Ileal "J" Pouch-anal Anastomosis

Clinical Outcome

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One hundred eighty-eight patients undergoing abdominal colectomy with distal mucosal proctectomy and endorectal ileal pouch-anal anastomosis were reviewed to assess long-term functional results and to identify factors that might influence them. There was no postoperative mortality, but 10 patients (5.3%) required permanent ileostomy because of postoperative complications or the development of unsuspected Crohn's disease. Immediate postoperative complications, including pelvic sepsis, small bowel obstruction requiring surgery, anastomotic stricture, and ileostomy dysfunction, were observed in 11%, 9%, 14% and 9% of patients, respectively. No males were impotent but nine (9%) developed retrograde ejaculation. Pouchitis occurred in 8% of patients. Among 157 patients assessed at least 60 days after ileostomy closure (mean ± SD, 375 ± 216 days), all evacuated their neorectum spontaneously, and stool frequency was 6.0 ± 2.6 daily and 1.2 ± 1.3 nightly. While continence was generally good, 2.5% of patients during waking hours and 4.5% during sleep had occasional frank soilage. Moreover, seepage was noted in 25 and 47% of patients during daytime and nighttime, respectively. Both stool frequency and degree of continence improved with time. Patients less than 50 years of age and those with polyposis coli had fewer stools and better continence than those older than 50 or those with ulcerative colitis. It is concluded that ileal "J" pouch-anal anastomosis can be performed safely and will provide acceptable anorectal function without late deterioration.

A BDOMINAL COLECTOMY with mucosal proctectomy and endorectal ileoanal anastomosis offers patients with ulcerative colitis or polyposis coli the promise of preserving anorectal function while removing all disease. Initial experience with this procedure was fraught with complications, and many patients had unacceptable functional results leading to a high overall failure rate.[1-4]

Experimental work by Karlan et al.[5] and later clinical results reported by Fonkalsrud,[6] Parks et al.,[7] Utsunomiya et al.,[8] Taylor et al.,[9] and others documented the im-

provement in functional results obtained by incorporating an ileal reservoir proximal to the ileoanal anastomosis. Several types of reservoirs or "pouches" have been proposed and used clinically. These include the "S" type, the "J" type, and more recently the "H" type (or lateral-lateral) ileal reservoirs. Each type of pouch has resulted in postoperative complications related to either the pouch or the anastomosis.[6,7,9] Moreover, none of these various types of pouches has provided satisfactory functional results for every patient undergoing the procedure.[6,7,9] Thus, controversy remains as to which type of pouch should be used and which factors identifiable before surgery might influence postoperative clinical results.

Our aim, therefore, was twofold: to assess short-term and long-term outcome in a large series of patients with a "J" type pouch and so allow comparison with the results of others obtained with different types of pouches, and to determine any factors identifiable before surgery that might contribute to either postoperative complications or to poor functional results.

Materials and Methods

Between January 1981 and May 1983, 188 patients underwent abdominal colectomy with mucosal proctectomy and ileal pouch-anal anastomosis. One hundred eighty-three patients had a "J" pouch constructed (similar to that described by Utsunomiya et al.[8]). For technical reasons, five patients had an "S" pouch constructed (similar to that described by Parks et al.[7]). One hundred eighty patients had a temporary diverting ileostomy established at the time of colectomy. Radiologic contrast studies of the neorectum were obtained 2 or 3 months before surgery, and if anastomotic healing was demonstrated, ileostomy closure was performed as the second stage of the procedure. The other eight patients did not have a tem-

porary ileostomy constructed; *they had a single stage procedure.* The average (±SD) duration of hospitalization was 14 days (±9) after colectomy, and 10 days (±5) after ileostomy closure.

The indication for operation was ulcerative colitis in 177 (3 of whom had coexistent carcinoma), and polyposis coli in 11 (2 of whom had coexistent carcinoma). Nineteen patients had undergone previous colectomy with either construction of an ileostomy and Hartmann's pouch performed (15 patients) or ileorectostomy (4 patients). There were 96 men and 92 women with a mean ± SD age of 31 ± 9 years (range: 15 to 63 years). Intestinal continuity had been reestablished in 173 patients, and, of these, 167 were available for follow-up at least 2 months after closure of the ileostomy.

Immediate postoperative morbidity was assessed both after proctocolectomy and after ileostomy closure where applicable. Previous follow-up data collected and reported by Taylor et al.[10] were combined with current follow-up status obtained in most instances by telephone interviews. Patients were questioned about their average daily and nightly stool frequency. When a range was given in response, the mean was taken as the average number of stools. Continence was considered perfect if patients had neither seepage, *i.e.,* staining of underclothes less than the size of a 25 cent piece and requiring no protective measures, nor soilage, *i.e.,* degree of incontinence was such that it required interruption of usual activities and protective measures such as the wearing of a pad.

Perineal irritation was classified as either major, if it had required hospitalization or had interfered with usual activities, or minor, if it had been sufficient to require only local treatment. Patients were also asked about use of medications, further hospitalizations or operations, and episodes recognized as "pouchitis" (bacterial overgrowth syndrome). They were asked to compare their current life-style to that while they had a temporary loop ileostomy. The resultant data were analyzed statistically using the Wilcoxon 2 sample test and the Kruskal-Wallis test.

Results

Clinical Evaluation

No immediate postoperative mortality occurred, but two patients who had ulcerative colitis died in the follow-up period of metastatic adenocarcinoma.

Ten patients (5.3%) have had permanent ileostomies reestablished and are classified as failures. Excision of the pouch was required for control of pelvic sepsis in five patients, because of intractable diarrhea in three patients, and due to development of symptomatic Crohn's disease in the ileal pouch in two patients.

Clinical pelvic sepsis occurred in 21 patients (11%).

Pelvic sepsis was defined as clinical evidence of infection associated with an obvious pelvic source. Twelve patients (6.4%) required laparotomy for control of sepsis, and five of these eventually had the pouch excised. Four patients required local drainage procedures. Five patients were treated with antibiotics alone.

Fifteen patients (8%) had anastomotic sinuses demonstrated by contrast studies of the "neorectum" at the time of planned ileostomy closure. Eight of these patients had no evidence of pelvic sepsis after surgery and thus represented subclinical or radiological anastomotic leaks. The remaining seven had been treated for pelvic sepsis in the postoperative period. Eleven of these 15 patients subsequently underwent uneventful ileostomy closure after radiographic healing of the sinus was demonstrated. Three patients had ileostomy closure attempted with radiographic evidence of a sinus. Two of these patients developed localized evidence of sepsis after surgery and had temporary ileostomies reestablished. The other patient's course was uneventful. One patient is awaiting closure.

Anastomotic strictures requiring dilation developed in 22 patients (14%). These were usually evident at the time of ileostomy closure and were dilated at that time. Eight patients (or 4.9% of the entire group) required only a single dilatation. Eight patients required more than one dilatation, and six patients (3.9%) were presently undergoing intermittent dilatations. The incidence of anastomotic complications did not appear to correlate with preoperative nutritional status, steroid usage, or disease severity.

Small bowel obstruction requiring laparotomy was encountered in 13 patients (7%) following abdominal colectomy and in three patients (1.7%) after ileostomy closure.

Four patients needed to have their temporary ileostomy revised for stomal retraction in the interval between colectomy and ileostomy closure. Eighty-two per cent of the ileostomies were closed through a small biconvex incision around the stoma; the remainder required a more extensive midline celiotomy.

Peritonitis developed in 10 patients (6.4%) after ileostomy closure. This occurred almost exclusively in patients closed *via* a peristomal incision and was secondary to either unsuspected enteric tears or leaks from the ileoileostomy. In three patients, reexploration and repair were combined with reestablishment of a temporary ileostomy. Two of these have subsequently undergone successful ileostomy closure. The other seven patients were managed by primary repair alone and did well.

No males were impotent, but nine (9%) developed retrograde ejaculation. Seven women (7.6%) reported dyspareunia after surgery, but this has only been a persistent problem in four women. Four women feel that minor incontinence interfers with sexual activities. Four women have become pregnant after surgery. Three patients had

transient urinary retention. Other complications are listed in Table 1.

The most frequent late complication was "pouchitis," which has been recognized in 13 patients (8%) during the follow-up period. This syndrome, which may be secondary to stasis and subsequent anaerobic bacterial overgrowth, is similar to that found in patients with Kock pouches. Clinically, it has been manifested by watery diarrhea, hematochezia, abdominal and pelvic discomfort, malaise, and occasionally fever. These episodes usually respond within 48 hours to oral metronidazole. Three patients (1.8%) have had recurrent episodes.

Functional Evaluation

Functional results were assessed in the 157 eligible patients. The mean interval from ileostomy closure to follow-up was 375 days (SD ± 216 days). The follow-up interval ranged from 60 to 890 days.

Nearly all patients (95%) preferred life after ileoanal anastomosis to their experience with an ileostomy. Mean ± SD stool frequency was 6.0 ± 2.6 stools/day and 1.2 ± 1.3 stools/night. Seepage occurred in 25% of patients during waking hours, while 47% of patients had episodic, nocturnal seepage. Frank fecal soilage occurred occasionally in 2.5% of patients during waking hours, and in 4.5% of patients during sleep. Over one-half of patients (60%) were able to distinguish reliably between gas and stool in the neorectum. Less than one-half of patients (43%) used bulking agents (such as mucilloid psyllium) to increase stool consistency, while 40% of patients used antidiarrheals (such as loperamide) to decrease stool frequency. The remaining patients (41%) did not require any medication to control stool consistency or frequency. Fifty-five per cent of patients had intermittent, minor perianal irritation, 3% had intermittent major perianal irritation.

Because patients had differing follow-up intervals, changes in functional results over time were difficult to evaluate in the overall group. When stool frequency was compared in mutually exclusive groups of patients at 3 (±1) and 6 (±1) months following ileostomy closure (Table 2), stool frequency decreased from a mean of 6.1 daytime stools and 2.1 nighttime stools at 3 months, to a mean of 5.6 daytime stools and 1.1 nighttime stools at 6 months. The difference was of borderline significance (p = 0.058).

Comparing functional results at 9 (±3) months and at 18 (±3) months, again no clear-cut difference in stool frequency occurred, but patients tended to have more stools during the daytime and fewer stools during the nighttime. Thus at 9 months, patients had a mean of 5.9 stools during the day and a mean of 1.3 stools at night compared to a mean of 6.2 stools during the day and a

mean of 0.8 stools at night at 18 months. At 18 months postileostomy closure, only 29% of patients required antidiarrheals compared to 46% of patients at 9 months postclosure (p = 0.145).

Comparing other parameters of functional results over this same time interval, improved continence was found during both daytime and nighttime hours (Table 3). During waking hours, 31% reported intermittent seepage, and 5% reported intermittent frank nocturnal soilage at 9 months, compared to 19% reporting seepage and none reporting frank soilage at 18 months. The ability to reliably distinsuish between gas and stool also tended to improve. At 9 months, 59% of patients could make this distinction compared to 67% of patients at 18 months. Thus, although major improvement in anorectal function occurred in the first few months after ileostomy closure, all parameters tended to improve for up to 18 months after ileostomy closure.

A criticism of these findings is that they are based on comparisons between different patient populations and that factors other than time may play a role in producing these differences. However, if one applies the same evaluation to the subset of patients (N = 16) who have follow-up data available at both 9 ± 3 months and 18 ± 3 months postclosure, the findings are essentially the same except that the improvement in discrimination, the decrease in

TABLE 1. *Infrequent Complications of Ileal Pouch-anal Anastomosis*

Complication	N
High ileostomy output requiring hospitalizations	6 (3.2%)
Postoperative bleeding	2 (1%)
Respiratory failure	2 (1%)
Enterocutaneous fistula	2 (1%)
Wound infection	2 (1%)
Pancreatitis	1 (0.5%)
Parotiditis	1 (0.5%)
Right hydronephrosis	1 (0.5%)
Hemothorax	1 (0.5%)
Perineal palsy (transient)	1 (0.5%)
Venous thrombosis of leg	1 (0.5%)
Nonfatal pulmonary embolus	1 (0.5%)
Right femoral artery thrombosis	1 (0.5%)
Parastomal abscess	1 (0.5%)
Salmonella gastroenteritis	1 (0.5%)

TABLE 2. *Stool Frequency after Ileal Pouch-anal Anastomosis**

	Mean Number of Stools/Period			
	3 Months (N = 21)†	6 Months (N = 14)	9 Months (N = 39)	18 Months (N = 27)
Day	6.1	5.6	5.9	6.2
Night	2.1	1.1	1.3	0.8

* Comparison between mutually exclusive groups of patients.
† N = number of patients.

TABLE 3. Incontinence after Ileal Pouch-anal Anastomosis

	% of Patients	
	9 Months Postop (N = 39)	18 Months Postop (N = 27)
Daytime		
None	64	81
Seepage	31	19
Soilage	5	0
Nighttime		
None	39	52
Seepage	56	44
Soilage	5	4

perineal irritation, and the decrease in the need for anti-diarrheals were definite and not borderline (p < 0.02).

The patient's gender had little effect on functional results, but age and preoperative diagnosis did influence the long-time outcome. Patients older than 50 years of age had a greater stool frequency than patients younger than 50 years. In the older group (N = 11), mean daytime stool frequency was 8.8, and mean nighttime stool frequency was 1.8. In contrast, the younger patients had a mean daytime stool frequency of 5.8, and a mean nighttime stool frequency of 1.3 (p = 0.04). Older patients also tended to have more difficulty with continence. About one-half of the older patients (46%) reported intermittent daytime seepage, although none had frank soilage, compared to a 22% incidence of intermittent daytime seepage and a 3% incidence of intermittent frank soilage in younger patients. This problem is also reflected in the fact that three of the 11 older patients have been hospitalized for diarrhea and perineal irritation since ileostomy closure, compared to only three of the 146 younger patients.

The disease for which operation was required also influenced outcome. Patients with polyposis had fewer daytime and nighttime stools than patients with colitis (p = 0.02). Mean daytime stool frequency was 4.3, and mean nighttime stool frequency was 0.3 in polyposis patients compared to a mean daytime stool frequency of 6.1 and a mean nighttime stool frequency of 1.3 in patients with ulcerative colitis. Additionally, polyposis patients tended to have improved continence. None had frank soilage, only 10% had intermittent daytime seepage, and only 30% had intermittent nocturnal seepage. No one had soilage.

The length of follow-up was identical in polyposis patients and in those patients with ulcerative colitis, but polyposis patients did tend to be younger. Comparing the polyposis patients to a group of ulcerative colitis patients matched for age, sex, and length of follow-up, the difference in results remains, but it was not statistically significant because of the small number of patients.

Discussion

The ideal operation for patients with ulcerative colitis or polyposis coli would remove all disease but maintain the usual route of fecal evacuation. Of the surgical options presently available, only colectomy with mucosal proctectomy and ileoanal anastomosis can meet these criteria. Yet, this operation should be chosen only if the functional results are acceptable to the patient and do not interfere with usual activities.

Our experience with the endorectal, ileal pouch-anal anastomosis indicates that most patients have acceptable long-term functional results with this procedure. Certainly, these patients do not have "normal" stooling habits or continence. The mean stool frequency is strikingly similar to that reported after ileorectostomy[11] or other types of ileal pouch-anal anastomoses.[7,8,12,13] Furthermore, although anorectal function continues to improve over time, much of the improvement, especially with regard to stool frequency, occurs in the first 3 to 6 months after ileostomy closure. Thus, although there is a period of adjustment during which stool frequency may be bothersome, most patients achieve reasonable functional results relatively rapidly.

Satisfactory short-term and long-term functional results have been shown to depend on several factors. Heppell et al.,[13] in evaluating patients with rectal manometry prior to closure of the temporary ileostomy, found that stool frequency postclosure was dependent on both distal enteric compliance and resting sphincteric pressure. Greater compliance and higher resting sphincteric pressure favored a smaller stool frequency after ileostomy closure. Schraut et al.,[12] in evaluating different types of reservoirs, found that both "S" type reservoirs or double-barrelled types of reservoirs ("J" or "H" type) were compliant in experimental dogs. However, the "S" type of pouch lacked coordinated propulsive contractions; it tended to become an inert, obstructed viscus over time. This tendency was shared by the double-barrelled reservoirs with conduits if the efferent conduit was excessively long. Double-barrelled reservoirs without conduits (i.e., "J" type reservoirs) maintained contractile ability best over time in their experimental animals. These studies are supported by our clinical results. None of our patients have had to intubate their pouches to evacuate, and functional results have actually improved over the follow-up period.

Clinical experience with the "S" type of pouch is similar to that with the "J" pouch in terms of stool frequency but has been clouded by two problems. Firstly, several reports have indicated that up to 50% of patients with "S" pouches need to intubate to evacuate.[6,7,14] Shortening of efferent limb decreases but does not eliminate pouch emptying difficulties. In a series reported by Rothenberger,

12% of patients required intubation in spite of a short efferent limb.[15] Secondly, because stasis may be a predisposing factor in pouchitis, one would expect patients with either an "S" type or "H" type reservoir to have a higher incidence of pouchitis. Indeed, this has been reported in up to 50% of patients with an "H" type of reservoir[12,14] as compared to 8% of our patients.

It is difficult to compare anastomotic complications in our patients to those reported by others, because the number of patients described in other reports is smaller than in our report. However, anastomotic complications requiring excision of the pouch have only occurred in 2.8% of our patients, and anastomotic stenosis, although relatively common in our series (13.4% of patients), has been an easily managed problem. From a technical standpoint, the "J" type of reservoir is easier to construct than "H" or "S" type of reservoir. Thus, it would seem that on both an experimental and on a clinical basis, the "J" pouch offers advantages over other types of reservoirs; it may be the reservoir of choice.

The poorer results obtained in our older patients may be a reflection of the changes in anal sphincteric function seen with aging.[16] With the aging process, there is a gradual decline in the resting and squeeze anal sphincteric pressures. Clinical studies by Heppell et al.[13] suggest that this decline favors a greater stool frequency and more difficulty with continence. Conversely, the superior results seen in polyposis patients may be a reflection of relatively increased sphincteric pressures in this group. Both the younger age of this group and the ease with which mucosal proctectomy can be performed in this patient population (with presumably less disturbance of the internal sphincter) could result in greater resting sphincteric pressures and, therefore, a lower stool frequency. Whatever the precise mechanism, the difference in these subgroups is clear and should guide decision making as to the optimal candidate for an ileal-pouch anal anastomosis.

In summary, abdominal colectomy with mucosal proctectomy and ileal pouch-anal anastomosis can be performed safely, but the operation carries a significant risk of postoperative complications. Our experience with the "J" pouch shows that this type of pouch provides good long-term functional results and may be the reservoir

of choice. In view of these findings, we believe that abdominal colectomy with mucosal proctectomy and ileal pouch-anal anastomosis should be considered for younger patients requiring proctocolectomy for polyposis coli or ulcerative colitis.

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