

S-Pouches *vs.* J-Pouches

A Comparison of Functional Outcomes

S. M. MCHUGH, M.D., N. E. DIAMANT, M.D., R. MCLEOD, M.D., Z. COHEN, M.D.

McHugh SM, Diamant NE, McLeod R, Cohen Z. S-pouches *vs.* J-pouches: a comparison of functional outcomes. *Dis Colon Rectum* 1987;30:671-677.

Subjects undergoing proctocolectomy with ileoanal anastomosis of either a J-shaped or an S-shaped ileal reservoir were studied with respect to functional status. Both subjective and objective measures were used. The S-pouch subjects appeared to have better early functional results, but no differences were found between groups evaluated at least one year from ileostomy closure. While virtually all subjects preferred restorative proctocolectomy to their previous loop ileostomy, there was a relatively high frequency of bowel-related symptoms, worries about bowel activity, and associated behavioral changes. The actual significance of these symptoms is difficult to determine at present. Further assessment of the quality of life in individuals with restorative proctocolectomy in comparison with subjects undergoing alternative surgical treatments is recommended. [Key words: Pelvic pouch; Ileoanal anastomosis; Continence; Restorative proctocolectomy]

PROCTOCOLECTOMY WITH pelvic pouch and ileoanal anastomosis is often the surgical procedure of choice for young individuals with normal sphincter function who require proctocolectomy because of ulcerative colitis or familial polyposis. Since the initial reports,^{1,2} techniques have been modified to reduce complications and improve functional results. This has led to a reduction in rectal cuff length from 8 to 10 cm to 2 to 3 cm and a variety of different pouch constructions, including two-limb (J-

From the Divisions of Gastroenterology, Toronto Western Hospital, and General Surgery, Toronto General Hospital, Toronto, Ontario, Canada

pouch and lateral isoperistaltic pouch), three-limb (S-pouch), and even four-limb (W-pouch) constructions.

The preservation of continence and more normal defecation patterns in subjects undergoing such surgery depends upon multiple factors. These include normal resting anal canal pressures,^{3,4} the ability to augment anal canal closure through voluntary contraction,^{5,6} the size and compliance of the ileal pouch^{7,8} and its position within the pelvis,⁹ the nature of the pouch motor activity,^{10,11} and the efficiency of evacuation.¹²

Previous reports have suggested that the S-shaped reservoir attains a larger capacity than J-shaped pouches and that individuals with S-pouches experience fewer bowel movements than J-pouch subjects.^{8,13,14} However, there is no consistent evidence that the S-pouches are associated with a better functional result.

This report compares the functional outcomes of subjects who have had three different types of pouch constructions (J-pouch long rectal cuff of 8 to 10 cm, J-pouch short rectal cuff of 2 to 3 cm, and S-pouch short rectal cuff of 2 to 3 cm). This evaluation was performed in collaboration with, but independently of, the surgical team.

Patients and Methods

Between December 1981 and January 1985, 89 patients underwent restorative proctocolectomy with loop ileostomy closure. Of these, 74 had restoration of gut conti-

Read at the meeting of the American Society of Colon and Rectal Surgeons, Houston, Texas, May 11 to 14, 1986.

Supported through the Elsie Watt Foundation.

Address reprint requests to Dr. McHugh: Division of Gastroenterology, Toronto Western Hospital, 399 Bathurst Street, Toronto, Ontario M5T 2S8, Canada.

nunity for longer than three months at the time of this follow-up evaluation. Until July 1983, rectal cuffs of 8 to 10 cm were fashioned; after this date, cuffs of 2 to 3 cm were used. Of the 70 responding subjects, 31 subjects had a J-pouch and long rectal cuff (J-long), 20 subjects had a J-pouch and short rectal cuff (J-short), and 19 subjects had an S-pouch and short rectal cuff (S-short). Two subjects had an S-pouch with long rectal cuff and were excluded from analysis. Details of the surgical procedure have been described in a previous report.¹⁵

All subjects in this surgical series were asked to complete a 59-item questionnaire and maintain a self-monitoring diary of bowel activity and soiling events for ten days. The questionnaire dealt with gastrointestinal symptoms including questions related to pouch catheterization and general systemic symptoms. The majority of questions were attitudinal and asked for a response between "strongly agree" or "strongly disagree" on a 5-point Likert-type scale. All trips to the toilet other than for urination and the reason for the trip (bowel movement, passage of gas, or a change of underwear or protective pads due to an accident or fecal staining) were recorded in self-monitoring diaries.

The survey was repeated eight months later for all S- and J-pouch subjects with a short rectal cuff who responded to the first survey ($N = 34$), using the same questionnaire and self-monitoring diary.

Statistical analyses included Student's *t* tests comparing the mean questionnaire scores between the groups, regression analyses comparing self-monitoring diary and questionnaire results, and factor analyses comparing the questionnaire results to the self-monitoring diary data. All data are reported as the mean \pm standard deviation (SD).

Results

Subjects: Seventy of the 74 potential subjects participated in this study. There were 42 males (mean age, 34 years; range, 16 to 55) and 28 females (mean age, 34 years; range, 18 to 50). Ninety-five percent of the respondents had ulcerative colitis as an indication for surgery. The time of longest follow-up refers to the first survey for the J-long, and the second survey for the J-short and S-short subjects. The response rates for completion of the questionnaire were 95 percent (70/74) and 94 percent (32/34) at the time of the first and second surveys, respectively. The response rates for the self-monitoring diaries were 80 percent (59/74) and 82 percent (28/34) at the time of the first and second surveys, respectively. Reasons for not participating in either the first or second survey included language barrier, refusal, and moving to a nontraceable address. The demographic profile of subjects was similar in the three groups. Of working subjects at point of longest follow-up, 90 percent of J-long, 70 percent of

J-short, and 83 percent of S-short subjects had missed no time (or less than three days) from work in the preceding year because of symptoms related to bowel dysfunction.

Ileostomy Closure Interval: At the time of the first survey, the interval from ileostomy closure was 26 ± 8.0 months for the J-long, 9 ± 6.2 months for the J-short, and 4 ± 4.4 months for the S-short subjects. At the time of the second survey, the ileostomy closure interval was 18 ± 6.8 months for the J-short and 11 ± 5.8 months for the S-short subjects. Self-monitoring diaries at both survey times were completed within one month of the questionnaires.

Subjective Reports:

Short and Long Cuffs: At the time of the first survey, there were differences between J-pouch subjects with short and long cuffs. While the J-long subjects used protective pads more regularly ($P = .034$), the J-short cuff subjects reported more urgency ($P = .045$), had more worries of incontinence of flatus during social activities ($P = .004$), and had more worries of the possibility of losing control over bowel activity and soiling themselves ($P = .034$). In addition, J-short cuff subjects were more likely to feel that soiling occurred largely during sleep ($P = .042$). All these differences had disappeared when the responses of the J-short subjects in the second survey were compared with the J-long subjects in the first survey.

Compared with the J-long subjects, S-pouch short cuff subjects at the time of the second survey (follow-up time: J-long 25.8 ± 8 mo; S-short 11.4 ± 5.8), used pads more regularly ($P = .013$), felt they soiled only at night ($P = .013$), and worried more about passing flatus on social occasions ($P = .031$).

Short Cuffs—S- and J-Pouches: In the first survey, the J-short subjects reported considerably more symptoms related to bowel function than the S-short. They had more urgency ($P = .0015$) and more bowel movements per 24-hour period ($P = .033$). Significantly more felt their bowel movement frequency constituted a significant problem ($P = .006$) and that their bowel activity generally interfered with daily life ($P = .023$) and was likely to get them up at night ($P = .018$). They tended to avoid more social activities because of bowel activity ($P = .025$), were more likely to look for the location of toilets in unfamiliar surroundings ($P = .05$), and, overall, worried more about losing control of bowel activity and soiling themselves ($P = .03$).

At the time of the second survey, the S-short and J-short subjects differed in that more S-short patients felt that their soiling tended to occur only at night ($P = .03$). This represented a shift in attitudes of the S-pouch subjects, who had previously experienced soiling at night and in the daytime.

When the results of the two surveys were compared, only a few differences were noted between the responses of

each group. Within the J-short group, subjects worried less about the passage of flatus during social occasions ($P = .04$) than they had previously. Within the S-short group, subjects reported more urgency about getting to the toilet to have a bowel movement ($P = .025$) than they had previously and now felt that their fecal soiling occurred only at night ($P = .046$).

Bowel Symptoms: At the point of longest follow-up, one of 28 J-long, two of 16 J-short, and one of 16 S-short subjects reported ever having required a catheter to assist in pouch emptying. At the time of the first survey, the percentage of subjects using antidiarrheal medications ranged from 35 percent (J-long) to 50 percent (J-short), and 56 percent (S-short). The bulking agent Metamucil® was used by 28 percent (J-long), 6 percent (J-short), and 17 percent (S-short) of subjects. At follow-up, the percentage taking antidiarrheal medications was 35 percent (J-short) and 56 percent (S-short) while the percentage of subjects taking the bulking agent was 18 percent (J-short) and 19 percent (S-short).

Concerns about bowel activity were common among the subjects (Table 1). Thirty percent of subjects worried

about their bowel habit to some degree. A similar proportion (35 percent) felt their bowel activity constituted a significant problem that interfered with daily activities (22 percent) or caused them to miss meals before social activities (30 percent), or avoid social activities altogether (23 percent). Only 43 percent of subjects felt their bowel activity was predictable. Therefore, it was not surprising that 41 percent of subjects looked specifically for the location of toilets upon finding themselves in unfamiliar surroundings.

Over half (51 percent) of the subjects considered themselves as having problems with "diarrhea" (not defined), with 38 percent describing problems with bowel movement frequency and 56 percent describing their stool as generally watery. Decreased ability to sense flatus since surgery was noted by 55 percent of subjects. Only 16 percent of subjects had total absence of fecal soiling (defined simply as staining of underwear). Over half of the subjects (55 percent) reported that this occurred only occasionally while 20 percent reported that fecal soiling was a significant problem. Protective pads were used regularly by 32 percent of subjects and 27 percent reported

TABLE 1. Pouch Subjects' Symptoms

Symptom	Percentage of Subjects*	Symptom	Percentage of Subjects*
Bowel Activity		Defecation Habits	
Worry about bowel activity	30	Never catheterize pouch	94
Feel bowels are predictable	43	Use antidiarrheal medications	42
Feel bowel activity is a significant problem	35	Use bulking agents	22
Bowel frequency is a significant problem	38	Control of Flatus	
Have problems with diarrhea	51	Less able to sense flatus	55
Nocturnal bowel movements		Little control over flatus	23
None	20	Worry about passage of flatus	12
Once	38	Difficulties passing flatus	34
More than once	33	Fecal Incontinence	
Interference in Activities		Staining of underwear	
Feel bowel activity interferes in daily life	22	Never	16
Avoid social activities because of bowel activity	23	Occasionally	55
Avoid eating before social activities	30	Frequently	12
Look for location of toilets in new places	41	Once or more daily	17
Bowel Symptoms		Use pads regularly	32
Have a sense of incomplete evacuation of pouch	39	Fecal soiling only at night	44
Have a sense of urgency about getting to toilet	26	Fecal soiling mainly at night	55
Have to strain to empty pouch	41	Feel soiling is a significant problem	20
Stool is usually watery	56	Worry about losing bowel control	27
		Sexual Dysfunction†	
		Female (N = 29)	
		Intercourse avoidance because of soiling worries	10
		Males (N = 41)	
		Ejaculatory disorder	12
		Impotence	5

*Subjects with a positive response scored on Likert scale.

†Intermittent or continuous.

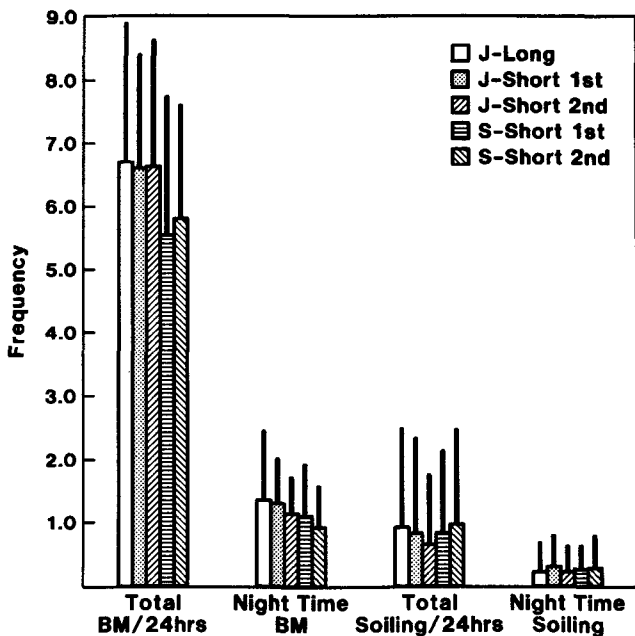


FIG. 1. Self-monitoring diary data. The frequencies of bowel movements and soiling for each type of pouch construction do not differ significantly. The J-short and S-short are differentiated according to the first and second survey times while the J-long were surveyed only once.

worries about possible soiling.

Despite the relatively high frequency of bowel-related concerns, 94 percent of survey subjects reported that they preferred their surgically constructed pouch with anal anastomosis as compared with the defunctioning ileostomy which they had had for three or more months. The same percentage of subjects stated that they would

recommend their surgical procedure to other subjects who had a choice between these two alternatives.

Sexual Function: There were no differences between the groups with respect to increases or decreases in sexual drive before and after surgery. When subjects were asked open-ended questions about whether they had experienced any sexual difficulties since their surgery, 10 percent of females (N = 3) volunteered that they avoided intercourse because they were afraid that they would lose control over their bowels and have an accident, although none actually described having had such accidents. Five percent of males reported some erectile problems (N = 2) and 12 percent reported some form of ejaculatory disturbance (N = 5). These figures include both intermittent or continuous difficulties.

Objective Outcomes: The mean number of bowel movements per 24-hour period did not differ significantly between any of the surgical groups (Fig. 1) because of the wide intersubject variation (Fig. 2) and relatively small number of subjects in each group. Short and long J-pouch subjects had seven bowel movements per 24 hours and subjects with S-pouches had six bowel movements per 24 hours. Similarly, all subjects [92 percent (J-long); 100 percent (J-short, both surveys); 87 percent (S-short, both surveys)] made one trip (on the average) to the toilet at night during the period in which they recorded their bowel activity (9.0 ± 1.8 days). The grouped diary data showed frequencies of soiling ranging from two to three episodes during the ten nights and four to seven episodes during the ten days (Table 2). Soiling occurred in relatively few individuals as the majority of subjects [81 percent (J-long), 73 to 78 percent (J-short, first and second surveys), and 69 percent (S-short, both surveys)] recorded

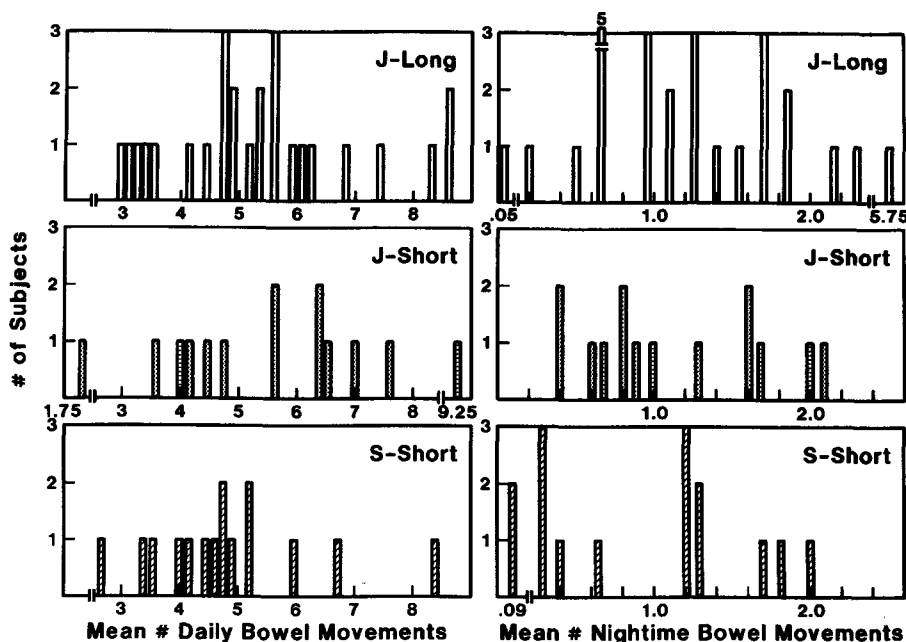


FIG. 2. Histogram of bowel movement frequency according to pouch type. There is considerable variation in total and nocturnal bowel movement frequency irrespective of pouch construction.

TABLE 2. *Self-Monitoring Diary Outcomes*

	Pouch and Cuff Construction Type				
	J-long	J-short		S-short	
		First	Second	First	Second
Mean no. bowel movements per 24 hours (\pm SD)	6.7 (\pm 2.3)	6.58 (\pm 1.8)	6.84 (\pm 2.0)	5.54 (\pm 2.2)	5.89 (\pm 1.8)
Number of nighttime bowel movements (\pm SD)	1.35 (\pm 1.1)	1.3 (\pm 0.7)	1.19 (\pm 0.6)	1.07 (\pm 0.8)	0.94 (\pm 0.6)
Episodes of daytime soiling (\pm SD)	0.70 (\pm 1.2)	0.53 (\pm 1.13)	0.41 (\pm 0.77)	0.61 (\pm 0.9)	0.57 (\pm 1.0)
Episodes of nighttime soiling (\pm SD)	0.22 (\pm 0.5)	0.30 (\pm 0.5)	0.26 (\pm 0.4)	0.26 (\pm 0.4)	0.27 (\pm 0.5)
Mean no. episodes of soiling/24 hours (\pm SD)	0.92 (\pm 1.52)	0.83 (\pm 1.42)	0.67 (\pm 1.09)	0.87 (\pm 1.11)	0.84 (\pm 1.5)

no soiling during the self-monitoring periods. Daytime bowel activity, daytime soiling, nighttime bowel activity, and nighttime soiling were each regressed against the length of time from ileostomy closure (12 to 42 months for J-long, 7 to 30 months for J-short, and 5 to 25 months for S-short). None of these regressions was statistically significant.

Discussion

Most surgical centers have performed one type of pouch construction predominantly. Therefore, comparisons of the various pouch constructions have required comparisons of different surgical series. While subjects' ability to defecate spontaneously without pouch catheterization is fairly easy to elicit by questioning, individual continence abilities are more difficult to determine. Rarely have the different surgical series used similar definitions of continence and some have not even defined it at all.¹⁶⁻¹⁸ Consider the following terminologies: "satisfactory" continence¹⁸; gross rectal continence (patient is socially functional)⁸; total continence⁷; normal continence¹⁹; or excellent continence.² Other investigators have used similar terminology but have defined it differently. Stryker *et al.*¹¹ define seepage as minor staining resulting in spots of < 2.5 cm in diameter and soiling as the need to wear a pad; while Nicholls *et al.*¹⁹ define minor leaks as the need to wear a pad; and Cohen *et al.*¹⁵ refer to minor fecal soiling as the need to use pads continuously.

Most previous series have used only subjective measures of outcome and each has used a different definition to describe results. Individual subjective reports of bowel movement frequency are open to considerable error, however, particularly as stooling frequency increases from the norm of one bowel movement per day.²⁰ Assuming that other aspects of bowel function (such as soiling) are likely to be susceptible to the same inaccuracies, this study therefore used objective outcome measures in addition to subjective reports, and defined these parameters in a manner that allows comparison and/or replication. It was also recognized that an individual's report of his or her soiling is hard to quantify because it is affected by personal attitudes. Frequency of protective pad usage is

probably not very useful for comparisons between studies since the use of pads is significantly influenced by the surgeon's attitudes.¹⁵ For these reasons soiling was defined as any stains resulting in a change of underwear or pads and using self-monitoring diaries, subjects counted actual soiling events. Thus this study attempted to circumvent some of the limitations and vagaries associated with previous reports on the outcome of pelvic pouch surgery.

In the present study, virtually all subjects preferred their pouch surgery to conventional ileostomy and would recommend the same procedure to others contemplating surgery. However, bowel habit worries were common and were reported by one third of subjects. These worries were associated with behavioral changes to accommodate a bowel habit that was not entirely predictable. Greater than normal frequency of bowel activity was associated with stools that were usually watery and with decreased abilities to discriminate flatus from stool. Fecal soiling was present in the majority of subjects (84 percent) but was believed to be a significant problem by only 20 percent of individuals. Despite the high preference for a pelvic pouch where gut continuity is maintained, some individuals are left with a significant element of disability in terms of interference in social, recreational, and work activities. Preference for this procedure may, in part, represent a strong aversion to the disfigurement, handling of fecal matter, and nuisance associated with the alternative of a permanent ileostomy.

A short rectal cuff and efferent limb reduce surgical complications¹⁵ and are viewed as helping to overcome the high rates of defecation difficulties and subsequent need to catheterize S-pouches as reported in the early series of Parks *et al.*¹ and Pezim and Nicholls.¹³ For assessment purposes, the J-pouch subjects were separated into long and short cuff groups to permit a truer comparison with the S-pouch subjects. The short cuff procedures were performed more recently, were well standardized, and the surgical team was much more experienced. The results confirm that both S- and J-pouch subjects with short rectal cuffs have a low (6 percent of subjects) requirement of pouch catheterization to assist with defecation.

The first survey of the functional outcomes among the

three surgical groups (J-short, J-long, and S-short) suggested that the S-short subjects appeared to have a better functional outcome than the J-short subjects.¹⁴ However, when the mean time from ileostomy closure was at least a year in each of the groups (S-short, 11 to 12 months; J-short, 17 to 18 months; J-long, 26 to 27 months) virtually all of the earlier differences in subjective reporting had disappeared. When the time from ileostomy closure for all subjects was compared with the bowel movement and soiling frequency recorded in the self-monitoring diaries, no significant correlations were found. Therefore, it is likely that the majority of improvement in bowel function commonly noted in pouch subjects occurs between zero and four months from ileostomy closure. The improvement of the J-short subjects may be due to greater adaptational changes of their pouch reservoir, which is usually smaller in volume than the pouches of S-short subjects.²¹ This improvement in subjective reports with passage of time was accompanied by limited objective changes in soiling or bowel movement frequency in J-short subjects, with a 20 percent reduction in soiling events. The overall results from enquiry into the subjective experiences of the subjects suggest few differences in the functional outcome of S- and J-pouch constructions after one year. This is consistent with the preliminary report of Heyen *et al.*,²² who found little difference between the two groups.

The self-monitoring diaries were of value in providing a more objective measure of some features. The S-short subjects experienced about one bowel movement less per 24-hour period than the J-short subjects, a difference that was not statistically significant and did not appear to be associated with subjective differences in ease of bowel management. Similarly, J-short subjects had slightly less fecal soiling than S-short. These differences were not statistically significant although they followed the same trend of reduced daily and total episodes of fecal soiling. While the time from ileostomy closure was longer in the J-short subjects (18.8 months) compared with the S-short (12.0 months), no correlation between soiling and time of follow-up was demonstrated. Furthermore, 27 percent of J-short subjects and 40% of S-short subjects reported absence of nighttime bowel movements, and both 78 percent and 69 percent, respectively, did not record any during their period of self-monitoring (9.1 ± 1.8 days).

Discrepancies between subjective reports (questionnaires) and objective measures (diaries) of soiling frequency and nocturnal bowel movements were found; these discrepancies could be due to the relatively short period during which the diary data were collected and to fluctuations in bowel function and/or dietary habits. Alternatively, patients may have had difficulties understanding or responding to questionnaires. While one might conclude that diary data are more accurate than

questionnaires, it is probably more appropriate to consider that these measures yield different types of information. The data do support the contention that self-report measures (questionnaires) by themselves are inadequate when trying to determine the functional outcomes of these surgical procedures.

Conclusions

The majority of subjects in both S- and J-pouch groups have acceptable toileting habits and reasonable control over bowel activity. However, a number of the subjects have significant social, recreational, and work disability that correlates with increased total bowel movement frequency, nocturnal bowel movement frequency, and more episodes of fecal soiling. No significant differences were found between the functional results of the S- and J-pouch procedures. Therefore, greater attention and future study should be directed toward features separate from pouch size, *e.g.*, pouch motor function and preoperative screening for sphincter dysfunction, in order to further improve the functional outcome.

From the patient's perspective, control over bowel activity in terms of the ability to be continent is probably more important than actual stool frequency. Further work is required to put the definitions used when referring to patients' subjective experiences of bowel control into operational terms, with particular attention paid to the psychologic aspects.²³ In addition, in view of the relatively high incidence of bowel-related symptomatology and behavioral alterations, greater consideration should be given to quality of life comparisons between the options open to subjects having surgery for ulcerative colitis and familial polyposis.

Acknowledgments

The technical assistance of S. Lico and the statistical advice of Dr. J. Rochon were greatly appreciated.

References

1. Parks AG, Nicholls RJ, Belliveau P. Proctocolectomy with ileal reservoir and anal anastomosis. *Br J Surg* 1980;67:533-8.
2. Utsunomiya J, Iwama T, Imajo M, et al. Total colectomy, mucosal proctectomy, and ileoanal anastomosis. *Dis Colon Rectum* 1980;23:459-66.
3. Heppell J, Taylor BM, Beart RW Jr, Dozois RR, Kelly KA. Predicting outcome after endorectal ileoanal anastomosis. *Can J Surg* 1983;26:132-4.
4. Nicholls RJ, Belliveau P, Neill M, Wilks M, Tabaqchali S. Restorative proctocolectomy with ileal reservoir: a pathophysiological assessment. *Gut* 1981;22:462-8.
5. Stryker SJ, Daube JR, Kelly KA, et al. Anal sphincter electromyography after colectomy, mucosal rectectomy, and ileoanal anastomosis. *Arch Surg* 1985;120:713-6.
6. Belliveau P, Rolstad BS, Rothenberger DA. Ileal-anal reservoir: an alternative to permanent ileostomy. *J Enterostom Ther* 1982;9:44-50.
7. Taylor BM, Cranley B, Kelly KA, Phillips SF, Beart RW Jr, Dozois RR. A clinico-physiological comparison of ileal pouch-anal

- and straight ileoanal anastomoses. *Ann Surg* 1983;198:462-8.
8. Beart RW Jr, Dozois RR, Wolff BC, Pemberton JH. Mechanisms of rectal continence: lessons from the ileoanal procedure. *Am J Surg* 1985;149:31-4.
 9. Lindquist K, Liljeqvist L, Sellberg B. The topography of ileoanal reservoirs in relation to evacuation patterns and clinical function. *Acta Chir Scand* 1984;150:573-9.
 10. Rabau MY, Percy JP, Parks AG. Ileal pelvic reservoir: a correlation between motor patterns and clinical behaviour. *Br J Surg* 1982;69:391-5.
 11. Stryker SJ, Borody TJ, Phillips SF, Kelly KA, Dozois RR, Beart RW Jr. Motility of the small intestine after proctocolectomy and ileal pouch-anal anastomosis. *Ann Surg* 1985;201:351-6.
 12. Stryker SJ, Phillips SF, Dozois RR, Kelly KA, Beart RW Jr. Anal and neorectal function after ileal pouch-anal anastomosis. *Ann Surg* 1986;203:55-61.
 13. Pezim ME, Nicholls RJ. Quality of life after restorative proctocolectomy with pelvic ileal reservoir. *Br J Surg* 1985;72:31-3.
 14. McHugh S, Cohen Z, McLeod R, Grant D. Restorative proctocolectomy—are 'S' pouches better than 'J' pouches? (abstr). *Clin Invest Med* 1985;8:A117.
 15. Cohen Z, McLeod RS, Stern H, Grant D, Nordgren S. The pelvic pouch and ileoanal anastomosis procedure: surgical technique and initial results. *Am J Surg* 1985;150:601-7.
 16. Fonkalsrud EW. Endorectal ileoanal anastomosis with isoperistaltic ileal reservoir after colectomy and mucosal proctectomy. *Ann Surg* 1984;199:151-7.
 17. Martin LW, Fischer JE. Preservation of anorectal continence following total colectomy. *Ann Surg* 1982;196:700-4.
 18. Failes DG. Proctocolectomy without ileostomy: ileo-anal anastomosis with an ileal reservoir. *Aust NZ J Surg* 1983;53:551-6.
 19. Nicholls RJ, Moskowitz RL, Shepherd NA. Restorative proctocolectomy with ileal reservoir. *Br J Surg* 1985;72(suppl):S76-9.
 20. Manning AP, Wyman JB, Heaton KW. How trustworthy are bowel histories? Comparison of recalled and recorded information. *Br Med J [Clin Res]* 1976;2:213-4.
 21. Nicholls RJ. Sphincter sparing colo-anal surgery. In: Dozois RR, ed. *Alternatives to conventional ileostomy*. Chicago: Year Book Medical Publishers, 1985.
 22. Heyen F, Belliveau P, Heppell J, Dube S, Ouimet A. Clinical comparison of ileoanal reservoirs: S-pouch vs J-pouch (abstr). *Clin Invest Med* 1985;8:A117.
 23. McHugh S, Segal Z, Lico S, Diamant NE. Control over bowel activity (abstr). *Gastroenterology* 1987;92:1527.