, but most often it occurs at the age of 40–70 years and one of the causes of colonic obstruction may be volvulus of the sigmoid or cecum. Volvulus of the sigmoid colon is most common and reaches 15% of all types of strangulation intestinal obstruction.

The mortality rate in sigmoid colon volvulus reaches 14–16%. In cases of necrosis of the sigmoid colon, the mortality can reach 70–78%.

AIM OF STUDY To evaluate the results of diagnosis and treatment of patients with sigmoid volvulus.

MATERIAL AND METHODS In 2015–2020 at the N.V. Sklifosovsky Research Institute for Emergency Medicine we treated 28 patients with volvulus of the sigmoid colon. Of these, there were 13 women (46.4%) and 15 men (53.6%). The average age of the patients was 69 years.

Upon admission to the hospital, patients underwent a clinical examination, basic laboratory and instrumental methods of examination. If volvulus of the sigmoid colon was suspected, colonoscopy, irrigoscopy, computed tomography of the abdominal organs with contrast enhancement, and diagnostic laparoscopy were additionally performed. In the department, patients underwent fluid maintenance, antispasmodic and symptomatic therapy, cleansing enemas. According to the indications, an operative benefit was provided by open and laparoscopic accesses.

RESULTS The sensitivity of the x-ray method was 88%, but the sensitivity of the plain x-ray examination, supplemented with a barium enema (irrigoscopy), was 100%. The sensitivity of the ultrasound method was 57%, however, when supplemented with a Doppler study, the sensitivity increases to 72%. The sensitivity of CT was 100%. The sensitivity of colonoscopy among those studied is 96%.

Operations performed in patients with volvulus of the sigmoid colon: endoscopic detorsion in 15 patients (64.3%), video-laparoscopic elimination of volvulus of the sigmoid colon in 3 (10.7%) patients. Midline laparotomy in 17 patients (60.7%).

Among patients after endoscopic bowel detorsion, no complications were observed in the early period. After laparotomy and elimination of volvulus of the sigmoid colon, postoperative complications were observed in 3 (17.7%) patients. There were 3 deaths (10.7%).

CONCLUSION High mortality does not allow us to call the results of treatment satisfactory, and a small number of observations does not allow us to obtain statistically significant results, which requires further case recruitment and data analysis.

Keywords: sigmoid volvulus, colonic obstruction, irrigoscopy (barium enema), colonoscopy, laparoscopy, intestinal detorsion

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CT – computed tomography
LBO – large bowel obstruction
SV – sigmoid volvulus

INTRODUCTION

Intestinal obstruction can occur in all age groups, but it most often occurs between the ages of 40–70 years, and one of the causes of large bowel obstruction (LBO) may be sigmoid volvulus (SV) or cecum volvulus [1–13]. SV is the most common form and reaches 15% of all types of strangulated intestinal obstruction [1, 6, 9, 10, 13–15].

Intestinal obstruction caused by sigmoid volvulus continues to be accompanied by high mortality rates, reaching 14–16%. [6, 9, 16–19]. In cases of necrosis of the sigmoid colon, the mortality can reach 70–78%. Today, it is difficult to consider the results of treatment of SV as satisfactory [3–5, 10, 12, 20–23].

The major reasons for high mortality and infectious complications (25–80%) are the predominance of elderly and senile people, late presentation of patients and a significant percentage of diagnostic errors, as well as tactical errors in decision-making at all stages of treatment [24–27].

Aim of study: to improve the results of diagnosis and treatment of sigmoid volvulus by optimizing the diagnostic and treatment algorithm.

MATERIAL AND METHODS

In 2015–2020 there were 28 patients with SV at the N.V. Sklifosovsky Research Institute for Emergency Medicine. Of these, there were 13 women (46.4%) and 15 men (53.6%). The mean age of the patients was 69 years.

During the study, 20 patients (71.4%) were admitted within the first 6 hours from the onset of the disease, 5 patients (17.9%) were admitted after 12 hours, and 3 (10.7%) were admitted later than 24 hours. Of all the patients 12 (42.6%) were in severe condition, the condition of the remaining 16 (57.4%) patients were of moderate severity. The severity of the patients' condition was aggravated by the presence of concomitant cardiovascular, bronchopulmonary and hemostatic system disorder.

The main symptoms of the disease were abdominal pain, bloating, vomiting, and lack of gas and stool.

All patients underwent instrumental diagnostic methods upon admission: X-ray examination of the abdominal cavity, if indicated, contrast examination of the colon using barium enema (irrigoscopy), ultrasound examination of the abdominal organs, colonoscopy, computed tomography (CT) of the abdominal cavity and diagnostic laparoscopy.

A mandatory method for diagnosing intestinal volvulus was a polypositional X-ray examination of the abdominal organs, supplemented if indicated by a barium enema (irrigoscopy).

Plain X-ray examination of the sigmoid colon revealed a dramatically increased volume of the sigmoid colon, reaching the diaphragm, often with two levels of fluid in the proximal and distal ends of the obstructed colon. When performing a barium enema, a characteristic symptom of SV was a conical narrowing of the lumen of the distal parts of the sigmoid colon with a stop in the advancement of the contrast agent at this level, the "bird beak" sign.

Ultrasound. Ultrasound of the abdominal organs was the most accessible non-invasive method for diagnosing intestinal obstruction.

The examination was carried out upon admission to identify concomitant diseases of the abdominal organs and retroperitoneal space. The diameter and thickness of the intestinal wall, the presence of effusion in the abdominal cavity, the nature of peristalsis, and the presence or absence of blood supply to the intestine were assessed.

CT scan of the abdomen. CT scan of the abdominal cavity made it possible to confirm the presence of intestinal obstruction, identify the cause of intestinal obstruction, as well as formations in the abdominal cavity that cause the clinical and instrumental picture of intestinal obstruction, and assess the state of blood flow in the intestinal wall.

Colonoscopy. The location of colonoscopy for the diagnosis and treatment of SV is very important, as it allows us to assess the condition of the intestinal mucosa, determine the level of volvulus and perform detorsion in the absence of intestinal necrosis. Colonoscopy was performed in all patients with a clinical and instrumental picture of intestinal volvulus, in the absence of clinical peritonitis and the presence of dilated loops of the colon proximal to the volvulus no more than 12 cm. The study was performed in an operating room. A characteristic symptom of SV was the "whirlpool symptom" — a spirally narrowed segment of the colon.

Comparative sensitivity indicators for diagnostic methods for SV are presented in Fig. 1.

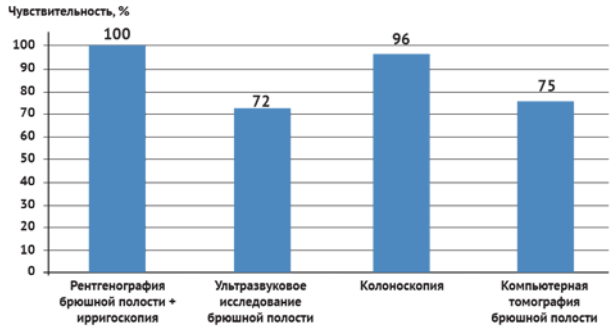

Fig. 1. Sensitivity of diagnostic methods

Thus, the main methods for diagnosing colonic volvulus are plain radiography of the abdominal cavity in combination with a barium enema (irrigoscopy), performed as indicated, and colonoscopy. However, to assess the presence of blood supply to the intestines, the most valuable diagnostic method is abdominal ultrasound, supplemented by Doppler ultrasound and CT.

When the diagnosis of SV was established, treatment began with conservative measures according to the general approach and included the following:

1. Decompression of the gastrointestinal tract (nasogastric tube, gas pipes according to indications).

2. Infusion therapy with saline solutions to correct disturbances in the electrolyte composition of the blood under the control of the acid-base state of the arterial blood. Infusion therapy with albumin solutions for hypoproteinemia.

3. Antibacterial therapy:

- in case of possible laparotomy — 1-2 hours before the intervention;

- if perforation, peritonitis or sepsis is suspected — emergency surgery after short-term preoperative preparations.

4. Management of concomitant diseases.

The effectiveness criteria were reduction in pain, reduction in abdominal volume, absence of abdominal asymmetry, presence of gases and stool, reduction in the diameter of colon loops according to X-ray examination, disappearance of horizontal fluid levels.

In the absence of effect from conservative therapy, a decision was made in favor of surgical treatment.

Indications for surgical intervention were:

— strangulation intestinal obstruction with necrosis of the intestinal wall;

— peritonitis;

— ineffectiveness of conservative measures and consequent progressive bloating.

In the absence of a history of abdominal surgery, and also taking into account the severity of the condition, a number of patients underwent diagnostic laparoscopy. If the sigmoid colon was viable, palliative and radical operations were used.

The scope of radical surgery included resection of the sigmoid colon with primary anastomosis and Hartmann's operation.

Palliative interventions included: straightening of the volvulus, detorsion in combination with mesosigmoplication or sigmopexy.

RESULTS

The sensitivity of the X-ray method was 88% (22 out of 25 patients), but the sensitivity of a survey X-ray study, supplemented with a barium enema (irrigoscopy), was 100%. The sensitivity of the ultrasound method was 57%, but with the addition of Doppler ultrasound, the sensitivity increases to 72%. The sensitivity of CT was 100%.

The sensitivity of colonoscopy among those studied is 96%.

In our study, endoscopic intervention was performed right in the course of conservative therapy: colonoscopy and endoscopic detorsion in 15 patients (64.3%).

Surgeries performed in patients with SV: videolaparoscopic removal of SV – in 3 patients (10.7%). Median laparotomy, detorsion and resection of the sigmoid colon, removal of an end colostomy – in 5 patients (17.9%), in 12 cases (42.9%) laparotomy was performed, elimination of the sigmoid colon, and sigmopexy after intestinal detorsion was performed in 8 patients (35, 7%).

Among patients after endoscopic intestinal detorsion, no complications were observed in the early period. Two patients had re-admissions, hospitalization with a picture of SV, and one required laparotomy, detorsion and sigmopexy to the parietal peritoneum. Another patient, upon re-admission with SV, required laparotomy, resection of the sigmoid colon and end colonostomy.

After laparotomy and elimination of the gastrocnemius veins, postoperative complications were observed in 3 patients (17.7%): in two patients (11.8%) occlusive thrombosis of the calf veins was observed, they were treated conservatively (II according to *Clavien-Dindo*), in one patient (5.9%) abdominal abscess was drained under ultrasound guidance (IIIa according to *Clavien-Dindo*).

Three patients died (10.7%) (*Clavien–Dindo V*). One patient after laparotomy, detorsion of the sigmoid colon, elimination of volvulus and 2 patients after laparotomy, resection of the sigmoid colon, removal of the end colonostomy.

The results of treatment of patients with SV are presented in the table.

Table

Results of treatment of patients with colonic volvulus

Diagnostic methods	Repeated arrivals	General bed day	Postoperative hospital stay	Complications	Mortality
Endoscopic detorsion	9	3.6	2.7	0	0
Videolaparoscopy	1	8	6.25	1	0
Laparotomy	2	13.8	10	6	3

Thus, the table shows that the safest method of treatment is endoscopic detorsion, however, the largest number of re-admissions with newly developed intestinal volvulus is observed.

Clinical case 1

A 70-year-old patient, a month after the first hospitalization, was re-admitted with SV, LBO and the emergency surgical intervention was performed including laparotomy, detorsion of the sigmoid colon, transanal intubation of the sigmoid colon, dissection of scar tissue in the area of volvulus, and sigmopexy to the parietal peritoneum.

First admission: SV. Large bowel obstruction. Operation: video laparoscopy, detorsion. Elimination of colonic obstruction. Decompression of the sigmoid colon. Drainage of the abdominal cavity.

The data obtained upon first admission are presented in Fig. 2.

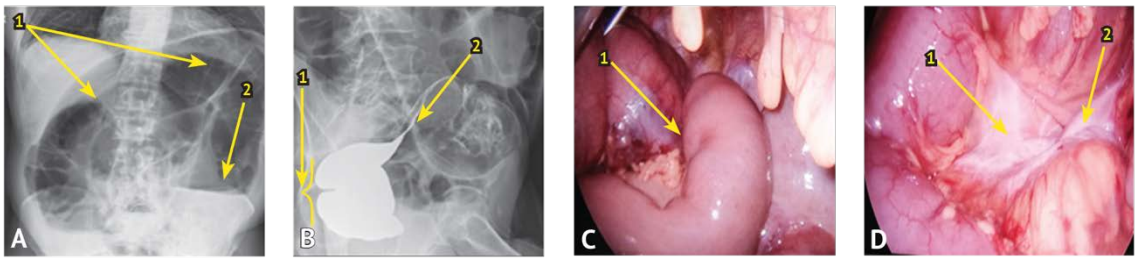

Fig. 2. First admission. A — plain X-ray image of the abdominal cavity. A sharply swollen loop of the sigmoid colon (arrows 1) with a fluid level (arrow 2) is revealed; B - irrigoscopy. The distal parts of the sigmoid colon are contrasted (arrow 1). The "beak" symptom is clearly defined (arrow 2); C — intraoperative photo of sigmoid colon volvulus before straightening (arrow 1 — torsion zone); D — intraoperative photo of the sigmoid colon after the volvulus has expanded (arrow 1 — enlarged dilated mesentery, arrow 2 — narrow base of the mesentery and strangulation zone)

Re-admission one month after the first operation: SV. Large bowel obstruction. The patient underwent laparotomy from a median approach, straightening of the volvulus, intestinal intubation, and detorsion. The combination of these manipulations with mesosigmoplication or sigmopexy is classified as palliative, eliminating intestinal obstruction and aimed at saving lives.

The data obtained upon re-admission are presented in Fig. 3.

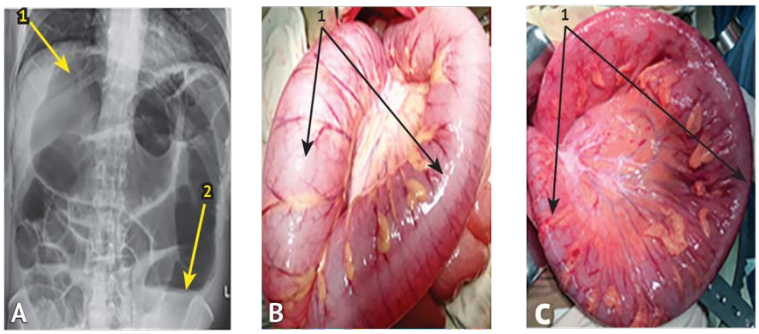

Fig. 3. Repeated admission. A — plain X-ray image of the abdominal cavity. A dramatically swollen loop of the sigmoid colon (arrow 1) with a fluid level (arrow 2) are revealed; B — intraoperative photo of volvulus of the sigmoid colon before decompression (arrow 1 — enlarged sigmoid colon); C — Intraoperative photo of volvulus of the sigmoid colon after melting and decompression (arrow 1 — intubated sigmoid colon)

A year later, this patient had another hospitalization with colonic obstruction, which was managed by colonoscopy.

Clinical case 2

A 91-year-old patient was admitted with a clinical signs of SV, taking into account peritoneal symptoms, emergency surgical intervention was performed in the amount of laparotomy, resection of the sigmoid colon, and removal of the terminal sigmostoma. Sanitation, drainage of the abdominal cavity.

The data obtained upon admission and during surgery are presented in Fig. 4.

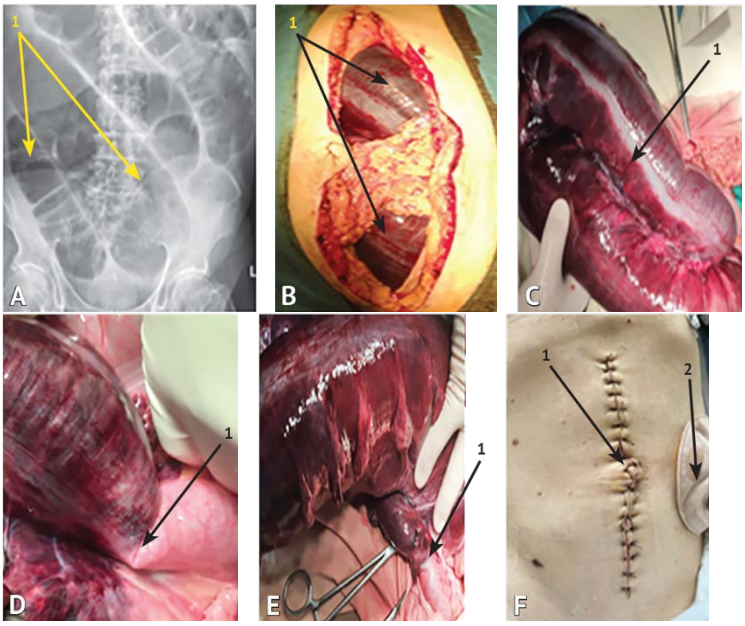

Fig. 4. Volvulus, strangulation, necrosis of the sigmoid colon. A — plain X-ray of the abdominal cavity. Sharply swollen loops of the sigmoid colon are detected (arrow 1); B - laparotomy. In the abdominal cavity there are dilated loops of the sigmoid colon (arrow 1) with signs of ischemia and necrosis; C—intraoperative photo. The sigmoid colon with significant signs of occlusive disorder of the blood supply to the intestine and its necrotic changes (arrow 1); D—intraoperative photo. The volvulus site with demarcation line (arrow 1); E—intraoperative photo. The volvulus site with demarcation line (arrow 1); F — the view of the postoperative laparotomy wound (arrow 1) and end sigmostoma with colostomy bag (arrow 2)

The patient died on the 9th day due to bilateral pneumonia and pulmonary embolism.

Clinical case 3

Another fatal outcome occurred in an 82-year-old patient who was hospitalized with advanced LBO (absence of bowel movements for 10 days) due to SV. When examined in the emergency department, the clinical and instrumental picture was of LBO, SV (?). In addition: coronary heart disease, atherosclerotic and post-infarction cardiosclerosis. Rhythm disturbances of the paroxysmal form of atrial fibrillation (CHA2DS2-VASC 3 points). Stage 3 hypertension, very high risk of cardiovascular complications. Chronic heart failure stage 2A, cerebrovascular disease. Chronic cerebral ischemia. Bilateral community-acquired polysegmental pneumonia of moderate severity.

The data obtained upon admission are presented in Fig. 5.

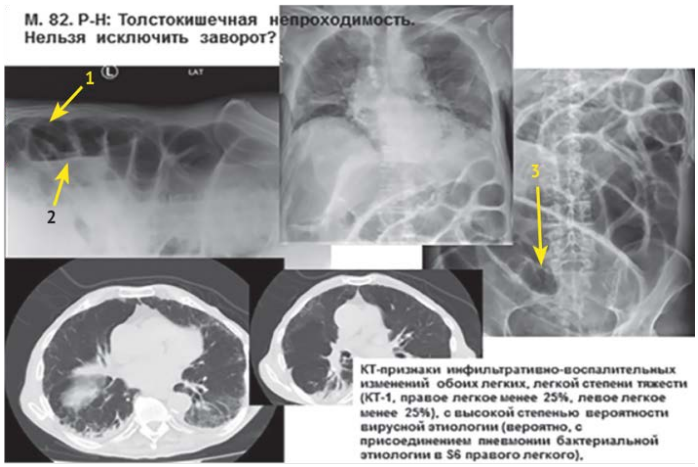

Fig. 5. X-rays, CT upon admission. Abdominal X-ray images show dilated loops of the colon and small intestine (arrow 1) with fluid levels (arrow 2) and dilated loops of the sigmoid colon (arrow 3 — coffee bean sign)

Due to changes in the lungs, the patient was hospitalized in the observation department due to suspected coronavirus infection and, after excluding it, was operated on through a midline laparotomy approach. SV with strangulation and perforation of the intestinal wall was detected. Resection of the sigmoid colon and end colonostomy were performed.

The data obtained during the operation are presented in Fig. 6.

Fig. 6. Intraoperative photos of changes in the sigmoid colon

Postoperatively: severe course, deep stupor, mechanical ventilation, and vasopressor support. On the day 5, a repeated operation was performed “on demand” due to intestinal perforation and peritonitis.

Performed: relaparotomy; resection of the cecum; removal of the terminal ascendostomy; ileostomy; sanitation, drainage of the abdominal cavity. During the operation, a violation of the blood supply to the intestine was revealed, which was more significant in the cecum, where perforation of the wall occurred. The patient died one day after the second surgery.

At the autopsy, non-occlusive disorders of the blood supply to the intestine were discovered: non-occlusive segmental necrosis of the cecum, ascending, transverse colon and rectum, which was also one of the causes of death against the background of liver cirrhosis.

The data obtained at the autopsy are presented in Fig. 7.

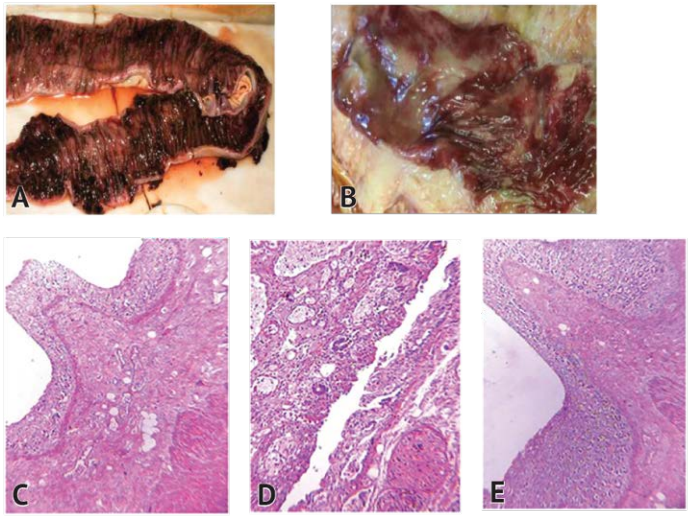

Fig. 7. Non-occlusive lesion of the colon, necrosis of the mucous membrane. A—gross specimen. Sigmoid colon; B—gross specimen. Mucous membrane of the sigmoid colon; C–D - microslide. Mucous membrane of the sigmoid colon

CONCLUSION

Upon admission of patients with colonic obstruction and suspected sigmoid volvulus with x-ray confirmation of this diagnosis, an emergency barium enema (irrigoscopy) is indicated, which allows the correct and accurate diagnosis to be established in a short time.

In cases where the differential diagnosis is the violation of the mesenteric blood supply, emergency computed tomography of the abdominal cavity with bolus contrast enhancement is indicated to determine the blood supply to the intestine.

Ultrasound examination of the abdominal cavity is less informative in cases of severe colonic obstruction and intestinal pneumatosis against the background of sigmoid colon volvulus, but at the same time it helps in detecting free fluid and excluding diseases of the liver, gall bladder, spleen and kidneys.

When diagnosing sigmoid volvulus, colonoscopy can be used for diagnostic and therapeutic purposes. Colonoscopy helps establish the cause of obstruction, exclude a tumor, establish the level of volvulus and the possibility of performing intestinal detorsion as a therapeutic measure and then inserting a probe above the sites of intestinal torsion. This is done to decompress the intestine and identify a possible second level of torsion and compression of the intestine.

After endoscopic decompression of intestinal volvulus (detorsion), it is necessary to continue decompression of the colon, lavage, and rinsing of the intestinal tube, when one is installed, for its full functioning.

Contraindications to colonoscopy are based on X-ray data and the results of measuring the diameter of the dilated colon, which should not exceed 9 cm in diameter, and the absence of peritoneal symptoms.

The use of videolaparoscopy to correct sigmoid volvulus currently does not have much clinical confirmation. This method can be used in the clinical picture of the disease, which does not allow excluding volvulus of the sigmoid colon without the phenomena of peritonitis, and in the absence of severe adhesive disease in the abdominal cavity, the presence of an acoustic window for installing trocars according to ultrasound.

Surgical interventions from laparotomic access with elimination of volvulus, intestinal intubation, decompression and fixation of the sigmoid colon are life-saving, but belong to the category of palliative interventions and do not allow to avoid a number of postoperative complications in the early postoperative period, and subsequently, in the long term - the occurrence of repeated volvulus sigmoid colon.

Performing resection of the sigmoid colon after eliminating the volvulus is a radical surgical intervention, but given that it ends with the removal of an intestinal stoma, it should not be considered radical in full, since a second stage of delayed intervention is required to eliminate the intestinal stoma.

Complex postoperative treatment should include full intravenous infusion therapy, antibiotic therapy, enteral correction, the use of intestinal lavage, the use of disaggregants, drugs that improve blood rheology, taking into account possible non-occlusive disorders of the mesenteric blood supply.

The long-term development of the disease with dolichosigma of a recurrent nature, complicated by volvulus, colonic obstruction and the danger of decompensation of blood circulation in the wall of the colon with the development of necrosis, the development of multiple organ failure require an earlier solution to the issue of radical intervention with intestinal resection in more favorable conditions.

A small number of observations does not allow us to obtain statistically significant results, which requires further study of the issue using different methods of diagnosis, treatment, surgical interventions and an increase in the number of observations of patients with sigmoid volvulus for convincing reliability of the results.

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