Ileal Pouch–Anal Anastomosis

A Single Surgeon's Experience with 100 Consecutive Cases

JAMES M. BECKER, M.D.   JANICE L. RAYMOND, M.S., R.D.

Between August 1982 and November 1985, 100 patients underwent ileal "J" pouch–anal anastomosis (IPAA) at the University of Utah. All operations were performed in a standard fashion by a single surgeon. Seventy-eight patients were operated on for chronic ulcerative colitis and 22 for familial polyposis coli. Sixty of the patients were male and 40 were female with a mean age of 33.2 years and a range of 11–63 years. Mean ± SEM operating time was 5.9 ± 0.4 hours, blood loss was 666 ± 49 ml, and total hospitalization was 10.1 ± 0.3 days. No operative deaths occurred. The overall operative morbidity was 13% after IPAA. Clinical "pouchitis" was observed in 18 patients, all of whom were operated on for chronic ulcerative colitis. No patients had frank incontinence. Twenty per cent of patients experienced frequent nocturnal leakage in the early postoperative period with a significant improvement over the ensuing 6 months. Stool frequency at 1, 3, 6, 12, and 24 months was 7.5 ± 0.2, 6.5 ± 0.1, 6.2 ± 0.3, 5.4 ± 0.1, and 5.4 ± 0.2, respectively. Stool frequency at 12 months correlated inversely with ileal pouch capacity and the diagnosis of familial polyposis. It is concluded that ileal pouch–anal anastomosis is a safe and effective operation for patients with chronic ulcerative colitis and familial polyposis coli.

CHRONIC ULCERATIVE COLITIS, Gardner's syndrome, and familial polyposis have until recently required total proctocolectomy and permanent ileostomy for definitive treatment. An operation involving colectomy, mucosal proctectomy, and endorectal ileoanal anastomosis has become a major surgical alternative. As first described by Ravitch and Sabiston in 1947,[1] the operation resulted in removal of all disease-bearing mucosa of the colon and rectum, avoided a permanent abdominal stoma, and preserved intestinal continuity. As initially proposed, the operation was performed by first removing the colon in a standard fashion. Rather than removing the entire rectum and anus, they dissected free and resected the disease-bearing mucosa of the rectum, preserving an intact rectal muscular cuff and anal sphincter mechanism. Continuity of the intestinal tract was re-established by extending the terminal ileum down into the pelvis within the rectal muscular tube and circumferentially suturing it to the anus. Early results with this operation were encouraging, although the end-to-end ileoanal anastomosis was often associated with high stool frequency and fecal incontinence, particularly in the early postoperative period.[2–4]

Several studies have demonstrated that the addition of an ileal pouch to the operation provides patients with increased ileal storage capacity, decreased stool frequency, and increased patient satisfaction.[5,6] Several types of pouches have been constructed. The three-loop "S" pouch creates a somewhat larger reservoir, but spontaneous defecation and pouch evacuation are incomplete in 40–50% of patients.[4,7] The lateral isoperistaltic ileal reservoir described by Fonkalsrud has been used primarily in children.[8] Utsunomiya[9] described the two-loop "J" pouch, which is attractive because of its relative simplicity and its preservation of spontaneous and complete evacuation.[10] Controversy exists as to which techniques of mucosal dissection and pouch construction result in the lowest operative morbidity and optimum functional result. Results from the large series reported to date have been difficult to interpret because of the variability in technique within a single institution where several surgeons may be performing the operation. In addition, the data collection has been largely retrospective and, in many cases, inconsistent. We report here a large series of patients undergoing ileal pouch–anal anastomosis at the University of Utah Medical Center where all operations were performed in a standard fashion by a single surgeon.

The aims of this study, therefore, were to assess the

operative and functional outcome in 100 consecutive patients undergoing mucosal proctectomy with ileal "J" pouch–anal anastomosis, with all patients followed prospectively and systematically. In addition, our aim was statistically to define major determinants of functional success in this group of patients.

Patients and Methods

Between August 1982 and November 1985, 100 patients underwent ileal pouch–anal anastomosis at the University of Utah Medical Center. Seventy-eight of the patients were operated on for chronic ulcerative colitis and 22 for familial polyposis coli or Gardner's syndrome. Sixty of the patients were male and 40 were female, with a mean age of 33.2 years and a range of 11–63 years. In all of the patients, the diagnosis was confirmed and the status of the rectal mucosa assessed by flexible sigmoidoscopy. All patients underwent anorectal manometry using a perfused catheter manometric system, which we have previously described.[11]

The initial operation in 78 of the patients included abdominal colectomy, mucosal proctectomy, endorectal ileal pouch–anal anastomosis, and temporary loop ileostomy. After colectomy, rectal mucosal dissection was begun via a circumferential myotomy at the pelvic peritoneal reflection and continued distally to the level of the levator ani sling. A 15 cm ileal J pouch was constructed by folding terminal ileum back on to itself and then anastomosing the 15 cm limbs together side-to-side in two layers. The patient was then placed in a lithotomy position, the rectal mucosal cuff everted, and the mucosal dissection continued from the pectinate line. The ileal pouch was extended into the pelvis endorectally and its apex opened and sutured circumferentially to the pectinate line. Finally, a diverting loop ileostomy was constructed 40 cm proximal to the pouch. Twenty-two of the patients had undergone previous abdominal colectomy with ileorectal anastomosis (8 patients) or ileostomy and Hartmann closure of the rectum (14 patients).

The first 40 patients received a preoperative broad spectrum antibiotic (cefoxitin), which was continued for 5 postoperative days. The next 40 patients were enrolled in a prospective randomized double-blind study in which they received either a three-dose perioperative course of antibiotics or the perioperative plus 5-day course described above. The final 20 patients were managed with a three-dose perioperative course of cefoxitin.

At 4 weeks after the initial operation, standardized radiographic studies were performed to assess continence and integrity of the ileal pouch and ileoanal anastomosis.[12] At 8 weeks after ileoanal anastomosis, anal manometry was repeated and ileal pouch capacity measured.[13] The ileostomy was closed using a technique we have previously reported.[14] Loperamide hydrochloride, a synthetic opioid agent, was prescribed for all patients immediately after ileostomy closure. Psyllium mucilloid and a high fiber diet were begun 2 weeks later. Anal manometry and measurement of ileal pouch capacity were repeated at 1 year after ileostomy closure.

Intestinal continuity was re-established in all 100 patients, and, of these, all 100 were available for follow-up at least 1 month after ileostomy closure. Operating time, blood loss, and total hospitalization were recorded. Postoperative morbidity was assessed after both ileal pouch–anal anastomosis and loop ileostomy closure. Stool frequency, level of continence, use of loperamide and psyllium, sexual function, and the presence or absence of pouchitis were recorded by a clinical research coordinator at follow-up visits at 1 month, 3 months, 6 months, 1 year, and 2 years after loop ileostomy closure. When patients were unable to be seen in clinic, they were contacted by telephone. Stool frequency was recorded as a 24-hour and nocturnal mean.

Patients were excluded from the stool frequency data for the reasons listed below. Two patients manifested clinical evidence of Crohn's disease and were excluded from follow-up stool statistics. One female patient had progressive sclerosing cholangitis and liver failure. Two patients became pregnant; therefore, their stool frequencies were excluded during the pregnancy. One patient had a temporary loop ileostomy re-established. Four patients had ileal pouch mucosal bridges diagnosed endoscopically and treated by laser. Their stool frequencies were not included until after laser treatment. Eighteen patients have had pouchitis and were excluded from follow-up statistics only during exacerbations of their pouchitis.

The presence or absence of gross incontinence was recorded. Nocturnal leakage of stool was scored as: never—0 episodes/week, seldom—fewer than 1 episode/week, occasional—1–2 episodes/week, and frequent—more than 2 episodes/week.

Pouchitis has been observed in patients after continent ileostomy or ileoanal anastomosis.[15–17] It is a clinical syndrome that includes high stool frequency, watery stools, hematochezia, urgency without defecation, nocturnal leakage, and, in some cases, abdominal cramping, malaise, and fever. In this study, pouchitis was defined as more than one episode of the above syndrome lasting at least 7 days and requiring metronidazole treatment.

Data were collected in a prospective fashion and managed with a dBase II (Ashton-Tate, Culver City, CA) computer program. Determinants of stool frequency at 1 year after operation were ranked by stepwise regression analysis and statistical significance determined by grouped T-test. Significant variables were then further evaluated by multiple regression analysis.

Results

Immediate Postoperative Results

The overall mean ± SEM operating time was 5.9 ± 0.4 hours: 5.2 ± 0.1 hours for patients undergoing single stage colectomy, mucosal proctectomy endorectal ileal pouch–anal anastomosis, and loop ileostomy (N = 78) and 6.2 ± 0.4 hours for those who had undergone previous abdominal colectomy (N = 22). A significantly shorter operating time was recorded for patients operated on for familial polyposis as opposed to chronic ulcerative colitis (5.2 ± 0.2 hours vs. 6.0 ± 0.1 hours, p < 0.01). A significant decline (p < 0.01) in operating time was observed over the 3.5 year period of the study (Fig. 1). Mean blood loss per operation was 666 ± 49 ml, with 73% requiring no blood, 21% requiring 1-2 units of packed red blood cells, and 6% requiring more than two units of packed red blood cells. A significant (p < 0.01) decline in the requirement for blood transfusion was observed over the 100-patient time period. The mean ± SEM duration of total hospitalization was 10.1 ± 0.3 days and included 8.2 ± 0.5 days after operation. The total length of hospitalization for loop ileostomy closure was 7.6 ± 0.3 days. No significant decline in hospitalization time was observed (p > 0.05) during the study period.

No postoperative deaths occurred (Fig. 2). A 47-year-old male patient with familial polyposis died 14 months after ileal pouch–anal anastomosis of duodenal adenocarcinoma (Fig. 3).

The overall operative morbidity was 13% after ileal pouch–anal anastomosis (Fig. 2). No pelvic or wound infections occurred. Two patients suffered pulmonary embolus after ileal pouch–anal anastomosis, and one developed deep venous thrombosis. Loop ileostomy closure was delayed by 3 months in these three patients while they underwent Coumadin® treatment. Coumadin was reinstituted for an additional 3 months after ileostomy closure in these patients. No recurrent thromboembolic events were observed. Three patients had prolonged postoperative ileus after ileal pouch–anal anastomosis (>6 days), and seven small bowel obstructions occurred, two of these requiring reoperation. In two patients, apparent leaks from the ileal pouch were demonstrated at the time of contrast study. In another two patients a sinus tract at the ileal pouch–anal anastomosis was detected. None of these findings was associated with clinical signs nor required specific treatment, although ileostomy closure was delayed until resolution was confirmed radiographically.

The overall operative morbidity was 25% after loop ileostomy closure (Fig. 2). Four patients had an anastomotic leak at the loop ileostomy closure site, two requiring reoperation and two resolving with percutaneous drainage, bowel rest, and total parenteral nutrition. Twelve patients
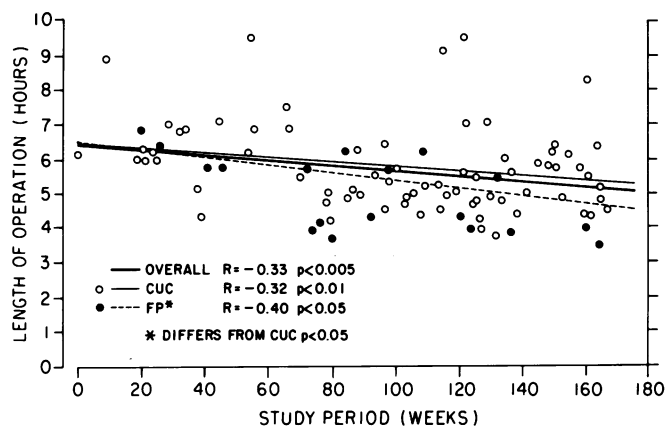

FIG. 1. Operative time in 100 patients who have undergone ileal pouch–anal anastomosis for chronic ulcerative colitis or familial polyposis over the 180-week study period.

had prolonged ileus, and eight had small bowel obstruction with five requiring reoperation. In one patient a delayed wound infection at the ileostomy site occurred.

Late complications included ileal pouch mucosal bridges, which occurred in four patients and were successfully treated in each case by endoscopic laser application (Fig. 3). Two patients, late in the postoperative period, manifested clinical and pathologic evidence of ileal Crohn's disease. One patient was successfully managed with steroids and Azulfidine®; the other patient, who presented with perianal disease and an ileo-ileal fistula, required Brooke ileostomy and Hartmann closure of the afferent limb of the ileal pouch. A temporary loop ileostomy was re-established at an outside institution in a patient with psychological problems and apparently poor functional result. One patient with sclerosing cholangitis at the time of initial surgery had progressive liver failure and required liver transplantation.

The most common late complication in this series was pouchitis (Fig. 3). As defined above, this syndrome was
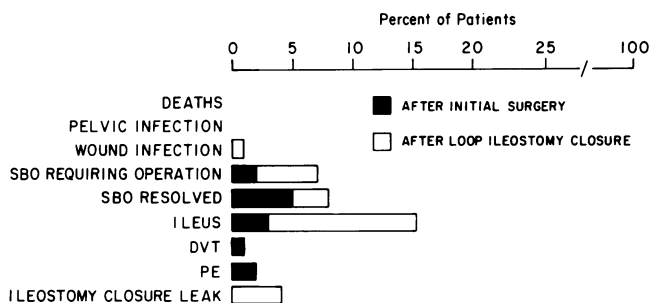

FIG. 2. Operative complications in 100 patients who have undergone ileal pouch–anal anastomosis with loop ileostomy and loop ileostomy closure.
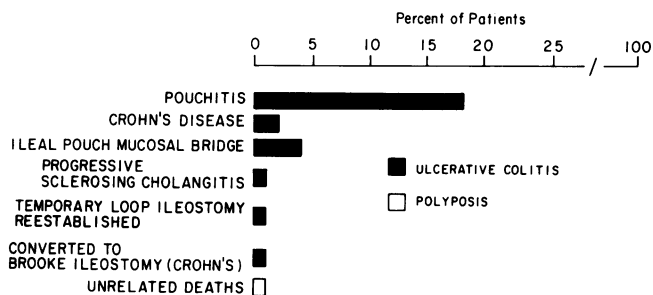
FIG. 3. Late complications in patients with chronic ulcerative colitis or familial polyposis who have undergone ileal pouch–anal anastomosis.
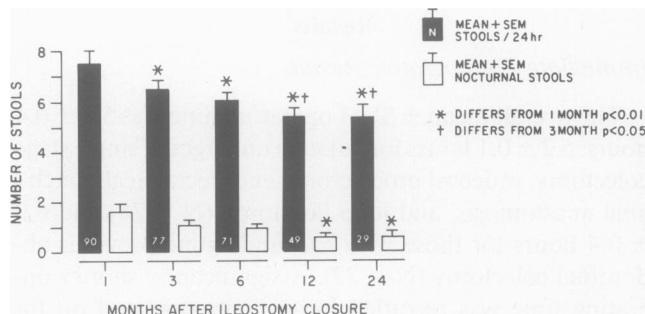

FIG. 4. Twenty-four hour and nocturnal stool frequency in patients following ileal pouch–anal anastomosis and loop ileostomy closure.

observed in 18 patients (18%) following ileostomy closure. A consistent response to oral metronidazole was observed, although three patients had recurrent pouchitis and eight patients had prolonged episodes of pouchitis. A significant difference in the incidence of pouchitis was observed between patients operated on for chronic ulcerative colitis and those for familial polyposis, with all episodes of pouchitis occurring in the chronic ulcerative colitis patients (23%) and none in the polyposis patients.

Retrograde ejaculation developed in two male patients (3.3%); however, no impotence was observed. One female patient complained of dyspareunia. Two women have become pregnant during the follow-up period.

Functional Results

Early functional results were evaluated in all 100 patients in the study. Late results were recorded in eligible patients, as described above. All of the patients were able spontaneously and fully to evacuate their ileal pouch and thus did not require transanal pouch intubation.

None of the patients experienced frank incontinence during the waking hours. Thirty-nine per cent of the patients reported no nocturnal leakage of stool at 1 month after ileostomy closure. By 12 months, 75% of patients reported no nocturnal leakage (Table 1). Conversely, 20% of patients reported nocturnal leakage occurring more than two times per week at 1 month after ileostomy closure, but by 12 months no patients experienced frequent nocturnal leakage. Twenty-five per cent of patients re-

ported the occurrence of two or fewer episodes of nocturnal leakage at 12 months after ileostomy closure. While all patients were placed on loperamide, psyllium, and a high fiber diet after ileostomy closure, 63% and 59% of the patients remained on loperamide or psyllium, respectively, 1 year later.

Overall 24-hour mean ± SEM stool frequency was 7.5 ± 0.2 at 1 month after ileostomy closure, 6.5 ± 0.1 at 3 months, 6.2 ± 0.3 at 6 months, 5.4 ± 0.1 at 12 months, and 5.4 ± 0.2 at 24 months (Fig. 4). Mean nocturnal stool frequency showed a similar decline, decreasing from 1.6 ± 0.2 at 1 month to 0.6 ± 0.2 at 24 months.

Patients undergoing ileal pouch–anal anastomosis for familial polyposis had significantly fewer bowel movements per 24 hours than those operated on for chronic ulcerative colitis at 1, 3, 6, and 12 months after ileostomy closure (Fig. 5). The difference was no longer statistically significant at 24 months. Mean ileal pouch capacity increased from 57.2 ± 4.0 ml at the time of ileostomy closure to 219.7 ± 21.3 ml 1 year later, an increase of 262%. Both ileal pouch capacity and ileal pouch dilatation between the time of ileostomy closure and 12 months later correlated inversely with 24-hour stool frequency (Fig. 6). In contrast, no correlation was found between stool frequency and ileal pouch capacity measured at the time of ileostomy closure.

TABLE 1. Episodes per Week of Nocturnal Leakage of Stool

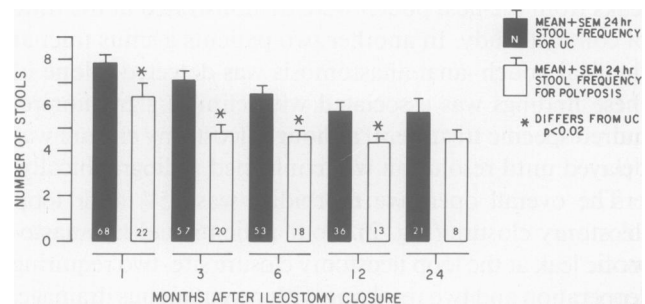| Time after Ileostomy Closure (Months)	% of Patients			
	0	<1	1–2	>2
1	39	19	22	20
3	43	3	38	16
6	52	14	31	3*
12	75*	8	17	0*

* Differs from 1 month, p < 0.001.

FIG. 5. Twenty-four hour stool frequency in patients with chronic ulcerative colitis or familial polyposis after ileal pouch–anal anastomosis.
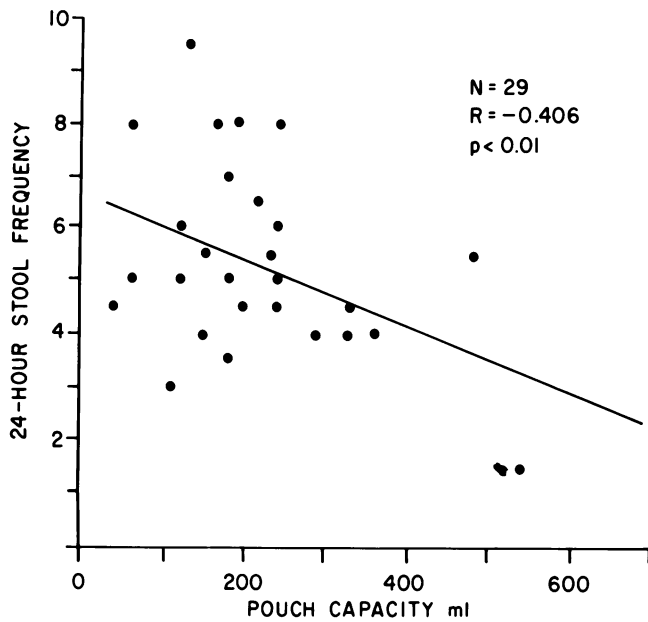
FIG. 6. Correlation between ileal pouch capacity and twenty-four hour stool frequency at 1 year after ileal pouch–anal anastomosis.

N = 29
R = −0.406
p < 0.01

Seven potential determinants of stool frequency at 12 months after loop ileostomy closure were identified (Table 2) and then ranked by stepwise regression analysis (Table 3). Increased ileal pouch capacity and the diagnosis of familial polyposis were both associated with a significantly lower stool frequency at 12 months after operation by stepwise regression analysis. With stool frequency at 1 year as the dependent variable, age was not a significant factor in the development of a regression equation. Additionally, no difference in stool frequency was observed in subgroups of patients less than 20 years of age, 20–50 years of age, or greater than 50 years of age. No significant correlation was found between stool frequency and the use of loperamide or psyllium, the sex of the patient, or the activity of the inflammatory process at the time of operation. Ileal pouch capacity and diagnosis accounted for only 10% of the total variance of stool frequency. Therefore, other determinants of functional result remain unidentified.

Discussion

By preserving nearly normal anal sphincter function[11] and maintaining intestinal continuity, thereby eliminating a permanent abdominal stoma, ileoanal anastomosis offers patients with chronic ulcerative colitis or the genetic colonic polyposis syndromes an attractive alternative to proctocolectomy and Brooke ileostomy. End-to-end endorectal ileoanal anastomosis, as initially described by Ravitch,[1] was often associated with high stool frequency and fecal incontinence, particularly in the early postop-

TABLE 2. Determinants of Stool Frequency at 1 Year after Operation

Determinants	24-Hour Stool Frequency (Mean ± SEM)	
Pouch capacity (ml)	≤219 5.8 ± 0.5	>219 4.7 ± 0.4*
Diagnosis	CUC 5.8 ± 0.4	FP 4.4 ± 0.2*
Age (years)	>33 5.8 ± 0.5	≤33 5.2 ± 0.3
Psyllium usage	Yes 5.7 ± 0.4	No 4.6 ± 0.4
Loperamide usage	Yes 5.8 ± 0.4	No 4.8 ± 0.4
Sex	Male 5.6 ± 0.4	Female 5.0 ± 0.3
Disease activity	Not active 5.5 ± 0.3	Active 5.6 ± 0.4

* Significant difference, $p < 0.05$.

erative period.[3] However, progressive ileal dilatation would result in increased stool storage capacity and decreased stool frequency.[18] Several studies have demonstrated that the addition of an ileal pouch to the operation provides patients with increased ileal storage capacity, decreased stool frequency, and greater patient satisfaction even in the early postoperative period.[5,6] A number of types of ileal pouches have been constructed, although controversy has surrounded the optimum method of pouch construction. Several studies[10,13,19] have suggested that the ileal "J" pouch provides an adequate intestinal reservoir that can be spontaneously evacuated and, therefore, results in both anal continence and acceptable stool frequency.[21] These studies have been difficult to interpret, however, because the operation has been done by a number of different surgeons, even within a single institution, utilizing different techniques. In addition, the follow-up has been largely retrospective and in some cases inconsistent. In the series reported in this article, all 100 of the operations were performed in standard fashion by a single surgeon at one institution. All patients were followed prospectively and systematically, with the data being entered into a computer for concurrent review.

Our experience with ileal pouch–anal anastomosis supports the absence of mortality and the low morbidity that can be achieved with this operation if performed frequently, carefully, and with a standard operative technique. Pelvic and wound infections have been reported to occur in 10–21% of patients undergoing ileoanal anas-

TABLE 3. Determinants of Stool Frequency at 1 Year after Operation

Determinants	Rank Order	Sig. T	Beta Weight
Pouch capacity	1	0.0047	−0.39757
Diagnosis of familial polyposis	2	0.0113	−0.35339
Age	3	0.1145	
Psyllium usage	4	0.2568	
Loperamide usage	5	0.2604	
Sex	6	0.4401	
Disease activity	7	0.5434	

Total $R^2 = 0.10$.

tomosis.[6,8,10,20] In our series, the only infectious complication was a superficial wound infection that occurred after loop ileostomy closure. We found that the preservation of a long rectal muscular cuff was not associated with "cuff abscesses," as has been reported by others, and did not significantly prolong operating time. Moreover, as we have previously reported,[11,13] the long cuff is likely responsible for preservation of the rectal inhibitory reflex after operation in our patients. This reflex has been abolished in most patients with a short rectal cuff.[18]

This series supports the concept that increased experience with a complex operation results in decreased operating time, blood loss, and overall morbidity. Our major surgical complication was bowel obstruction. In none of these cases, however, was the obstruction specifically related to the operation; rather it was related to nonspecific adhesive disease. In our experience, major morbidity was not associated with the loop ileostomy, as has been reported by others.[22,23] The relatively high complication rate associated with loop ileostomy closure was comprised primarily of postoperative ileus.

The major long-term medical complication in this series was pouchitis. This poorly defined syndrome has been reported to occur in approximately 10% of patients after both ileal pouch–anal anastomosis and the Kock continent ileostomy.[15-17] In our patients, the syndrome often followed viral gastroenteritis and presented as a distinct elevation in stool frequency accompanied by watery stools, urgency, nocturnal leakage, abdominal cramping, and occasionally malaise and fever. The fact that this syndrome responded in the vast majority of cases to a short course of metronidazole suggests that it may be secondary to bacterial overgrowth, although this has not been carefully studied. In our series, pouchitis was observed to occur only in patients who underwent ileal pouch–anal anastomosis for chronic ulcerative colitis. We have not observed a single episode of pouchitis in the 22 patients with familial polyposis or Gardner's syndrome. This suggests that the etiology of pouchitis may be more complex than simple bacterial overgrowth. It has been suggested that pouchitis is an early manifestation of Crohn's disease. While this might be the case in those few patients with protracted pouchitis, it is unlikely in patients with a single short episode that promptly and completely responds to metronidazole.

As defined by the overall stool frequency and the degree of continence, the short- and long-term functional result in our patients after ileal pouch–anal anastomosis has been acceptable. The early postoperative stool frequency was significantly lower than that reported in the early postoperative period for adult patients who have undergone straight ileoanal anastomosis without an ileal reservoir. A significant improvement in stool frequency occurred in the first year after the operation and then reached a plateau. During this time, nocturnal stool frequency and nocturnal leakage of stool also significantly declined. The overall stool frequency in this series was very similar to that reported by others who have performed ileal pouch–anal anastomosis.[10,17] We did not observe the incomplete pouch evacuation reported in patients with the "S" pouch[7] or the lateral isoperistaltic ileal reservoir.[8]

We have previously reported that in the early period after endorectal pull-through of an ileal "J" pouch, resting anal sphincter pressure is decreased by approximately 20% but is returned to preoperative levels by 1 year. Both anal sphincter squeeze capacity and ileal pouch storage capacity increase significantly during the year after operation.[10,11] In this study we found that both the change in volume of the ileal pouch during the year after ileostomy closure, i.e., pouch dilatation, and the absolute capacity of the pouch at 1 year after surgery were inversely correlated with overall stool frequency. We were unable to find any correlation between intraoperative pouch volume or early postoperative pouch capacity and overall stool frequency. This would further support the use of the "J" pouch, which has a smaller volume at the time of construction but is simple to construct, dilates freely, and preserves spontaneous and complete evacuation.

We found that patients who underwent ileal pouch–anal anastomosis for familial polyposis as opposed to chronic ulcerative colitis had a significantly lower morbidity and a better functional result. This is consistent with the report of Metcalf et al.[10] in patients after ileoanal anastomosis and with earlier reports of patients after ileorectal anastomosis.[24]

In contrast to other investigators, we found that age difference was not a determinant of stool frequency. A poorer functional result has been reported in patients over age 50,[10] which was thought to be due to changes in anal sphincter function seen with aging. We performed anorectal manometry on all patients prior to surgery and found no significant depression in either resting sphincter tone or squeeze capacity in patients over 50 years of age. While we did not eliminate any patient in this age group because of inadequate sphincter function, it is still possible that the good results in our older patients may reflect selection.

In this study, neither oral loperamide nor psyllium supplementation was a major determinant of stool frequency at 1 year after operation. Our previous studies, however, have demonstrated that these drugs were effective in the early postoperative period when used concurrently.[25] While the level of activity of disease in patients with ulcerative colitis was found not to correlate closely with ultimate stool frequency or morbidity, an attempt was made in all patients prior to surgery to maximally control their rectal disease with oral, parenteral, or rectal steroids and azulfidine.

It is important to emphasize that of the seven factors considered, pouch capacity and diagnosis were the only significant determinants of stool frequency at 1 year after ileoanal anastomosis. Furthermore, together they accounted for only 10% of the total variance by multiple regression analysis. Thus, identification of other variables is indicated.

In summary, we report our experience with 100 consecutive cases of ileal "J" pouch–anal anastomosis performed in a standard way by a single surgeon. Ileal pouch–anal anastomosis was found to be a safe and effective operation for patients with ulcerative colitis or familial polyposis. Increasing experience with the operation resulted in decreased operative time and blood loss and reduced postoperative morbidity. Ileal pouch dilatation and the diagnosis of familial polyposis were the major determinants of functional success after ileal pouch–anal anastomosis. Both of these factors were associated with a significant decrease in stool frequency in the late postoperative period. We believe that endorectal ileal pouch–anal anastomosis should be the operation of choice for most patients who require colectomy for chronic ulcerative colitis or the genetic colon polyposis syndromes.

Acknowledgments

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DISCUSSION

DR. ERIC W. FONKALSRUD (Los Angeles, California): I would like to congratulate Dr. Becker on the excellent results and the meticulous follow-up he has achieved with the endorectal ileal pullthrough operation during a 3½ year period with a very large number of patients.

The report minimizes major variable factors that influence results by presenting one surgeon's clinical experience using a standard operative technique. Most surgeons have experienced a marked improvement in their results as they have perfected their operative technique.

As Dr. Becker indicated, patient selection greatly influences the functional results. Polyposis patients have technically easier and shorter operations with better results than do patients with colitis. In our experience with 130 pullthrough operations, colitis patients with severe rectal disease and obesity, and those on high-dose steroids with thick mesenteries limiting the ability of the ileum to reach the anus, had more complications than did other patients. Has Dr. Becker observed any different results based on these factors?

Technical aspects of the operation that appear to improve functional results and reduce complications include (1) leaving only a 5 cm rectal