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Elective Resection for Diverticular Disease: An Evidence-Based Review

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Abstract Controversy exists as to the most appropriate management of patients following two episodes of diverticulitis. Despite a growing body of new evidence challenging the concept of elective sigmoid resection after a patient experiences two attacks of diverticulitis, we continue to base our practice on outdated studies carried out more than 30 years ago. The recommendation that patients undergo elective sigmoid resection after two attacks of acute diverticulitis should be re-evaluated as it is generally inappropriate and is not cost effective. Elective resection for uncomplicated diverticulitis does not alter outcome, nor does it decrease mortality or prevent complications of the disease. In fact, based on current literature, 18 patients would have to undergo elective operation to prevent one emergency surgery. This article aims to review the current evidence for elective resection following episodes of diverticular disease and addresses emerging controversies in the management of this disease.

Introduction

Diverticular disease is a common gastrointestinal (GI) disorder, with an age-dependent prevalence of 5–45% [1] and is the fifth most costly GI disorder in the United States, placing a substantial burden on inpatient and outpatient resources [2]. Up to 30% of the population over the age of 60 have evidence of diverticulosis, and 10–25% of these patients will suffer an acute attack, with a further 30% developing complicated diverticular disease [3, 4].

Best practice in surgery is dependent on evidence-based medicine; however, it takes time for new evidence to be incorporated into daily hospital practice. This is particularly relevant in the management of recurrent diverticulitis. Most existing guidelines on the management of diverticular disease, and indeed of recurrent diverticular disease, are based on outdated, single-center, retrospective studies. It is worthwhile to note that there has never been a randomized controlled trial comparing conservative management to operative management of acute diverticulitis.

Over the last decade, new insights into the natural history of diverticulitis have caused us to reconsider the current practice of elective sigmoid resection for recurrent diverticular disease. The present study was designed to review the current evidence for elective resection following diverticular disease and to help clarify the emerging controversies in the management this disease.

Methods

A text word literature review was performed using the PubMed and Medline databases. Search terms including *acute diverticulitis, recurrent diverticulitis, diverticular disease*, and *elective resection AND diverticulitis* were used. The reference lists of identified articles were searched for further relevant publications.

Present guidelines

In 2006, the American Society of Colon and Rectum Surgeons (ASCRS) revised its practice parameters concerning

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the management of diverticular disease. Specifically, it is stated that "the decision to recommend elective sigmoid colectomy after recovery from acute diverticulitis should be made on a case by case basis" as "the number of attacks of acute uncomplicated diverticulitis is not necessarily an overriding factor in defining the appropriateness of surgery" [5]. This change in practice has been long awaited as previous guidelines were based on several outdated theories. Prior to this revision, it was proposed that following two episodes of acute diverticulitis, patients should be offered an elective sigmoid colectomy[6–8]. These recommendations were based on several flawed observations:

> recurrent diverticulitis gives rise to more serious complications such as abscess formation, perforation, stricture or fistula [9]; the response to conservative treatment decreases with each episode of diverticulitis and an elective procedure is a safer option with lower morbidity and mortality rates compared to surgery in the emergency setting.

The Ad Hoc Practice Parameters Committee of the American College of Gastroenterology [7] states that "recurrent attacks are less likely to respond to medical therapy and have a higher mortality rate: therefore, most authorities agree that elective resection is indicated after two attacks of uncomplicated diverticulitis." This concept is reaffirmed by the European Association of Endoscopic Surgeons [8], who also advocate elective resection after two attacks of acute diverticulitis.

Much of this evidence comes from studies carried out in the early 1970s, when the natural history of diverticular disease was still undetermined. Today, far more is known about the progression of this disease, and advances in antimicrobial therapy, critical care, and diagnostic and interventional radiology mean that diverticular disease can now be treated without ever requiring surgical intervention.

It is now widely accepted that diverticulitis encompasses a wide spectrum of pathologies ranging from acute uncomplicated diverticulitis to perforation with peritonitis. Although the underlying pathophysiology is similar in all cases, the clinical manifestation of the disease differs greatly between individuals. In this regard it is helpful to further classify patients according to those who have "mild diverticulitis" and those with "severe diverticulitis" [10] (Table 1).

Table 1 Computed tomography classification of acute diverticulitis

	Mild diverticulitis	Severe diverticulitis
CT findings	Sigmoid wall thickening (<5 mm)	Abscess
	Pericolic fat stranding	Extraluminal air
		Extraluminal contrast

Source: Ambrosetti et al. [10]

The primary question remains: does an acute episode of diverticulitis predispose to complicated disease? New insights into the natural history of mild diverticulitis show that this disease entity follows a rather benign course, with patients being unlikely to have a recurrence and even less likely to require emergency surgical intervention for recurrent disease (Table 2). The calculated annual recurrence rate is in the order of 2% per year [14] with a risk of requiring an emergency Hartmann's procedure following one episode of mild diverticulitis being 1 in 2,000 patient-years of follow-up [18].

The earliest study, reported by Parks in 1969, followed 455 patients over a period of 1–16 years, with a follow-up of nearly 100% [11]. Of the 317 (70%) patients who were treated conservatively (antibiotics and bowel rest) on their first admission, only 25% re-presented with a second episode. In fact, it was estimated that 70% of patients will respond to medical management on the first presentation. Although the Parks study gives long-term results, it has several limitations: patients were investigated with clinical evaluation and barium enema, but only half of the barium enema examinations demonstrated changes consistent with acute diverticulitis. Furthermore, one third of the patients had persistent symptoms after treatment, suggesting that some patients may have had other colonic pathology such

Table 2 Mild diverticular disease

Study	Reference	Follow-up (years)	Number	Management		Recurrence		
				Operative	Conservative	Total	Operative	Conservative
Parks 1969	11	16	455	138	317	80		
Anaya and Flum 2005	12	n/a	25,058	5012	20046	4761	857	3904
Moreno and Willie-Jorgensen 2007	13	6.5	455	120	325	157	25	98
Broderick-Villa et al. 2005	14	8.9	3,165	601	2,564	241	18	223
Chautems et al. 2002	15	9.5	118	–	118	38	37	81
Salem et al. 2007	16	5	119	–	119	2	1	116
Shaikh 2007	17	1–10	232	53	179	60	9	51

as irritable bowel syndrome. In addition, the study number is small and is therefore prone to error.

The largest study to date looked at 25,058 patients admitted with a diagnosis of diverticulitis [12]. Of the 80.3% who were treated conservatively on their first admission, 19% had a further episode, with only 18.1% of this group requiring emergency surgical intervention. This study demonstrated that only 5.5% of patients who recovered from an initial episode of diverticulitis would require emergency surgical intervention.

Several other studies with medium to long-term results further challenge Parks's findings. Moreno and Willie-Jorgensen followed 445 patients over 5 years; 35.3% had recurrence of diverticular disease, and only 3.5% died of diverticular-related causes. Only 7.6% underwent an operation for diverticular disease, all in the elective setting [13]. In a retrospective, multicenter cohort study of patients hospitalized for acute diverticulitis, 3,165 patients were reviewed with a mean follow up of 8.9 years. Of this group 81% of patients were treated nonoperatively. Of those who were followed up, 9.4% had a single recurrence, and 3.9% had a re-recurrence [14]. Similarly in a 7-year follow up study of 252 patients treated conservatively for diverticulitis, only 10% underwent operative intervention, suggesting that surgery should be undertaken for symptomatic relief rather than prevention of complications [19]. Results of several other smaller studies have reinforced the findings that symptomatic mild diverticular disease runs a relatively benign course with a low incidence of subsequent complications[15, 16, 20].

Does elective resection prevent the complications of diverticular disease?

The incidence of perforated diverticular disease is increasing and is estimated to be 4/100,000 of the western population [21, 22]. If patients are undergoing elective surgery then why is perforated diverticular disease on the rise? Interestingly, the majority of patients presenting with severe diverticulitis have no previous history of the disease. In a retrospective study of 337 patients hospitalized for severe diverticulitis, Chapman et al. found that over half had no previous history of diverticulitis, and this included 89.5% of the patients with perforated diverticulitis [23]. Somasekar et al. reviewed 108 patients admitted with acute diverticulitis, only 26% of whom had a previous documented episode [24]. These findings have been consistently reproduced in several studies [19, 20, 23, 25, 26] (Table 3).

What has emerged from recent studies is that recurrent diverticultis may actually afford protection against complications of the disease. In 100 patients with perforated diverticultis treated by laparoscopic lavage, only 2 patients required re-admission for recurrence [27]. Furthermore, in patients who have had complications following recurrence, the outcome from surgical intervention is more favorable than for those who present initially with severe disease. The overall mortality rate in one study was 2.5% in patients with a prior history versus 10% in those with no previous history [24].

Costs of diverticular disease

In the United States diverticular disease is the fifth most costly digestive disease and one that places a significant burden on healthcare costs [2, 28] If unnecessary operations are being carried out, this puts more pressure on an already overstretched and under-resourced system. In 1998, there were 2.2 million cases in the USA, and total health care costs came to $2,358 million. Expectant surgical management of recurrent diverticulitis gives rise to fewer deaths, fewer colostomies, more quality adjusted life year (QALY)'s, and is less costly. Based on decision analysis, operating after the fourth attack, compared to the second attack, in patients over the age of 50 years results in 0.5% fewer deaths, 0.7% fewer colostomies, and can save $1,035

Table 3 Severe diverticular disease

Study	Year	Number	Previous diagnosis of diverticulitis	Surgery			
				Total	Elective	Emergency	
						Total	Previous history[a]
Chapman et al. 2006	23	337	157	331	n/a	331	157
Salem et al. 2006	20	77	23	25	10	15	1
Nylamo 1990	26	113	26	53	3	48	2
Lorimer 1997	25	392	n/a	154	28	126	15
Somasekar et al. 2002	24	108	28	104	–	104	28

[a] Previous history of diverticulitis

n/a: not available

per patient [29]. A smaller study using a Markov model to compare the costs and outcomes of performing surgery after one, two, or three uncomplicated attacks in 60-year-old hypothetical cohorts found that elective resection after the third episode is cost saving compared to surgery following a first or second attack [30].

Risks of elective surgery for diverticulitis

Elective sigmoid resection for diverticular disease is not without risk. The mortality associated with elective resection ranges from 1.0% to 2.3%, with morbidity rates of 25–55%, including a 10–14% incidence of stoma formation [31–33]. Furthermore, elective resection is not curative in all patients, with recurrence rates following surgery estimated at 2.6–10% [34–36].

Special circumstances

To date, there is no proven benefit for elective sigmoid colectomy in patients with mild diverticulitis except in those who are immunocompromised [37] and perhaps in patients who have undergone percutaneous abscess drainage [38]. Controversy remains about the most appropriate management of diverticulitis in patients younger than 50 years of age. There is a suggestion that the disease is more virulent in this subset of patients, especially in young men [39–41], but those findings have been refuted in several other studies [42–45]. The ASCRS suggests that "because of their longer life span, younger patients will have a higher cumulative risk for recurrent diverticulitis, even if the virulence of their disease is no different than that of older patients." Although this theory seems plausible there has been no long-term follow up of young patients with diverticulitis. Furthermore, current studies may be biased toward younger patients as surgeons have a lower threshold for operative intervention in this subgroup.

Conclusions

There is now an overwhelming body of evidence to challenge the current practice of carrying out elective sigmoid resection following two attacks of diverticulitis. It has been shown that prophylactic resection will not decrease the risk of emergency surgery in patients with mild diverticulitis, as the majority of patients require emergency intervention on their first admission. Further, the natural history of mild diverticulitis is that it runs a rather uncomplicated course and patients who are treated conservatively are at low risk of developing severe diverticular disease. In addition, elective resection does not completely prevent recurrent diverticulitis and it carries significant morbidity and mortality. It is also not the most cost effective solution. There are, however, some circumstances in which elective resection may be undertaken where there is evidence to show a benefit, such as in immunocompromised or young patients or in those who have required abscess drainage. Unfortunately, the retrospective and heterogeneous nature of available studies impairs definitive conclusions. What is required is a randomized controlled trial comparing outcomes in medically versus surgically managed patients with acute diverticulitis.

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