

# Laparoscopic Resection of Chronic Sigmoid Diverticulitis with Fistula

Mohammad A. Abbass, MD, Anna T. Tsay, NP, Maher A. Abbas, MD

## ABSTRACT

**Background and Objectives:** A growing number of operations for sigmoid diverticulitis are being done laparoscopically. There is a paucity of data on the outcome of laparoscopy for sigmoid diverticulitis complicated by colonic fistula. The aim of this study was to compare the results of laparoscopic resection of sigmoid diverticulitis with and without colonic fistula.

**Methods:** A retrospective review was conducted of all patients who underwent laparoscopic resection of sigmoid diverticulitis complicated by fistula at a single tertiary care institution over a 7-year period. Comparison was made with a group of patients who underwent resection for diverticulitis without fistula during the same study period.

**Results:** Forty-two patients were analyzed (group 1: diverticular fistula, group 2: no fistula). The median age was similar (49 vs. 50 years,  $P = .68$ ). A chronic abscess was present in 24% of patients in group 1 and 10% in group 2 ( $P = .40$ ). Fistula types were colovesical (71%), colovaginal (19%), and colocutaneous (10%). Operation types were sigmoidectomy (57% vs. 81%) and anterior resection (43% vs. 19%) in groups 1 and 2, respectively ( $P = .18$ ). Ureteral catheters were used more frequently in group 1 (67% vs. 33% [ $P = .06$ ]). No difference was noted in operative time, blood loss, conversion rate, length of stay, overall complications, wound infection rate, readmission rate, reoperation rate, and mortality. All patients healed without fistula recurrence.

**Conclusions:** Patients with sigmoid diverticulitis with fistula can be successfully treated with laparoscopic excision, with similar outcomes for patients without fistula.

Department of Surgery, Kaiser Permanente, Los Angeles, CA, USA (Drs. Abbass, Tsay).

Minimally Invasive and Robotic Surgery, Kaiser Permanente, Los Angeles, CA (Dr. Abbas).

Address correspondence to: Maher A. Abbas, MD, Chair, Minimally Invasive and Robotic Surgery, 4760 Sunset Boulevard, Third Floor, Los Angeles, CA 90027. Telephone: (323) 783-5442, Fax: (323) 783-8747, E-mail: maher.a.abbas@kp.org

DOI: 10.4293/108680813X13693422520512

© 2013 by JSLS, *Journal of the Society of Laparoendoscopic Surgeons*. Published by the Society of Laparoendoscopic Surgeons, Inc.

**Key Words:** Laparoscopic resection, Sigmoid diverticulitis, Colonic fistula.

## INTRODUCTION

The incidence of diverticulitis is rising in the United States.<sup>1,2</sup> Operative intervention is warranted in patients who present with acute perforation with peritonitis or recurrent disease with multiple episodes, or in patients with complicated diverticulitis.<sup>3-5</sup> Colonic fistula is a rare complication of chronic diverticulitis with a reported incidence of 6% to 16% of surgically treated patients.<sup>4-8</sup> The symptoms of diverticular fistulas can vary depending on whether the fistula is colovesical, colovaginal, colocutaneous, or a combination of two or more types.

Most patients with colonic fistula from diverticulitis require operative intervention for resolution of their symptoms. Various surgeries are available to treat this condition, including single-stage procedures such as resection with primary anastomosis or end colostomy versus two-stage procedures such as resection and temporary stoma or diverting colostomy with subsequent resection. Several studies have reported the technical feasibility and short-term recovery benefits of laparoscopic resection for sigmoid diverticulitis.<sup>9-14</sup> Although a laparoscopic approach can offer several advantages compared with the open technique, it can be technically challenging, especially in the setting of extensive inflammation, chronic abscess, disease extending down into the pelvis or engulfing the ureters, and prior pelvic surgery such as hysterectomy. Because of such factors, some surgeons advocate approaching complicated cases, including those associated with a colonic fistula, with the open technique.<sup>15</sup> The purpose of this study was to compare the outcome of laparoscopic resection in patients with chronic sigmoid diverticulitis with and without colonic fistula.

## PATIENTS AND METHODS

The study was approved by the institutional review board of Kaiser Permanente Southern California. A retrospective review was conducted of all consecutive patients who

underwent laparoscopic excision for chronic sigmoid diverticulitis with fistula over a 7-year period (2006–2012). This patient cohort (group 1) was matched with a group of consecutive patients who underwent laparoscopic resection for chronic sigmoid diverticulitis without fistula during the same study period (group 2). All operations were performed at Kaiser Permanente, Los Angeles Medical Center, a regional center that receives referrals from 13 hospitals that serve a population of approximately 3.4 million patients in southern California. The operations were conducted electively by one colorectal surgeon trained in minimally invasive surgery and whose standard practice was to offer a laparoscopic approach to all patients with sigmoid diverticulitis regardless of its severity or complexity. The diagnosis of diverticulitis was confirmed by the clinical history and computed tomography findings. All patients underwent mechanical bowel preparation. All operations were conducted with patients in the lithotomy position and a 4-trocar technique (two 12-mm trocars and two 5-mm trocars). The anastomosis was performed intracorporeally using a circular stapler. All specimens were extracted through a transverse left lower quadrant incision using a wound protector.

The outpatient and inpatient electronic records were reviewed, and the abstracted data included demographics, medical comorbidities (malnutrition [albumin level <3.3 g/dL], diabetes, anemia [hemoglobin level: male <42, female <37], smoking), American Society of Anesthesiologists class, body mass index (kg/m<sup>2</sup>), past surgical history, type of fistula, and the presence of a chronic pelvic abscess. Outcome measures included intraoperative data (type of operation, splenic flexure mobilization, ureteral catheter usage, diverting stoma, conversion rate, operative time in minutes, blood loss in milliliters, transfusion, intraoperative complications) and postoperative outcome (admission to intensive care unit, hospital length of stay in days, complications, transfusion, readmission rate, reoperation, mortality, and anastomotic/fistula healing).

Statistical analysis for group comparison was performed using an unpaired 2-tailed *t* test and a  $\chi^2$  test. A *P* value < .05 was considered statistically significant. All statistical analysis was performed using GraphPad software (La Jolla, California, USA).

## RESULTS

During the study period, 21 patients underwent laparoscopic resection for chronic diverticulitis complicated by colonic fistula (group 1). The patients with fistula were compared with 21 consecutive patients who underwent

laparoscopic resection during the same period for chronic diverticulitis without fistula (group 2). **Table 1** summarizes the characteristics of both groups. No difference was noted in median age, gender distributions, body mass index, and American Society of Anesthesiologists class between the groups. A chronic pelvic abscess was present in 24% of patients in group 1 and in 10% in group 2 (*P* = .40). Fifty-two percent of patients in group 1 had prior abdominopelvic operations compared with 38% in group 2 (*P* = .53). Nineteen percent of patients in both groups were malnourished. Most fistulas in group 1 were colovesical (71%), followed by colovaginal (19%), and colocutaneous (10%).

**Table 2** highlights intraoperative findings. A higher proportion of patients in group 1 compared with group 2 underwent laparoscopic anterior resection (43% vs. 19%) and the majority of patients in group 2 underwent laparoscopic sigmoidectomy (81% vs. 57%, *P* = .18). Splenic

	Group 1 (N = 21)	Group 2 (N = 21)	<i>P</i> Value
Median age, y (mean, range)	49 [56, 25–79]	50 [53, 26–83]	.68
Gender M/F, n (%)	9/12 (43%/57%)	11/10 (52%/48%)	.75
Median BMI <sup>a</sup> (kg/m <sup>2</sup> ) (mean, range)	31 [31, 19–47]	31 [31, 20–50]	.96
ASA class			
I	1 (5%)	1 (5%)	.38
II	12 (57%)	13 (62%)	
III	8 (38%)	7 (33%)	
Anemia	14 (67%)	17 (81%)	.48
Prior abdominal operation	11 (52%)	8 (38%)	.53
Chronic pelvic abscess	5 (24%)	2 (10%)	.40
Diabetes	5 (24%)	4 (19%)	1.0
Smoking	3 (14%)	5 (24%)	.69
Malnutrition	4 (19%)	4 (19%)	1.0
Fistula type			
Colovesical	15 (71%)	0	
Colovaginal	4 (19%)	0	
Colocutaneous	2 (10%)	0	

<sup>a</sup>BMI = body mass index; ASA = American Society of Anesthesiologists.

**Table 2.**

Intraoperative Outcome of Patients with Chronic Diverticulitis with Fistula (Group 1) or Without Fistula (Group 2)

	Group 1 (N = 21)	Group 2 (N = 21)	P Value
Operation type			
Sigmoidectomy	12 (57%)	17 (81%)	.18
Anterior resection	9 (43%)	4 (19%)	
Splenic flexure mobilization	14 (67%)	10 (48%)	.34
Ureteral catheters	14 (67%)	7 (33%)	.06
Diverting stoma	1 (5%)	1 (5%)	1.0
Conversion to open	0	2 (10%)	.48
Median operative time (min)	240	260	.36
Mean (range)	254 (168–360)	281 (127–641)	
Median blood loss (mL)	150	150	.94
Mean (range)	216 (50–800)	221 (30–1200)	
Intraoperative transfusion	0	1 (5%)	1.0
Intraoperative complication			
Ureteral laceration	0	1 (5%)	1.0

flexure mobilization was performed in 67% of the patients in group 1 compared with 48% in group 2 ( $P = .34$ ). Ureteral catheter placement was used more frequently in group 1 (67% vs. 33%,  $P = .06$ ). No difference in conversion rate was noted between the groups (0 vs. 10%,  $P = .48$ ). Median operative time and blood loss were similar in both groups. One patient in group 2 sustained ureteral laceration, which was repaired intraoperatively.

Median length of stay was 4 days in both groups (**Table 3**). No difference in overall complications was noted between the groups (38 vs. 33%,  $P = 1.0$ ). Only one anastomotic leak (5%) was noted in group 2. Mortality was 0% in both groups. Readmission rate was 10% and 5% in groups 1 and 2, respectively ( $P = 1.0$ ). Two patients (10%) in group 1 required reoperation (one small bowel obstruction from a trocar site hernia and one for incisional ventral hernia), and one patient had percutaneous drainage of a pelvic abscess. In group 2, two patients (10%) had reoperation (one anastomotic leak and one to evaluate for possibility of ischemic small intestine). Mean follow-up was 15 months (range, 1–72). All patients in group 1 had fistula healing without recurrence.

**Table 3.**

Postoperative Outcome of Patients with Chronic Diverticulitis with Fistula (Group 1) or Without Fistula (Group 2)

	Group 1 (N = 21)	Group 2 (N = 21)	P Value
Median hospitalization, d (mean, range)	4 (4, 2–9)	4 (8, 1–55)	.17
Intensive care admission	0	3 (17%)	.23
Overall complications	8 (38%)	7 (33%) <sup>a</sup>	1.0
Wound infection	4 (19%)	3 (14%)	
Abscess	2 (10%)	0	
Gastrointestinal bleeding	1 (5%)	2 (10%)	
Wound hematoma	0	1 (5%)	
Anastomotic leak	0	1 (5%)	
Urinary tract infection	0	1 (5%)	
Small bowel obstruction/trocar site hernia	1 (5%)	0	
Postoperative transfusion	1 (5%)	4 (19%)	.34
Readmission	2 (10%)	1 (5%)	1.0
Reoperation	2 (10%)	2 (10%)	1.0
Recurrence of fistula	0	0	
Mortality	0	0	

<sup>a</sup>Some patients had more than one complication.

## DISCUSSION

The field of minimally invasive surgery has evolved rapidly in the past 2 decades. Laparoscopic resection of chronic sigmoid diverticulitis has been widely reported as a safe alternative to open resection and is being used with increasing frequency because of patient-related benefits.<sup>9–17</sup> Various factors can add to the technical challenges of laparoscopic resection of chronic sigmoid diverticulitis including prior abdominopelvic surgery, the presence of chronic pelvic abscess, extensive inflammation surrounding the left ureter, or involvement of adjacent organs such as the bladder and vagina. Because of such factors, some surgeons recommend the open approach for complicated cases. However because of the potential patient-related benefits, the standard practice of the senior author at a tertiary center has been to offer all patients with chronic diverticulitis the laparoscopic approach regardless of the extent of disease seen on imaging findings and/or the presence of colonic fistula. In this study, we wanted to review the results of such an approach by investigating the outcome of patients with chronic diverticulitis complicated by the presence of a colonic fistula and compare

them with a group of patients without fistula who were operated on during the same period. All patients elected to have surgery. Patients either presented with spontaneously draining fistula or with a history of a previous diverticulitis attack with or without a previously drained abscess. In the case of the latter group, sufficient time was given (a minimum of 8 weeks) to allow for the inflammation to subside before elective operative intervention.

Overall, no differences were noted between patients with fistula and those without fistula with respect to conversion rate, blood loss, need for transfusion, intraoperative or postoperative complications, length of hospitalization, readmission rate, and reoperation rate. All study patients with fistula healed and there were no deaths. Although no statistically significant differences were found, a few trends were noted. Most patients without fistula underwent a standard sigmoidectomy, but 43% of patients with fistula required an anterior resection. In addition, the splenic flexure was mobilized more frequently in patients with fistula compared with those without fistula. Similarly, a higher proportion of patients with fistula had ureteral catheter placement to safely identify the left ureter. An interesting finding was the operative time. Although a higher percentage of patients with fistula had anterior resection, splenic flexure mobilization, and ureteral catheter placement, no significant difference was noted in the operative time. Although we do not have a definitive explanation for this, we speculate that the referral pattern to a tertiary center may have played a role. Although the cases of fistula were considered complicated and the patients were referred for a higher level of care, some had limited areas of inflammation, and the main indication for referral was the presence of the fistula. This is contrary to the patients with diverticulitis without fistula. Typically, the indication for referral was

extensive disease (patients with more limited disease were treated at local hospitals). Another potential explanation may have been the higher use of ureteral catheters in patients with fistula, which aids in identification of the ureters.

A review of the literature revealed only a few retrospective studies that have investigated the outcome of laparoscopic resection for chronic sigmoid diverticulitis with fistula.<sup>15,18–22</sup> **Table 4** summarizes the findings of these publications. None of the studies except for the current one has compared the outcome of patients with diverticular fistula with that of patients without fistula. The number of reported subjects has ranged from 7 to 31 patients. A colovesical fistula was the most common type of fistula treated laparoscopically. Except for the present study, the conversion rate has ranged from 18.7% to 50%, highlighting the technical challenges of approaching such a condition laparoscopically. Indications for conversion include an intraoperative complication such as bleeding or ureteral laceration, failure to progress, difficulty with rectosigmoid division in the pelvis, or inability to safely perform the anastomosis. However, all studies have reported 100% healing without recurrence.

We would like to acknowledge the limitations of this study. It was retrospective in nature with a small number of patients. The limited number of patients could have potentially introduced a type II error during statistical group comparison. The patients were referred to a tertiary center and were operated on by a single surgeon with much experience in advanced laparoscopic surgery and expertise in complex pelvic operations. Furthermore, the purpose of the study was to determine the outcome of the laparoscopic technique in patients with diverticular colonic fistula compared with patients with chronic diverticulitis without fistula. A priori as-

**Table 4.**  
Literature Review of Studies of Laparoscopic Resection of Diverticular Colonic Fistula

Authors	Year	N	Fistula Type				EBL <sup>a</sup>	ORT	Conversion	LOS	Morbidity	Mortality	Recurrence
			Vesical	Vaginal	Cutaneous	Other							
Hewett and Stitz <sup>18</sup>	1995	7	6	1	0	0	—	220	—	4.7	0	0	0
Vargas et al <sup>15</sup>	1999	8	—	—	—	—	—	50%	—	—	—	—	—
Bartus et al <sup>19</sup>	2005	36	34	2	0	0	—	220	25%	6.2	8%	—	—
Laurent et al <sup>20</sup>	2005	16	11	4	—	1	—	172	18.7%	5.7	12.5%	0	0
Nguyen et al <sup>21</sup>	2006	14	8	3	1	5	326	209	36%	6	14%	0	0
Engeldow et al <sup>22</sup>	2007	31	22	9	0	0	—	150	29%	7	6%	6%	0
Abbass et al <sup>b</sup>	2013	21	15	4	2	—	150	240	0	4	38%	0	0

<sup>a</sup>EBL = estimated blood loss (in milliliters); ORT = operating room time (in minutes); LOS = length of stay (in days).

sumption has been made that laparoscopic resection in the setting of diverticular fistula confer patient-related benefits compared with the open approach. This assumption is extrapolated based on experience with laparoscopic resection in patients without fistula, and an ideal study would compare the outcome of both the open and laparoscopic techniques in patients with diverticular colonic fistula.

## CONCLUSIONS

The incidence of symptomatic colonic diverticulitis is rising. In the era of minimally invasive surgery, an increasing number of patients with diverticulitis are treated with the laparoscopic technique. This study demonstrated that patients with complicated diverticulitis such as those with a colonic fistula can undergo successful laparoscopic resection. In the hands of experienced surgeons, it appears that the outcome of laparoscopic surgery is similar in patients with chronic diverticulitis with colonic fistula compared with patients without fistula.

## References:

1. Etzioni DA, Mack TM, Beart RW Jr, Kaiser AM. Diverticulitis in the United States: 1998–2005: changing patterns of disease and treatment. *Ann Surg*. 2009;249:210–217.
2. Etzioni DA, Cannom RR, Chiu V, et al. Outpatient treatment of acute diverticulitis: rates and predictors of success. *Dis Colon Rectum*. 2010;53(6):861–865.
3. Broderick-Villa G, Burchette RJ, Collins JC, Abbas MA, Haigh PI. Hospitalization for acute diverticulitis does not mandate elective colectomy. *Arch Surg*. 2005;140:576–583.
4. Bahdursingh AM, Virgo KS, Kaminski DL, Longo WE. Spectrum of disease and outcome of complicated diverticular disease. *Am J Surg*. 2003;186:696–701.
5. McConnell EJ, Tessier DJ, Wolff BG. Population-based incidence of complicated diverticular disease of the sigmoid colon based on gender and age. *Dis Colon Rectum*. 2003;46:1110–1114.
6. Beddy D, Wolff B. Advances and dilemmas in diverticular disease surgery for recurrent diverticulitis. *J Clin Gastroenterol*. 2011;45:S74–S80.
7. Chapman J, Davies M, Wolff B, et al. Complicated diverticulitis: is it time to rethink the rules? *Ann Surg*. 2005;242:576–581.
8. Farnakis N, Tudor RG, Keighley MR. The 5-year natural history of complicated diverticular disease. *Br J Surg*. 1994;81:733–735.
9. Smadja C, Sbai IM, Tahrat M, et al. Elective laparoscopic sigmoid colectomy for diverticulitis. Results of a prospective study. *Surg Endosc*. 1999;13:645–648.
10. Franklin ME Jr, Dorman JP, Jacobs M, Plasencia G. Is laparoscopic surgery applicable to complicated colonic diverticular disease? *Surg Endosc*. 1997;11:1021–1025.
11. Kockerling F, Schneider C, Reymond MA, et al. Laparoscopic resection of sigmoid diverticulitis. Results of a multicenter study. Laparoscopic Colorectal Surgery Study Group. *Surg Endosc*. 1999;13:567–571.
12. Berthou JC, Charbonneau P. Elective laparoscopic management of sigmoid diverticulitis. Results in a series of 110 patients. *Surg Endosc*. 1999;13:457–460.
13. Liberman MA, Phillips EH, Carroll BJ, Fallas M, Rosenthal R. Laparoscopic colectomy for diverticulitis. *Surg Endosc*. 1997;10:15–18.
14. Siriser F. Laparoscopic-assisted colectomy for diverticular sigmoiditis. A single-surgeon prospective study of 65 patients. *Surg Endosc*. 1999;13:811–813.
15. Vargas DH, Ramirez RT, Hoffman GC, et al. Defining the role of laparoscopic-assisted sigmoid colectomy for diverticulitis. *Dis Colon Rectum*. 2000;43:1726–1731.
16. Chen HH, Wexner SD, Weiss EG, et al. Laparoscopic colectomy for benign colorectal disease is associated with a significant reduction in disability as compared with laparotomy. *Surg Endosc*. 1998;12:1397–1400.
17. Royds J, O’Riordan JM, Eguare E, O’Riordan D, Neary PC. Laparoscopic surgery for complicated diverticular disease: a single-center experience. *Colorectal Dis*. 2011;14:1248–1254.
18. Hewett PJ, Stitz R. The treatment of internal fistulae that complicate diverticular disease of the sigmoid colon by laparoscopically assisted colectomy. *Surg Endosc*. 1995;9:411–413.
19. Bartus CM, Lipof T, Sarwar S, et al. Colovesical fistula: not a contraindication to elective laparoscopic colectomy. *Dis Colon Rectum*. 2005;48:233–236.
20. Laurent SR, Detroz B, Detry O, et al. Laparoscopic sigmoidectomy for fistulized diverticulitis. *Dis Colon Rectum*. 2005;48:148–152.
21. Nguyen SQ, Divino CM, Vine A, et al. Laparoscopic surgery for diverticular disease complicated by fistulae. *JSLS*. 2006;10:166–168.
22. Engledow AH, Pakzad F, Ward NJ, Arulampalam T, Motson RW. Laparoscopic resection of diverticular fistulae: a 10-year experience. *Colorectal Dis*. 2007;9:632–634.