Rectal Mucosal Replacement

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Preservation of the rectum in chronic ulcerative colitis or familial polyposis conserves continence at the risk of recurrent disease or malignant change. Replacement of rectal mucosa with a graft of ileum in these benign colonic mucosal diseases conserves fecal continence without the threat of continuing disease or the development of carcinoma. Rectal mucosal replacement with construction of a rectal reservoir includes total colectomy, removal of the rectal mucosa–submucosa and its replacement with an ileal graft. A rectal reservoir is constructed when intestinal continuity is restored. Twenty-nine patients have undergone rectal mucosal replacement; 12 for familial polyposis and 17 for ulcerative colitis. Twenty-five patients have had intestinal continuity restored. Patients have been followed from three months to seven years after the restoration of intestinal continuity. Twenty-three patients have a satisfactory result. Fecal continence has been preserved. Patients pass an average of six stools in a 24 hour period.

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PRESERVATION OF THE RECTUM in chronic ulcerative colitis or familial polyposis conserves continence at the risk of recurrent disease or malignant change. Replacement of rectal mucosa with a graft of ileum in these benign colonic mucosal diseases conserves fecal continence without the threat of continuing disease or the development of carcinoma.

Ravitch and Sabiston[7] described anal ileostomy in 1947 as an attempt to conserve continence in patients with ulcerative colitis and familial polyposis. Anal ileostomy has been reported periodically with variable results. Motility of the rectal segment in an anal ileostomy is altered and may be ileal in character. The preservation of ileal intestinal function and the absence of a rectal reservoir may yield less than optimal results.

The technique of rectal mucosal replacement was developed to eliminate ileal persistalsis and preserve rectal muscular function.[5] Subsequent studies in the dog independently confirmed Glotzer's[3] conclusion that anoderm is essential for fecal continence while rectal mucosa may be sacrificed without disturbing normal continence.

The author's initial clinical experience with rectal mucosal replacement suggested the need for a rectal reservoir. In 1968 the first patient had continuity restored as an end-to-end anastomosis without a reservoir. Frequent stools and nocturnal incontinence prompted diversion one month later. Subsequent investigation using dogs who underwent mucosal replacement, colectomy and the construction of a rectal reservoir resulted in healthy animals with satisfactory continence. In 1971 the first patient had an isolated rectal reservoir constructed. If functioned satisfactorily and intestinal continuity was restored six months later.

Operative Technique

Rectal mucosal replacement with the construction of a rectal reservoir is a two-stage operative procedure. The first stage has an abdominal and an anorectal phase. The abdominal portion of the procedure includes total colectomy, removal of the rectal mucosa–submucosa, preparation of an ileal graft, proximal fixation of the graft and diversionary ileostomy. The anorectal phase includes the removal of the remaining rectal mucosa–submucosa and distal fixation of the graft. Three months after Stage I intestinal continuity is restored and a rectal reservoir constructed via a long side to side ileorectal anastomosis.

Stage I: Total Colectomy with Rectal Mucosal Replacement and Ileostomy

Patients are prepared for surgery with mechanical colonic cleansing and antibiotic bowel preparation. The colon is removed to the upper rectum preserving the superior hemorrhoidal artery. The rectal mucosa and submucosa are separated from the muscularis of the rectum from the level of the sacral promontory to the anoderm (Fig. 1). The rectal lumen may be entered during the course of this dissection and contamination of the muscularis can occur. The rectal

muscular tube is irrigated with antibiotic solution. Systemic antibiotics are administered routinely.

The plane of dissection between the rectal muscle and submucosa may be scarred and partially obliterated in the following conditions: 1) inflammatory disease extending beyond the submucosa to involve the muscularis, 2) fulguration of polyps producing punctate scarring and 3) endometriosis involving the rectum.

In patients 1–9 the ileal graft was prepared by removing the seromuscular coat from a six inch length of terminal ileum as illustrated in Figure 2. The mesenteric blood supply was preserved. Difficulty in graft preparation was encountered if an attempt was made to separate the seromuscular coat from the submucosa of the chronically distended terminal ileum in patients with an established ileoproctostomy. Previous abdominal surgery and small bowel adhesions were associated with difficulty in separating the seromuscular coat of the ileum from its submucosa. Sharp dissection was necessary in several patients. During graft preparation the mucosa–submucosa may be disrupted. Small tears were easily repaired with fine absorbable suture.

The ileal graft described in the preceding paragraph was associated with the loss of a portion of the distal graft in two patients and distal anorectal stricture in three others. These complications prompted modification of the graft in order to better preserve its blood supply. In the remaining 20 patients the ileal
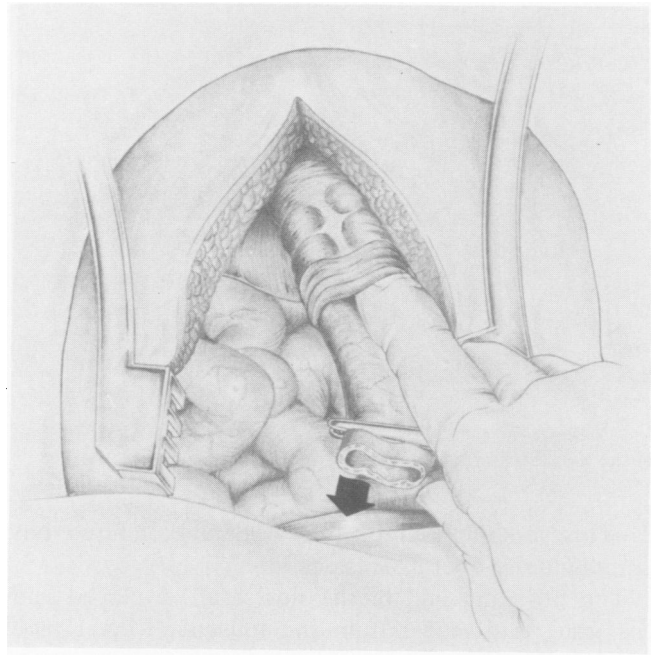

FIG. 1. The colon has been divided at the level of the sacral promontory. The rectal mucosa–submucosa is separated from the muscularis. The arrow indicates traction on the mucosa–submucosa. Traction on the muscularis tended to tear it and was avoided.

graft was prepared without removing the seromuscular layer. A 1 cm strip of serosa and a portion of the muscularis were removed from the antimesenteric border of the terminal ileum as illustrated in Figure
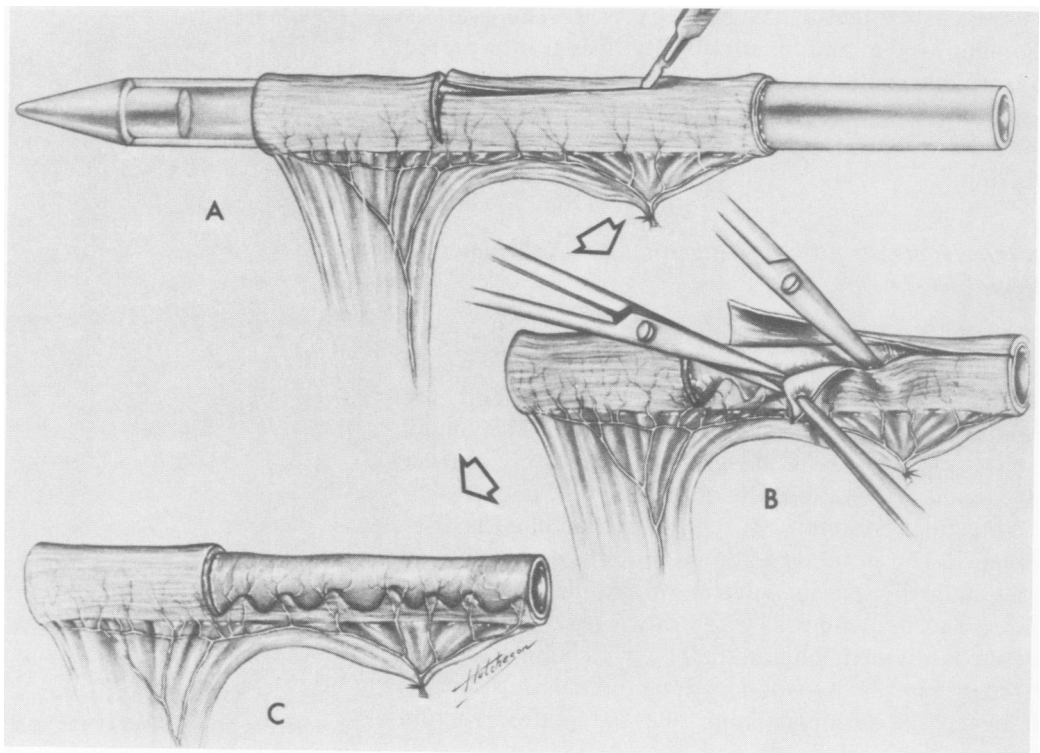
FIG. 2. Preparation of a graft of ileal mucosa–submucosa with preservation of its blood supply. (A) The ileum is supported on a stent and the seromuscular layers are incised. (B) The seromuscular layer is removed, except for small areas through which fine branches of the mesenteric artery and vein reach the submucosa. (C) Completed graft.
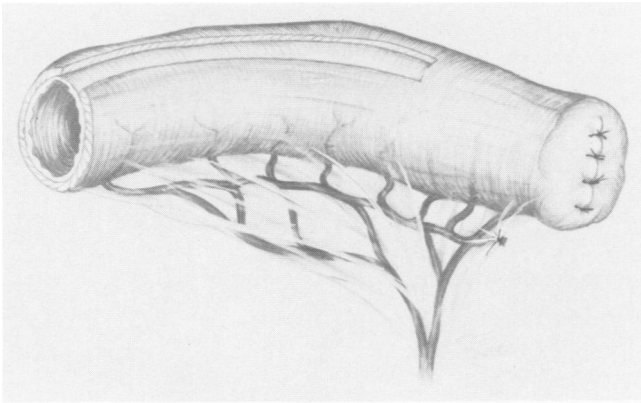
FIG. 3. Prepared ileal graft. A 1.0 cm strip of serosa and a portion of the muscularis were removed from the antimesenteric border.

3. This modification of the original technique has simplified the operative procedure.

The proximal end of the ileal graft is closed and the graft is placed within the muscular rectal tube (Fig. 4). The ileum is anastomosed to the upper margin of the seromuscular cuff of the rectum. A diversionary ileostomy is constructed and the abdomen is closed.

The patient is turned to the prone jackknife position and the remaining rectal mucosa–submucosa is removed (Figs. 5 and 6). A circumferential incision at the level of the Crypts of Morgagni is deepened to the circular muscular layer. Dissection in the plane between the submucosa and the muscularis is continued cephalad until all of the remaining rectal mucosa–submucosa has been excised. The graft is brought down and fixed distally using interrupted absorbable sutures uniting the ileal graft to the anoderm (Fig. 7). Drains are placed in the space between the ileal graft and the muscularis of the rectum.

Stage II: Restoration of Intestinal Continuity with a Rectal Reservoir

Viability of the graft is checked three weeks postoperatively. Retention enemas are started six weeks after Stage I. These enemas gently distend the grafted rectum and confirm continence. The length and configuration of the grafted rectum are further evaluated via proctoscopy and a contrast enema.

Intestinal continuity is restored three months after Stage I. The grafted rectum is mobilized and divided longitudinally on its ventral or antimesenteric surface. The ileostomy is taken down and the terminal ileum is divided longitudinally on its antimesenteric border (Fig. 8). A two-layer longitudinal anastomosis between the terminal ileum and the grafted rectum forms a rectal reservoir (Fig. 9).

Clinical Material

Thirty-one patients have been candidates for rectal mucosal replacement — 18 with chronic ulcerative colitis and 13 with familial polyposis. Twenty-nine patients have undergone rectal mucosal replacement and 25 of the 29 have had intestinal continuity restored with the construction of a rectal reservoir. Rectal mucosal replacement was combined with total colectomy in 13 patients while the remaining patients underwent colectomy from one to 19 years prior to mucosal replacement.

Familial Polyposis

Twelve patients with familial polyposis have undergone rectal mucosal replacement. These patients are summarized in Table 1. Their ages range from 12 to
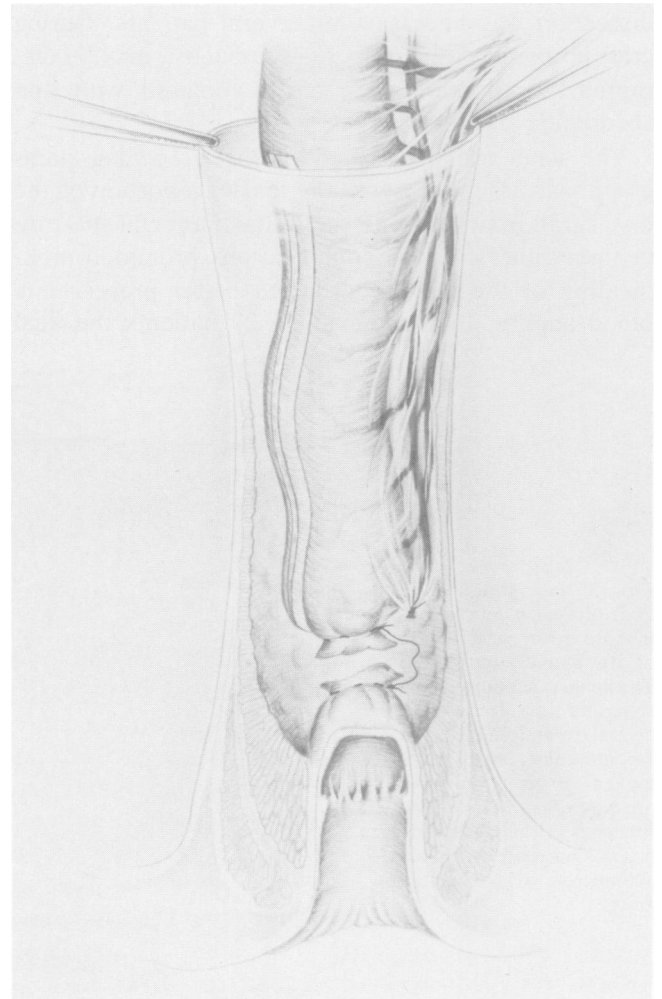

FIG. 4. The ileal graft has been placed within the rectal muscular tube. The distal graft has been tied to the stump of rectal mucosa and will be pulled through the sphincter during the perineal phase of Stage I.
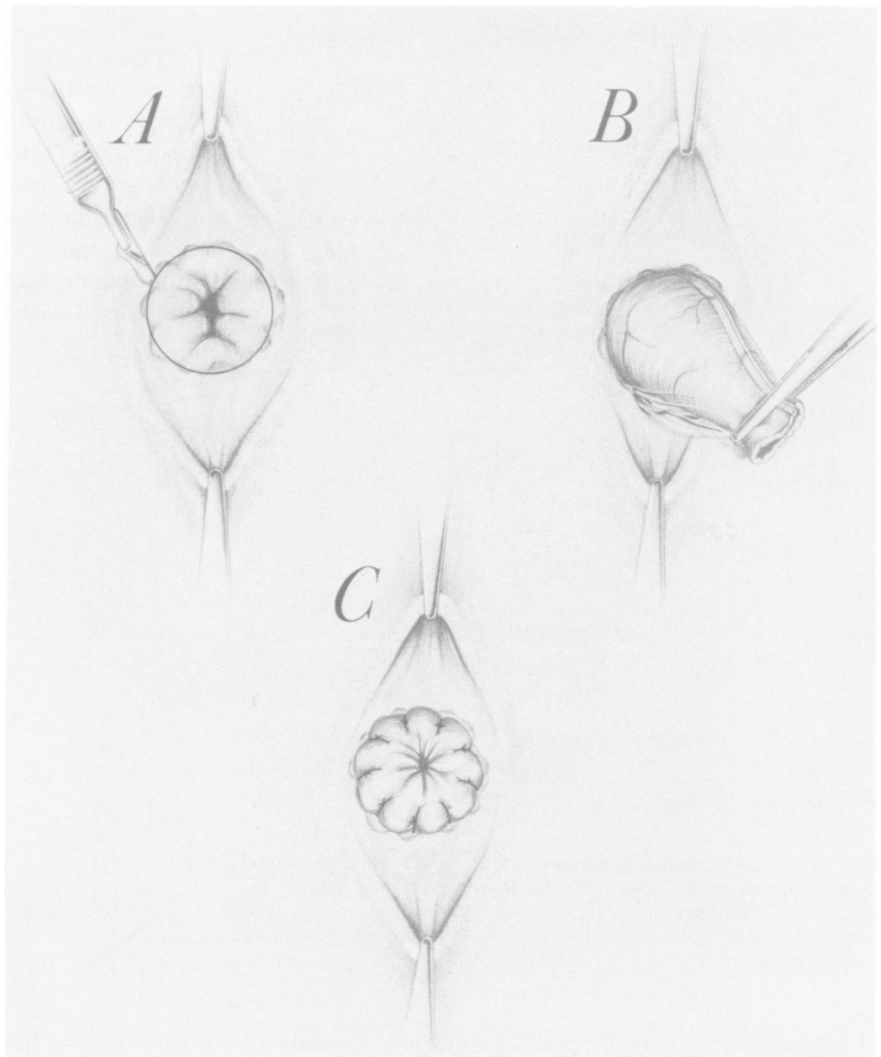
FIG. 5. (A) A circumferential incision has been made at or a few millimeters above the level of the Crypts of Morgagni. (B) The remaining rectal mucosa has been removed and the graft of ileum protrudes from the anus. (C) The graft of ileum has been sutured to the anoderm.

51 years with an average of 29.3 years. There are eight men and four women in the polyposis group. These patients are members of eight polyposis families. Nine of the 12 patients underwent total colectomy and ileoproctostomy 1–19 years prior to rectal mucosal replacement. One-half of the patients in this series did not have routine fulfuration of rectal polyps prior to mucosal replacement. Repetitive fulguration of polyps adversely affects the cleavage plane between the muscularis and the submucosa of the rectum.

The thirteenth patient with familial polyposis was a 61-year-old woman who had had repetitive fulguration of rectal polyps during the 29 year interval between scheduled rectal mucosal replacement and colectomy with ileoproctostomy. Scarring between the muscularis and submucosa was so severe that the cleavage plane was almost totally obliterated and it was not possible to separate the muscularis from the submucosa. Proctectomy and permanent ileostomy were performed.

Chronic Ulcerative Colitis

Seventeen patients underwent rectal mucosal replacement for chronic ulcerative colitis of 1.3–19 years duration, an average of 9.4 years. The colitis group is summarized in Table 2. Their ages range from 21 to 55 years with an average of 34.4 years. There were eight men and nine women in the colitis group. Ten patients underwent total colectomy and rectal mucosal replacement as a single operative procedure. Seven patients underwent colectomy and ileostomy from five months to three years prior to rectal mucosal replacement. The proximal portion of the retained rectum was either closed or managed as a mucous fistula.

Patients with granulomatous or Crohn's colitis are not candidates for rectal mucosal replacement. The pattern of the colitis and the absence of granulomatous change in both the resected colon and a preoperative rectal biopsy were carefully considered in the selection
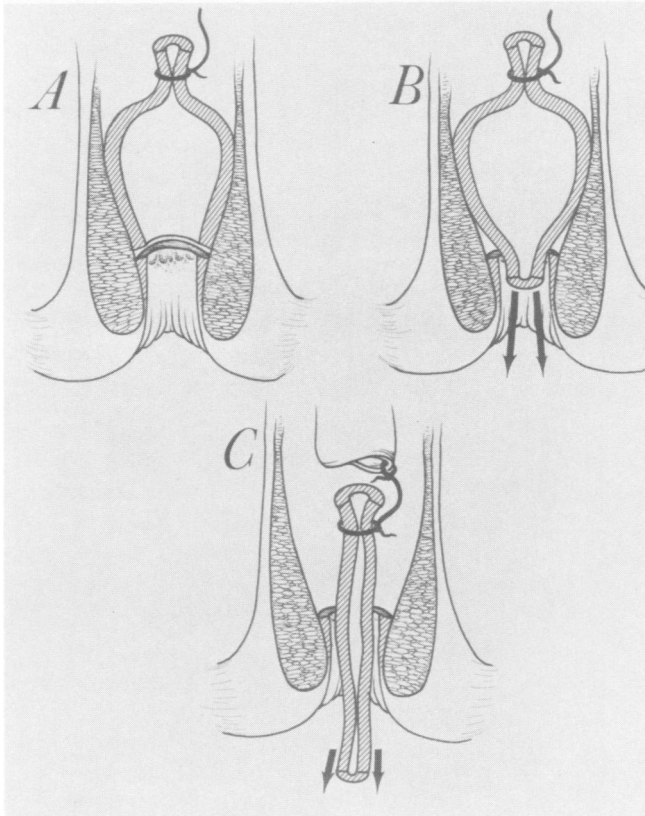
FIG. 6. The diagramatic illustration of the removal of the distal rectal mucosa–submucosa. (A) Incision at or just above the Crypts of Morgagni. (B) Separation of the submucosa and muscularis with traction on the mucosa–submucosa. (C) Completed dissection.

of patients for mucosal replacement. The severity of rectal inflammation varied among the patients in this group. Inflammatory disease may extend beyond the mucosa to involve the muscularis of the rectum. In general the removal of the mucosa and submucosa was more difficult in the colitis group than in patients with familial polyposis. Patient 13 had multiple areas of severe inflammation. During the course of the rectal dissection a portion of the muscularis of the rectum was sacrificed in a patchy fashion. Patients with ulcerative colitis of shorter duration generally have less severe inflammatory reaction.

An eighteenth patient with ulcerative colitis of 14 years duration was explored as a candidate for rectal mucosal replacement. A linitis platica carcinoma of the transverse colon with metastasis limited surgery to a total proctocolectomy and ileostomy. The rectal dissection used in this patient followed the technique of rectal resection for benign disease.[6] The rectal mucosa and submucosa were removed and the proximal portion of the rectal seromuscular tube was closed.

Results

Twenty-five patients have been followed from three months to 7.7 years following the restoration of intestinal continuity with construction of a rectal reservoir. Periodic reevaluation via examination and proctoscopy has been supplemented by a questionnaire.

Fecal continence includes the ability to defer defecation and to distinguish solid, liquid and gas. Continence includes nocturnal control and should be functional with both liquid and solid stool.
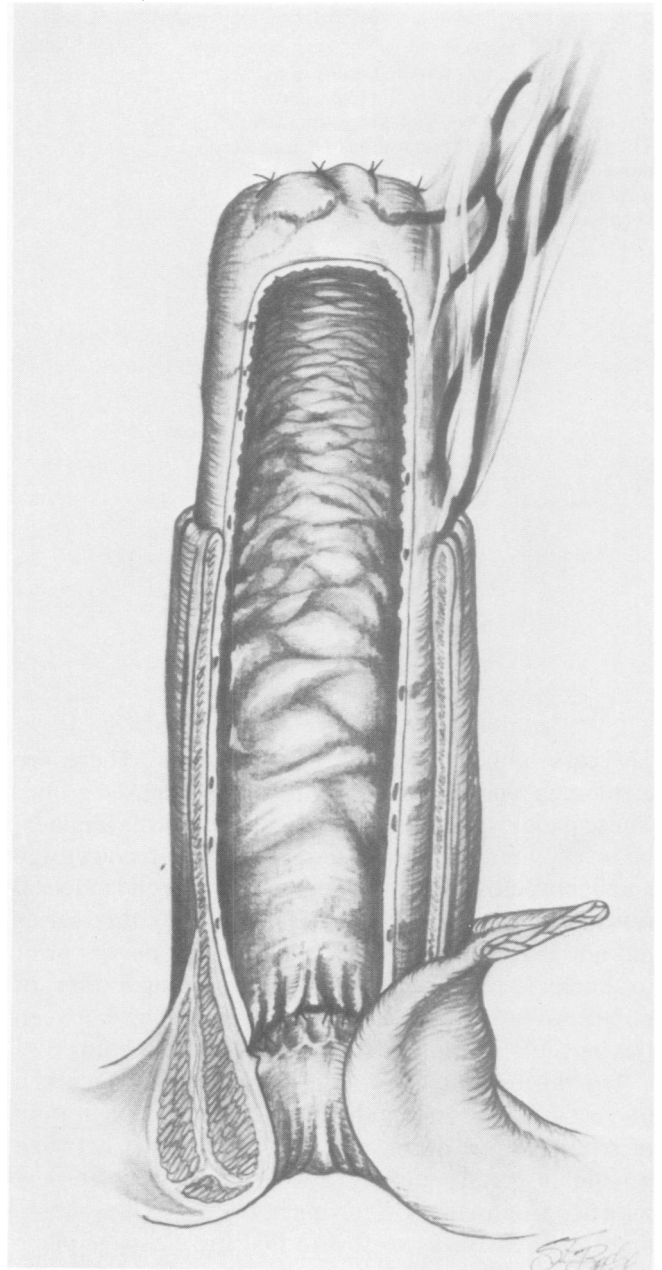

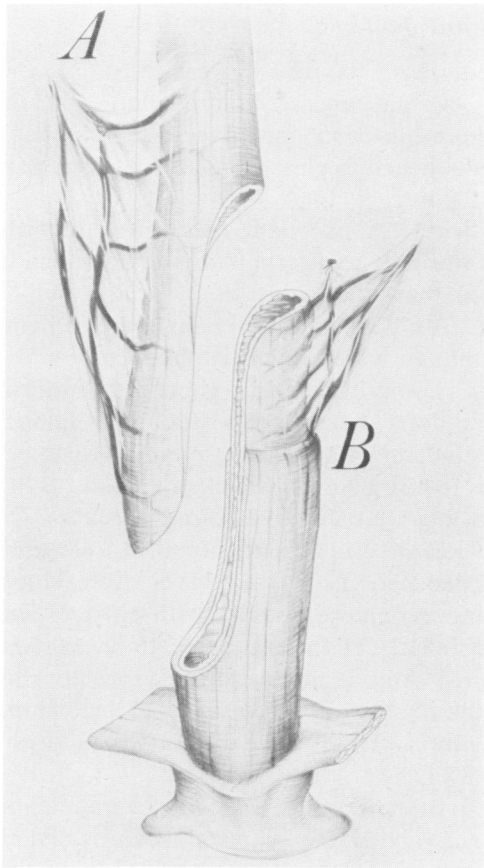FIG. 7. The grafted rectum at the completion of Stage I.

FIG. 8. (A) The terminal ileum has been divided longitudinally on its antimesenteric surface. (B) The grafted rectum has been divided longitudinally on its ventral or anterior surface.
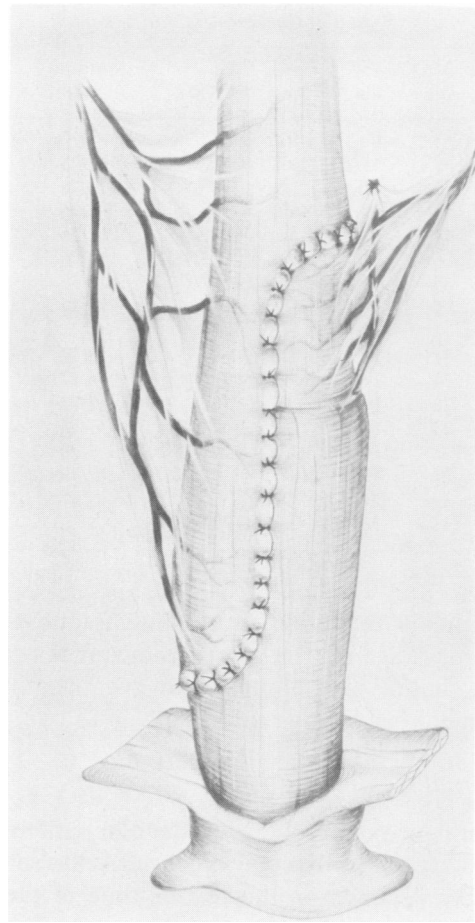

FIG. 9. An anastomosis between the terminal ileum and the grafted rectum forms a rectal reservoir.

Patients were evaluated with specific reference to 1) discrimination, 2) deferral, 3) stooling frequency, 4) nocturnal continence, 5) leakage and 6) patient satisfaction.

Discrimination

Discrimination refers to the ability to distinguish mush, liquid or gas. Twenty-three of 25 patients retained that function after rectal mucosal replacement. The remaining patients had difficulty distinguishing liquid stool from gas, however this did not adversely effect the overall results.

Deferral

All patients were able to defer defecation for variable periods of time ranging from five minutes to 12 hours. Most patients were able to defer stooling for one to two hours. Many patients reported an occasional urge to stool that was so strong that it had to be answered immediately.

Frequency

A tabulation of the frequency of stooling is listed in Tables 1 and 2. Patients with familial polyposis had an average of 5.0 stools in 24 hours, while the colitis group passed an average of 6.7 stools during the same time period.

TABLE 1. *Familial Polyposis*

Case No.	Age	Sex	Colectomy	RMR	Continuity Restored	Result
1.	24	M	1966	7/68	10/71	4–6 SD
3.	13	M	1970	8/73	11/73	1–2 SD
4.	38	F	1968	9/74	12/74	10 SD
7.	39	M	1956	8/75	6/76	4 SD
8.	34	M	1957	8/75	11/75	3–4 SD
10.	12	M	1970	12/75	6/76	5 SD
15.	38	F	Sept., 1976		3/77	5–6 SD
19.	18	M	1968	1/77	6/77	4–7 SD
22.	43	F	June, 1978		12/78	4–5 SD
23.	14	F	June, 1978		1/79	5–6 SD
24.	27	M	1976	8/78	12/78	5 SD
29.	51	M	1961	2/79		

TABLE 2. Chronic Ulcerative Colitis

Case No.	Age	Sex	Colectomy	RMR	Continuity Restored	Result
2.	53	F	1972	2/73	5/73	6 SD
5.	49	M	1972	3/75	12/75	4–10 SD
6.	22	M	May, 1975		10/75	3–4 SD
9.	33	M	1974	10/75	5/76	6 SD
11.	41	M	May, 1976		12/76	3–4 SD
12.	36	M	1973	5/76	10/76	10–12 SD
13.	55	M	July, 1976		10/77	Failure
14.	35	F	Sept., 1976		10/77	8–9 SD
16.	31	F	Nov., 1976			
17.	31	F	Dec., 1976		3/77	4–5 SD
18.	24	F	Jan., 1977		6/77	Failure
20.	26	F	Aug., 1977		12/77	6–8 SD
21.	23	F	2/77	9/77	7/78	4–5 SD
25.	35	F	4/78	9/78	3/79	12–14 SD
26.	21	F	10/77	9/78	12/78	5–7 SD
27.	39	M	Dec., 1978			
28.	31	M	Jan., 1979			

A gradual reduction in stooling frequency occurs following Stage II. The most significant change occurs in the initial six months, however continued improvement has been recorded for up to two years.

Nocturnal Continence

Continence of stool during sleep in patients with an ileoproctostomy or rectal mucosal replacement most probably depends on the resting tone of the internal anal sphincter and its relationship to the elasticity or adaptability of the rectal wall. Liquid ileal content enters the rectal reservoir. Continence is maintained by the intact internal sphinter reinforced by the external sphincter and puborectalis muscles. When the volume within the rectum exerts sufficient pressure the patient is awakened and defecates voluntarily.

Eleven patients sleep through the night while nine routinely awaken and pass an average of 1.6 stools per night. Three patients occassionally awaken to stool approximately one night per week.

Leakage or seepage of a small quantity of mucous or fecal material was reported frequently in the immediate postoperative period. As recovery progressed the frequency and severity diminished or disappeared completely. Of the 23 successful patients who have had continuity restored 21 had no leakage during the day and eleven were completely free of nocturnal leakage. Two patients had some leakage both night and day. Only four patients had soiling of sufficient severity to prompt the use of a protective pad.

The discharge of a significant quantity of ileal content onto normal skin results in severe excoriation. In all patients described in the preceding paragraph the anoderm and perineal skin has remained healthy.

Patient Satisfaction

Patients have expressed great satisfaction with the results of this operative procedure. In order to evaluate results more objectively the following criteria were established to classify results as excellent, good, fair or failure.

Excellent. An excellent result was recorded if a patient was able to discriminate, defer defecation pass no more than six stools in 24 hours and have no leakage. Ten patients (40%) enjoy an excellent result. Six of the ten were polyposis patients.

Good. The criteria for a good result included the ability to defer defecation, a stooling frequency of up to ten stools in 24 hours and minimal leakage. Eleven patients (44%) were classified as a good result. Six of the eleven were ulcerative colitis patients.

Fair. Results in two patients (8%) were considered fair. These patients passed 11 or more stools in 24 hours and were more troubled with leakage. The ability to discriminate and to defer defecation was preserved.

Failure. Any complication leading to the re-establishment of an ileostomy led to inclusion in this classification. There have been two failures in this series (8%).

Patient number thirteen had severe inflammatory disease involving the rectal muscularis. Patchy portions of that muscle were sacrificed with the rectal mucosa–submucosa. Continuity was restored as a clinical trial. Poor continence following Stage II failed to improve over the next 14 months. A permanent ileostomy was established in December of 1978.

Patient 18 had intestinal continuity restored in June of 1977. A good result followed. She passed eight stools in 24 hours, was able to discriminate and to defer defecation. In November of 1978 a posterior fissure *in ano* was treated surgically. The closure of an anterior rectovaginal fistula and a diversionary ileostomy were performed in March of 1979. Abdominal exploration did not reveal Crohn's disease, however the pattern of anal inflammation strongly suggests granulomatous disease.

Complications

Twenty-one of the 29 patients in this series had one or more postoperative or late complications following rectal mucosal replacement. Table 3 lists the complications occurring within thirty days of surgery. Table 4 outlines problems related to rectal mucosal replacement occurring later than one month after operation. There has been no operative mortality in this series. The tables separate patients 1–9 from the remaining patients. A reduction in the frequency of

complications in patients 10–29 suggests that modification of the ileal graft and/or increased clinical experience may be responsible for the decrease in the incidence of complications.

Postoperative complications include the many varied problems associated with major abdominal surgery. In seven patients hemorrhage between the mucosal graft and the muscularis of the rectum was usually followed by purulent infection. Rectal irrigation with a 1% Neomycin solution and systemic antibiotics was effective therapy. Three of these patients developed the late complication of stenosis with loss of a part of the distal graft. In two other patients anal stenosis followed bleeding and infection.

Partial separation of the anastomosis between the mucosal graft and the anoderm occurred in two patients. Healing by secondary intention was not followed by narrowing of the lumen. The postoperative rectovaginal fistula followed an unplanned vaginal entry in patient 21 during the anterior rectal dissection of Stage II. A trial of hyperalimentation was followed by ileal diversion and closure of the fistula. An excellent result was reported after the restoration of intestinal continuity.

Late Complications

The most significant complication following Stage I is the loss of a portion of the graft. Progressive rectal stenosis is associated with shortening of the ileal segment. This complication probably results from a loss of blood supply to the graft. Each of the five patients with this problem had rectal reconstruction during Stage II. The stenotic distal graft was divided longitudinally to the muscularis. Any scarring or stenosis of the muscular layer was incised and the

TABLE 3. *Postoperative Complications*

	Patients 1–9	Patients 10–29	Total
Hemorrhage & infection (between graft & muscularis)	3	4	7
Ileus	3		3
Distal anastomotic separation		2	2
Wound infection	1	1	2
Anastomotic leak		1	1
Atelectasis	1		1
Intraperitoneal bleeding		1	1
Loss of ileostomy-partial		1	1
Rectovaginal fistula		1	1
Thrombocytopenia & bleeding		1	1
Thrombosed hemorrhoid	1		1
Transient neuropathy		1	1
Total	9	13	22

TABLE 4. *Late Complications*

	Patients 1–9	Patients 10–29	Total
Anorectal stricture	4	2	6
Intestinal obstruction	4	1	5
(surgical)	(2)	(1)	(3)
Loss of distal graft with stenosis	2	3	5
Distal anastomotic separation	1		1
Fissure *in ano*		1	1
Incontinence (fecal)		1	1
Mucosal flap obstruction		1	1
Rectovaginal fistula		1	1
Total	11	10	21

distal rectum dilated. The longitudinally divided terminal ileum was anastomosed to the grafted rectum and the anoderm. A temporary loop ileostomy was fashioned in three of the five patients to protect the anastomosis. The final results have been good to excellent in these patients.

Anorectal stricture refers to narrowing of the distal anastomotic line of sufficient severity to require surgical correction. Each of these patients was treated via proctoplasty. The stenosis was incised vertically and closed transversely in two or more areas.

Four patients had five bouts of intestinal obstruction following Stages I or II. One patient had an adhesive obstruction treated surgically two months after Stage I. A second obstruction in the same patient was treated by operation 16 months after Stage II. A second patient with adhesive obstruction required surgery. Two patients with obstruction responded to medical management.

Distal separation of the ileorectal anastomosis occurred six weeks after Stage II and was associated with an intramural abscess. Therapy included systemic and topical antibiotics with a short period of hyperalimentation.

Mucosal flap obstruction refers to a patient's inability to empty the rectal reservoir when straining because a fold or valve of mucosa occludes the lumen. Transanal excision of the mucosal valve relieved the problem. The remaining late complications are referred to in the discussion of patients with unsatisfactory results.

Synchronous Disease

Carcinoma

Two patients in this series had carcinoma treated as a part of colectomy and rectal mucosal replacement. Patient 14 had ulcerative colitis of 12 years duration. A poorly differentiated adenocarcinoma of

the rectosigmoid was removed in 1976 during Stage I. The tumor had extended through the bowel wall to the serosal layer. There was no evidence of metastasis to the lymph nodes. To date there has been no evidence of recurrent or metastatic cancer.

Patient 15, a 38-year-old woman with familial polyposis, underwent colectomy and rectal mucosal replacement in 1976. A well differentiated polypoid adenocarcinoma with early invasion of the submucosa was in the resected colon. To date there has been no evidence of recurrent or metastatic cancer.

Mesenteric Fibroma

Five of the 12 polyposis patients had one or more mesenteric fibromata observed at operation. Most of these lesions involved the mesentery of the small intestine as a tumor mass. Resection of one or more tumors in three patients was performed to facilitate rectal mucosal replacement or to avoid impending obstruction.

Fecal Continence Mechanisms

Fecal continence includes the ability to defer defecation to a convenient time and place and the ability to discriminate between solid, liquid, and gas. The universal acceptance of ileorectal anastomosis as a technique which conserves fecal continence suggests that the mechanisms of fecal continence lie within the anorectum.

A bolus of stool or flatus entering and distending the normal rectum results in relaxation of the internal sphincter (receptive relaxation) and similtaneous contraction of the external sphincter, puborectalis and levator ani muscles. Relaxation of the internal sphincter permits the sensory nerves located within the anoderm, described by Duthie and Gairns[1] to be exposed to the fecal bolus permitting discrimination between solid, liquid and gas. The external sphincter, puborectalis and levator ani muscles maintain their sustained contraction for only 30–45 seconds. In that interval the internal sphincter returns to its resting tone and the rectum adapts to the fecal bolus. Defecation may then be initiated at a convenient time and place.

An essential feature of this continence mechanism is the myenteric plexus of the muscular wall of the rectum which transmits the stimulus to the internal sphincter for receptive relaxation. The rectal muscular wall must be sufficiently elastic so the rectum may function as a reservoir. The anoderm with its nerve endings must be intact. The external sphincter, the puborectalis and the levator ani muscles must function normally. Disruption of any of these features will impair continence. The mucosa and submucosa of the rectum may be sacrificed without impairing fecal continence.

Nocturnal fecal continence in the patient with an ileorectal anastomosis follows gradual rectal adaption to an enlarging liquid fecal bolus. Nocturnal fecal continence is maintained as long as pressure within the rectum does not exceed the resting tone or resistance of the internal sphincter. The loss of elasticity or adapability of the rectal wall may disrupt nocturnal fecal continence.

Discussion

Less than optimal results with anal ileostomy as described by Ravitch and Sabiston[7] prompted investigation designed to eliminate ileal peristalsis and preserve rectal muscular function. In 1968 the first patient in this series had continuity restored by an end-to-end anastomosis. Frequent stools and nocturnal incontinence prompted diversion one month later. The grafted rectum functioned as a semirigid tube. The reservoir was developed to restore rectal function to the grafted rectum. Normal elasticity of the full thickness of ileum which makes up the anterior half of the reservoir re-established the relationship between the rectal wall and the internal sphincter, external sphincter and puborectalis muscles preserving the fecal continence mechanism.

A large series reported by Martin et al.[4] described a two stage technique of mucosal proctectomy and its replacement with ileum. Martin's patients needed a long period for adjustment suggesting gradual development of the terminal ileum as a reservoir.

The rectal muscular tube lined with ileum does not have normal peristaltic activity. It functions as a semirigid conduit similar to the short segment type of Hirschprung's disease. The absence of a significant megaileum proximal to a grafted rectum probably results from the passage of liquid to mushy stool. Three dogs were followed for one year after rectal mucosal replacement and the restoration of intestinal continuity as described in an earlier report.[5] The colon was anatomosed to the grafted rectum. At autopsy megacolon and stercoral ulceration were observed in these animals.

Satisfactory modification of the grafted rectum via construction of the rectal reservoir using the technique described in Stage II prompted the application of this technique to five patients with Hirschprung's disease. The aganglionic rectum was preserved and divided anteriorly and longitudinally to the level of the internal sphincter. A long side-to-side anastomosis of innervated

colon completed the composite rectum. These patients have satisfactory fecal continence.

Ferrari and Foukalsrud[2] reported the construction of a reservoir proximal to a grafted rectum in a single patient. Their patient had very frequent stools and ileitis distal to the reservoir, perhaps due to a partial functional obstruction. Utsunomiya[8] has constructed a "J" shaped ileal reservoir that is placed within the rectal muscularis during the first operation. The limited elasticity of the grafted rectum may limit reservoir function in Utsunomiya's patients.

Summary

The technique of rectal mucosal replacement with the construction of a rectal reservoir has been described. Seventeen patients with chronic ulcerative colitis and 12 patients with familial polyposis have had rectal mucosal replacement. Twenty-five patients have had continuity restored with the construction of a rectal reservoir. Eighty-four per cent of these patients have good to excellent results.

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