

## **Elective Laparoscopic Resections and Laparoscopic Colostomy Reversal Procedures for Diverticular Disease of the Colon**

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### **Abstract**

**Introduction:** Diverticular disease of the colon and its complications is a frequent pathology in representatives of Western civilization. Most often, acute and chronic diverticulitis, bleeding from diverticula, the formation of strictures and fistulas of the colon develop. Diverticulum perforation is still one of the leading causes of emergency laparotomy and colostomy. The choice of surgical tactics for acute diverticulitis complicated by abscess and peritonitis remains a matter of debate. Even less unambiguous are approaches to determining indications for elective colon resection for diverticular disease. The introduction of laparoscopic technologies into colorectal surgery allowed us to take a fresh look at the elective resection of the colon for diverticular disease. The use of laparoscopic technologies during reconstructive surgery can improve the immediate results of treatment of patients.

**Aim:** Implementation in clinical practice and obtaining own experience of elective laparoscopic surgical interventions in the management of complicated diverticular disease of the colon.

**Materials and Methods:** Fourteen patients with diverticular colon disease were operated using laparoscopic techniques and the formation of a large intestine anastomosis. In five patients (46%), only laparoscopic colon resection was performed with a large intestine anastomosis due to diverticular disease complicated by recurrent diverticulitis. Nine patients (64%) underwent laparoscopically assisted reconstructive surgery for a colostomy formed by a diverticular disease of the colon complicated by acute diverticulitis. patients with diverticular colon disease were operated using laparoscopic techniques and the formation of a large intestine anastomosis. In five patients (46%), only laparoscopic colon resection was performed with a large bowel anastomosis due to diverticular disease complicated by recurrent diverticulitis. Nine patients (64%) underwent laparoscopically assisted reconstructive surgery for a colostomy formed by a diverticular disease of the colon complicated by acute diverticulitis.

**Results and Discussion:** Surgery was successful in all patients. High duration of operations and low blood loss were noted. Colonic anastomosis is formed in all patients. Stapler anastomosis performed in 71% of patients, manual anastomosis in 29% of patients. One patient with a low colorectal anastomosis had a preventive loop ileostomy. Conversions of operative access to laparotomy and postoperative mortality were not. Class II complication developed in one patient. A short duration of the postoperative period and a short stay in the intensive care unit, low intensity of the pain syndrome and early restoration of bowel function were recorded.

**Conclusion:** The resulting experience confirms the need to use laparoscopic techniques in patients with diverticular disease of the colon. A small number of complications and good immediate results allow us to predict a wider use of such operations in patients with diverticular disease.

**Keywords:** *Laparoscopic Resection; Diverticular Disease; Diverticulitis; Colonic Anastomosis*

### Introduction

Diverticulosis of the colon is a common medical condition among representatives of Western civilization. It affects men and women with equal frequency. In most cases, the disease affects the left colon and most often proceeds with minimal clinical manifestations or asymptomatic, however, surgical complications of diverticulosis develop in 5 - 20% of cases. In this case we are talking about diverticular disease of the colon. Most often one has to deal with acute and chronic diverticulitis (75% of cases), bleeding from diverticula (3 - 15% of cases), formation of colon strictures and intestinal fistulas [1-3]. Perforation of the diverticulum with the development of peritonitis is still one of the leading causes of emergency laparotomy and colostomy formation [1,4]. Thus, diverticular disease of the colon and the treatment of its complications remains an important medical and social problem.

The choice of surgical tactics for acute diverticulitis complicated by abscess and peritonitis remains a matter of debate. With the development of medical science and technology and the approaches vary. Often, what was previously rejected and considered unacceptable is now recognized by most surgeons as a technique that meets modern requirements. So many authors are increasingly giving preference to a restrained approach in relation to indications for surgical treatment. Small pericolic abscesses, as well as local peritonitis in acute diverticulitis, are often successfully treated conservatively. Larger abscesses, along with conservative treatment, are subjected to minimally invasive puncture and drainage interventions. These approaches make it possible to reduce the number of emergency laparotomies, reduce surgical trauma, and avoid patient disability due to colostomy removal. Moreover, the duration and cost of such treatment are comparable or even lower compared to emergency laparotomy [1,4-8].

The approaches to determining the indications for elective colon resection for diverticular disease are even less straightforward. Most authors consider it shown as such in diverticular disease of the colon, complicated by recurrent diverticulitis. It means that the patient received inpatient conservative treatment for acute diverticulitis at least twice, and the diagnosis in each case of hospitalization must be confirmed by objective methods [4,5,9,10]. Both surgeons and patients often refrain from performing elective resection by laparotomy in the absence of signs of acute inflammation and an immediate threat to life. This is due to a rather high number of complications, possible mortality, a presumed large surgical trauma, low cosmetic results, etc. It should be noted that the introduction of laparoscopic technologies in colorectal surgery allowed to reduce the number of complications, including anastomotic leakage, mortality, inpatient treatment, reduce the intensity of pain syndrome, and accelerate the recovery of bowel function in the postoperative period [9-12]. These and other advantages of laparoscopic surgery have made it possible to rethink the feasibility of elective colon resection for diverticular disease and make it more attractive to both the patient and the surgeon.

Laparoscopic surgery for diverticular disease of the colon has its own characteristics. The presence of a chronic inflammatory process leads to the emergence of an adhesive process, difficulties with the mobilization of the resected segment, difficult identification of the embryonic layers and orientation in them. In addition, given the benign nature of the pathology, as a rule, there is no need for isolation and intersection at the base of the feeding vessels. On the contrary, when resecting the left colon, it is advisable to preserve the main trunk of the inferior mesenteric and superior rectal arteries, which will ensure sufficient blood supply in the area of the colorectal anastomosis [3]. Working in altered anatomical conditions and the peculiarities of surgical laparoscopic technique in this pathology makes increased demands on the training of the surgeon and assistants, as well as on the equipment of the operating room.

A special group is made up of patients with diverticular disease of the colon who underwent urgent surgery with colostomy formation. The variety of the clinical picture and variants of the course of the pathological process lead to the fact that in an emergency situation, both end and loop colostomas can be formed. In the case of obstructive resection, the affected segment is most often resected. However, surgeons do not need to during an emergency operation and should not perform the most radical resection of the affected segment of the intestine. Excessive volume of surgical intervention in conditions of widespread peritonitis opens up new ways for the spread of

intra-abdominal infection. It is enough to resect a section of the colon with perforation or abscess and form the end colostomy [1]. In this case, at the stage of reconstructive treatment, resection of the affected intestine may be required. In the formation of a loop colostomy, in most cases the pathological process is not eliminated, which necessitates the subsequent resection of the affected intestine during reconstructive surgery to close the colostomy. Conventional colostomy closure and the reversal of the Hartmann's procedure are traumatic, accompanied by high mortality, a large number of complications, and a high incidence of anastomotic leakage. The use of laparoscopic technologies in the course of reconstructive interventions can improve the immediate results of treatment by reducing mortality, the number of complications, less blood loss, faster recovery of bowel function, and low intensity of pain syndrome [13]. However, such operations are technically difficult, time-consuming, demanding on the preparation of the surgical team and the equipment of the operating room.

According to the Resolution of the XVI Congress of Surgeons of the Republic of Belarus, the introduction and application of laparoscopic technologies for the treatment of diseases and pathological conditions of the colon and rectum is one of the "immediate tasks of colorectal surgery in Belarus" [14].

### Aim of the Study

Introduction into clinical practice and gaining our own experience of laparoscopic surgical interventions in surgery for complicated diverticular disease of the colon.

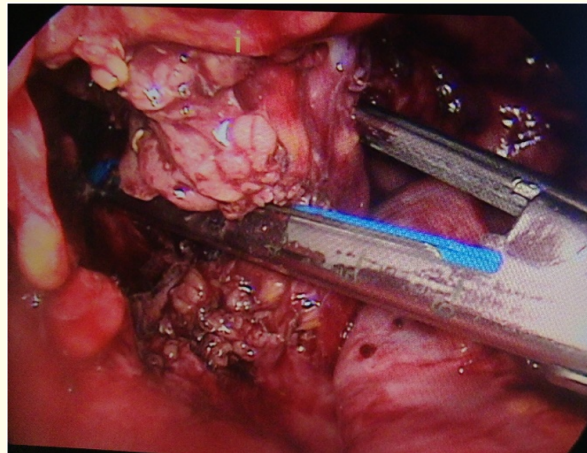
### Materials and Methods

In 2018 - 2020 14 patients with diverticular disease of the colon were operated on in the coloproctology department of the health establishment "Vitebsk Regional Clinical Specialized Center" using laparoscopic technologies and the formation of a large bowel anastomosis. The average age of the patients was 58.9 years. Body mass index  $27 \pm 4.4$  kg/m<sup>2</sup>. Among the patients there were 9 women (64%) and 5 men (36%). In principle, according to the type of surgery performed, patients could be conditionally divided into those who underwent only laparoscopic resection of the colon with colonic anastomosis for diverticular disease complicated by recurrent diverticulitis. There were 5 such patients (36%).

Nine patients (64%) underwent laparoscopically assisted reconstructive surgery for colostomy formed due to diverticular disease of the colon complicated by acute diverticulitis with perforation. The time from the moment of initial surgery with the formation of a colostomy to the moment of reconstructive surgery was  $4.3 \pm 1.6$  months. In 7 patients (78%), obstructive resection of the Hartmann type with the formation of an end colostomy was previously performed. Two patients (22%) had loop sigmoidomas. Resection of the affected intestine was not performed at the stage of emergency surgery. All patients (2 patients) with a loop sigmoidostomy and one patient with an end sigmoidostomy required a laparoscopically assisted colon resection.

For patients who underwent only laparoscopic resection of the sigmoid colon, surgery was performed according to the generally accepted technique. A laparoscopic multiport approach with four working trocars was used. A revision of the abdominal cavity was performed, if necessary, the adhesions were divided in the area of the affected intestine. Then proceeded to mediolateral mobilization of the sigmoid colon. At the same time, we tried to preserve the main trunk of the inferior mesenteric and superior rectal arteries. In case of difficulties in identifying embryonic layers due to inflammatory infiltration in the colon and its mesentery, additional landmarks were used, such as the inferior mesenteric artery and vein, ureters, hypogastric nerves, iliac vessels, gonadal vessels, bone structures of the pelvis, etc. After the completion of mobilization, the colon the intestine was transected with a linear endoscopic cutting stapler at the level of the rectosigmoid junction (Figure 1). Through minilaparotomy according to Pfannestil or in the left iliac area, the intestine to be resected was brought out to the anterior abdominal wall and extracorporeally resected. At the same time, they did not seek to resect the entire colon containing diverticula, but only the most macroscopically altered segment of the intestine with signs of inflammation or fibrotic changes

was removed. The resected segment in all cases was the sigmoid colon. After the resection, the anvil of the circular stapler was fixed in the adductor colon and immersed in the abdominal cavity. The wound of the abdominal wall was sutured, then intracorporeally under the control of laparoscopy, sigmoidorectal or descendorectoanastomosis was formed, depending on the volume of colon resection, with a circular stapler (C.D. Knight - F.D. Griffin (1990) technique modified for laparoscopic operations). The tightness of the stapler anastomosis was checked by the A.H. Davies (1988) in all cases.



**Figure 1:** The mobilized colon is being transected at the level of the rectosigmoid junction.

In patients with loop sigmoidomas, in addition to restoring intestinal continuity, it was also necessary to resect the affected part of the colon. In the midline above the navel according to H.M. Hasson (1971) performed access to the abdominal cavity. Four working trocars were installed. The severity of the adhesive process was evaluated according to the classification of O.I. Blinnikov (1993) and the technical feasibility of laparoscopic surgery. Continuation of laparoscopic intervention was considered indicated at I-III grade and inappropriate at IV grade the severity of the adhesive process. The adhesions in the stoma area were partially divided. Then the colostomy was sutured, separated from the tissues of the abdominal wall, and immersed in the abdominal cavity. To seal the wound of the abdominal wall, which remained after the separation of the colostomy, an original device was used for temporary sealing of trocar and minilaparotomic wounds (Patent for utility model of the Republic of Belarus No. 12253). The pneumoperitoneum was re-created. Further, the course of the operation did not fundamentally differ from that described above (Figure 2).



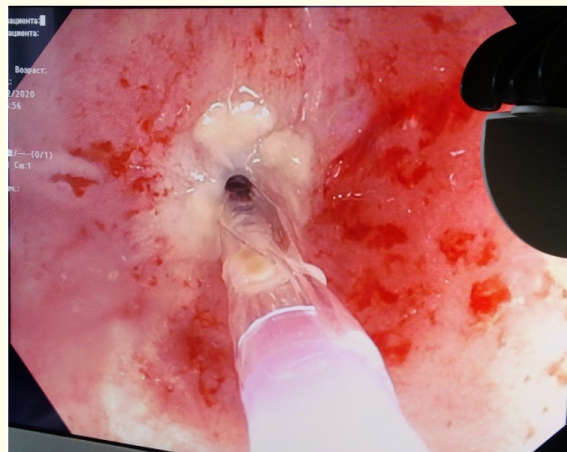
**Figure 2:** The minilaparotomy wound was temporarily sealed using the original device.

At the first stage, the patients with terminal colostomy underwent stoma suturing. Then an operative access to the abdominal cavity by H.M. Hasson (1971) was created. Three or four working trocars were used. After assessing the intensity of the adhesive process, adhesiolysis was performed in the area of surgery. The adductor gut was mobilized, and the disconnected segment of the colon was identified. Then the carboxyperitoneum was removed, the ostomied colon was separated from the abdominal wall tissues, and it was sparingly resected. In one case, a more extended resection (about 15 cm) of the adductor sigmoid colon was required due to the presence of many large diverticula and inflammatory infiltration in this area. With a sufficient length of the anastomosed segments, a manual extracorporeal anastomosis was formed (4 observations). In cases of a short distal stump (5 observations), the anastomosis was formed using a circular stapler transanally according to the method described above.

### Study Results and Discussion

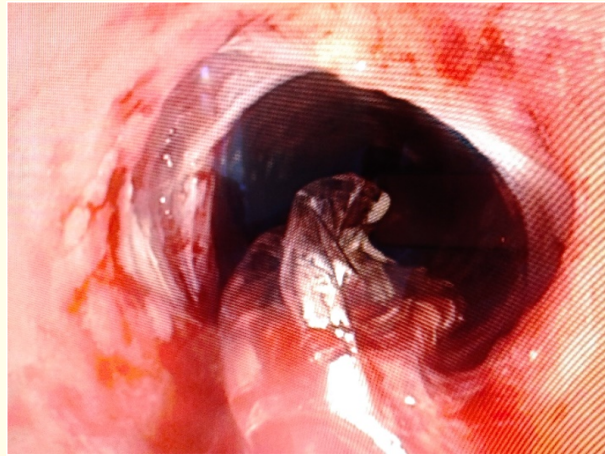
Surgical interventions were completed successfully in all patients. Quite long in time -  $235 \pm 78$  minutes, with a slight blood loss of  $86.4 \pm 54$  ml. Simultaneously, two patients underwent laparoscopic cholecystectomy for concomitant gallstone disease, one patient underwent hernia repair for an umbilical hernia. Colonic anastomosis was formed in all patients. Circular stapler anastomosis was applied in 10 (71%) patients, manual extracorporeal anastomosis - in 4 (29%) patients. One patient (7% of cases) with a low colorectal anastomosis underwent a preventive loop ileostomy in order to prevent its leakage. There were no conversions of the operative access to laparotomy. There was no postoperative mortality. However, one patient (7% of observations) developed a class II complication according to the Accordion classification (2009) in the form of hypostatic pneumonia, which required conservative treatment. The postoperative period in the hospital was  $8.9 \pm 3$  days. Of these,  $2.5 \pm 0.85$  days on the bed of the intensive care unit. Prescription of opioid analgesics was not required, all patients received an epidural catheter prior to surgery, and prolonged epidural anesthesia was performed. On demand, non-narcotic analgesics were administered. Gases appeared on day  $2 \pm 0.78$ , stool was obtained on day  $4 \pm 1.7$ .

The clinical status of all patients was monitored throughout the year by conducting follow-up examinations once every six months. The state of health of the majority of the patients did not cause concern. One of the patients a year after the laparoscopic resection of the sigmoid colon with the formation of stapler sigmoidorectal anastomosis began to complain of recurrent bloating, pain, and changes in the shape of the stool by pronounced decrease in its diameter. Rectoscopy was performed, in which a fibrotic stricture of the anastomosis was diagnosed up to 5 - 6 mm in diameter. After bowel preparation in a hospital, endoscopic balloon dilatation of the stricture to a diameter of 20 mm was performed (Figure 3 and 4). No complications followed, the symptoms described above disappeared.



**Figure 3:** A balloon-dilatator is passed through the stricture of the anastomosis.





**Figure 4:** Endoscopic balloon dilatation of the anastomotic stricture up to 20 mm was performed.

### Conclusion

The experience gained confirms the feasibility and clinical efficacy of using laparoscopic technologies during elective resections and laparoscopic colostomy reversal in patients with complicated diverticular disease of the colon. A small number of complications and good immediate results, confirmed by data from foreign authors, make it possible to predict a wider use of such operations in patients with diverticular disease as surgeons master laparoscopic colorectal surgery and improve the material and technical base of specialized hospitals.

### Conflict of Interests

There is no conflict of interests.

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