Surgery for Diverticulitis in Renal Failure

H. FLETCHER STARNES, JR., M.D.,* J. MICHAEL LAZARUS, M.D., GORDON VINEYARD, M.D.

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Twenty-five patients were operated on at the Brigham and Women's Hospital for colonic diverticulitis complicating treated renal failure during the period 1951 to 1983. Twelve patients had functioning renal allografts (eight cadaver, four living-related); 13 were on dialysis therapy. Six patients had polycystic kidney disease. The majority of patients had acute abdominal pain. Four had histories of chronic abdominal pain; nondiagnostic exploratory laparotomies were performed on two of these patients, who developed localized tenderness. The overall mortality in this series was 28 percent, with sepsis being the most common cause of death. Six of seven patients who died had free colonic perforations at surgery. Mortality correlated with age, with six of 14 patients (43 percent) over age 50 dying, as compared with one of 11 patients (9 percent) under age 50. There was no correlation between survival rate and type of surgery performed, dose of prednisone or azathioprine used, or type of treatment received for renal failure. [Key words: Diverticulitis; Chronic renal failure; Surgical therapy]

From the Departments of Surgery and Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts

THE INCIDENCE OF DIVERTICULOSIS in Western societies like the United States, as documented by autopsy studies, rose from 5 percent in the fifth decade to 50 percent in the ninth decade of the twentieth century. Parks estimates that 10 to 25 percent of patients with diverticulosis will develop peridiverticular inflammation at some time.[1]

A number of investigators have noted a high incidence of gastrointestinal disease in patients with chronic renal failure.[2-4] More specifically, Scheff et al.[5] found that the incidence of diverticulosis among 43 renal failure patients who had had barium enemas was 45 percent, with a 3 percent incidence of diverticulitis among all renal failure patients treated at their hospital. Similarly, Bailey et al.[6] found that 49 percent of chronic renal failure patients who had undergone barium enemas had colonic diverticulosis, and 30 percent of these had episodes of acute diverticulitis. For transplant patients as a group, Sawyerr et al.[7] reported a 13 percent incidence of diverticular disease documented by either barium enema or autopsy. Some have estimated the incidence of colonic diseases for transplant patients to be 10 percent,[8] with the incidence of diverticulitis between 1 and 1.5 percent.[4,9,10]

The present study is a retrospective review of diverticulitis in renal failure patients under surgical treatment with either dialysis or transplant at our hospital, with a discussion of the incidence, presentation, treatment, and mortality of this disease.

Patients and Methods

Between 1951 and 1983, 25 of the 2261 patients with treated chronic renal failure (1398 on dialysis, 863 with working renal allografts) underwent surgery for acute colonic diverticulitis, an incidence of 1.1 percent. One patient had two different episodes (eight years apart, both surgically treated).

Table 1 lists the patient characteristics. Similar age and sex distribution, history of polycystic kidney disease and duration of current treatment were found in both types of treatment. Differences between the dialysis and transplant groups will be discussed only when these are significant.

Symptoms and signs at presentation are listed in Table 2. The majority of patients with diverticulitis presented with abdominal pain of less than two days' duration. The only exceptions were four patients with histories of chronic abdominal pain—two developed tenderness on examination and had nondiagnostic exploratory laparotomies two weeks and three months prior to definitive surgery. At laparotomy one of these patients had minor thickening along the antimesenteric colonic border, which was the site of perforation found two weeks later. Twenty percent of the patients had occult or gross blood in the stool at presentation. Six patients were febrile, and only three patients had noted a change in bowel habits.

Five patients had preoperative barium or Gastrografin® enemas; signs of diverticula were seen in all of them, several showing signs of diverticulitis with local abscess, sinus tracts, and areas of perforation. All patients received

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Address reprint requests to Dr. Vineyard: Department of Surgery, Brigham and Women's Hospital, 75 Frances Street, Boston, Massachusetts 02115.

TABLE 1. *Patient Characteristics*

	Dialysis	Transplant
Number of patients	13	11
Number of cases	13	12
Mean age (years)	52	51
Sex (M/F)	5/8	6/5
Years after onset of renal failure	4	7
Years on current therapy	4	3
History of polycystic kidney disease	3	3
History of chronic peritoneal dialysis	—	—
History of previous transplant	3*	1
History of previous abdominal surgery other than transplant or nephrectomy	3	1
Current treatment with immunosuppressants	—	12
prednisone dose (mg/dl)		32.5
azathioprine dose (mg/dl)		107.5
Mean serum creatinine at presentation (mg/dl)	8.5	2.5
Receiving phosphate binders	10	2

*One patient had a transplant nephrectomy; two patients had residual nonfunctioning transplant grafts.

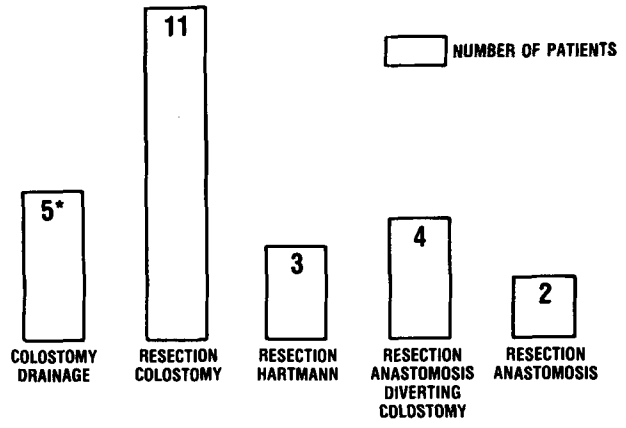

FIG. 1. Initial surgical procedure performed.

treatment with broad spectrum antibiotics perioperatively. All transplant patients were taking prednisone and azathioprine at the time of presentation. With the exception of perioperative corticosteroid coverage, immunosuppression was reduced or discontinued in all patients after the diagnosis was established.

Results

Surgical therapy: All patients underwent exploratory laparotomy; sigmoid diverticulitis was found in each case. Fourteen patients had free perforation of the diverticula with gross peritoneal contamination.

The surgical procedures performed are shown in Fig. 1. Five patients underwent drainage of the abscess and diverting colostomy as the initial procedure. The other 20 patients had resection of the involved sigmoid colonic segment with colostomy in most cases.

Complications: There was a high postoperative complication rate (88 percent). Table 3 lists the complications and their associated mortality. Over 40 percent of the patients developed major complications, including frank sepsis, hemorrhage, anastomotic leaks, or subphrenic abscesses. Eleven patients had minor complications, including wound infections or hernias.

All three patients who had frank septicemia and septic shock died. Three patients (all on dialysis) had episodes of hemorrhage (one, bleeding from the colostomy site; one, rectal bleeding, one, major diverticular hemorrhage due to additional diverticular disease leading to death despite emergency total colectomy).

Two patients with primary anastomoses had anastomotic leaks. One had a small, asymptomatic leak after resection with proximal diversion which completely resolved. Another patient had an initial resection with end colostomy and mucous fistula, and subsequently developed an anastomotic leak following colocolostomy. A diverting colostomy was performed. Both patients survived.

Three patients developed subdiaphragmatic abscesses postoperatively. Two died despite repeated drainage procedures.

Dialysis patients appeared to suffer postoperative complications more frequently (100 percent) than transplant patients (58 percent). Most major complications (eight of 11) occurred in patients over the age of 50. A high proportion of the major complications occurred among patients who had diverting colostomies and drainage (three of five), as opposed to those patients who had resection of the involved sigmoid colon (eight of 20) as their initial procedure.

Mortality: The 30-day mortality in this series was 28 percent. Sepsis due to enteric pathogens was the cause of five of the seven postoperative deaths. The remaining two deaths in this period were due to pulmonary aspergillosis with fungemia and diverticular hemorrhage, respectively.

Patient age and duration of symptoms at diagnosis were the best predictors of mortality. Six of the 14 patients (43 percent) older than age 50 died, as compared with one of the 11 patients younger than age 50. Five of the seven patients who had symptoms for over a week prior to therapy died as compared with two of the 18 patients with symptoms less than one week. Of the 14 cases of perforation, there were six deaths , accounting for 86 percent of the total deaths in this series. Free colonic perforation occurred more frequently in dialysis patients (eight patients) than in transplant patients (six patients).

There were two deaths among the five patients who had diverting colostomies and drainage only; there were five deaths among the 20 patients who had complete resection of the involved colon as their primary procedure (Fig. 2).

There was no notable difference in mortality between patients who were on dialysis vs. those with renal transplant. Dialysis mortality was 3 of 13 (23 percent) and transplant mortality was 4 of 12 (33 percent). No correlation was found between doses of prednisone or azathioprine and mortality. Among transplant patients, allograft function did not correlate with survival: the mean serum creatinine at presentation of the three transplant patients who died was 1.9 mg/dl, while the mean creatinine of the transplant patients who survived was 2.7 mg/dl.

Discussion

In our series we encountered a 1.1 percent incidence of diverticulitis requiring laparotomy from among all treated chronic renal failure patients. The incidence of those patients treated medically for diverticulitis, or those patients with asymptomatic diverticulosis in this population is not known.

This study confirms the previously reported incidence of diverticulitis in renal failure.[4,5,9,10] It is not clear that this incidence is greater than the general population. However, diverticulitis in renal failure patients differs from that seen in the nonuremic population because a far greater proportion of younger renal failure patients have symptomatic diverticular disease. In this series, 30 percent of patients were 40 years of age or younger, as opposed to 1.7 to 4.8 percent in the general population.[11,12] Forty-six percent were 50 years of age or younger.

The presentation of diverticulitis in our series is similar to that in the general population—acute abdominal pain, fever, blood in the stool. What is striking is the timing and severity at presentation in the renal failure group. Over one half of the patients had free perforation of diverticula into the peritoneal cavity, often with minimal surrounding inflammation. Other series have commented on this phenomenon; Guice et al.[13] noted that five of seven transplant patients in a similar setting had perforation of diverticula rather than localized diverticulitis commonly seen in the general population.

The overall morbidity and mortality rates in this series are high (88 percent and 28 percent, respectively), as expected in this patient population. As in the nonuremic population, sepsis due to enteric organisms was the major cause of morbidity and mortality. The high rate of free perforation is reflected in these figures.

The single patient characteristic that correlated most highly with both morbidity and mortality was age. Most major complications (eight of 11) occurred in patients older than 50 years of age, and a higher proportion of those patients died (43 percent) as opposed to those under 50 (9 percent). It has been previously reported from this hospital that transplant patients over age 50 have a higher morbidity and mortality rate in general.[14]

The other important determinant of outcome was duration of symptoms: five of seven patients with symptoms that lasted longer than a week died, as opposed to two of 18 patients with symptoms that lasted less than one week. Similarly, Guice et al.[13] found the time interval from onset of symptoms to operation to be an important determinant of outcome. Four of our patients had chronic symptoms of abdominal pain not previously attributed to diverticular disease, and three of these died despite therapy. Two of these patients underwent nondiagnostic exploratory laparotomies prior to their definitive surgery. One must presume that these patients had undetected disease, and that possibly a more prompt diagnosis might have reduced the mortality rate.

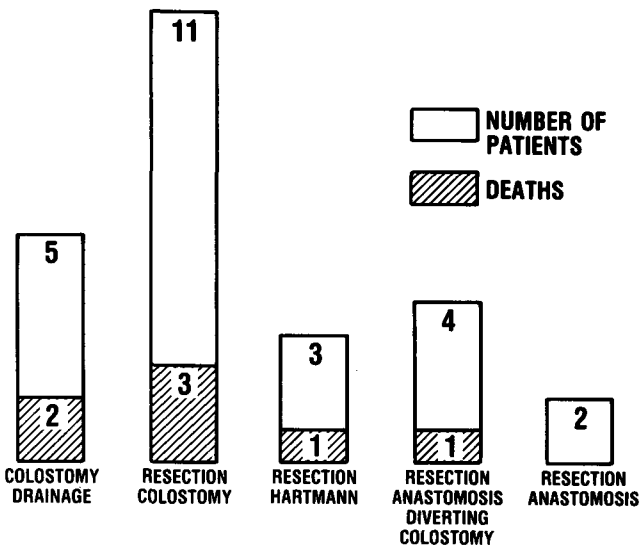

FIG. 2. Mortality by type of initial surgical procedure.

TABLE 2. *Presenting Symptoms and Signs*

	Dialysis Cases (N = 13)	Transplant Cases (N = 12)
Symptoms		
Abdominal pain		
acute	9	10
chronic	2	2
Constipation	1	1
Diarrhea	—	1
Presence of blood in stool	4	1
Signs		
Fever	5	1
Pneumoperitoneum	—	1

Dialysis patients had a higher complication rate than transplant patients, primarily due to several cases of hemorrhage. Platelet dysfunction has been recognized in patients with elevated creatinine levels.[15] Iatrogenic anticoagulation, despite routine use of regional heparinization, most likely accounts for the higher incidence of hemorrhage in the dialysis patients.

Corticosteroid use, necessary in transplant therapy, may contribute to the complications of diverticular disease. Corticosteroid administration has been implicated in several cases of spontaneous colonic perforation in transplant patients unassociated with diverticular disease. In one series of acute colonic perforations associated with corticosteroid use, the perforation failed to wall off in nine of 11 patients.[16] In our series, corticosteroids alone do not account for the high perforation rate, as over one half of the patients with perforations were on dialysis therapy and were not receiving steroid therapy. Although several series have suggested an association between steroid usage, perforation, and lack of healing,[2,9,13,17] one transplant series showed no significant difference between prednisone dosage and mortality.[10] We find a similar picture, with no notable correlation between azathioprine or prednisone dosage, morbidity, and mortality. Nonetheless, corticosteroid or azathioprine usage in some of these patients must have played a role in the timing or severity of presentation.

Scheff et al.[5] reported a high incidence of diverticulosis and diverticulitis in renal failure patients who had polycystic kidney disease. They reported the incidence of polycystic kidney disease among their renal failure patients to be 8 percent. A high proportion of our patients with diverticulitis had polycystic kidney disease—six of 24 patients (25 percent). These patients with polycystic kidney disease accounted for three of the seven deaths.

In terms of surgical management, several authors have reported mortality rates of 21 to 45 percent[18] for the traditional three-stage surgical treatment and 5 to 10 percent for the one- or two-stage treatment for diverticular disease in the general population.[19] Complication rates for these procedures have been reported as 40 to 70 percent.[18,20] Both morbidity and mortality rates are increased in cases of freely perforated diverticulitis.[18]

For these reasons, many authors recommend resection of the involved sigmoid colon segment as the initial procedure, and there is statistical evidence to support this approach. In our series, patients who had diverting colostomy and drainage tended to have more complications than those who underwent primary resection. Similarly, Carson et al.[10] found improved survival among patients who had resection with colostomy or exteriorization of the perforation at initial operation. In renal failure patients and the general population, the procedure of choice is expeditious resection of the inflamed colonic segment. The decision regarding diversion or anastomosis is tailored to the individual patient.

A number of factors have been proposed that might account for diverticular disease as seen in renal failure patients. In general, these patients suffer from chronic constipation, presumably with increased intraluminal bowel pressure. Certainly their required phosphate binders, and possibly their diets and restricted fluid intake contribute to this situation.[21] Autonomic nervous system dysfunction in renal failure patients has been described.[22,23] Tissue strength and wound healing are reduced, possibly due to interference with protein metabolism.[13]

One would like to reduce diverticular disease in high-risk renal patients, if possible. In particular, constipation should be prevented with stool softeners and a high-fiber diet. The latter has been shown to reduce symptoms in patients with diverticular disease, and might benefit renal failure patients.[24,25]

With the relative infrequency of symptomatic diverticulitis in renal failure patients, elective colonic resection for asymptomatic patients with diverticular disease probably is not warranted. However, considering the high morbidity and mortality of symptomatic diverticulitis in

TABLE 3. *Complications and Associated Mortality*

	Dialysis		Transplant	
	Number of Cases (N = 13)	Related Deaths	Number of Cases (N = 12)	Related Deaths
Minor complications				
Wound infection	2	—	4	—
Hernia	5	—	—	—
Major complications				
Hemorrhage	3	1	—	—
Anastomotic leak	1	—	1	—
Subphrenic abscess	1	—	2	2
Sepsis	2	2	1	1

these patients, there appears to be justification for elective colonic resection after an initial episode of diverticulitis.

The differential diagnosis of abdominal pain in renal failure patients should include diverticulitis as an initial consideration. Both symptoms and signs of diverticulitis may be masked in this population, and may not reflect the severity of the underlying disease. Early diagnosis and treatment is necessary to reduce morbidity and mortality.

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