

COMPLICATED COLONIC DIVERTICULAR DISEASE - INDICATIONS AND STRATEGIES FOR SURGICAL TREATMENT

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ABSTRACT

PURPOSE: Colonic diverticular disease is a common disease worldwide. Complicated diverticulitis is determined by presence of perforation, abscess, phlegmon, stricture, obstruction, fistula or hemorrhage. It is an indication for operative management. The aim of the present study was to determine the indications for surgery of complicated diverticular disease, to compare resection with primary anastomosis to Hartmann's procedure as the optimal urgent operative strategy for patients with complicated acute diverticulitis and to analyze the factors affecting the outcome.

MATERIAL AND METHODS: Between 1999 and 2012, 250 patients with symptomatic colonic diverticular disease were hospitalized in the Department of General and Hepatopancreatic Surgery, University Hospital Alexandrovska of Sofia. Of them, 39 patients with complicated colonic diverticulitis were surgically treated. Several factors that could influence on the choice of surgical strategy were analyzed by means of SPSS 19.0.1 statistical package.

RESULTS: Surgery was applied in 31 patients with perforation, one patient with diverticular bleeding, five patients with fistulas and two patients with bowel obstruction based on diverticular disease.

CONCLUSION: The surgical treatment of complicated diverticular disease, especially of that with peritonitis, remains a challenge. The performance of resection with primary anastomosis with or without protective stoma in selected patients is an alternative to Hartmann's procedure.

Key words: *complicated colonic diverticular disease, perforation, Hartmann's procedure, primary anastomosis, protective stoma*

INTRODUCTION

Colonic diverticular disease is a common pathology in the developed countries and is the fifth most important gastroenterological disease worldwide (13). About 10 to 25% of patients will develop symptoms and only in 20% of cases there

are complications that require emergency surgery (2,14). They can be divided into inflammatory complications such as abscess, fistula, perforation and subsequent peritonitis and sepsis) and non-inflammatory ones such as hemorrhage, strictures and obstructions (3). The importance of the disease is obvious from the fact that one-third of colostomies and colonic resections are due to the development of acute diverticulitis (5,17). Perforated diverticulitis is the most common benign cause of surgical mortality after ruptured abdominal aortic aneurysm (11). Indications and choice of surgical treatment of complicated acute diverticulitis of the colon are matter of interest. Because of the frequent

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complications and relatively low percentage of reversal after Hartmann's resection, in the recent years, operations with primary anastomosis with/without protective stoma are more often used in practice (3,8,17). A laparoscopic peritoneal lavage was described as an alternative technique for surgical treatment of acute diverticulitis complicated with purulent peritonitis (12).

The aim of the present study was to determine the indications for surgery of complicated diverticular disease, to compare resection with primary anastomosis to Hartmann's procedure as the optimal urgent operative strategy for patients with complicated acute diverticulitis and to analyze the factors affecting the outcome.

MATERIAL AND METHODS

Between 1999 and 2012, 250 patients with symptomatic colonic diverticular disease were hospitalized in the Department of General and Hepatopancreatic Surgery, University Hospital Alexandrovska of Sofia. Of them, 67 patients underwent surgical treatment and the rest 183 ones were treated conservatively. Some 39 patients were operated because of complicated diverticular disease of the colon. Several factors that could influence on the choice of surgical strategy were analyzed by means of SPSS 19.0.1 statistical package.

RESULTS

They were 113 males (45,2%) and 137 females (54,8%). Mean patients' age was 64 years and 6 months. Those aged 51-80 years were most commonly affected with a peak in the group of 1-70 years. Symptoms were determined by the location of the process and the type of the developed complication of the disease. The distribution according to the type of complication of colonic diverticulosis in patients who underwent surgery was shown in Fig. 1.

Colonic diverticular disease complicated with perforation was observed in 31 patients (three with feculent peritonitis, 23 with total purulent peritonitis and five with local purulent peritonitis). In 28 cases, perforated diverticulitis was located in the left colon. Fistulizing disease was found out in five patients, i.e. colovesical fistula in three and colocutaneous fistula

in two patients. Bleeding from colonic diverticula was detected in 21 patients. The conservative therapy was unsuccessful and surgery was required in one case only. Bowel obstruction requiring surgical intervention occurred in two patients with colonic diverticular disease. The mechanical stop of the passage was a result from strictures formed by the expansion of fibrous tissue due to frequent acute attacks of the disease and persistent inflammation in the area.

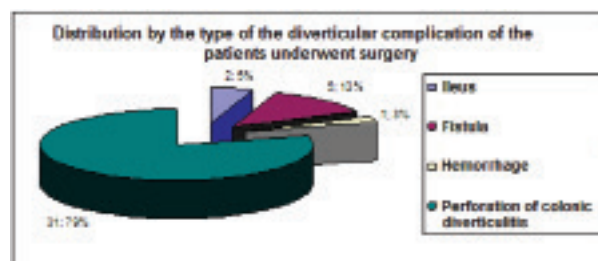


Fig. 1. Distribution of operated patients according to the type of complications of colonic diverticulosis

The types of performed surgical procedures were presented in Table 1. Data about the procedures performed in uncomplicated diverticular disease helped comparing the elective and emergency surgical strategy.

In cases with diverticular perforation limited resection in perforation area with subsequent suture and proximal stoma was applied in three patients only. As the involved bowel segment was not removed the technique was used only to reduce operative trauma in highly risky patients, usually with feculent peritonitis. Hartmann's resection was performed in 12 patients - in one patient with feculent peritonitis, in 10 patients with total purulent peritonitis and in one patient with local peritonitis. Hartmann's resection was rarely used in stage II by Hinchey, however, sometimes clinical picture and even macroscopic intraoperative findings mimicked neoplastic process due to the severe inflammatory changes. Colon resection with primary anastomosis was applied in eight patients. The possibility to resect the left colon with subsequent extraperitoneal transversorectostomy after the relevant extraperitoneal drainages was the main indication of its performance. Resection of a colon with primary

Table 1. Distribution of the performed surgical procedures in patients with diverticular disease

Clinical presentation of colonic diverticular disease	Surgical procedures	n
perforation	Resection of the sigmoid colon	3
	Resection of the sigmoid colon. Transversostomy	1
	Resection of the sigmoid colon. Ileostomy	2
	Resection of the sigmoid colon. Meckel's diverticulectomy	1
	Hartmann's operation	12
	Left hemicolectomy	3
	Left hemicolectomy. Trasversostomy	1
	Left hemicolectomy. Ileostomy	3
	Right hemicolectomy	1
	Right hemicolectomy. Ileostomy	1
hemorrhage	Resection of the transverse colon. Ileostomy	1
	Sutures of the sigmoid colon. Ileostomy	3
ileus	Right hemicolectomy	1
	Resection of the sigmoid colon. Ileostomy	1
colocutaneous fistula	Right hemicolectomy	1
	Resection of the sigmoid colon. Excision of the fistula	1
colovesical fistula	Resection of the transverse colon. Excision of the fistula	1
	Hartmann's operation. Excision of the fistula. Sutures of the urinary bladder	2
	Resection of the sigmoid colon. Excision of the fistula. Sutures of the urinary bladder	1
uncomplicated diverticular disease (elective surgery)	Right hemicolectomy	1
	Resection of the sigmoid colon	9
	Left hemicolectomy	14
	Subtotal colectomy	1
colon cancer and presence of colonic diverticulosis	Extended left hemicolectomy. Appendectomy. Omentectomy	1
	Right hemicolectomy. Omentectomy. Resection and sutures of a sigmoid diverticulus	1
	Subtotal colectomy. Omentectomy. Cholecystectomy.	1
total*		68

* Note: total number is greater than patients' number because of the relaparotomy in one and the same patient

anastomosis and proximal protective stoma was performed in nine patients presenting with purulent

peritonitis based on diverticular perforation (stage III by Hinchey). In two cases, a loop transversostomy

was performed. In the remaining seven cases, Vitzel's ileostomy was carried out. The advantage of using it was the achievement of adequate protection of the anastomosis without necessity of subsequent reversal. The ileostomy was usually removed after the 12th day after the operation.

Seven of the 14 patients with performed colostomy (protective or part of Hartmann's procedure) for diverticular perforation were re-hospitalized for reversal. Six patients were after Hartmann's resection of the colon and in one case, a loop protective transversostomy was carried out. The time between the urgent operation and reversal in these series ranged between two and eight months.

Because of the bleeding diverticula of the cecum a right hemicolectomy was performed in one patient. The patients with colovesical fistula underwent an excision of the fistula and suture of the urinary bladder. The treatment strategy related to the colon was Hartmann's procedure in two patients and resection of the sigmoid colon with primary anastomosis in one patient. The reversal in the first two patients was performed three and four months after the first operation.

Two patients were hospitalized because of bowel obstruction based on colonic diverticular disease. One patient underwent right hemicolectomy and resection of the sigmoid colon while proximal protective Vitzel's ileostomy was carried out in the second case.

Early postoperative surgical and nonsurgical complications were observed in 11 operated patients (in 28,2% of the cases) with complicated diverticular disease of the colon: in seven patients with perforation, in one with fistula, in one with bleeding and in two - after the reversal. There was no insufficiency of anastomosis in any patient who underwent resection with primary anastomosis. As a result from the appearance of complications, three relaparotomies were carried out due to the establishment of intestinal abscesses, wound dehiscence or anastomosis (after the restitution of the passage). In two cases, primary surgery was due to the presence of diverticular perforation, while in one case, the reason was diverticular bleeding. In the early postoperative period, fatal outcome occurred in

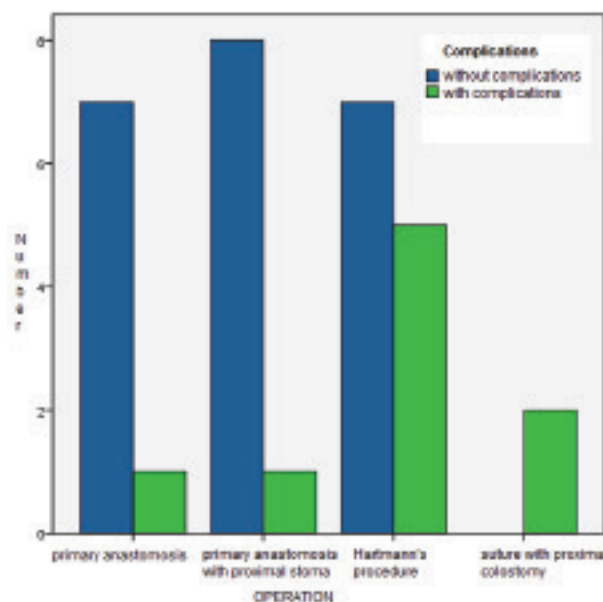


Fig. 2. Comparison between surgical procedures concerning the early postoperative complications

five patients presenting with diffuse peritonitis based on diverticular perforation.

To identify the factors influencing the results in the early postoperative period, several factors were analyzed. The presence of leukocytosis ($p=0,039$), significant comorbidities such as arterial hypertension, diabetes mellitus, and cerebrovascular disease ($p=0,014$), diverticular perforation ($p=0,04$), performance of perioperative blood transfusions ($p=0,027$) and hypoproteinemia ($p=0,001$) were statistically significant. The patients with diverticular perforation were further divided into groups according to the type of established peritonitis - local, total purulent or feculent. The analysis demonstrated that the risk of development of postoperative complications significantly increased with dissemination of the process ($p=0,009$). In order to select the most appropriate surgical strategy in terms of emergency concerning to diverticular perforation, different procedures were compared in relation to the occurrence of postoperative complications and early mortality rate (Fig. 2). The result was statistically significant ($p=0,041$). The lowest complication rate was observed in patients who underwent resection with primary anastomosis and proximal protective stoma. The analysis of the early postoperative mortality rate showed similar results ($p=0,007$).

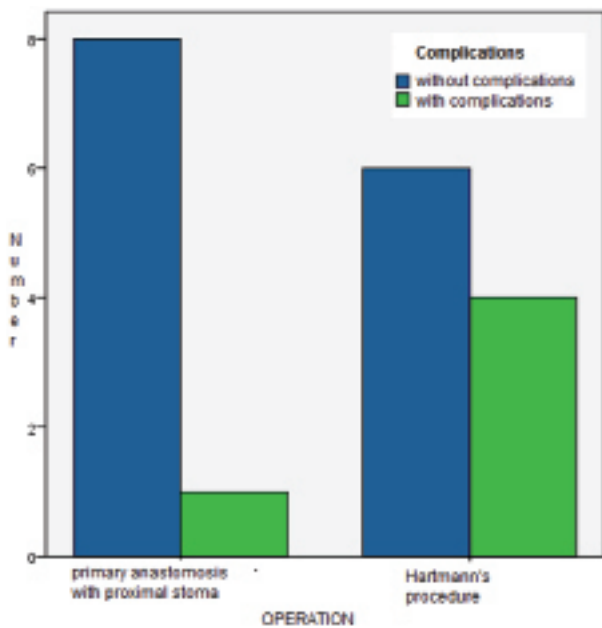


Fig. 3. Comparison between Hartmann's resection and performance of primary anastomosis with protective stoma in patients with acute diverticulitis (Hinchey III) concerning the early postoperative complications

The surgical tactic in 23 patients with acute diverticulitis in stage III by Hinchey was interesting. Postoperative complications were observed in 25% of the patients operated with resection and primary anastomosis, in 11,1% of those operated with primary anastomosis and applied protective stoma and in 40% of those treated with Hartmann's operation. The number of patients with primary passage reconstruction without proximal protection was too small, and that was why the statistical analysis could not be accurate. So the main comparison was made between the cases with Hartmann's resection and those with primary anastomosis and proximal stoma (Fig. 3). The study of these two groups in regard to postoperative morbidity rates demonstrated a statistically significant difference between them ($p=0,05$). Besides the complication rate was lower after the ileostomy compared to that after the loop transversostomy ($p=0,047$).

DISCUSSION

Despite of the substantial progress in the conservative treatment of diverticulitis the number of the patients who require surgery, but not always a matter of urgency, remains significantly high. This percentage varies between 10% and 30% in the

literature available (4,11,19). The patients subject to surgical emergency treatment are, usually, in severe status and its treatment remains extremely challenging (4) because of the reported mortality rate of 4-16% reaching even up to 50% in the patients with feculent peritonitis due to diverticular perforation. The type of surgery depends on the established intraoperative findings with the extent of the inflammatory process and the involved structures, the comorbidities and surgeon's experience. There are several classification systems designed to assess the severity of complicated diverticular disease and diverticulitis (Fig. 4) (18).

Recently, Hartmann's procedure (15), i. e. resection of the affected segment with secondary restoration of passage usually six weeks to six months after surgery depending on the degree of inflammation and general condition of the patient was recommended as 'the gold standard' for surgical treatment of complicated diverticulitis in terms of emergency (4). The prevalence of this type of procedure shifted the delayed resection applied to 1980 and known as the three-step technique, that involved drainage and removal of the perforation with proximal stoma followed by a second staged resection of the affected area (3,4). This change in the approach was due to performance of randomized, multicentre studies showing a higher postoperative complication rate after three-step technique associated with persistent, smoldering diverticulitis, reoperations and prolonged hospital stay when compared with Hartmann's resection (20).

We consider the suture of the perforation opening with proximal stoma as an appropriate approach only for patients in extremely severe pathology in order to reduce the operative trauma and shorten the intraoperative time. However, Hartmann's operation has some significant disadvantages, too. One of the largest studies including analysis of 54 combined studies performed for the period 1966-2003 and investigating a total of 1051 patients showed that Hartmann's procedure was related to high postoperative morbidity rate - wound infections in 24-29,1%, complications of the stoma in 10-12%, anastomosis insufficiency in 30% of the cases with reversal and mortality rate of 15-30% (3,7,18). Because of various reasons a reversal after Hartmann's procedure would not

	Original Hinchey classification	Sher, Kohler modification	Wasvary modification	Kaiser modification
Stage I	Pericolic abscess confined by the mesentery of the colon	Pericolic abscess	I a phlegmon I b pericolic abscess	I a confined pericolic inflammation-phlegmon I b confined pericolic abscess
Stage II	Pelvic abscess resulting from a local perforation of a pericolic abscess	II A distant abscess amenable to percutaneous drainage II B complex abscess associated with/without fistula	Pelvic abscess	Pelvic, distant intrabdominal or retroperitoneal abscess
Stage III	Generalized peritonitis resulting from rupture of pericolic/pelvic abscess into the general peritoneal cavity	Generalized purulent peritonitis	Purulent peritonitis	Generalized purulent peritonitis
Stage IV	Fecal peritonitis results from the free perforation of a diverticulum	Fecal peritonitis	Fecal peritonitis	Fecal peritonitis

Fig. 4. Classification systems for assessment of the severity of complicated diverticular disease and diverticulitis (cited after 18)

be performed in 30-70% of the patients which substantially and statistically significantly impaired their quality of life (3,18).

In recent years, a resection with primary anastomosis is discussed as an alternative to Hartmann's procedure for cases with acute complicated diverticulitis (10,18). In 1955, Gregg first presented a series of patients who underwent resection with primary anastomosis (9). Later on, relative and absolute contraindications for performing the primary anastomosis were described (16). The factors on the part of the patient such as hemodynamic stability, anemia, nutritional status, and immunosuppression, the factors related to the disease process such as stage and nature of the peritoneal contamination, and the technical factors should be taken into consideration by the surgeon in order to precisely select the candidates suitable for single-stage procedure.

The European Association of Surgeons Endoscopists recommended one-step operation in acute diverticulitis in the first and second stage by Hinchey, while in the third stage it has to be obligatory accompanied by the performance of protective stoma (3,6). Over the past five years, three large comparative trials including patients with advanced diffuse peritonitis (stages III and IV by Hinchey) were published. The one-step procedures were related to significantly lower mortality and morbidity rates in comparison with those with Hartmann's resection (1,8,17). The data derived from our own study showed that the performance of resection with primary anastomosis and proximal protective stoma was the method of choice in

selected patients as it did not cause any increased early postoperative mortality and morbidity rates. Insufficiency of anastomosis was not observed in any patient with one-stage procedure. The comparative analysis of the operative techniques revealed that the complication rate was lower after ileostomy than after transversostomy. Vitzel's ileostomy was preferred in our own surgical practice. The advantage of this method over the performance of loop derivation was the achievement of adequate protection of the colonic anastomosis without need for re-operative restoration of the passage.

CONCLUSION

The surgical treatment of complicated diverticular disease, especially of that with peritonitis, remains challenge not only because of the high mortality and morbidity rates but also because of the striving for long-term improvement of patient's quality of life. For these reasons, the performance of resection with primary anastomosis with or without protective stoma in selected patients is an alternative to Hartmann's procedure.

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