Omission of Temporary Diversion in Restorative Proctocolectomy—Is It Safe?

Joe J. Tjandra, M.D., Victor W. Fazio, M.D., Jeffrey W. Milsom, M.D., Ian C. Lavery, M.D., John R. Oakley, M.D., Jean M. Fabre, M.D.

From the Department of Colorectal Surgery, Cleveland Clinic Foundation, Cleveland, Ohio

PURPOSE: The aim of our study was to evaluate the safety and functional outcome of restorative proctocolectomy (RP) without diversion. METHODS: Fifty patients underwent RP without diversion for ulcerative colitis (82 percent), familial adenomatous polyposis (12 percent), and indeterminate colitis (6 percent). The perioperative course and functional outcome of these patients were compared with another group of 50 patients undergoing RP with diverting ileostomy during the same time period (1989–1991) and closely matched for age, gender, surgeon, diagnosis, extent and duration (median, 10 years) of colitis, prior colectomy (~22 percent), steroid use (40 percent), type of pouch, distance of ileal pouch-anal anastomosis from the dentate line (median, 1.5 cm), and the duration of follow-up (median, 12 months). All patients had a stapled ileal pouch-anal anastomosis without mucosectomy and a smooth conduct of the operation. RESULTS: There was no operative mortality. Anastomotic leaks and pelvic abscess were more common in patients without ileostomy (7/50 or 14 percent *vs.* 2/50 or 4 percent); 8 of these 9 patients were taking ≥20 mg of prednisone/day. Septic complications requiring relaparotomy (6 percent *vs.* 0 percent), prolonged ileus, and fever of unknown origin (10 percent *vs.* 4 percent) were also more common in patients without ileostomy. Despite similar functional results at 6 weeks and at 12 months after initial pouch function, patients without ileostomy had a poorer quality of life index (5 *vs.* 8; 10 being best) in the early period (0–6 weeks) of pouch function. CONCLUSION: In equally favorable cases, RP without diversion is not as safe as RP with diversion, especially in patients taking ≥20 mg of prednisone/day. [Key words: Restorative proctocolectomy; Ileoanal pouch; Postoperative complication]

Tjandra JJ, Fazio VW, Milsom JW, Lavery IC, Oakley JR, Fabre JM. Omission of temporary diversion in restorative proctocolectomy—is it safe? Dis Colon Rectum 1993; 36:1007–1014.

Restorative proctocolectomy (RP) is increasingly becoming the operation of choice for patients with ulcerative colitis and familial adenomatous polyposis. Because of the large number of suture or staple lines involved in RP and the fact that many patients with ulcerative colitis are on steroids and malnourished, a temporary defunctioning ileostomy has traditionally been used.[1]

However, disadvantages of a diverting stoma are well recognized.[2, 3] Tension on the small bowel mesentery frequently necessitates a fairly proximal loop ileostomy with resultant high stoma output, dehydration, and various metabolic sequelae. Other common problems include stoma retraction, peristomal skin irritation, and incomplete fecal diversion. Furthermore, additional cost and time off work are incurred with the care of a temporary stoma and a second operation for subsequent ileostomy closure is necessary, with its potential morbidity.

With increasing experience, there has been less trepidation about leaving the ileal pouch-anal anastomosis (IPAA) unprotected in selected patients. Early experience with this approach was disappointing and septic complications were considerable.[4] Since then a number of enthusiastic reports (Table 1) on a small number of variably selected patients have surfaced, reporting the incidence of anastomotic leaks to be around 13 percent (range, 0 to 25 percent). In addition, a number of patients had prolonged ileus or fever of unexplained origin that necessitated a prolonged hospital stay.[3, 5]

The aim of this study was to determine the postoperative complications and functional results in 50 patients who have undergone RP without diversion and compare them with a closely matched group of patients undergoing RP with a diverting ileostomy.

PATIENTS AND METHODS

Between 1989 and 1991, 50 patients at our institution underwent RP without a diverting ileostomy. A second group of 50 patients was retrospectively selected from the remaining 393 patients who had

Read at the meeting of The American Society of Colon and Rectal Surgeons, Chicago, Illinois, May 2 to 7, 1993.
Address reprint requests to Dr. Fazio: Department of Colorectal Surgery, Cleveland Clinic Foundation, 9500 Euclid Avenue, Cleveland, Ohio 44195.

Table 1.
Reports on One-stage Restorative Proctocolectomy

Reference	Patient No.	IPAA (Pouch)	Unexplained Fever/Ileus (%)	Anastomotic/Pouch Leaks (%)	Pouch* Failures (%)
Minneapolis[4]	6	?HSA (S)	NS	4 (67)	2 (33)
Carle Clinic[5]	21	HSA (J)	10 (48)	2 (10)	1 (5)
Mayo Clinic[6]	9	HSA (J)	2 (22)	0 (0)	1 (11)
Mayo Clinic[3]	37	HSA (J)	5 (14)	2 (5)	1 (3)
Oslo[7]	19	SA (Straight)	NS	2 (11)	2 (11)
San Jose[8]	38	SA	NS	5 (13)	0 (0)
Birmingham[9]	16	SA (J)	NS	2 (13)	3 (18)
Birmingham[10]	32	SA/HSA (J or W)	NS	?4 (12)	2 (6)
Cambridge[11]	29	HSA (W)	NS	4 (14)	NS
Tampere[12]	25	HSA (J)	NS	1 (4)	1 (4)
Virginia[13]	19	SA (J)	NS	3 (16)	3 (16)
Helsinki[14]	16	HSA (J)	NS	4 (25)	0 (0)
Leeds[15]	30	SA (W)	1 (3)	3 (11)	0 (0)
Present series	50	SA (J/S)	5 (10)	6 (12)	0 (0)

Abbreviations: IPAA = ileal pouch-anal anastomosis; HSA = handsewn IPAA; SA = stapled IPAA; NS = not stated.
* Pouch excision or ileostomy not closed.

a RP with a diverting ileostomy over the same period. The two groups were individually matched as in a previous report[6] with regard to age, gender, surgeon (n = 4), diagnosis (mucosal ulcerative colitis or familial adenomatous polyposis), extent of colitis, steroid intake, prior subtotal colectomy, type of pouch, technique of IPAA, distance of IPAA from dentate line, and the duration of follow-up (Tables 2 and 3).

Operative Techniques

Restorative proctocolectomy was performed as described previously.[1] All patients underwent complete mobilization of the root of the small bowel mesentery, total abdominal colectomy (if not already done), and proctectomy at the level of the anorectal ring. Ileal J-pouch was constructed by a stapled technique and S-pouch by a handsewn technique. All pouch-to-anal anastomoses in this study were performed by stapled techniques (Table 3). The doughnuts were inspected and the integrity of the anastomosis was checked by air and/or betadine insufflation. The distance of the IPAA from the dentate line was individually measured at the completion of the procedure.

The decision to use or to omit the diverting ileostomy was made at the end of the operation and was at the discretion of the individual surgeon. In general, the following preconditions were present: elective operation, absence of toxicity, severe malnutrition, and other co-morbid factors such as prolonged consumption of high-dose steroids, smooth conduct of the operation with good hemostasis, absence of tension on the IPAA, minimal intraoperative contamination, complete tissue

Table 2.
Patient Characteristics

	No Ileostomy (N = 50)	Diverting Ileostomy (N = 50)
Age—median (range)	32 (11–69) yr	34 (12–60) yr
Sex ratio (F:M)	35:15	36:14
Disease		
FAP (%)	6 (12)	6 (12)
UC (%)	41 (82)	41 (82)
Indeterminate (%)	3 (6)	3 (6)
Duration of colitis (mean ± 95% CL)	9.5 ± 2 yr	10 ± 2 yr
Previous abdominal colectomy (%)	12 (24)	10 (20)
Pancolitis* (%)	35 (70)	36 (72)
Use or prednisone†		
Overall (%)	20 (40)	20 (40)
≥20 mg/day (%)	7 (14)	9 (18)
Dose range (mg)	0–40	0–40
Laboratory indices (median (range))		
Serum albumin (g/l)	4.3 (3.3–5.2)	4.1 (3.5–5.0)
Hemoglobin (g/100 ml)	12.8 (9.0–16.0)	12.2 (9.3–15.1)

* As defined by colitis extending proximal to hepatic flexure.
† Refers to use of prednisone in the three months preceding surgery. All patients were on doses ≥20 mg/day for less than six months preceding surgery.

Table 3.
Comparison of Technical Details

	No Ileostomy (N = 50)	Diverting Ileostomy (N = 50)
Pouch design		
J (%)	32 (64)	32 (64)
S (%)	18 (36)	18 (36)
Stapled IPAA (%)	50 (100)	50 (100)
Double-stapled (%)	4 (8)	7 (14)
IPAA from dentate line (median (range))	1.5 (0.5–3) cm	1.5 (0.5–2.5) cm
Operative time of RP (median (range))	3.5 (1.8–6.5) hr	3.5 (2.0–5) hr
Operative blood loss (median (range))	450 (100–1200) ml	525 (200–1900) ml
Transfusion		
None (%)	36 (72)	38 (76)
1 unit (%)	7 (14)	4 (8)
2 units (%)	7 (14)	8 (16)

doughnut rings, intact pouch, and IPAA on intraoperative testing. These same criteria were applied to the selection of matched controls with a diverting ileostomy in this study.

Postoperative Management

All patients had prophylactic parenteral broad-spectrum antibiotics for at least 48 hours and, if clinically indicated, for a more prolonged period. In forty-six (92 percent) patients without a diverting ileostomy, a 24-French Foley catheter was used to decompress the ileal pouch transanally until passage of stool and flatus occurred and usually remained in place for four to eight days. Postoperative management was not influenced by the presence or absence of a diverting ileostomy. All patients had a gastric decompression tube for at least 48 hours. A sump drain was left in the pelvis until the drainage was less than 50 ml/day and usually for four to seven days.

First follow-up data were obtained six weeks (range, 4–8 weeks) after initial pouch function (*i.e.*, after closure of the temporary ileostomy if applicable) and was performed by personal interview using a standard questionnaire[7] to evaluate the bowel function and quality of life. Incontinence was graded as none, spotting (staining of clothing with liquid stool or mucus), or gross fecal incontinence. Pouchitis was defined as the episodic onset of frequent watery, often bloody, stools accompanied by fever, lethargy, and vague lower abdominal discomfort that responded promptly to oral metronidazole.

Results of surgery were compared between the two groups of patients. Comparisons of proportions were made with the chi-squared test. Probability values < 0.05 were considered to be statistically significant.

RESULTS

Patient Characteristics

Patient characteristics and operative details are shown in Tables 2 and 3, respectively. Patient characteristics, nature and severity of disease, and the techniques of pouch construction were similar between patients with and without a diverting ileostomy. The operative time of RP, the amount of operative blood loss, and the transfusion requirements were also similar. The median postoperative hospital stay was 11 days (range, 7–24 days) for the no-ileostomy group, compared with 9 days (range, 6–12 days) for the matched IPAA patients with a diverting ileostomy.

Postoperative Complications

These compications are listed in Table 4. There was no operative mortality in either group. The incidence of overt anastomotic leaks and pelvic sepsis was significantly higher in the patients without temporary diversion (14 percent *vs.* 4 percent; $P < 0.05$, chi-squared). Of those patients with septic complications, six of seven patients without a diverting ileostomy and two of two patients with an ileostomy were on 20 to 30 mg of prednisone/day in the three months preceding surgery. Of patients who underwent RP without diversion, the incidence of septic complications was higher in those on ≥20 mg of prednisone/day compared with

Table 4.
Postoperative Complications After Restorative Proctocolectomy

	No Ileostomy (N = 50)	Diverting Ileostomy (N = 50)
None (%)	35 (70)	41 (82)
Death (%)	0 (0)	0 (0)
Leakage		
IPAA (%)	5 (10)	2 (4)
Pouch (%)	1 (2)	0 (0)
Pelvic abscess* (%)	3 (6)	1 (2)
Pouch-vaginal fistula (%)	1 (2)	0 (0)
Ileus > 7 days ± fever†	5 (10)	2 (4)
Small bowel obstruction‡	0 (0)	1 (2)
Wound infection (minor)	2 (4)	1 (2)
Failures (pouch excision or ileostomy not closed)	0 (0)	0 (0)
Stoma related§ (%)		3 (6)
Gastrocutaneous fistula‖ (%)	1 (2)	
Pneumonia (%)	2 (4)	1 (2)
Relaparotomy		
Pelvic sepsis (%)	3 (6)	0 (0)
Bleeding mesenteric vessel (%)	1 (2)	0 (0)

* Associated with disruption of IPAA (n = 2; one with and one without diverting ileostomy), ileal pouch (n = 1), and pelvic hematoma (n = 1).
† No obvious site of sepsis.
‡ Occurring within six weeks after surgery.
§ Stoma retraction (n = 2) or high stoma output (n = 1).
‖ From gastrostomy tube site.

the remaining patients (6/7 or 86 percent *vs.* 1/43 or 2 percent; $P < 0.05$, chi-squared).

The clinical presentations of these nine patients (two of nine patients had RP with a diverting ileostomy) with septic complications were often subtle but usually developed around the sixth postoperative day (range, 4–15 days). They commonly presented with fever (n = 8), ileus (n = 5), vague abdominal pain (n = 5), sphincter spasm (n = 5), or urinary retention (n = 4). Proctoscopy demonstrated the presence of a defect in the IPAA in two of seven patients by noting the presence of pus in the lumen. Gastrografin® (E. R. Squibb & Sons, Inc., Princeton, NJ) pouchogram was diagnostic in all six patients in which it was performed. Examination under anesthesia detected the defect in the IPAA in all seven patients examined. Computerized tomographic scan of the abdomen and pelvis was helpful in detecting the presence of pelvic abscess in three of four patients. The most common (5/7) site of defect in IPAA was at the anterior staple line.

In patients without diversion, secondary treatment for partial dehiscence of IPAA (n = 5) and ileal pouch (n = 1) depended, to a large extent, on the severity of the sepsis. Four patients with a minor defect of IPAA underwent transanal repair of the anastomotic dehiscence and were managed with parenteral antibiotics, bowel rest, and parenteral nutrition. One of these patients required subsequent laparotomy, drainage of pelvic abscess, and diversion. Two patients had pelvic abscess associated with a defect in the upper end of the ileal pouch in one patient and with a 1-cm defect in the IPAA in another patient. Both patients underwent laparotomy, formal drainage of the pelvis, and diversion; one of them also had transanal repair of the IPAA at the same time.

One patient had a significant intra-abdominal bleed from a mesenteric vessel which was controlled at relaparotomy. Two weeks later, the patient developed a minor perianastomotic collection that was detected by examination under anesthesia and transanastomotic needle aspiration and was successfully managed by parenteral antibiotics. In patients who had a diverting stoma, the pelvic abscess (n = 1) was drained percutaneously under computerized tomographic guidance and in another patient the small defect in IPAA was repaired transanally. None of these patients had pouch ex-

cision as a result. In all cases, the diverting ileostomy was successfully closed.

Prolonged ileus beyond seven days and/or fever (>38°C) of unknown cause were also more common in patients without temporary diversion (10 percent *vs.* 4 percent; $P < 0.05$, chi-squared); five of these seven patients were treated empirically with parenteral antibiotics and bowel rest with a successful outcome. Only one of these seven patients was on prednisone (10 mg/day) prior to surgery. Pouch-vaginal fistula developed during the second postoperative week in one patient. It closed spontaneously without surgical intervention.

Complications Associated with Ileostomy Closure

Fifty patients with a temporary diverting ileostomy underwent stoma closure 8 to 21 weeks (median, 12 weeks) later; all of them through a parastomal incision. The median hospital stay was 5 days (range, 3 to 12 days). Postoperative complications included ileus prolonged beyond seven days (n = 4), small bowel obstruction that settled with nonoperative management (n = 3), fever of unknown cause (n = 1), and minor wound infection (n = 1).

Functional Outcome

Functional results were similar in the two groups of patients (Tables 5 and 6) with or without temporary diversion, either at six weeks after initial pouch function or at the conclusion of the study. The functional outcome in patients who had anastomotic dehiscence and pelvic sepsis was also very similar. However, the quality of life index, as assessed by patients, was significantly worse in the early postoperative period in patients without temporary diversion (Table 6).

DISCUSSION

The results of one-stage restorative proctocolectomy without diversion have been variable (Table 1). The number of patients tends to be small and often not comparable to the control patient population with a diverting ileostomy. The one-stage

Table 5.
Functional Results After Restorative Proctocolectomy

	No Ileostomy		Ileostomy	
	First FU	Last FU	First FU	Last FU
Follow-up				
Median	6 wk	12 mo	6 wk	12 mo
Range	4–8 wk	6–36 mo	4–8 wk	6–41 mo
Stool frequency				
Median	9	5	9	5
Range	4–20	2–15	5–18	2–20
Nocturnal defecation				
Median (/night)	2	1	2	1
Range (/night)	0–4	0–3	0–4	0–3
Urge suppression				
Median (hr)	0.5	1	0.3	1
Range (hr)	0–2	0.5–10	0–3	0.2–10
Continence				
Perfect (%)	9 (18)	33 (66)	11 (22)	29 (58)
Spotting (%)	34 (68)	16 (32)	35 (70)	19 (38)
>1/wk (%)	23 (46)	9 (18)	20 (40)	7 (14)
Gross incontinence (%)	7 (14)	1 (2)	4 (8)	2 (4)
Antidiarrheal medications				
Regular use (%)	50 (100)	16 (32)	50 (100)	18 (36)
Intermittent (%)	0 (0)	25 (50)	0 (0)	20 (40)
None (%)	0 (0)	9 (18)	0 (0)	12 (24)
Pouchitis (%)	2 (4)	11 (22)	1 (2)	9 (18)

FU = follow-up.

Table 6.
Outcome After Restorative Proctocolectomy

	No Ileostomy (N = 50)		Ileostomy (N = 50)	
	6 wk	Last FU	6 wk	Last FU
Quality of life*				
Median	5	9	8	9
Range	1–7	3–10	3–10	6–10
Quality of health*				
Median	5	9	8	9
Range	1–8	3–10	4–10	5–10
Energy level*				
Median	3	8	7	8
Range	1–7	3–10	3–10	5–10
Satisfaction with outcome*				
Median	5	9	8	9.5
Range	1–8	3–10	5–10	8–10
Dietary restrictions				
Patient no. (%)	50 (100)	17 (34)	50 (100)	12 (24)
Social restrictions				
Patient no. (%)	50 (100)	4 (8)	36 (72)	4 (8)

* Score, as assessed by patients, was obtained using an analogue scale 1 to 10; 10 being the best.

group tends to be healthier[8, 9] and have a technically easier operation.[3–6, 8–15] In some studies,[9, 12, 16] a stapled IPAA is preferentially used for one-stage RP without diversion, in the belief that, compared with mucosectomy and a handsewn anastomosis, it is technically easier, safer, and is associated with less tension in the small bowel mesentery. Thus, interpretation of data from these studies has to take into account these inherent biases. There has also been no consistent data on the criteria that temporary diversion can be safely omitted, especially with regard to the use of steroids[13, 17] and duration or activity of colitis.[3]

This is the first report of a large number of closely matched patients who have undergone RP with or without diversion, with comparable patients, surgeons, techniques, and operative course. This is the clinical situation usually regarded as "low-risk"[1] with very low septic complication rates (<5 percent in this study) when RP with a temporary ileostomy was performed. In this study, the frequency of pouch-related complications following one-stage RP was comparable to the published reports (Table 1). However, these complications (14 percent *vs.* 4 percent) and their relaparotomy rate (6 percent *vs.* 0 percent) were significantly more frequent when compared with the matched RP patients with temporary diversion. Additionally, fever and prolonged ileus without documented site of sepsis were also more common in patients undergoing RP without a diverting ileostomy.

Septic complications after RP without a diverting ileostomy were more common in patients taking ≥20 mg of prednisone/day. Most dehiscences of IPAA occurred at the anterior anastomotic line and mostly appeared around the sixth postoperative day, often soon after the catheter draining the pouch was removed. Thus, more prolonged pouch decompression with a catheter transanally might have a protective effect. It is possible that a newly created ileal pouch may not evacuate well and a full pouch lying in the sacral hollow may exert excessive tension on the anterior anastomotic line. Others have similarly reported beneficial effects from the use of a pouch decompression tube,[3] intraluminal bypass tube of Coloshield™ (Deknetel, Fall River, MA) type,[18] and prolonged bowel rest with or without long decompression tube inserted *via* a gastrostomy.[5] Use of total parenteral nutrition in the postoperative period has also been advocated,[5, 6] but it is doubtful whether significant advantage is conferred by a short period of total parenteral nutrition.

Of the series reported to date, studies from two centers[3, 13] stood out as having the lowest incidence of pouch-related complications following RP without diversion. In both reports, mucosectomy and a handsewn IPAA were employed. Compared with a stapled anastomosis, these techniques usually involve significantly more anal manipulation with resultant weakness of the anal sphincters for a period postoperatively.[19] This feature, along with a handsewn anastomosis that is invariably lower in the anal canal than a stapled anastomosis, might result in easier pouch evacuation and, thereby, a more effective pouch decompression in the immediate postoperative period. These may account for the apparent superior results in terms of anastomotic integrity of these two reports[3,13] compared with others (Table 1) that employed a stapled anastomosis. Although the functional results were often not formally examined in those reports, there are suggestive data[20] that, compared with a stapled anastomosis, a handsewn anastomosis is assoicated with more nocturnal fecal seepage.

Pouch-related complications that developed following one-stage procedures were all potentially serious, requiring urgent therapeutic intervention.

One-half of these were managed by transanal repair and/or antibiotics without a laparotomy. The fact that this group of patients with septic complications had similar functional outcome as those without complications is possibly a reflection of prompt therapeutic intervention.

While care of a temporary ileostomy for two to four months incurred time, inconvenience, and cost, closure of ileostomy in this study was relatively safe and incurred minimal morbidity. In contrast to a reported incidence of pouch failure of 0 to 33 percent (Table 1) from septic sequelae following one-stage RP without diversion, an ileostomy-related complication rarely leads to pouch failure and permanent diversion. Furthermore, patients with temporary diversion were at a better physical and mental state to cope with the urgency and frequent bowel movements that were prevalent in the first few weeks of pouch function. This was reflected in the superior quality of life index at six-week follow-up of patients with prior temporary diversion, despite similar functional results.

This study highlights what can safely be achieved in good-risk patients with temporary diversion in whom the RP procedure has proceeded smoothly. Under very favorable circumstances, loop ileostomy may be omitted in some patients. However, at present, the role of one-stage RP without diversion is not fully defined. We regard certain preconditions as being important: surgical expertise, elective nature of the surgery, absence of toxicity, malnutrition, co-morbid problems, and factors adverse to anastomotic healing such as anemia, prolonged consumption of high-dose steroids, and inadequate bowel preparation. Additionally, it is important that the operation has proceeded smoothly, with good hemostasis, minimal contamination, lack of tension on IPAA, complete tissue rings, intact pouch, and IPAA. Despite these careful selection criteria, RP without diversion was still associated with a higher incidence of septic complications (especially in those taking $\geq$20 mg of prednisone/day) and a more prolonged recovery period.

Often a decision to omit a covering ileostomy can only be made at the end of the procedure. This should only be considered in highly motivated patients who have been fully informed of the attendant risks and benefits of the options available. Careful postoperative care, including the use of a pouch decompression tube and prompt therapeutic intervention in the presence of pelvic sepsis or anastomotic dehiscence, is also crucial.

CONCLUSION

As to the question whether "omission of temporary diversion in RP is safe," this has to be considered in relation to the greater safety and better quality of life in the immediate postoperative phase with the use of a covering ileostomy, weighing them against the restrictions and problems associated with temporary diversion. Based on our data, the answer is a qualified "yes" in highly selected patients but we would caution enthusiasm for RP without temporary diversion until the criteria for omission of an ileostomy are fully defined.

ACKNOWLEDGMENT

The authors thank Dr. James Church for his assistance in the preparation of this manuscript.

REFERENCES

1. Fazio VW, Tjandra JJ, Lavery IC. Techniques of pouch construction. In: Bartolo D, Mortensen N, Nicholls J, eds. Techniques to restorative proctocolectomy. Oxford: Blackwell Scientific Publications (in press).
2. Fazio VW, Tjandra JJ. Prevention and management of ileostomy complications. J ET Nurs 1992;19: 48–53.
3. Galandiuk S, Wolff B, Dozois R, Beart R Jr. Ileal pouch-anal anastomosis without ileostomy. Dis Colon Rectum 1991;34:870–3.
4. Wong WD, Rothenberger DA, Goldberg SM. Ileoanal pouch procedures. Curr Probl Surg 1985;22:9–78.
5. Thow GB. Single-stage colectomy and mucosal proctectomy with stapled antiperistaltic ileoanal reservoir. In: Dozois RR, ed. Alternatives to conventional ileostomy. Chicago: Year Book Medical Publishers, 1985:420–32.
6. Metcalf AM, Dozois RR, Kelly KA, Wolff BG. Ileal pouch-anal anastomosis without temporary, diverting ileostomy. Dis Colon Rectum 1986;29:33–5.
7. Emblem R, Larsen S, Torvet SH, Bergan A. Operative treatment of ulcerative colitis: conventional proctectomy with Brooke ileostomy versus mucosal proctectomy with ileoanal anastomosis. Scand J Gastroenterol 1988;23:493–500.
8. Peck DA. Stapled ileal reservoir to anal anastomosis. Surg Gynecol Obstet 1988;166:562–4.
9. Kmiot WA, Keighley MRB. Totally stapled abdominal restorative proctocolectomy. Br J Surg 1989;76: 961–4.

10. Hosie KB, Grobler SP, Keighley MRB. Temporary loop ileostomy following restorative proctocolectomy. Br J Surg 1992;79:33–4.
11. Everett WG, Pollard SG. Restorative proctocolectomy without temporary ileostomy. Br J Surg 1990;77:621–2.
12. Matikainen M, Santavirta J, Hiltunen K-M. Ileoanal anastomosis without covering ileostomy. Dis Colon Rectum 1990;33:384–8.
13. Sugerman HJ, Newsome HH, Decosta G, Zfass AM. Stapled ileoanal anastomosis for ulcerative colitis and familial polyposis without a temporary diverting ileostomy. Ann Surg 1991;213:606–19.
14. Jarvinen HJ, Luukkonen P. Comparison of restorative proctocolectomy with and without covering ileostomy in ulcerative colitis. Br J Surg 1991;78:199–201.
15. Sagar PM, Lewis W, Holdsworth PJ, Johnston D. One-stage restorative proctocolectomy without temporary defunctioning ileostomy. Dis Colon Rectum 1992;35:582–8.
16. Tjandra JJ, Fazio VW, Church JM, Lavery IC, Milsom JW. Functional results after restorative proctocolectomy are similar in patients with familial adenomatous polyposis and mucosal ulcerative colitis. Am J Surg (in press).
17. Scott NA, Dozois RR, Beart RW Jr. Postoperative intra-abdominal and pelvic sepsis complicating ileal pouch-anal anastomosis. Int J Colorectal Dis 1988;3:149–52.
18. Launer DP, Sackier JM. Pouch-anal anastomosis without diverting ileostomy. Dis Colon Rectum 1991;34:993–8.
19. Tjandra JJ, Fazio VW. Indications for and results of ileal pouch. Curr Pract Surgery (in press).
20. Tuckson WB, Lavery IC, Fazio VW, Oakley JR, Church JM, Milsom JW. Manometric and functional comparison of ileal pouch-anal anastomosis with and without anal manipulation. Am J Surg 1991;161:90–6.