

Clinical and functional results after elective colonic resection in 75 consecutive patients with diverticular disease

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Abstract

Background: Functional results after elective colonic resection in patients with diverticular disease have seldom been studied.

Methods: Seventy-five consecutive patients were reviewed and sent a questionnaire about abdominal symptoms and functional results. Possible associations between patients' characteristics and postoperative complications or functional outcome were analyzed.

Results: Major complications including anastomotic leakage, bleeding, and bowel obstruction occurred in 10 patients (13%). Six patients (8%) had recurrent diverticulitis. No significant associations were found between clinical characteristics and postoperative complications or recurrent disease. Fifty patients classified their final result as excellent or good. Functional symptoms or symptoms suggestive of irritable bowel syndrome before the operation predicted a less successful result ($P < 0.05$).

Conclusions: Elective surgery in patients with diverticular disease was hampered by postoperative complications but resulted in most cases in good functional outcome and a low rate of recurrent disease. Those with functional bowel symptoms before surgery had significantly worse results. © 2002 Excerpta Medica, Inc. All rights reserved.

Keywords: Colonic resection; Diverticular disease; Surgical results

A continuous increase in the incidence of diverticulosis of the sigmoid colon has been observed in the industrialized world during the last century [1–4]. The prevalence has been estimated to be 15% to 37% [5–7]. Emigration studies from Israel [8] and Hawaii [9] support the hypothesis that environmental risk factors are important in the etiology of diverticulosis. A low fiber diet has been proposed as a risk factor for both colonic cancer and diverticular disease [1,10–13]. It has been estimated that diverticulitis will develop in about 10% to 25% of patients with diverticulosis of the colon [14–16] and among those with diverticulitis, 10% to 20% will be treated surgically [2,17,18].

The benefit of elective colonic resection in patients with diverticular disease has been debated. Good immediate and long-term clinical results has been reported suggesting that prophylactic resection is indicated in patients with repeated attacks of diverticulitis and with chronic symptoms of di-

verticular disease [19]. This view is supported in two recent studies [20,21] whereas others [22,23] claim that there is no indication for prophylactic colonic resection since it cannot prevent major complications or recurrent disease. Furthermore, there are no publications showing functional results after elective surgery for diverticular disease.

For these reasons we studied all patients who had had diverticulitis and were subjected to elective colonic resection at the University Hospital in Uppsala, Sweden, 1989 to 1994. We analyzed clinical data in relation to postoperative complications and functional results.

Patients and methods

Patients

In total 469 patients treated at the Department of Surgery, University Hospital, Uppsala, Sweden, during the period 1989 to 1994 had a clinical diagnosis of colonic diverticular disease. After colonic investigation (radiography with barium enema or colonoscopy), 442 patients remained

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with this diagnosis and 27 patients did not have diverticular disease. Seventy-two patients had an acute operation and 75 patients were subjected to elective surgery (24 men, mean age 56 years, range 30 to 76; and 51 women, mean age 62 years, range 36 to 80). Of the 75 patients, 4 patients had died owing to various causes not related to their diverticular disease. The remaining 71 patients received a questionnaire and 64 patients (90%) replied. Mean follow-up was 4.0 years (range 1.5 to 7.3).

Clinical data

The patients' hospital records were reviewed and the following data were collected. Concomitant diseases: diabetes mellitus, cardiovascular disease, lung disease, cancer or other diseases were registered. History of diverticular disease: the number of clinical episodes of diverticulitis before surgery was recorded. An episode was defined as tenderness in the left iliac fossa in combination with fever of at least 38°C, or alternatively, either sedimentation rate, or C-reactive protein, or white blood cell count above normal values. The number of attacks according to patient history was also estimated, these attacks were defined as pain in the lower abdomen in combination with fever. Functional symptoms: it was recorded whether the patients had experienced functional bowel symptoms defined as constipation, diarrhea, incontinence, or a history of irritable bowel syndrome (IBS) [24] before surgery. Barium enema: the location of diverticular disease in the large intestine was recorded. The number of diverticulas was categorized as none, a few or many and it was noted if there was a stenosis. Indications for surgery and surgical procedures: the main reason for surgery was classified as (A) one or more episodes of diverticulitis; (B) a stenosis of the colon; (C) abscess or fistula; or (D) functional problems (ie, constipation, diarrhea, incontinence, pain). The type of operation was recorded (left-sided hemicolectomy; resection of the sigmoid colon; other operation), and whether or not the splenic flexure had been mobilized. Furthermore, the level (promontory level or below promontory), and type of anastomosis were registered. Postoperative course and complications: complications were specified as anastomotic leakage detected by radiographic enema or at reoperation, bleeding, infectious complications, bowel obstruction, incisional hernia, or other complications related to the surgical procedure. All reoperations due to complications were noted. Recurrent diverticulitis: the diagnosis was based on the same criteria as above (history of diverticular disease), and confirmation of diverticulas in the colon on a subsequent investigation with large bowel enema, endoscopy, or diagnostic laparoscopy.

Questionnaire data

The questionnaire included questions about bowel function, (stool characteristics, bowel movements per week,

Table 1
Number of "verified" attacks of diverticulitis and total number of attacks

"Verified" attacks n	Patients n	%	Total number of attacks n	Patients n	%
0	16	21	0	11	15
1	29	39	1	11	15
2	13	17	2	2	3
3	10	13	3	21	28
4	4	5	4	10	13
≥5	3	4	≥5	20	26

constipation, continence, functional abdominal symptoms before and after operation), use of drugs or laxatives before and after surgery, and the patient's own judgement of the surgical outcome.

Statistical analysis

The chi-square test or Fisher's exact probability test was used for statistical analysis of possible associations between patient characteristics and postoperative complications or functional outcome. A two-tailed *P* value of 0.05 or less was considered statistically significant.

Results

Patient characteristics

Concomitant diseases were present in 28 patients (37%), most commonly ischemic heart disease (5 patients), and lung disorders (4 patients). The number of "verified" attacks of diverticulitis as well as the total number of attacks, defined as the number of verified attacks plus the number of anamnestic attacks is shown in Table 1. The majority of patients had in total three or more attacks of diverticulitis. Functional symptoms preoperatively were experienced by 34 patients, 50% of them had constipation, 40% diarrhea, and 10% irritable bowel syndrome-like symptoms. All patients except one were investigated with radiographic (barium enema) before resection. The distribution of diverticular disease is shown in Table 2. Nearly all patients had many diverticulas in the sigmoid colon, about one third of them also had many diverticulas in the descending colon. Twenty-three patients (30%) had a stenosis in the sigmoid colon.

The main indications for surgery were repeated episodes of clinical diverticulitis (59%), or a stenosis in the sigmoid colon (25%). In 7 patients (9%) the main indication was chronic bowel symptoms and in 5 patients (7%) it was a fistula (colovesical, colovaginal, and large to small bowel fistulas). One-stage resection of the sigmoid colon with primary anastomosis was the most common operation (Table 3).

Table 2
Localization of diverticular disease at barium enema among 68 consecutive patients* undergoing elective colonic resection

Location	Approximate number of diverticula		
	None	Few	Many
Sigmoid colon	0	8	60
Descending colon	19	28	21
Transverse colon	43	19	6
Ascending colon	47	19	2
Cecum	54	12	2

* In 6 patients with stenosis in the sigmoid colon the number of diverticula and localisation were not possible to visualize with barium enema. One patient was not investigated with barium enema.

Postoperative complications and recurrent diverticulitis

There was no postoperative mortality. Complications occurred in totally 25 patients (33%); the most serious events were anastomotic leakage, 4 patients (5%); postoperative bleeding, 2 patients (3%); Douglas abscess, 2 patients; bowel obstruction, 2 patients. The majority (64%) of postoperative complications occurred within 30 days from the operation. Furthermore, 9 patients (12%) developed incisional hernia. In total 10 patients (13%) had a reoperation due to postoperative complications excluding incisional hernia (Table 4). The characteristics of the patients or surgical procedures did not differ significantly between patients who had postoperative complications and patients without complications.

In total 6 patients (8%) had recurrent diverticulitis but nobody had a second colonic resection. None of the recorded variables or surgical procedures were significantly associated with the risk of recurrent diverticulitis. The mean

Table 3
Surgical features among 75 consecutive patients undergoing elective colonic resection due to diverticulitis

Type of operation	Number of patients	%
Sigmoid resection	63	84
Left-sided hemicolectomy	9	12
Anterior resection	3	4
Total	75	100
Mobilization of the left flexure	28	37
Peroperative stoma	0	
Level of anastomosis		
At promontory level	64	85
Below promontory	11	15
Total	75	100
Suture technique		
Manual two layer	53	71
Manual one layer	19	25
Staples	2	3
Valtrac "button"	1	1
Total	75	100

Table 4
Postoperative complications among 75 patients undergoing elective colonic resection due to diverticulitis

	All postoperative complications	Number of complications requiring reoperation
Anastomotic leakage	4	4
Bleeding	2	2
Douglas abscess	2	2
Bowel obstruction	2	2
Abdominal infection (fever)	2	0
Wound infection	4	0
Hernia	9	8
Total	25	18

length of time from operation to diagnosis of recurrent disease was 25 months (range 2 to 55).

Functional results

In total 40 patients (62%) reported changes in bowel function after the operation. Fifty patients (78%) classified the final result of their operation with respect to bowel function as excellent or good whereas 13 patients classified the outcome as fair and one patient as worse after surgery. Patient characteristics or surgical procedures were not significantly related to the patients' own judgement of the surgical result (Table 5). The patients with fair or worse final results of the operation had significantly more functional symptoms (for example; low abdominal pain with mucus in stool or emptying difficulties), before the operation compared with the patients who were satisfied with the final outcome (Table 6). Symptoms often related to diverticular disease, such as urgency in micturition, did not differ between satisfied or unsatisfied patients. Similarly, continence or ability to empty the bowel was not significantly affected by the operation. The majority of patients would choose to have the operation again if they were in the same situation. Most patients did not use any laxatives or drugs for their bowel function after surgery.

Comments

This study showed that elective surgery in patients after diverticulitis usually resulted in good functional outcome and a low risk of recurrent disease although postoperative complications were quite common. Patients who had functional bowel symptoms before surgery had significantly worse results.

The clinical data in our study were collected retrospectively and some relevant information might not have been recorded in the original charts. Similarly, functional results were assessed through a questionnaire at a mean follow-up of 4 years. It cannot be totally excluded that some of the

Table 5

Patients' own opinion of surgical outcome in relation to preoperative clinical characteristics and factors related to surgical treatment

Clinical characteristics	Surgical outcome		
	Excellent or good n	Fair or poor n	Exact chi-square test*
Age (years)			
<60	27	4	$P = 0.13$
≥60	23	10	
Sex			
Male	17	2	$P = 0.20$
Female	33	12	
Concomitant disease			
Yes	20	4	$P = 0.54$
No	30	10	
Number of verified attacks			
≤2	37	11	$P = 1.00$
≥3	13	3	
Number of total attacks			
≤3	27	9	$P = 0.56$
≥4	23	5	
Functional symptoms			
Yes	18	8	$P = 0.22$
No	32	6	
Main reason for surgery			
Attacks of diverticulitis	33	7	
Stricture	10	5	$P = 0.47$
Fistula	3	0	
Functional problems	4	2	
Surgical procedure			
Left-sided hemicolectomy	6	2	
Resection of the sigmoid colon	44	10	$P = 0.05$
Other	0	2	
Mobilization of left flexur			
Yes	21	4	$P = 0.54$
No	29	10	
Anastomosis level			
At promontory	45	11	$P = 0.36$
Below promontory	5	3	
Type of anastomosis			
Manual one layer	15	2	
Manual two layer	32	12	$P = 0.33$
Stapled	3	0	
Postoperative complications			
Yes	14	5	$P = 0.74$
No	36	9	

* Chi-square test was used when more than 2 options were compared.

answers regarding earlier bowel symptoms were afflicted by recall bias. For these reasons our results should be interpreted with some caution.

In the present audit 147 patients (33%) of all 442 patients with diverticular disease had surgical treatment (acute or elective). This proportion is higher compared with that (10% to 20%) reported in earlier studies [2,17,18]. One explanation may be that our study was based on patients treated at the hospital and outpatients were not included. Furthermore, the indications for elective or prophylactic surgical treatment might have been wider during recent

Table 6

Patients' own judgement of surgical outcome in relation to functional symptoms before surgical treatment

Functional characteristics	Surgical outcome		
	Excellent or good n	Fair or poor n	Exact chi-square test
Low abdominal pain relieved by defecation			
Yes	17	9	$P = 0.06$
No	33	5	
Low abdominal pain and loose stool			
Yes	11	3	$P = 1.00$
No	39	11	
Low abdominal pain and urgency			
Yes	12	4	$P = 1.00$
No	38	10	
Low abdominal pain and distension			
Yes	15	6	$P = 0.52$
No	35	8	
Low abdominal pain and stool with mucus			
Yes	5	5	$P = 0.03$
No	45	9	
Low abdominal pain and difficulties in emptying bowel			
Yes	7	7	$P = 0.008$
No	43	7	
One or more IBS symptom	26	11	$P = 0.12$
Not any IBS symptom	24	3	

IBS = irritable bowel syndrome.

years and also somewhat different between the present study and earlier studies [17–22]. In previous studies the most common indications were anatomical deformity of the sigmoid colon (including stenosis and fistula), followed by recurrent acute diverticulitis, chronic symptoms and uncomplicated diverticulitis. Our main indications were recurrent acute diverticulitis (59% of cases) and stenosis of the sigmoid colon (25%).

A stenosis or stricture of the sigmoid colon is most often caused by diverticular disease but carcinoma must be excluded. In a series of 1,039 consecutive colonoscopies [25], there were 19 cases of sigmoid stricture of unknown cause that could not be passed with the colonoscope. Fifteen patients underwent laparotomy, a final diagnosis of diverticular disease was made in 9 cases and adenocarcinoma in 6 cases, indicating that a stenosis should be considered a case for surgery if not very strong evidence can prove a benign stenosis. The present study solely encompassed patients with a diagnosis of diverticulitis and patients with a sigmoid stricture due to malignant disease were not included.

An earlier study of prophylactic resection for diverticular disease including 177 patients showed postoperative com-

plications only in 10 patients (5.6%) [19]. The low frequency of complications compared with the present study may be explained by more strictly applied surgical techniques. In their study, the entire sigmoid colon was resected in all patients usually with a posterior rectal mobilization and in most cases the left colonic flexure was mobilised. However, the resection was normally limited to the sigmoid colon and proximal noninflamed diverticula were not resected. In our study there were patients who had shorter resections of the sigmoid colon and also patients treated with left-sided hemicolectomy. Patients who had large left-sided resections extending outside the sigmoid colon had more postoperative complications. Regarding our 4 patients with anastomotic leakage, it was not possible to find out from their charts whether the anastomosis was made to the upper part of the rectum (which is usually recommended), or if it was made to the distal sigmoid colon. The latter situation might predispose both to recurrent diverticular disease and anastomotic leakage if sutures are placed in diseased sigmoid colon. The high number of postoperative complications in the present study put forward the importance of clinical audit and the options for improved care of these patients.

An interesting finding in this study is the high incidence of incisional hernia after elective surgery due to diverticular disease. This incidence is much higher than in patients treated with sigmoid resection for cancer. Speculatively, patients with diverticular disease may have some defect in their collagen production that increases the risk of developing diverticulas in the colon and also leads to impaired postoperative wound healing with increased risk of incisional hernias [25–27].

We found a low risk of recurrent diverticulitis, only 8%, which is comparable with previous publications [28]. No patient needed surgical treatment, supporting the view that resection limited to the part of the colon with chronic inflammation is sufficient also when diverticulas are located outside the sigmoid colon.

Most patients in our study were satisfied with the final result. However, patients with diverticular disease in combination with functional bowel symptoms before surgery were not pleased with the outcome. It may be of value to recognize these patients with functional symptoms and inform them about the risk of poor surgical results. It is suggested that these patients should be further investigated with tests of colonic function or at least a detailed patient history regarding functional bowel symptoms should be taken. If obvious functional symptoms are present, it is unlikely that surgery for diverticular disease will cure the patient.

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