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Laparoscopic surgery for diverticulitis

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Abstract

Background: Resection of diverticular disease may be quite challenging; the acute inflammatory process, thick sigmoid mesentery, and any associated fistula or abscess can make this procedure technically demanding. The aim of this study was to compare the results between laparoscopic and laparotomy-type resections stratified by disease severity and thereby predict outcome and possibly a subset of patients who may benefit from a laparoscopic approach.

Methods: From August 1991 to December 1995, all patients with diverticular disease were classified according to a modified Hinchey classification system. The laparoscopic group included 18 patients who underwent a laparoscopic assisted colectomy, one with a loop ileostomy. The identical procedures were performed in 18 patients by laparotomy. The mean age of the two groups were 62.8 and 67.1 years, respectively (p = NS).

Results: Seven of 18 patients in whom laparoscopy was attempted (38.9%) had conversion to laparotomy. Six of seven (85.7%) conversions were directly related to the intense inflammatory process. Laparoscopic treated patients with Hinchey IIa or IIb disease had a morbidity rate of 33.3% and a conversion rate of 50% while all patients with Hinchey I disease were successfully completed without morbidity or conversions to laparotomy. However, after the first four cases, the intraoperative morbidity and postoperative morbidity rates were zero and 14.3% and after ten cases they were zero and zero, respectively. Furthermore, the median length of hospitalization for Hinchey I patients after laparoscopy was 5.0 days vs 7 days after laparotomy ($p < 0.05$). In Hinchey IIa and IIb patients, the median length of hospitalization was almost 50% shorter with a laparoscopic approach (6 days vs 10 days, $p < 0.05$).

Conclusion: In conclusion, laparoscopic resection of diverticulitis can be performed without additional morbidity particularly in Hinchey I patients and with a reduced length of hospitalization in patients with class I or II disease. Patients with class I disease, and after initial experience even those with class II disease, can benefit from the reduced morbidity and length of hospitalization associated with laparoscopic treatment.

Key words: Laparoscopy — Diverticular disease — Hinchey system

The surgical approach for ‘‘complicated diverticulitis has undergone significant changes. Traditionally, a three-stage approach was the accepted treatment for acute diverticulitis. However, morbidity and mortality were prohibitively high and sepsis persisted when the diseased segment was left in situ. In the 1980s, it became clear that the perforated segment should be resected whenever possible and the Hartmann’s procedure was popularized [1, 10]. After realizing the difficulty of Hartmann reversals, surgeons began to perform resection with primary anastomosis with or without loop ileostomies in select cases.

Whether diverticulitis is resected through a laparotomy or a laparoscope, such surgery can be challenging due to the acute inflammatory process and associated fistulae or abscess. We assessed the results of laparoscopic surgery for diverticulitis as stratified by severity of disease. We then sought to compare the results to well-matched patients who had undergone the same procedure for the same indications by laparotomy. Ultimately, we aimed to identify a subset of patients with diverticulitis who may benefit from a laparoscopic approach.

Materials and methods

We reviewed all colorectal laparoscopic cases performed from August 1991 to December 1995. Patients with diverticulitis were classified according to a modified Hinchey grading system (Table 1) [5]. Medical records from a control group of patients matched for age, procedure, and Hinchey class were reviewed during the same time interval (January 1993–

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Table 1. Modified Hinchey et al. grading system [5]

I.	Pericolic abscess
IIA.	Distant abscess amenable to percutaneous drainage
IIB.	Complex abscess associated with fistula
III.	Generalized purulent peritonitis
IV.	Fecal peritonitis

December 1995). All laparoscopic cases were performed by a single surgeon, whereas laparotomies were performed by one of two surgeons, neither of whom routinely performed laparoscopic surgery. All patients with Hinchey I or II disease were offered a laparoscopic approach when cared for by the one surgeon who routinely performed laparoscopy. Age, gender, diagnosis, procedure, operative time, hospital stay, morbidity, and mortality were evaluated for comparison. Comparisons were made among Hinchey classes, between converted vs laparoscopic completed procedures, and between open vs laparoscopic procedures. Patients with Hinchey III or IV disease were not offered a laparoscopic approach and thus were excluded from the study.

Laparoscopic procedures were performed in the standard manner as previously described [13]. Mann-Whitney, Kruskal-Wallis nonparametric ANOVA and Fisher exact tests were used for statistical analysis; $p < 0.05$ was considered significant (Instat Graphpad, San Diego, CA).

Results

One hundred eighty-five laparoscopic colorectal procedures were reviewed. Eighteen patients (9.7%) were of a mean age of 62.8 (range 34–86) years; eight males and 10 females were operated on for diverticulitis and make up the study group. There were six patients with Hinchey I, seven patients with Hinchey IIa, and five patients with Hinchey IIb disease. There were four patients with fistula in the Hinchey IIb group, one colofallopian, one coloenteric, and two colovesical. Eighteen patients underwent a laparoscopic assisted sigmoid colectomy, one with Hinchey IIb disease who had a concomitant loop ileostomy. Eighteen matched patients with a mean age of 67.1 (range 33–77) years, seven males and 11 females, underwent elective laparotomy for diverticular disease. Eighteen patients underwent a sigmoid resection, one of whom had a loop ileostomy. The patients were matched to the laparoscopic group, specifically by age, Hinchey class, procedure, and presence of a fistula. There were four patients with a colovesical fistula in the Hinchey IIb group who were treated in the conventional manner (sigmoid resection, takedown, and repair of the fistula with Foley catheter drainage for 5 days).

Converted group vs laparoscopically completed group

In seven of the 18 patients (38.9%), a laparotomy was necessary. Six of the seven (85.7%) conversions were directly related to the intense inflammatory process. Two of the seven were due to intraoperative complications (one enterotomy, and one colotomy), both of which occurred during the first four cases. The average operative time for the converted group was 214 min vs 213 min for the laparoscopically completed group (p = NS). Furthermore, the median length of hospitalization for the converted group was 8 days vs 5 days for the laparoscopically completed group ($p < 0.01$) (Fig. 1). The converted group had a postoperative morbidity of 28.6% (2/7 patients) while two of seven patients (28.6%) had intraoperative complications (one enterotomy and one colotomy both requiring conversion) yielding an overall morbidity of 57.1%. Both the anastomotic leak and the enterotomy occurred in the same patient, who was the fourth patient operated on for diverticulitis. The colotomy occurred in the first patient operated upon for diverticulitis; that patient also developed a wound infection. Conversely, there was only one postoperative pneumonia in 11 patients (9.17%) of the laparoscopically completed group ($p < 0.05$).

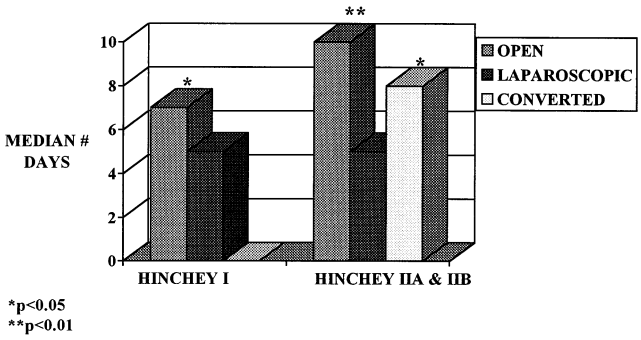

Fig. 1. Results: open vs laparoscopy, hospital stay.

Laparoscopic group: Hinchey I vs Hinchey IIa/IIb

While the patients with Hinchey I disease had no morbidity and no conversions, Hinchey IIa and IIb groups combined had morbidity and conversion rates of 33.3% (p = NS) and 50% ($p < 0.5$), respectively. In addition, the median hospital stay for patients with Hinchey I diverticulitis was 5 days vs 6 days for Hinchey IIa and IIb disease (p = NS). Interestingly, there was no difference in the operative time in patients with Hinchey I (215 min) vs Hinchey IIa or IIb pathology (213 min) (p = NS).

Open vs laparoscopic in Hinchey I patients

The laparoscopic operative time for Hinchey I patients was significantly longer (215 min) than it was for patients who underwent a laparotomy (108.3 min) ($p < 0.005$). Conversely, the median hospital stay was significantly longer in the open group, 7 days vs 5 days ($p < 0.05$) (Fig. 1), and no mortality or morbidity was noted in either group.

Open vs laparoscopy in Hinchey IIa or IIb patients

The operative time was much more closely aligned in more advanced disease. Specifically, the operative time was 213 min for the laparoscopic group vs 167 min for laparotomy (p = NS). Furthermore, the median length of stay for the laparoscopic group was 6 vs 10 days after laparotomy ($p < 0.05$) and morbidity was not significantly higher for the laparoscopic group (33.3%) than for the open group (33.3%) being treated for complicated diverticular disease. However, procedure-related morbidity was three for the laparoscopic group and zero for the open group. This consisted of one anastomotic leak, one colotomy, and one enterotomy. The colotomy and enterotomy occurred in the first and

Table 2. Laparoscopic colectomy for diverticulitis

Author	Total no. patients (all etiologies)	No. patients with diverticulitis only	Overall conversion rate	Conversion rate for cancer	Conversion rate for diverticulitis
Phillips et al. [9]	51	13 (25.4%)	7.8%	5%	15.3%
Zucker et al. [14]	65	10 (15.4%)	3%	0%	10%
Hoffman et al. [6]	80	26 (32.5%)	22.5%	10%	38%
Falk et al. [4]	66	19 (28.8%)	41%	36%	53%
Sher and Wexner [12]	185	18 (9.7%)	23%	4%	38.9%

fourth cases performed for diverticulitis at this institution. No such injuries have occurred during the last 3 years. Thus, after the ''learning curve'' the intraoperative morbidity was zero and the postoperative morbidity 14.3%. There was no postoperative morbidity during the last 10 cases.

Discussion

All surgeons know that resection of diverticulitis can be quite challenging. Therefore, it is intuitive that the acute inflammatory process also renders laparoscopy technically demanding, with higher conversion rates (Table 2) [4, 6, 9, 12, 14]. The fact that there were no statistical differences between the operative times for laparotomy and laparoscopy for Hinchey IIa and IIb patients supports the notion that even resection by laparotomy can be difficult. In a multicenter retrospective study, Falk et al. [4] reported a 53% conversion rate for all laparoscopic assisted sigmoid colectomies. Most reports of laparoscopic surgery for diverticular disease combine acute and chronic cases, elective and emergency cases, and cases associated with complications of diverticulitis. In addition, most authors combine the results of both benign and malignant diseases. In the multicenter trial it was impossible to determine outcome data specific for diverticulitis [4]. Phillips et al. [9] reported their experience with 51 colectomies, including 13 for diverticular disease. However, only four patients were treated for complicated diverticulitis. They, too, noted that inflammatory lesions with an indurated mesentery increased the likelihood of conversion and recommended preoperative computerized tomography scans to help select patients. They converted two of 13 patients with acute diverticulitis but only two of 38 for noninflammatory conditions.

Hoffman and associates [6] reported 26 colectomies for diverticulitis. There were 10 conversions to open procedures (38.5%)—two for recurrent diverticulitis, four with fistula, one with an abscess, and three technical, not related to the inflammatory process. Complications were more prevalent in the converted cases. The overall conversion rate for all 80 patients who had laparoscopic surgery was 22.5%, while 70% of conversions were due to the inflammatory process.

Similarly, 38.9% in the current study required conversion to laparotomy. Like other series 85.7% of the conversions were directly related to the inflammatory process including two intraoperative complications. Both enterotomies were related to scarring and inflammation; both were intraoperatively recognized and repaired after converting to an open procedure. Both injuries led to major postoperative morbidity—one anastomotic leak and one wound infection. However, all intraoperative complications and all postoperative septic complications occurred during the first four cases.

Importantly, the average total operative time in the converted group was not different from the completed group. Despite rapid conversion if no progress was made, the hospitalization for the converted group was significantly longer than it was for the completed group, primarily due to more advanced disease. The higher morbidity in the converted group parallels previous findings [2, 4, 6, 8, 9, 12, 14].

Hinchey class at operation reflects overall outcome. Auguste et al. [1] reported zero mortality with stage I disease treated by primary resection vs 5% mortality for stage II and 18% for stage III. We categorized patients according to a modified Hinchey grading system. Patients with complex abscesses not amenable to computerized-tomography-guided drainage and patients with a colovesical fistula or other fistulae were included in class IIb. Patients with a pelvic abscess or phlegmon amenable to drainage were classified as Hinchey class IIa and after computerized-tomography-guided drainage were reclassified as class I. As had been previously mentioned, staging by computerized tomography scan may allow selection of patients most likely to benefit from laparoscopy and/or percutaneous abscess drainage [8].

There was a shorter hospitalization in the laparoscopic procedures compared to laparotomies in all Hinchey groups. All of our patients, open and laparoscopic, were fed clear liquids immediately postoperative and progressed to a regular diet as tolerated [3, 10]. None of the patients in the laparoscopic group required a nasogastric tube, while seven of 18 (38.8%) patients treated by laparotomy required a nasogastric tube. This was the single most important factor leading to prolongation of hospital stay. Unlike other series, all of our patients were discharged only after tolerating a regular diet for at least 24 h. Thus the postoperative ileus appears less with a laparoscopic approach. Liberman and Hoffman also noted a decreased time to return to bowel function and discharged patients on 6.2 and 5.2 days, respectively [6, 8].

There was no morbidity in either the laparoscopic or laparotomy groups for ''uncomplicated'' Hinchey I patients. Moreover, there was no statistically significant difference between complication rates for laparotomy or laparoscopy for Hinchey IIa or IIb patients. Furthermore, and of crucial importance, is the fact that after the first four cases, there was no intraoperative morbidity and only a 14.3% postoperative morbidity, and that postoperative morbidity has decreased to zero during our last 10 cases.

Conclusion

Laparoscopic resection of diverticulitis can be performed without additional morbidity in Hinchey I patients and with a reduced length of hospitalization in all patients with diverticulitis. However, if conversion to laparotomy is necessary due to intraoperative complications, such benefits are less likely to be seen. Such problems are more frequently encountered early during one's experience. Morbidity rates of zero to 14.3% can be expected even in these complicated cases, as more procedures are performed. Therefore, patients with class I disease and, after initial experience, even those with class II disease can benefit from the reduced morbidity and length of hospitalization associated with laparoscopic treatment.

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