The Endorectal Pull-through for the Management of Ulcerative Colitis in Children and Adults

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Between June 1977 and November 1981, 26 children and adults with ulcerative colitis have undergone a total colectomy, an endorectal dissection of the rectal mucosa, and an ileoanostomy. A combined abdominoperineal approach was used to perform the operation, and the mucosal-submucosal rectal tube was dissected out intact from the abdominal approach. Every patient survived the operation and showed marked clinical improvement presumably due to resection of the diseased colon. Three patients developed intestinal obstruction that was successfully treated with an enterolysis. A rectal cuff abscess and a retroperitoneal abscess were the only other complications. The postoperative stooling pattern of each patient was obtained through detailed interviews. All the patients were continent during the day and at night one month after surgery. Twenty-two patients had a median stool frequency of seven per 24 hours one month after surgery. At one year, the average number of stools was seven per day. Six patients experienced a stool frequency of seven per 24 hours two years after surgery. The results with this series of patients has encouraged the authors to continue to recommend this approach to children and adults with ulcerative colitis, since it offers an alternative lifestyle that is more attractive to certain patients than the presence of an abdominal stoma.

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SINCE 1948, when Cattel introduced the total proctocolectomy and ileostomy as the definitive surgical procedure for the management of ulcerative colitis, this operation has remained the standard approach to this disease.[1] The description of the eversion technique of ileostomy construction by Brooke in 1952 improved ileostomy management significantly and made the operation of total proctocolectomy and permanent ileostomy more attractive to patients with ulcerative colitis.[2] Although the Kock pouch has improved the lifestyle of patients with permanent ileostomies, it still involves the presence of a stoma on the abdominal wall.[3,4] The search for a sphincter-saving operation for the definitive management of ulcerative colitis has gone on extensively during the past 25 years. In 1948, Ravitch proposed a technique in which the colon was resected, the rectal mucosa removed, and an ileoanal anastomosis was created.[5] Following Ravitch's introduction of the endorectal pull-through for ulcerative colitis, the procedure was not used until 1963 when it was popularized by Soave for the treatment of Hirschsprung's disease.[6] Modifications of the procedure were introduced in 1968 by Boley[7,8] and in 1976 by Coran.[9] The technique was used in 1969 by Glotzer on two adults with ulcerative colitis,[10] but it was not until 1977 that the first large series of patients was reported by Martin.[11] Although the popularity of this operation has increased significantly during the past few years, only a few centers have treated enough patients to evaluate the results of this approach.[12,16]

Materials and Methods

Between June 1977 and November 1981, 26 children and adults with ulcerative colitis have been operated upon, 20 at the University of Michigan Hospitals and six at other hospitals. These patients comprise the basis for this report. There are 11 males and 15 females in the series with ages ranging from seven to 46 years (mean 20 years) at the time of operation. All patients underwent an air contrast barium enema and a small bowel radiography series and, in every case, the barium enema was characteristic of ulcerative colitis, and the small

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TABLE 1. *Indications for Surgery in 26 Patients with Ulcerative Colitis*

Poor response to medical therapy	23
Gastrointestinal bleeding	14
Growth retardation	7
Delay in sexual maturation	5
Risk of carcinoma	2
Carcinoma of the colon	1
Rectal stricture	1

bowel series was entirely normal. The diagnosis always was confirmed histologically with a rectal or colonic biopsy. The duration of medical management, which in all cases consisted of varying and intermittent courses of sulfasalazine and corticosteroids, ranged from one to 22 years with a mean of 5.5 years.

Fourteen of the 26 patients underwent an urgent subtotal colectomy because of either severe rectal bleeding or worsening symptoms in the face of maximal dosages of corticosteroids and complete bowel rest with total parenteral nutrition (Table 1). The other 12 patients had an elective colectomy together with a mucosal proctectomy and loop ileostomy. The 14 patents who underwent an initial subtotal colectomy, ileostomy, and mucous fistula of the sigmoid colon returned to the hospital for the endorectal pull-through about three to six months after the initial operation.

All patients were restricted to a clear liquid diet for 48 hours prior to surgery. Oral erythromycin and neomycin were administered the day prior to surgery and irrigations of 1% neomycin were given through the mucous fistula during the same period in those patients who had undergone a previous subtotal colectomy. Patients with intact colons received tap-water enemas during the 48-hour period prior to surgery. Gentamycin and ampicillin were given parenterally the night prior to surgery and on-call to the operating room. These parenteral antibiotics were continued for five days after surgery. Sigmoidoscopy was carried out one week prior to the pull-through procedure in order to determine the state of the rectal inflammation. If significant inflammation was present, the operation was delayed and the patient was treated with steroid enemas with or without bowel rest and total parenteral nutrition.

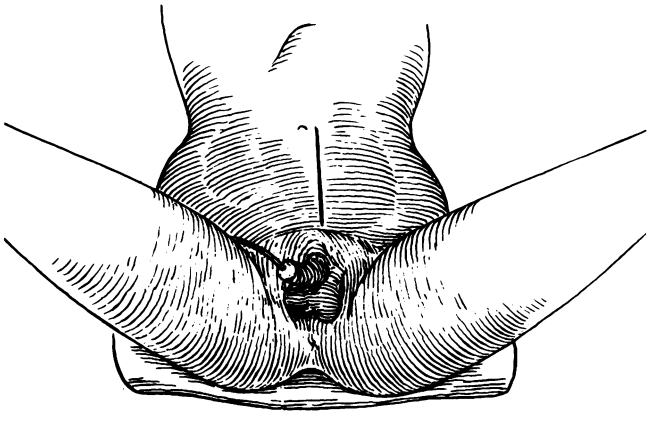

FIG. 1. Position of patient.

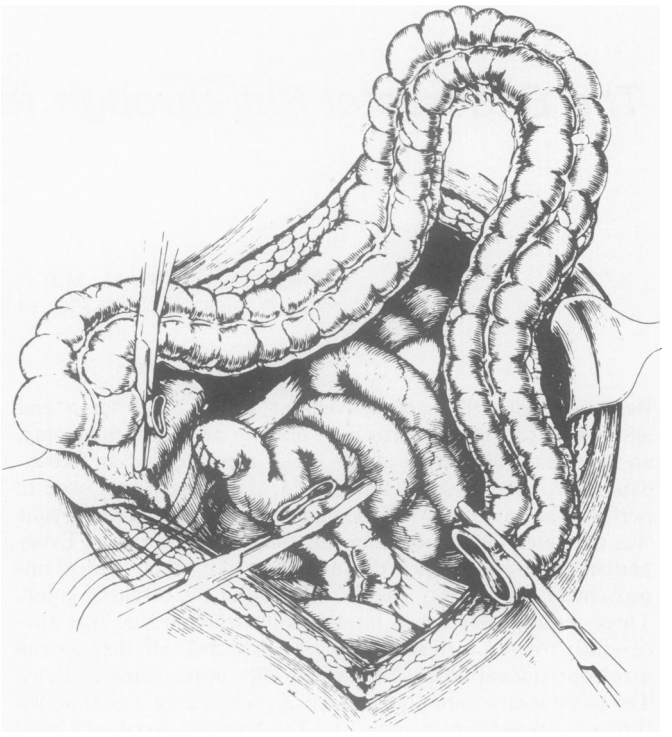

FIG. 2. Subtotal colectomy.

The operation is performed with the patient in the lithotomy position for a combined approach to the abdomen and perineum. Sigmoidoscopy is carried out again and the liquid material in the rectum and sigmoid colon is thoroughly suctioned out. The abdomen and perineum are draped as one field. A foley catheter is inserted into the bladder prior to preparation of the field. The abdomen is entered through a long left lower abdominal paramedian incision (Fig. 1). The entire colon is mobilized down to the level of the mid-sigmoid and a standard subtotal colectomy is carried out (Fig. 2). The terminal ileum is closed with several long sutures of 3–0 silk and a clamp is placed across the mid-sigmoid colon. If a previous subtotal colectomy has been carried out, the mucous fistula, which has usually been placed at the lower end of a left paramedian incision, is mobilized from the incision once the abdomen is opened. The ileostomy in this situation is not taken down until it is determined that an endorectal dissection is feasible. The endorectal dissection is begun by incising the seromuscular layer of the rectum at its peritoneal reflection. This incision is carried around the rectum, and a plane is developed between the submucosa and the muscularis.

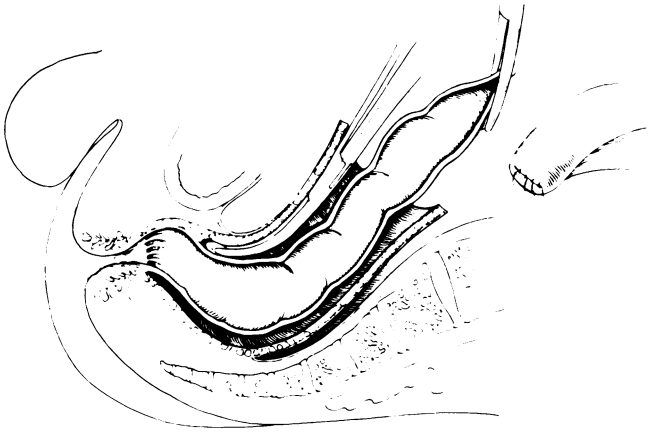

FIG. 3. The endorectal dissection of the rectal mucosal-submucosal tube.

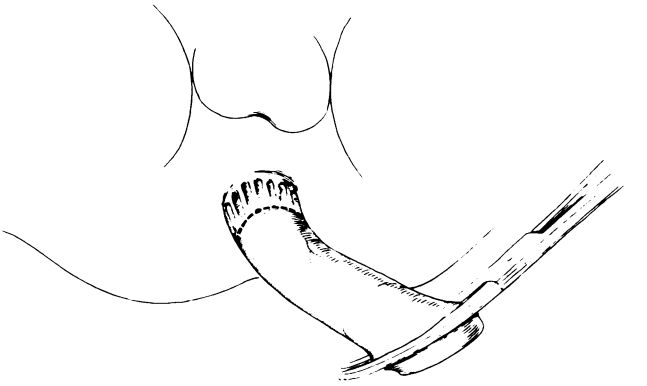

FIG. 5. Incision in the everted tube at the pectinate line.

The dissection is continued bluntly and sharply in this plane all the way down to the anus from the abdominal approach (Fig. 3). There are many large blood vessels running along the submucosa, and these must be cauterized during the dissection to prevent excessive blood loss. Early in the series, three units of blood were often required to complete the operation because of the blood loss encountered during the endorectal dissection. More recently, no blood transfusion has been given during the operation. Once the dissection has been carried down to the anus, the top of the rectal mucosal-submucosal tube is grasped with a long clamp and is everted outside the anal opening (Figs. 4 and 5). In two patients, severe stricture formation in the rectum required both the abdominal and perineal approach to remove the mucosal-submucosal tube completely. At this point, the mesentery of the terminal ileum is incised for a reasonable distance so that the small bowel can be brought down to the anus without tension. If an ileostomy is in place, it is taken down at this time, and its mesentery is incised for an appropriate distance. With traction on the everted mucosal-submucosal tube, an incision is made just proximal to the pectinate line for a distance of 180° (Fig. 5). A clamp is placed through this incision and is passed up through the rectal cuff in order to grasp the sutures on the terminal ileum (Fig. 6). The ileum is brought down to the opening in the everted tube and a similar incision on the anterior half of the ileum is created (Fig. 7). An anastomosis is now performed between the anorectal mucosa and the full thickness of ileum with interrupted sutures of 3–0 or 4–0 absorbable material (polyglycolic acid) (Fig. 8). A third quadrant of the pulled-through ileum and the everted tube is cut and the anastomosis is continued. After the anastomosis of the third quandrant is completed, the remainder of the everted tube and the distal portion of the ileum is excised and the anastomosis is completed with several more interrupted sutures (Fig. 9). Before the last suture is placed, a small penrose drain is inserted between the rectal cuff and the pulled-through ileum (Fig. 9). The top of the rectal muscular cuff is then tacked to the pulled-through ileum with several interrupted sutures of 3–0 or 4–0 silk (Fig. 10). Next, a loop ileostomy is created just proximal to the pulled-through ileum and is exteriorized in the right lower quadrant of the abdomen (Fig. 11). The ileostomy is tacked circumferentially to the peritoneum

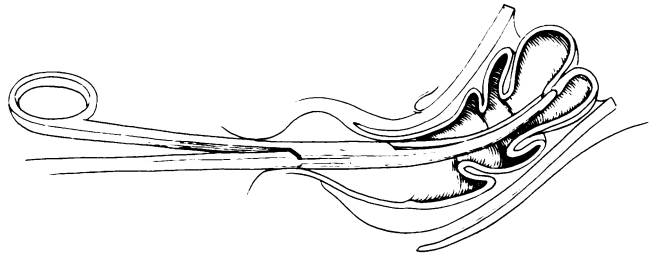

FIG. 4. Eversion of the mucosal-submucosal tube outside the anal opening.

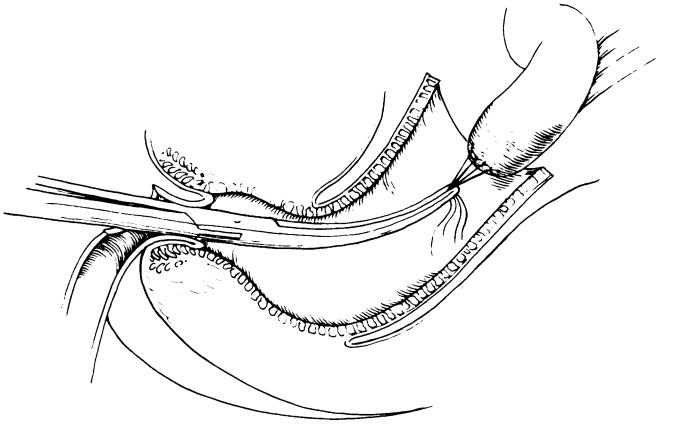

FIG. 6. The terminal ileum is brought through the rectal muscular cuff to the opening in the everted tube.

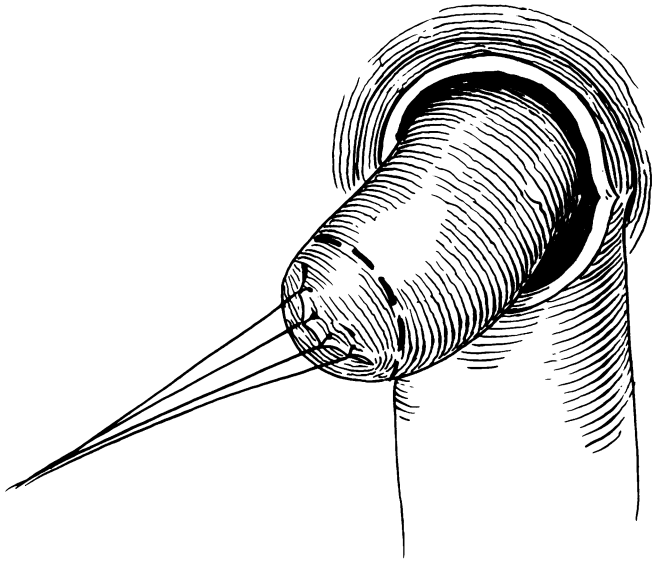

FIG. 7. Incision in the terminal ileum.

with interrupted sutures of 3–0 or 4–0 silk and a rod is fashioned around the ileostomy with a no. 24 French rubber catheter that is sutured to itself (Fig. 12). This type of rod is preferable to the standard glass or silicon one because it makes fitting of appliances much easier. Once the abdomen is closed, the ileostomy is opened transversely in the operating room (Fig. 13).

Between the seventh and tenth postoperative day, a rectal examination is carried out to check the status of the anastomosis. At that time, the ileostomy rod is removed and the ileostomy is allowed to sink slightly below the skin so that spill-over of fecal content will begin to occur, and the patient will start to experience the presence of semiliquid feces in the new rectal ampulla. While the rod is in place, the ileostomy is totally diverting; this facilitates healing of the ileoanal anastomosis.

Two months after the endorectal pull-through procedure, the patient is returned to the hospital for ileostomy closure. Under anesthesia prior to ileostomy closure, the pull-through area is palpated and is dilated if necessary. This is an extremely important step because the anastomosis can become somewhat tight during this two-and-one-half-month interval.

Results

Each patient survived the operation and showed marked clinical improvement presumably due to resection of the diseased colon. Two patients underwent enterolysis for intestinal obstruction one week following iloestomy closure (Table 2). One teenage girl underwent lysis of adhesions one year after surgery. The first patient in this series developed a small cuff abscess three weeks after ileostomy closure, which was treated with drainage and reconstitution of an ileostomy. One 19-year-old female developed a retroperitoneal abscess one year after her endorectal pull-through which was drained intraoperatively; she has had no further problems with this since that time. There were no abdominal wound infections encountered either after the endorectal pull-through or after the ileostomy closure. The length of hospital stay following the endorectal pull-through ranged from seven to 19 days with a mean of 10.4 days. The

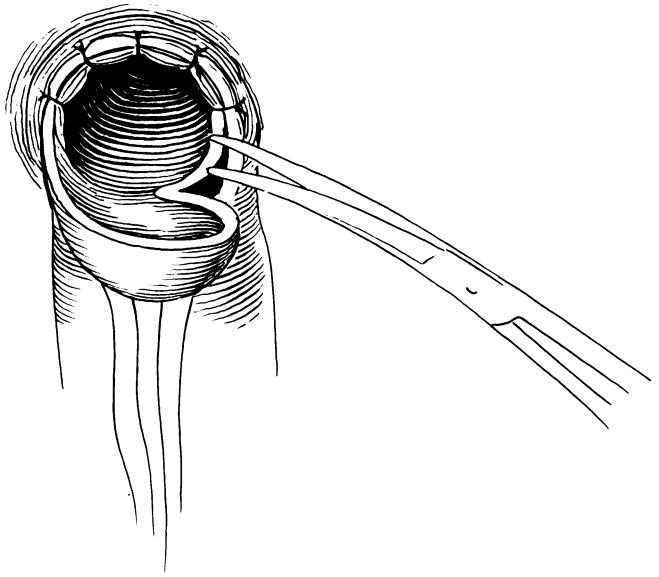

FIG. 8. Creation of the anastomosis between the ileum and the anal mucosa.

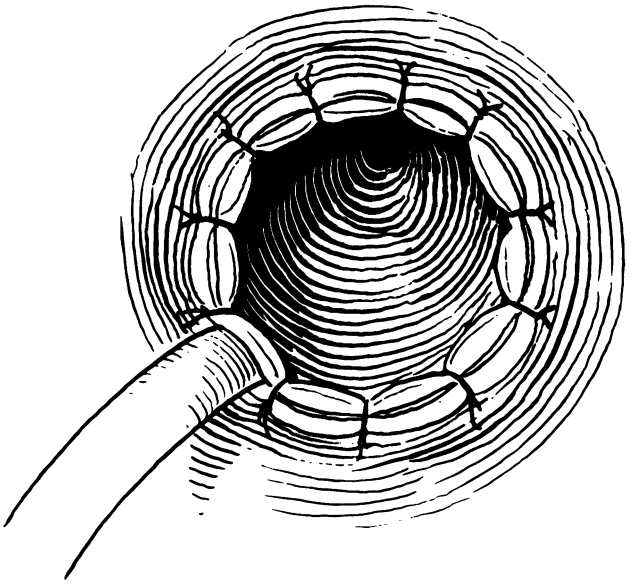

FIG. 9. Completed anastomosis with penrose drain in place.

first patient in the series, who underwent an end ileostomy after the development of a cuff abscess, is awaiting the long-term results of this procedure before undergoing an ileostomy closure.

All patients were continent during the day immediately after ileostomy closure and, with rare exceptions, were continent at night within a month after the ileostomy had been closed. Very few, even during the first month after the ileostomy closure, experienced any significant fecal soiling during sleep.

Besides the continence data, the most important information for evaluation of the efficacy of this operation is the stool frequency (Table 3). Twenty-three of the 26 patients have undergone ileostomy closure; 21 of these 23 have been followed for more than a month after closure of their ileostomy. These 21 patients have been carefully interviewed in the office or by telephone to determine the minute details of their continence and stooling patterns. One month after ileostomy closure, the number of stools ranged from two to 20 per 24 hours with a median of seven in 22 patients. The nine male patients experienced a stool frequency of 12 per 24 hours with a range of 5 to 20, and the 13 female patients averged six stools per 24 hours with a range of two to 12. Twenty-one patients had a median stool frequency of eight per day three months after surgery with a range of four to 20. The nine male patients experienced 11 stools per 24 hours with a range of eight to 20, and the 12 female patients had six stools per 24 hours with a range of four to ten. At six months, there were 18 patients available for evaluation. Their median stool frequency was five per 24 hours with a range of three to 20. The eight males averaged 11 stools per day (range four to 20), and the ten females experienced five stools per 24-hour period (range four to ten). Sixteen patients were evaluated one year after surgery, and they had a median stool frequency of seven per 24 hours (range three to 20). The stool frequency in the seven males was 12 with a range of three to 20 and in the nine females was five with a range of three to 20. Six patients were available for evaluation two years after the endorectal pull-through. The median stool frequency in this group was seven with a range of two to 16. The two males

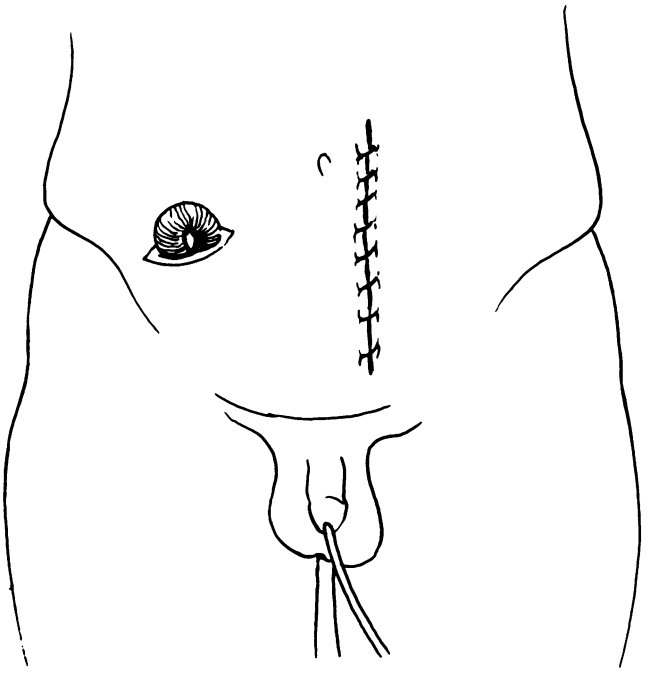

FIG. 11. The loop ileostomy is placed in the right lower quandrant of the abdomen.

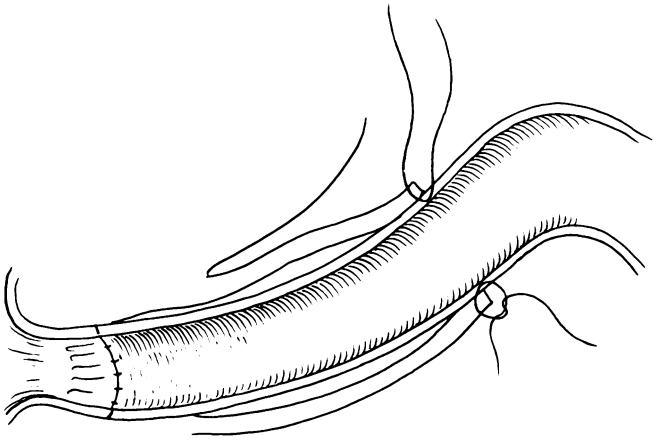

FIG. 10. The top of the rectal cuff is tacked to the ileum.

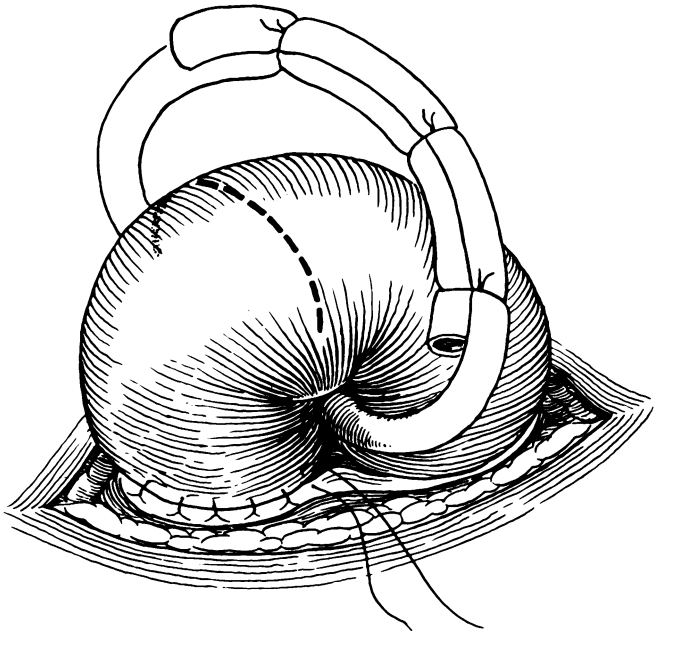

FIG. 12. The ileostomy is tacked to the peritoneum.

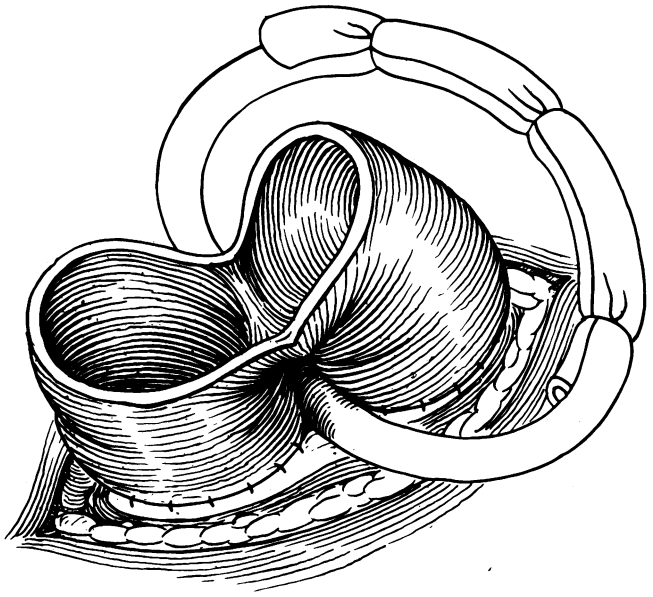

FIG. 13. The ileostomy is opened transversely.

averaged four stools per 24-hour period, and the four female patients experienced eight stools per day. There are two female patients who have been followed for three years after the procedure; one has an average of five stools per day and the other experiences ten to 15 bowel movements per 24 hours. The stool frequency was analyzed with regard to age above or below 18 years, and no significant difference beween these two age groups was noted. Only one patient developed any significant perianal excoriation; this occurred in an adult male who was having between ten and 15 semiliquid bowel movements per day. After one year, this problem has disappeared.

Although many of the patients required intermittent use of Metamucil and Lomotil during the first six to 12 months after surgery, only three required frequent use of these medications after one year.

Each patient was asked to compare his lifestyle with an ileostomy with that experienced after the ileostomy was closed. In every case except two, the patient preferred the increased stool frequency associated with the endorectal pull-through over the presence of an abdominal stoma. In two patients, however, the persistent stool frequency of 15 per 24-hour period began to interfere with their lifestyle to such an extent that they requested the reconstitution of an end ileostomy 14 and 21 months after the original operation. One 8-year-old girl experienced severe diarrhea five months after her ileostomy closure. This could only be managed by recreation of a loop ileostomy. Subsequent biopsies of her ileum strongly suggested that her diagnosis was Crohn's disease rather than ulcerative colitis.

TABLE 2. *Complications Following the Endorectal Pull-through for Ulcerative Colitis in 26 Patients*

Complication	Number of Patients
Intestinal obstruction	3
Rectal cuff abscess	1
Retroperitoneal abscess	1

TABLE 3. *Stool Frequency Following the Endorectal Pull-through for Ulcerative Colitis*

Time Interval	Total Number of Patients	Stools per 24 Hours	
		Median	Range
One month	22	7	2 to 20
	9 males	12	5 to 20
	13 females	6	2 to 12
Three months	21	8	4 to 20
	9 males	11	8 to 20
	12 females	6	4 to 10
Six months	18	5	3 to 20
	8 males	11	4 to 20
	10 females	5	4 to 10
One year	16	7	3 to 20
	7 males	12	3 to 20
	9 females	5	3 to 20
Two years	6	7	2 to 16
	2 males	4	2 to 6
	4 females	8	6 to 16
Three years	2 (both females)	12	5 to 15

Discussion

The endorectal pull-through procedure is ideally suited for the management of ulcerative colitis since the disease is limited to the mucosa. However, it is important that nearly all the rectal mucosa be removed during the procedure. This technique, which involves an intact dissection of the entire mucosal-submucosal tube from the abdominal approach with subsequent eversion of this tube prior to its excision, guarantees removal of almost all the diseased mucosa.[9] All the other techniques of endorectal resection described have involved a combined abdominal and perineal dissection of the rectal mucosal-submucosal tube.[5,7,8,12,13,15] With this latter approach, the surgeon cannot always be certain that all the rectal mucosa has been removed. Even though all the rectal mucosa is removed intact by the technique described here, there is still a 1 cm rim of distal mucosa left that is at potential risk of malignant change. Therefore, it is felt that any patient undergoing this type of operation must be followed indefinitely in order to detect any neoplastic changes in this small segment of remaining mucosa.

Because of the success with the modified endorectal pull-through in the treatment of classical Hirschsprung's disease,[17] in 1974, the authors began to use the same operative approach for the management of children with total colonic aganglionosis.[18] The experience with six children with total colonic and partial small intestinal aganglionosis who had undergone an endorectal pull-

through procedure following a total colectomy has been excellent. All patients are totally continent and are having two to three formed bowel movements per day.[18] One girl with aganglionosis extending to the distal jejunum, who underwent a total colectomy and ileectomy followed by an endorectal pull-through and a jejunoanostomy, is totally continent and has four to six soft stools per day seven years following surgery. The encouraging results in this small group of children with total aganglionosis prompted the authors, in 1977, to consider this operative approach for children and adults with ulcerative colitis. At that time, Martin published his experience with 17 patients with chronic ulcerative colitis with satisfactory results in 15.[11] Parks and Nicholls described a modification of the procedure in 1978 in which a reservoir was added in order to decrease the stool frequency; however, several of these patients were unable to defecate spontaneously and required a rectal tube for stool evacuation.[12] In 1980, Fonkalsrud reported five patients on whom he did the operation described by Parks and Nicholls. Only one of these patients had had his intestinal continuity restored at the time of the report; at that time, he was experiencing four to 12 stools daily and was totally continent.[13] More recently, Peck described 29 patients who underwent a rectal mucosal replacement operation together with the insertion of an ileal graft. Twelve of these patients had familial polyposis and the other 17 suffered from ulcerative colitis. The operation is far more complicated than the standard endorectal pull-through; however, the results have been quite satisfactory in the 25 patients who have had their intestinal continuity restored. These patients are totally continent and have an average stool frequency of six per 24 hours.[14] This past year, Telander et al. reported on 12 children and young adults who underwent a classical subtotal colectomy and rectal mucosectomy for chronic ulcerative colitis.[15,19] The follow-up in these patients has ranged from seven to 27 months, and they all appear to have fecal continence and a satisfactory stooling pattern.

Although the total protocolectomy is an excellent operation for the definitive management of ulcerative colitis, many patients are emotionally disturbed by the presence of an abdominal stoma. This often results in a significant delay in surgery. The endorectal pull-through has the advantage of offering the patient with ulcerative colitis proper treatment of his basic disease together with a more acceptable lifestyle. All of the patients except two preferred the operation to a permanent ileostomy in spite of the fact that several experienced a relatively high stool frequency. The presence of fecal continence is probably the most important factor in patient satisfaction. If the operation is done properly, incontinence should not result. In fact, none of the patients have had any difficulty with fecal continence. The two patients in this series who requested reconversion to an ileostomy did so not because of incontinence but because of an unacceptable stool frequency.

The results with this series of patients have encouraged the authors to continue to recommend this approach to children and adults with ulcerative colitis. If the patient is not anxious to have the endorectal pull-through procedure done at the time of colectomy, it is strongly recommended that a subtotal colectomy and mucous fistula of the sigmoid colon be performed together with an end ileostomy so that the pull-through procedure can be done at a later date if desired by the patient. The results from the few large series that have been reported seem to support this recommendation.

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