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Operative management of diverticulitis in a tertiary care center

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Abstract

BACKGROUND: Diverticulitis has become a medically managed disease process; the indications and timing of surgical intervention have evolved.

METHODS: We retrospectively reviewed all patients who underwent surgical intervention due to diverticular disease by the Division of Colon and Rectal Surgery from 2012 to 2014.

RESULTS: Ninety-eight surgeries were performed. Indications included colovesicular fistula, multiple recurrences of diverticulitis, medically refractory diverticulitis, stricture, abscess, colocutaneous fistula, and colovaginal fistula. Average length of stay was 5.7 ± 5.9 days (range, 1 to 51). Eighteen patients (18%) required an ostomy. Postoperative complications occurred in 18% of patients, including anastomotic leak (3.3%), wound infection (7.1%), acute kidney injury (5.1%), and urinary tract infection (2.0%). Thirty-day readmission rate was 7.2%; unplanned 30-day reoperation rate was 3.1%. There were no deaths.

CONCLUSIONS: The type of patient undergoing surgery for diverticulitis has changed, with selection bias toward chronic, advanced disease due to the proliferation of medical management strategies.

Diverticular disease accounts for a significant amount of health care spending. It is responsible for 312,000 admissions and 1.5 million days of inpatient care per year, resulting in an annual treatment cost within the United States of more than 2.6 billion dollars.[1] As the incidence of diverticulitis continues to rise (one population study showed an increase from 115 per 100,000 person-years in the 1980s to 188 per 100,000 person-years in the 2000s),[1,2] so has controversy regarding its management. It is generally accepted that uncomplicated diverticulitis can undergo conservative management, and emergent surgical intervention is necessary for patients presenting with peritonitis.[1] There is a lack of consensus, however, on what to do with patients whose severity on presentation falls in between those 2 categories. Over the past 1 to 2 decades, there has been a paradigm shift in favor of nonoperative management for these patients with complicated diverticulitis.[3,4] There is also a lack of consensus regarding the need or timing of elective colectomy after a successful conservative management strategy. Practice parameters state that the decision for surgical intervention should be individualized.[5] Despite the paradigm shift toward nonoperative management, recent literature has shown a high failure rate in those presenting with abscesses,

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calling into question a nonoperative strategy in these patients.[6,7] In addition, there may be some evidence of increased patient satisfaction with surgical intervention.[8]

Given the evolving indications and timing of surgical intervention, we sought to review our own practice patterns. Specifically, we aimed to study the patients at our institution who underwent surgical exploration for diverticulitis in an effort to clarify the current role of operative management. We hypothesized that the patients receiving surgical resection for diverticular disease today tend to have advanced, chronic, and more complicated disease compared with those of a decade ago; thus, there would be a higher rate of conversion and complications.

Methods

All patients who underwent elective or semielective surgical intervention due to diverticular disease by the Division of Colon and Rectal Surgery from 2012 to 2014 were retrospectively reviewed from the Division of Colon and Rectal Surgery's prospectively collected operative database. It is maintained by surgical schedulers and populated by surgeons. This database was used to identify demographic information, surgery performed, indications, types and rates of complications, and conversion rate. Complications and conversion rates were compared with historical published data. Specifically, all resections for diverticular disease in the study period were compared with published studies evaluating subjects before 2002. We hypothesized that due to more advanced, chronic, and more complicated disease compared with a decade ago, high rates of conversion and complications were likely to be seen.

Emergent cases were excluded as the lone exclusion criteria. At our institution, all elective and semielective surgical interventions performed for diverticular disease are done by the Division of Colon and Rectal Surgery. Emergent cases are done by an acute care surgeon on call, which did not always include a colorectal surgeon, and thus, these cases may not have been in our database. Five attending colorectal surgeons comprising the department performed the cases analyzed in the study; all are fellowship trained and adept in minimally invasive surgery. Fellows and/or residents were involved in every case. Patients were offered elective resection after a single episode of complicated diverticulitis (abscess, stricture, and fistula), after 4 or more episodes of uncomplicated diverticulitis, or if they developed medically refractory or smoldering diverticulitis (with recurrent disease within 1 month of cessation of antibiotics).

Main outcome measures included anastomotic leak, other postoperative morbidity, 30-day readmission rate, unplanned 30-day reoperation rate, and mortality.

The retrospective data analysis was approved by the Institutional Review Board of the University of Southern California and was compliant with Health Insurance Portability and Accountability Act regulations.

Results

There were 98 patients (52 men and 46 women) included during the study period. Average age was 53 years old, and average body mass index was 30 ± 6.6. Median American Society of Anesthesiologists class was 2 (range, 1 to 4), and 56% of patients had prior abdominal surgery (see Table 1). Indications for surgery included colovesicular fistula (29%), multiple recurrences of diverticulitis (20%, mean 5.2 ± 2.7 recurrences, range, 2 to 12), medically refractory diverticulitis (17%), stricture (17%), abscess (9%), colocutaneous fistula (4%), and colovaginal fistula (4%; see Table 2). All patients with multiple recurrences had at least 1 episode of complicated diverticulitis with abscess formation.

Median length of stay was 5.7 ± 5.9 days (range, 1 to 51), and median length of stay was 4 days. Semielective resection (during the same hospital admission for complicated disease) was performed in 9.2% of patients. Elective resection was done in 91% of cases. Laparoscopic surgery was used in 48% of cases. Of these 38% of cases required conversion to open surgery. The most common indication for conversion was due to lack of natural tissue planes (n = 9), lack of working space in an obese patient (n = 4), and concern for iatrogenic injury (n = 2, once for bowel and once for ureter; see Table 3). Ureteral stents were not routinely used in this population. The lone intraoperative complication was a ureteral transection due to distorted anatomy from adhesions. This was identified and repaired with an immediate ureteral reimplantation. Mean operative time was 168 ± 77 minutes (range, 60 to 590). Eighty-six percent of patients received a stapled anastomosis, 3% underwent sutured anastomosis, and 18 patients (18%) required an ostomy. Of these, 7 were a diverting ileostomy and 11 were an end colostomy (Hartmann's type). Ostomies were not preoperatively planned for but rather decided intraoperatively based on operative findings. Eventually, all

Table 1 Demographics and outcomes

Demographics	N = 98
Age, y	53
BMI	30 ± 6.6
ASA	2.6 ± .6
Prior surgery	56%
Length of stay	5.7 ± 5.9 d
Laparoscopy	48%
Conversion rate	38%
OR time	168 ± 77 min
Ostomy	18%
Readmission (30 d)	7.2%
Reoperation (30 d)	3.1%
Death (30 d)	0
Complication rate	19%

ASA = American Society of Anesthesiologists; BMI = body mass index; OR = operating room.

Table 2 Indications for surgery

Indications for surgery	N = 98 (%)
Colovesicular fistula	29
Multiple recurrences*	20
Medically refractory	17
Stricture	17
Abscess	9
Colocutaneous fistula	4
Colovaginal fistula	4

*Mean 5.2 ± 2.7 recurrences.

but 6 of these 18 ostomies were reversed. Reasons precluding ostomy reversal included comorbid conditions (3) and lost to follow-up/moved (3).

Postoperative complications occurred in 18% of patients. Most common, these included anastomotic leak (3.3%), wound infection (7.1%), acute kidney injury (5.1%), and urinary tract infection (2.0%; see Table 4). Thirty day readmission rate was 7.2% and unplanned 30-day reoperation rate was 3.1%. Of the 3 anastomotic leaks, 2 were performed laparoscopically and 1 was an open procedure. All 3 cases had negative leak tests, and none were diverted at the index operation. The 2 laparoscopic leaks required return to the operating room for diversion, while the third required percutaneous drainage and antibiotics. Besides the 2 anastomotic leaks that returned to the operating room, the third operative take back was for a rectal stump blowout after an open Hartmann's procedure that occurred despite transanal drainage in a patient with multiple comorbidities. There were no deaths.

Comments

We hypothesized that, due to the increased use of medical strategies for uncomplicated diverticulitis, the type of patient undergoing surgery for diverticular disease has advanced, chronic, complicated pathology, and that this would likely lead to a higher rate of conversion and complications after surgery. Our results suggest that our hypothesis is at least partially correct. We observed a high conversion rate of 38%, but our complication rate of 18% (including a leak rate of 3.3%) is comparable to other studies.

Over the past decade, there has been a proliferation of medical management for complicated diverticulitis. As radiologic-guided percutaneous drainage has improved, so has the success rate of nonoperative management of complicated diverticulitis. Many authors advocate a nonoperative management strategy for the index presentation of acute complicated diverticulitis.[9–11] This strategy has been expanded to repeat presentations, with results indicating that patients with recurrent diverticulitis can be managed nonoperatively without worse outcomes[12,13] and without increased conversion to open surgery if surgical resection ultimately is necessary.[14]

Table 3 Reasons for conversion to open surgery

Reasons for conversion	N = 17
Lack of natural planes	9
Lack of working space	5
Iatrogenic injury	2
Adhesions	1

Table 4 Complications

Complications	N = 19
Wound infection	7
Acute kidney injury	5
Anastomotic leak	3
Urinary tract infection	2
Ureteral injury	2

The result of this paradigm shift in management strategy has resulted in a change in the type of patient undergoing surgery for diverticular disease. Whereas decades ago patients with uncomplicated disease or even complicated disease with small abscesses would undergo surgery relatively soon after presentation, most of these patients would now be managed conservatively. At our institution, our results indicate this change as well; this has resulted in a selection bias, with surgical intervention being reserved for those with chronic, advanced disease, with a higher risk for conversion or complication. More than half (54%) of our patients underwent surgical intervention due to a complication that could not be resolved without surgical management (fistula and stricture). The remaining patients were operated on for medically refractory diverticulitis, abscess, and multiple recurrences. This change in management style is easily seen as our cohort had an average of 5.2 ± 2.7 recurrences. It also undoubtedly will have financial implications on institutions managing patients with complicated diverticulitis that necessitates surgical intervention; it has been shown that the care of high-risk patients (such as those with advanced, complicated disease undergoing surgical intervention for diverticulitis) is not feasible under the current reimbursement system.[15,16]

Our patients' elevated body mass index, American Society of Anesthesiologists score, and high rate of prior abdominal surgery likely placed our population at increased risk of complication and conversion. Prior surgery would result in increased likelihood of adhesive scarring, and it is well-known obesity has been associated with increased morbidity and mortality in colon and rectal surgery.[17,18] Despite this, laparoscopic surgery was still attempted in 48% of cases. A recent large prospective cohort study reports a conversion rate of 16.5% in laparoscopic colectomies for diverticular disease, but this increased to 33% in the subgroup of nonelective disease.[14] Several recent reviews of laparoscopic surgery for

diverticular disease report a range of conversion from 0% to 35.7%.[19–22] Our conversion rate of 38% lies at the high end of this range. The laparoscopic surgical approach at our institution does not involve a hand-assist port. It typically involves a camera port and 2 working ports, and occasionally an assistant's port as well. It could be argued that utilization of a hand-assist port may reduce our conversion rate, but it is not typically used by our surgeons. In addition, lack of adequate working space was a major indication for conversion in our study, and this would not have improved with a hand-assist approach. Of the patients undergoing laparoscopic surgery, 59% had previous abdominal surgeries, whereas 53% of those undergoing open surgery had previous abdominal surgeries. Of note, only 1 conversion was due to adhesions, so previous surgery should not preclude patients from attempts at laparoscopic surgery.

As surgical intervention for diverticular disease today has shifted to more complex disease, it is enlightening to look at results from when elective disease for uncomplicated disease was still commonplace. After searching the literature for studies regarding surgical intervention for diverticular disease from more than 10 years before our patients, some interesting trends came to light. In those studies, mean operative time ranged from 109 to 397 minutes. Average length of stay ranged from 4 to 12 days. Postoperative complication rate ranged from 8% to 32%. Conversion rate in these studies where laparoscopy was attempted ranged from 4% to 26%, but when only cases with uncomplicated diverticulitis were considered, this range dropped to 4% to 14%.[23–37] Our conversion rate was markedly higher than this historical data, possibly reflecting the change in type of diverticular disease that undergoes surgical intervention. However, our mean operative time, length of stay, and postoperative complication rate were in line with these historical controls.

Another controversial issue is whether to create a surgical ostomy during diverticular surgery. Published guidelines from the American Society of Colon and Rectal Surgeons (ASCRS) state that "the decision to restore bowel continuity must incorporate patient factors, intraoperative factors, and surgeon preference."[5] Numerous studies report no increase in adverse outcomes after primary anastomosis.[38–41] Primary anastomosis was achieved in 87 of our 98 patients (7 of these patients had a diverting ileostomy). Our anastomotic leak rate in these patients was 3.4% (3 patients), wound infection rate was 7% (7 patients), average length of stay 5.7 days, and overall complication rate was 19% (19 patients). It is our general practice to perform a primary anastomosis if there is at least one healthy end of tissue (in the proximal colon or distal rectal stump). A proximal diversion is performed in the setting of a positive air leak test or poor quality tissue on the assessment of the surgeon. The reasons for proximal diversion in our study included poor quality of tissues, positive air leak test, and grossly incomplete donuts on stapled anastomosis. A systematic review of patients undergoing surgery for acute complicated diverticulitis with primary anastomosis lists anastomotic leak rate at 5.5%, wound infection rate at 14%, average length of stay from 7.4 to 18.7 days, and overall morbidity at 29%.[38] Our results are favorable when compared with these, although it must be pointed out that our cohort did have some elective resections as well.

This study is limited by the fact that our sample size is small. However, this is not something that is unique to our study. The other single-center case series' looking at outcomes after surgical intervention for diverticulitis cited in this study have sample sizes ranging from 14 to 304 patients. As mentioned previously, our conversion rates are higher than most, but our complication rate is comparable. Despite the small sample size, advantages of a smaller, focused review such as ours allows for a more thorough evaluation of each case. Examining operative and postoperative management strategies can better elucidate reasons for conversion and complications, thus giving insight into how to improve in future practice.

In addition, the retrospective analysis and nonrandomized nature of our observational study are inherent limitations. Finally, the total number of diverticulitis episodes is not fully known in our overall study population, only the ones that came to surgery. As a referral center, we may not see many of the uncomplicated episodes that do not warrant hospital admission, and some patients were managed elsewhere before presentation to consider surgery. We do feel, however, that this is a representative cohort of typical patients with diverticulitis undergoing surgery in today's practice environment. All surgeons at our institution are qualified in advanced laparoscopic surgery, with an experience of over 200 cases each. It is a testament to the degree of difficulty of this disease process that even in skilled hands that there exist a high rate of conversion, complications, and need for ostomy creation. This is important when considering the applicability of our results. Large, multi-institutional randomized controlled trials will be needed in the future to confirm our findings.

Conclusions

The type of patient undergoing surgery for diverticular disease has changed, with a selection bias toward chronic, advanced disease due to the proliferation of medical management strategies. A primary anastomosis is feasible in the overwhelming majority of these patients with a low leak rate, although there remains a significant risk of other postoperative complications. As a result, length of stay is increased. Laparoscopy can be used in selected cases, although it must be understood that there is a higher conversion rate. Prospective studies are needed to validate our findings and help further define the operative indications for diverticular disease.

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