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Evaluation of current surgical management of acute inflammatory diverticular disease

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During the period 1980 to 1987, 127 patients were admitted with acute complications of diverticular disease; clinically diagnosed as acute diverticulitis in 86, peritonitis in 33 and colonic obstruction in eight. In those patients diagnosed as acute diverticulitis, conservative treatment was effective in 73 (85%), the other 13 requiring surgery. Of 31 patients, with a clinical diagnosis of peritonitis who underwent operation, 19 (61%) had free purulent or faecal fluid at laparotomy and the remainder had a localised phlegmonous mass.

Sigmoid resection was performed in 34 patients and non-excisional surgery in 18. In the earlier period of the study, there was a preference for the former procedure in patients with peritonitis rather than those with phlegmonous diverticulitis (63% *vs* 28%), and in the later period of the study, resection was the preferred treatment in both groups (91% *vs* 93%). The increase in resectional surgery significantly reduced mortality, at completion of treatment, in patients with peritonitis ($P<0.05$) but not in those with phlegmonous diverticulitis. There was an additional benefit of resection in the lower number of procedures per patient (1.5 *vs* 2.1), a lower median total hospital stay (32 days *vs* 50.5, $P<0.01$) and a lower wound infection rate (16% *vs* 32%, $P<0.01$) at the end of treatment. The optimum surgical approach at laparotomy for acutely complicated diverticular disease would therefore appear to be a resectional procedure.

Of the patients operated on for 'peritonitis', 39% were found to have a localised diverticular mass/phlegmon. This group of patients, if identified earlier, may respond to conservative management in the first instance, and highlight an area where further improvements in management may be possible.

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Diverticular disease of the colon affects up to one-third of the adult Western population, and is especially common in the elderly where it may even be considered a variation of the norm *(1,2)*.

Symptoms arising from diverticular disease or its complications severe enough to warrant inpatient management are somewhat more unusual and the number of patients needing operative treatment for acute inflammatory complications is relatively low *(2–4)*.

Awareness of the high morbidity and mortality associated with acute complications of diverticular disease has prompted debate over the issue of delayed versus emergency resection for the treatment of faecal or purulent peritonitis secondary to this condition. Since the 1950s, enthusiasts have advocated resection and even primary anastomosis as the most satisfactory approach *(5,6)* but this has not been widely accepted because of concern about the added risks of major surgery in these, often elderly, ill patients. A recent review suggested that primary resection was most likely to result in a better outcome in the presence of faecal or generalised peritonitis *(7)*. Both resection and non-resectional conservative treatments are staged procedures and their final outcome is not clearly documented.

The purpose of this retrospective study was to examine current surgical management of complicated inflammatory diverticular disease at our hospital and to assess any changes in management policy during the period of the study.

Methods

The case notes of all patients admitted over an 8-year period (1980 to 1987) to University College Hospital, London, with a diagnosis of complicated acute inflamma-

tory diverticular disease were reviewed. The study comprised patients presenting with a clinical diagnosis of acute diverticulitis, peritonitis or obstruction.

The management was recorded and patients undergoing operation were subdivided according to the operative findings into those having generalised faecal or purulent peritonitis and those phlegmonous diverticulitis (with or without localised abscess). Patients were further grouped into those who had a primary resection and those who did not.

The morbidity, mortality and length of hospital stay with respect to both initial and subsequent operative treatments were recorded.

Comparison was made between the operation performed in the first 4 years of the study and the second 4-year period. Statistical analysis was by χ^2 test with Yates' correction for continuity, and also Wilcoxon's Rank Sum Test for unpaired samples.

Patients and results

There was a total of 75 females and 52 males with a median age of 67.5 years (range 34–90 years); 86 patients presented with acute diverticulitis, 33 with peritonitis and eight with bowel obstruction.

The patients with diverticulitis were treated initially with intravenous fluids and antibiotics. A clinical diagnosis of acute diverticulitis was made on the basis of pyrexia, leucocytosis, tachycardia, left iliac fossa pain and tenderness with subsequent confirmation by barium enema and/or colonoscopy. The median inpatient stay was 12 days (range 5–24 days). All responded to conservative management except 13 (15%) who underwent surgery after a median of 7 days (range 3–14 days). There was one fatality (1.3%), a 59-year-old female with a previous cardiac history who died of a myocardial infarction.

In 33 patients a clinical diagnosis of peritonitis was made. Two did not undergo laparotomy, one a 60-year-old lady in whom steroids given for rheumatoid arthritis had masked an acute abdomen, and the other a 58-year-old who was admitted moribund and was misdiagnosed as a superior mesenteric artery infarction. Both these patients died within hours of admission, post-mortem examination revealing faecal peritonitis in the first and generalised purulent peritonitis in the second, both secondary to diverticular disease. Of the 31 patients who underwent laparotomy, 19 (61%) were found to have either generalised faecal or purulent peritonitis and 12 (39%) were found to have an acute inflammatory mass with a localised abscess.

There were eight patients who presented with colonic obstruction and at laparotomy were found to have an inflammatory mass involving the sigmoid colon.

Therefore, 52 (42%) patients required emergency surgery; 31 for a clinical diagnosis of peritonitis, 8 for obstruction and 13 patients with diverticulitis who failed to respond to conservative treatment (Table I).

The six patients with faecal peritonitis all underwent primary resection with one postoperative death caused by bronchopneumonia. There were no deaths in any of the nine patients who underwent primary resection for generalised purulent peritonitis; one of the four patients who had conservative surgery died of a pulmonary embolus, but in this group two of the other three died after subsequent 'definitive' procedures a few months later, one of an anastomotic dehiscence and one of a pulmonary embolism. There was a significantly ($0.02 < P < 0.05$) higher mortality after initial and subsequent treatment in those patients who presented with either faecal or generalised purulent peritonitis and underwent non-resectional (ie conservative) procedures.

Phlegmonous diverticulitis with a localised abscess was found in the pelvis and/or left paracolic gutter in nine patients and was treated without mortality. A total of 24 patients had an inflammatory mass at operation, eight of whom had presented with large bowel obstruction. There were two deaths; one from anastomotic dehiscence after resection and primary anastomosis, and the other from bronchopneumonia after a 'defunctioning' colostomy carried out as a primary procedure.

Table II shows the length of hospital stay for each procedure and lists the overall complications.

Table I. Emergency operations undertaken for acute complications of diverticular disease

	Peritonitis				*No peritonitis*			
	Total	*Faecal*	*Purulent*		*Abscess*	*Infl. mass*	*Obstruction*	
Resection								
Hartmann's procedure	8(0)	2	5	15(1)	1	—	—	19(1)
Paul Mickulicz procedure	7(0)	3	1		2	1	—	
Resection + anastomosis	19(2)	1(1)	3		2	9(1)	4	
Non-resection								
Colostomy + drainage	13(2,*)	—	4(1,*)	4(1,*)	1	4(1)	4	14(1)
Drainage only	5(0)	—	—		3	2	—	
Total	52(4,*)	6(1)	13(1,*)		9(0)	16(2)	8(0)	

(*n*) Mortality at first operation
(*) Two patients who died at subsequent procedures

Table II. Length of hospital stay and the complications in patients undergoing initial resection or non-resection emergency procedures

	Resection ($n=34$)	*Non-resection* ($n=18$)	
Length of stay			
Median (range)			
1st Procedure	$n=34$, 28 (8–90) days	$n=18$, 22.5 (8–66) days	
2nd Procedure	$n=17$, 15 (11–39) days	$n=14$, 24 (12–70) days	
3rd Procedure	$n=0$	$n=6$, 17 (8–24) days	
Total stay per patient	$n=34$, 32 (8–90) days	$n=18$, 50.5 (11–108) days $P<0.01$	
Complications			
Anastomotic failure	1	1	
Ent/cut fistula	0	2	
Wound infection	8	12	$P<0.01$
Abd wound dehiscence	2	1	
Chest infection	3	1	
Deep vein thrombosis/PE	0	2	
Acute renal failure	0	1	
Mortality	2 (6%)	4 (22.2%)	$P>0.1$

Of the 34 patients who underwent primary resection, two (6%) died, with no mortality in the 17 who required further surgery. Of the 18 patients in whom no resection was performed, two (1.1%) died after the primary procedure, and of 14 patients who required further surgery, two (14%) died.

Patients who underwent primary resection required a total of 51 separate admissions (1.5 per patient) before treatment was deemed complete. Of the 15 patients who required reversal of a Hartmann's or Paul Mickulicz's procedure, one patient refused further operative treatment, and in another patient reversal of the procedure was abandoned because of technical difficulty. Three patients had closure of colostomy carried out as a second procedure after initial resection, primary anastomosis and defunctioning colostomy.

Non-resectional procedures were performed in 18 patients who required 38 admissions (2.1 per patient). Of those who had had an initial defunctioning colostomy, five had resection and closure of colostomy at the next admission; six underwent resection only at the second procedure, followed by closure of their colostomy at a later date. Of the patients who were treated by drainage only, three had a resection and primary anastomosis during a second admission and the remaining two underwent no further surgery.

The total median hospital stay until treatment was completed was 32 days (range 8–90 days) for patients who underwent primary resection, compared with 50.5 days (range 11–100 days) for patients who did not ($P<0.01$).

The patterns of surgical practice in the earlier and later halves of this study period (Figs. 1–3) show that in the later period, more patients were treated by primary resection whether for peritonitis (91%) or for phlegmonous diverticulitis (93%); whereas in the earlier period, although resection was the choice for faecal or purulent peritonitis (63%), it was undertaken in only 28% of patients with phlegmonous diverticulitis.

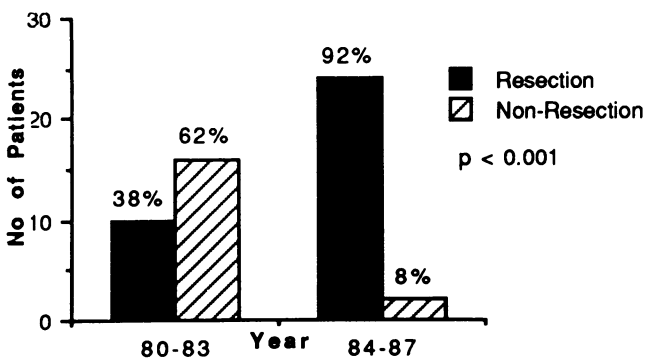

Figure 1. Type of operation undertaken for all patients submitted to surgery, $n=52$.

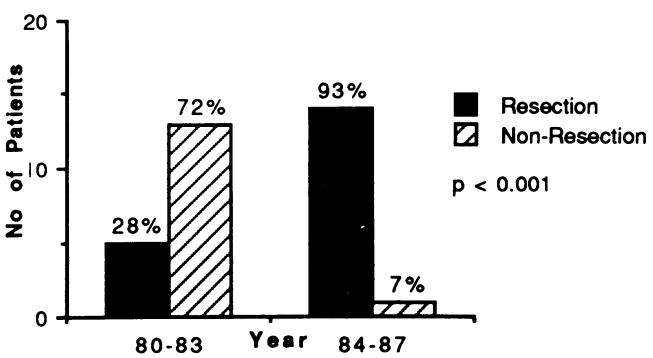

Figure 2. Type of operation undertaken for all patients with an inflammatory mass/abscess, $n=33$.

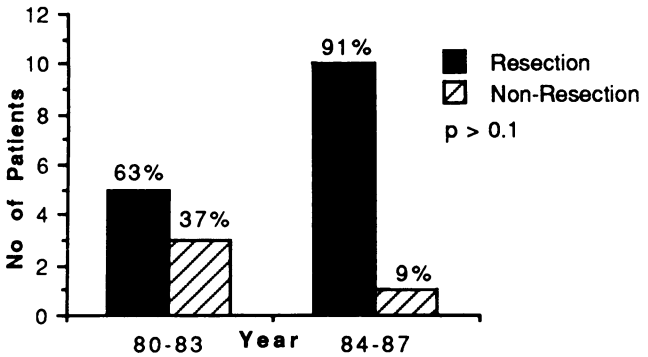

Figure 3. Type of operation undertaken for faecal and generalised peritonitis, $n = 19$.

Discussion

There is a growing body of opinion which suggests that a more radical approach to the operative treatment of faecal and generalised purulent peritonitis in diverticular disease may reduce the high morbidity and mortality associated with this condition *(7–13)*. In 1984, Krukowski and Matheson concluded that resection of the source of contamination is the optimum treatment *(7)*. Whether implementation of this policy would improve the prognosis is difficult to ascertain, as the number of cases presenting to any one unit is small *(7)*. Indeed, over the 8-year period reviewed in the present study, only 52 (42%) patients admitted with complicated acute diverticular disease required operation. For meaningful comparison, large numbers are difficult to achieve, and lack of uniformity in definition of the different clinicopathological entities of this condition makes collaborative studies difficult. We are aware of the limitations of a retrospective study of small numbers, and have therefore simply classified our patients into those with peritonitis and those with a localised phlegmonous mass, regarding local abscess formation as part of the pathological process.

Surgeons have been slow in accepting resection for acute diverticular disease as a primary procedure as shown in the earlier period when compared with the later period of our study. While most authors have focused on the immediate results of resection compared with non-resection, particularly for faecal and purulent peritonitis, there is scarcity of information regarding the overall mortality and morbidity at the completion of treatment, since several operations may be required.

Our mortality rate of 11% after primary non-resection and 6% after resection, regardless of pathology, is within the range reported by other authors *(9,13)*. Our results are probably influenced by the fact that non-resection was offered to a larger number of patients with localised disease, while resection was undertaken in the majority of patients with faecal or purulent peritonitis. Indeed, in patients with phlegmonous diverticulitis, there was no difference in mortality whether resection was performed or not. A benefit for primary resection in peritonitis could not be demonstrated because insufficient patients with peritonitis were treated by conservative surgery to allow adequate comparison. However, when conservative surgery had been carried out initially, the mortality at the completion of subsequent operative treatment reached 22%. Similarly, there was no difference in the complication rate except for wound infection, which was significantly more common in those patients who did not undergo primary resection, probably due to the overall multiplicity of procedures in this group.

Although the numbers are small, the evidence from our analysis suggests that, in the absence of peritonitis, both resection and non-resection have similar mortality; resection is preferable, however, because of the shorter length of hospital stay and reduced morbidity. It is reassuring that primary resection, originally advocated for faecal or purulent peritonitis, has been safely employed, particularly in the later half of this analysis, to phlegmonous diverticulitis.

There is a definite reduction in hospital stay when primary resection is carried out. Nevertheless, the hospital stay is long irrespective of type of surgery. Operative mortality is still appreciable and many patients with diverticulitis can be treated successfully with supportive therapy as evidenced by the 85% response rate in this study. Peritonitis and obstruction are the principal indications for surgical operation.

It should be noted, however, that 12 patients (39%) operated on for a clinical diagnosis of 'peritonitis' had an inflammatory mass or abscess at laparotomy. Lambert *et al. (14)* reported similar findings in their series of 96 patients operated on for peritonitis, in whom 23 patients (24%) were found to have an acute inflammatory mass/abscess. In this group of patients clinical error in judgement still exists. It is important, therefore, to distinguish between local peritoneal irritation secondary to diverticulitis and generalised peritoneal sepsis. Repeated clinical assessment by the attending surgeon supplemented by preoperative investigation is essential. Ultrasound and CT scanning may identify some patients with a localised abscess and these patients could be treated by percutaneous drainage.

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Book review

Arterial Surgery of the Lower Limb by P R F Bell. 200 pages, illustrated. Churchill Livingstone, Edinburgh. 1990. £75.00. ISBN 0 443 03541 5

Eager to make a start I turned to the Contents and was surprised to see that Chapter 10 dealt with 'Femeropopliteal occlusion' [*sic*] and Chapter 11 with 'Femeropopliteal grafts below the knee'. It took me about two years to convince my secretary that femoropopliteal was the correct spelling and I was appalled with the prospect of having to admit to her that all along she had been right! Reassuringly the correct spelling is used in the remainder of the text.

The book deals principally with the technical aspects of arterial surgery in the lower limb. The main emphasis is on bypass grafting, but it also deals with profundaplasty, femoral and popliteal aneurysms and popliteal artery entrapment. There is brief coverage of indications, preoperative investigation, postoperative care and results. This balance makes the book easy to read. References are adequate and deliberately not excessive.

The clarity of Professor Bell's text is exemplary and complemented by Patrick Elliot's superb line drawings. This combination helps to illuminate difficult areas such as dissection of the popliteal trifurcation, finding the route through the obturator canal in cases of groin infection, exposure of the distal profunda artery and suturing techniques. Less good is the reproduction of radiographs, but this is not important and few are used.

Where there is a choice of techniques the author usually describes them all but gives his preference and reasoning. This is welcome. In a few instances alternatives are not mentioned. For example, metal clips are popular for ligating branches of the long saphenous vein when it is being prepared for bypass, but these are not mentioned. In the description of femoropopliteal bypass it appears that the author prefers to expose the popliteal artery first and to dissect the saphenous vein later. I think many surgeons prefer to expose the vein first, decide if it is suitable and, if so, follow it down the thigh with the skin incision directly over the vein to avoid undermining the skin. This way Duplex mapping of the vein is not necessary (and is not always available). Professor Bell apparently always places a reversed femoropopliteal graft in the anatomical route rather than subcutaneously, although the latter is perfectly satisfactory and, later in the book, the subcutaneous route is regarded as an advantage for the *in situ* vein graft because it allows postoperative surveillance with Duplex scanning. Why is it then not also advantageous to have a reversed graft under the skin? A newcomer to the field would also gain the impression that exposure of the whole of the popliteal trifurcation is necessary for femoropopliteal grafting below the knee. This is not so if the graft can be placed on a reasonably healthy distal popliteal artery and the distal run-off is known to be satisfactory. Finally, I would take issue with the advice to use spirit-based skin preparations. The medical defence organisations advise against this.

The book is aimed at educating both trainee and practising vascular surgeons. It undoubtedly succeeds in its objectives and the obsessional attention to detail which Professor Bell refers to in the Preface, and which is necessary for this type of surgery, is consistently emphasised. He ends with a comment on 'Future Prospects' and a somewhat gloomy warning to trainee surgeons that they had better be wise about all techniques relating to very distal grafts as there will be an ever increasing demand for such procedures among the ageing population. I am not convinced. After all, we all have to die of something!

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