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Emergency surgery for colonic diverticulitis: differences between right-sided and left-sided lesions

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Abstract *Background and aims:* Right-sided diverticulitis is rare in Western societies but is not uncommon in Asian countries. Many of the patients are operated with the presumptive diagnosis of appendicitis. This study compared the results of emergency surgery for patients with right-sided and left-sided diverticulitis. *Patients and methods:* Demographic data, type of operation, and surgical outcome were recorded in 60 patients who had undergone emergency surgery for colonic diverticulitis (37 right-sided, 23 left-sided). *Results:* Patients with right-sided disease were significantly younger (mean age 41.9 vs. 74.2), and there was a tendency to male predominance (78.4% vs. 56.5%). All patients with right-sided disease had localized peritonitis while 74% of patients with perforated left-sided diverticulitis had generalized faecal or purulent peritonitis. Mortality rates for right-sided disease and left-sided disease were 0% and 13%, respectively, and morbidity was 14.2% and 61%, respectively. Longer hospital stay was also found in patients with left-sided diverticulitis. *Conclusions:* There are major differences in the demographics, presentation, type of operation and outcome of patients who had emergency surgery for colonic diverticulitis, with emergency operation for left-sided diverticulitis being associated with higher mortality and morbidity.

Keywords Emergency surgery for colonic diverticulitis · Differences between right-sided and left-sided lesions

Introduction

Diverticular disease is a common condition in Western societies. Its incidence increases with age, and in Western countries diverticula are reported to be present in the colon in 80% of those aged over 85 years [1]. The lack of dietary fibre and the increase in luminal pressure of the colon are believed to be important aetiological factors. The majority of diverticula in the West occur in the sigmoid colon, and only 20% become symptomatic. Some 10–15% of patients develop acute diverticulitis with inflammation of the one or more of the diverticula. Nowadays most patients with uncomplicated diverticulitis can be treated conservatively, with bowel rest and antibiotics. Emergency operations are now mostly performed for those with generalized peritonitis due to perforation. Other indications include unresponsiveness to conservative management and the development of complications such as bleeding and obstruction. High mortality of up to 10% has usually been reported in series of patients following emergency operation for diverticulitis [2].

The distribution of colonic diverticula in Asian populations is different from that in the West, and more than 50% of diverticula occur at the right colon [3, 4]. Diverticula at the right colon can be congenital, true diverticula, but more commonly these are false diverticula without any muscle layers. The cause of acquired right-sided diverticula remains unknown. Right-sided diverticulitis is rare in Western societies, but its occurrence in Asian

countries is not uncommon. Accurate preoperative diagnosis is difficult, and many of these patients are operated on as emergency cases with the presumptive diagnosis of acute appendicitis. Owing to the peculiar geographic distribution of colonic diverticulitis, comparisons between right-sided and left-sided diverticulitis with comparable number of patients in the two groups have seldom been carried out. We review here the results of emergency surgery for colonic diverticulitis, analysing the clinical features and outcome of surgery in patients with right-sided vs. those with left-sided colonic diverticulitis.

Patients and methods

This study included all 60 patients who underwent emergency operation for colonic diverticulitis between January 1990 and June 2000 at the Department of Surgery, Queen Mary Hospital. Fifty-nine of them were Chinese and one was a Caucasian. There were 42 men and 18 women, and their mean age was 54.3 years (range 19–87). Thirty-seven patients had right-sided diverticulitis; these included caecal diverticulitis in 34 patients and involvement of the ascending colon in two and transverse colon in one. Twenty-three had left-sided diverticulitis, and all except one had lesions at the sigmoid colon. All patients presented with acute abdominal pain and were operated on based on clinical features of peritonitis, either localized or generalized. All the operations were performed in an emergency setting, and the subsequent diagnosis of colonic diverticulitis was confirmed by histological examination. The charts of the patients were reviewed, and the patients' demographic data, presentation, surgery, pathology and outcome were recorded. Lesions proximal to the splenic flexure were considered as right-sided lesions and those distal to the splenic flexure as left-sided lesions. Postoperative mortality was defined as in-hospital death, and morbidity was defined as complications that would lead to prolonged hospitalization or additional procedures. Differences between those with right-sided and left-sided diseases were reviewed. Statistical analysis of nominal variables was carried out with the χ^2 test or Fisher's exact test where appropriate. Continuous variables were analysed by Student's t test. P values less than 0.05 were considered statistically significant.

Results

Comparison of the patients with right-sided and left-sided disease is shown in Table 1. Patients with right-sided diverticulitis were significantly younger than those with left-sided disease (41.9 vs. 74.2 years). Of those with right-sided diverticulitis 78.4% were men while of those with left-sided diverticulitis 56.5% were men. There was a tendency to male predominance in patients with right-sided diverticulitis, although the difference was not statistically significant. Premorbid conditions occurred in 18 patients: cardiac disease in eight, pulmonary disease in six, diabetes in three, and rheumatoid arthritis, chronic renal failure, neurological disease and malignancy in one each (some patients had more than one premorbid condition).

All patients presented with abdominal pain, and there was no difference in the duration of pain between the

Table 1 Comparison of patients with and outcome of right-sided and left-sided diverticulitis

	Right-sided (n=37)	Left-sided (n=23)	P
Sex: Male/female	29/8	13/10	0.07
Age (years)	41.9	74.2	<0.001
Fever	25 (67.6%)	15 (65.2%)	0.85
Leucocytosis	28 (75.7%)	12 (52.2%)	0.06
Pre-morbid condition	4 (10.8%)	14 (60.9%)	<0.001
Primary resection	35 (95.6%)	22 (95.7%)	1.0
Hinchey classification			<0.05
I	35 (94.6%)	1 (4.3%)	
II	2 (5.4%)	5 (21.7%)	
III	0	14 (60.9%)	
V	0	3 (13.0%)	
Mortality	0	3 (14.3%)	0.052
Mean hospital stay (days)	8.3	17.9	<0.05
Morbidity	6 (16.2%)	14 (60.9%)	<0.05

two groups. Leucocytosis occurred in 75.7% of patients with right-sided diverticulitis but only 52% of those with left-sided diverticulitis. In fact, six patients with left-sided diverticulitis presented with leucopenia.

Thirty-three patients with right-sided diverticulitis were explored through a grid iron incision with the presumptive diagnosis of appendicitis, and four had midline incision. All but one of those with left-sided diverticulitis were operated on through a midline incision. All the patients with right-sided diverticulitis had localized disease, and none had generalized peritonitis. According to the Hinchey's classification, all patients with right-sided diverticulitis were of stages I or II while 74% of patients with left-sided diverticulitis had stage III or IV disease.

Ileocaecectomy or right hemicolectomy was performed in 35 patients with right-sided diverticulitis. Multiple diverticula were found in 11 resected specimens. Of the remaining two patients one had diverticulectomy and the other invagination of the diverticulum. The disease-bearing segment of the colon was resected in all patients except one with left-sided diverticulitis. Only two had primary anastomosis following resection. Hartmann's operation was performed in 20 patients. There was no operative mortality in patients with right-sided diverticulitis while three patients with perforated left-sided diverticulitis and general peritonitis died after Hartmann's operation. Restoration of bowel continuity after Hartmann's operation was carried out in only 4 of the 17 patients who survived the operation.

Postoperative morbidity occurred in 20 patients: cardiac in four, pulmonary in five, wound infection in nine, gastrointestinal bleeding in two, retracted colostomy in two, prolonged ileus in one and intestinal obstruction in one. Six of the 37 patients with right-sided diverticulitis developed complications. These included four with wound infection, one with prolonged ileus and one with postoperative intestinal obstruction requiring laparotomy and en-

terolysis. In patients with left-sided diverticulitis complications occurred in 14 of the 23 patients, resulting in three deaths on days 1, 3 and 20 after surgery. Morbidity was significantly higher and the hospital stay significantly longer in patients with left-sided diverticulitis. The presence of premorbid conditions was also found to be associated with an increase in postoperative morbidity. Postoperative complications occurred in 67% and 19% of patients with and without premorbid conditions, respectively(P=0.001).

Discussion

Diverticula can occur at any sites in the colon. There are great variations in the incidence and the distribution of diverticula in different geographic areas. In Western countries, where the incidence of diverticulosis is high, 85% of the diverticula occur in the descending and sigmoid colon. The site of involvement of colonic diverticula in the Asian countries is different. Radiological studies in Hong Kong and Singapore show the incidence of diverticulosis to be 25–28% and thus lower than that in Western societies [3, 4]. Caecum and ascending colon are usually involved, and the incidence of pure right-sided diverticula ranges from 55 to 71% [3, 4].

Most patients with diverticulosis are asymptomatic, notwithstanding the location of the diverticula. Acute inflammation is the commonest complication of diverticular disease. Since its first description in 1899, diverticulitis has become a common disease in Western countries. Its incidence has been well documented, and its treatment has evolved over the past 100 years. It is estimated that 10–25% of patients develop an episode of diverticulitis during their lifetime [5]. Most patients with uncomplicated left-sided diverticulitis can be treated conservatively, and subsequent management depends on the progress of the disease. Emergency operation is usually reserved for complications such as perforation, obstruction and bleeding. Purulent or faecal peritonitis resulting from perforation of the diverticula is the most frequent indication for emergency operation [6]. The traditional treatment of colostomy and drainage has given way to resection of the diseased colon. Nagorney et al. [7] showed that resection of the diseased colon is associated with better postoperative results. They reported mortality of 7% in patients with resection and 26% mortality in patients with colostomy and drainage.

In contrast to the extensive literature in left-sided diverticulitis in Western countries, the cause and clinical course of right-sided diverticulitis are less well studied because of its rarity in the West.

The results of the present study show major differences between patients having undergone emergency surgery for right-sided and left-sided diverticulitis. The mean age of patients with right-sided diverticulitis was 41.9 years. This finding is comparable to that of our previous study as well as to the results of other series [8, 9]. They were significantly younger than patients with perforated left-sided diverticulitis. The mean age of patients with left-sided diverticulitis was 74.2 years, which is much older than other series of patients with surgery for diverticular disease [6, 10]. In addition to their more advanced age, more than one-half of our patients with left-sided diverticulitis had concomitant medical illness, and this was significantly more than patients with right-sided diverticulitis. Advanced age and concomitant medical conditions adversely affected the surgical outcome of patients with left-sided diverticulitis in the present study.

The sex distribution also differed between the two groups. We found that 78% of patients with right-sided diverticulitis were men, and the male predominance is consistent with our previous report [8]. Female predominance is usually found in most series with patients with uncomplicated sigmoid diverticulitis [10, 11]. In our series, however, men accounted for more than 50% of cases of left-sided diverticulitis. In the study by Schwesinger et al. [6] 60% of patients with surgery for complicated diverticulitis were men. The male predominance in the present series might be due to ethnic differences, or male patients might be more susceptible to severe complications of diverticulitis such as free perforation that requires urgent operation.

The severity of the disease differs between the two groups of patients in our series. All of the patients with right-sided disease presented with localized disease with inflammatory phlegmon or localized abscess. However, in patients with left-sided diverticulitis 74% presented with generalized peritonitis, either purulent or faecal. This was obviously due to the fact that conservative treatment for localized left-sided diverticulitis was usually successful, and only those with generalized peritonitis would require emergency surgery. On the other hand, patients with right-sided diverticulitis were usually operated on as emergency cases with the preoperative diagnosis of acute appendicitis. Chen et al. [12] reported that patients with diverticulitis have longer duration of symptoms, less pain migration, less nausea and vomiting, and less fever and leucocytosis than patients with acute appendicitis. Nirula and Greaney [9] found only less nausea and vomiting in patients with right-sided diverticulitis. However, these series were based on small number of patients for comparison. The claimed differences in clinical features are difficult for a clinician to make an accurate diagnosis of right-sided diverticulitis on clinical grounds only. In addition, even in high incidence areas in Asian countries, right-sided diverticulitis is relatively rare compared to appendicitis. Lo and Chu [8] previously reported that one in 180 patients operated on for acute appendicitis had right-sided diverticulitis. Fischer and Farkas [13] also found that caecal diverticulitis comprised fewer than 1% of patients with hospital admission with the diagnosis of acute appendicitis.

Preoperative imaging has recently shown some encouraging results in the diagnosis of right-sided diverticulitis. Computed tomography has been shown to reveal characteristic features in patients with caecal diverticulitis [14, 15]. However, computed tomography and ultrasound are not routine preoperative investigations for acute appendicitis in most centres except in atypical cases. In practice, the differentiation by imaging can be difficult, and the decision to operate is usually based on the clinical features. Nirula and Greaney [9] reported that the differentiation of right-sided diverticulitis from appendicitis was not possible in the seven patients with preoperative ultrasound, and that computed tomography could make an accurate diagnosis in only one of the two patients.

Resection of the diseased segment is the recommended approach for treating acute diverticulitis. Resection was performed in the initial operation in 57 of our 60 patients, which included cases of both right and left-sided diverticulitis. In left-sided diverticulitis, resection has been shown to be associated with less mortality and morbidity [7, 16]. The mortality rate in our series was 13%, and all patients died had generalized faecal or purulent peritonitis. Great variations in mortality have been reported, and this is due mainly to the inclusion criteria of different series. High mortality rates are usually reported in series with patients with perforated diverticulitis and poor premorbid conditions [11, 17]. The high mortality in the present series was due to the patients' relatively advanced age and poor premorbid state. Primary anastomosis is not usually performed in the presence of peritoneal contamination and poor general condition of the patient, although we have extensive experience in the primary anastomosis with on-table antegrade lavage for obstructing left-sided colonic cancers [18]. Recent series have advocated the use of primary anastomosis in patients with perforated diverticulitis [19, 20, 21, 22]. It is obviously an attractive option for patients with inflammatory phlegmon or localized abscess. However, the general condition of the patients and the degree of peritoneal contamination are the main determining factors for this approach. In the report by Elliot et al. [11] 3 of the 25 patients with primary anastomosis died after the operation.

On the other hand, in patients with right-sided diverticulitis resection by right colectomy or ileocecectomy is the most commonly performed operation [13]. In our series resection with primary ileocolonic anastomosis was carried out in 35 of the 37 patients. We favoured resection and anastomosis in most of the cases because a definite diagnosis was obtained with the resected specimen and recurrence of the disease could be prevented. Resection and anastomosis was not a hazardous procedure as most of the patients did not have generalized peritonitis or severe peritoneal contamination. We did not encounter any anastomotic complications in this series. Low mortality and morbidity associated with right colectomy or ileocaecectomy have also been reported by others [9, 23, 24]. On the other hand, a lesser operation, such as diverticulectomy and invagination of the divertuculum, can be performed only in patients with less degree of inflammation, when the diverticulum can be easily defined. Conservative treatment, as in the management in left-sided diverticulitis, can be adopted in cases when preoperative diagnosis can be made. However, the subsequent clinical course and the rate of recurrence of these patients need to be further studied.

The use of laparoscopy has been showed to be accurate and effective in the diagnosis and management of suspected appendicitis [24]. Differentiation of acute appendicitis from inflammation of the caecum is possible by laparoscopy. Management of right colonic diverticulitis either by laparoscopic diverticulectomy or drainage had been reported [25, 26]. However, definite diagnosis of caecal diverticulitis and exclusion of a caecal cancer may not be easy during laparoscopy. Recommendations for the optimal treatment of inflammatory caecal masses during laparoscopy are lacking in the literature. It is hoped that with the more widespread practice of laparoscopy for suspected appendicitis, optimal treatment of inflammatory mass of the caecum can be better defined in the future.

This study showed significant differences in patient age and sex distribution, presentation, and the surgical outcome between patients with emergency surgery for right-sided and left-sided diverticulitis. Emergency surgery for left-sided diverticulitis was associated with high mortality and morbidity owing to the advanced age, concomitant medical conditions, and presentation with generalized peritonitis. Emergency resection in patients with right-sided diverticulitis is a safe procedure. However, whether this is the best treatment for right-sided diverticulitis requires further studies.

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