Is Age Relevant to Functional Outcome After Restorative Proctocolectomy for Ulcerative Colitis?

Prospective Assessment of 122 Cases

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Objective

Restorative proctocolectomy for mucosal ulcerative colitis is well established. However, the effect of age on physiologic sphincter parameters is poorly understood. Our objective was to determine whether age at the time of restorative proctocolectomy correlates with physiologic changes.

Summary Background Data

In the approximately 20 years during which restorative proctocolectomy has been performed for ulcerative colitis, the indications have changed. Initially, the procedure was recommended only in patients under approximately 50 years. However, the procedure has been considered in older patients because of the increasing age of our population, the increasing frequency of recognition of patients during the "second peak" of mucosal ulcerative colitis, and the decreasing morbidity rates, due to the learning curve and to newer techniques, such as double-stapling. Few authors have presented data analyzing the effects of this operation in older patients.

Methods

One hundred twenty-two patients who had undergone a two-stage restorative proctocolectomy for mucosal ulcerative colitis were divided into three groups according to age: group I (>60 years), 11 men, 6 women; group II (40–60 years), 29 men, 18 women; and group III (<40 years) 29 men, 29 women. The patients were prospectively evaluated using anal manometry and subjective functional results. Comparisons were made before surgery, after colectomy and before closure of ileostomy, and at 1 or more years after surgery.

Results

There were no significant differences among the groups relative to manometric results, frequency of bowel movements, incontinence scores, or overall patient satisfaction. The

postoperative mean and maximum resting pressures were significantly reduced (p < 0.001), and conversely the sensory threshold (p < 0.005) and capacity (p < 0.001) were increased in all groups up to 1 year after surgery. There were no statistically significant changes in the squeeze pressure or length of the high-pressure zone in any group at any point in time. After surgery, the mean and maximum resting pressures had returned to 80% of their original values.

Conclusion

Although anorectal function is transiently somewhat impaired after restorative proctocolectomy, the impairment is not an age-related phenomenon.

Restorative proctocolectomy for mucosal ulcerative colitis is a well-established procedure.[1,2] Detailed postoperative physiologic studies have been performed to define the alterations in physiology that occur as a result of the operation.[3-6] However, the effect of age on functional outcome after surgery is poorly understood. Therefore, pouch surgery may occasionally be denied to older patients because of anticipated poor functional results. Previous smaller studies from this center have noted no differences in either subjective function or objective morbidity between older and younger groups.[7-11] The aim of this study was to determine any age-dependent physiologic changes induced by restorative proctocolectomy.

METHODS

One hundred twenty-two patients who had undergone a two-stage restorative proctocolectomy for mucosal ulcerative colitis were divided into three groups according to age: group I (>60 years), 11 men, 6 women; group II (40–60 years), 29 men, 18 women; and group III (<40 years) 29 men, 29 women (Table 1). The lengths of follow-up (see Table 1) were not statistically significantly different among the three groups. The patients were prospectively evaluated using anorectal manometry and subjective functional results. Comparisons were made before surgery and 1 or more years after surgery.

Restorative proctocolectomy with ileal pouch-anal anastomosis (IPAA) was performed using the double-stapled technique previously described.[1] A temporary ileostomy was performed in all patients. Intestinal continuity was re-established 2 to 3 months after surgery.

Anal manometry was performed with a flexible six-channel water-perfused system as described previously.[8]

Manometry was performed on at least three of the following four occasions: before pouch construction; after restorative proctocolectomy but before ileostomy closure; 1 year after colectomy; and during subsequent annual follow-up visits. The following parameters were measured and recorded: 1) length of high-pressure zone; 2) mean and maximum resting pressure (the average and maximum pressures across the high-pressure zone, respectively); 3) maximum squeeze pressure (the maximum pressure across the same length of the high-pressure zone); 4) sensory threshold; and 5) pouch capacity. The high-pressure zone was defined as the point where the resting pressures decreased in 50% or more of the quadrants by at least 20 mmHg or fell to below 20 mmHg in at least 50% of the quadrants.[8] Sensory threshold and pouch capacity were recorded by distending a thin-walled latex balloon positioned at 6 cm within the pouch to assess first sensation and maximum tolerable volume.

The subjective evaluation was assessed by detailed questionnaires mailed to all patients who had their ileostomy closed for >1 year. The questionnaires surveyed the frequency of bowel movements, level of incontinence using a scoring system, and overall patient satisfaction. The incontinence scoring system evaluated the severity of incontinence (0 for perfect continence to 20 for complete incontinence) by grading the patient's ability to control gas and liquid and solid stool; the frequency of pad usage; and the alterations in lifestyle that resulted from abnormal bowel function[9] (Table 2).

Differences between pre- and postoperative values

Table 1. PATIENTS WHO HAD UNDERGONE TWO STAGE RESTORATIVE PROCTOCOLECTOMY FOR ULCERATIVE COLITIS

Group	Age (yr)	n	Male/Female (n)	Length of Follow-up [range (mo)]
I	>60	17	11/6	48 (25–71)
II	40–60	47	29/18	57 (24–137)
III	<40	58	29/29	49 (25–177)

Table 2. INCONTINENCE SCORING SYSTEM[9]

Type of Incontinence	Never	Rarely	Sometimes	Usually	Always
Solid	0	1	2	3	4
Liquid	0	1	2	3	4
Gas	0	1	2	3	4
Wears pad	0	1	2	3	4
Alteration in lifestyle	0	1	2	3	4

0 = perfect; 20 = complete incontinence.

were assessed using a one-factor analysis of variance and an unpaired Student's t test. Differences among the groups were assessed by a repeated measure analysis of variance with 5% Scheffe's *post hoc* test. The Wilcoxon signed rank test was used to assess differences between pre- and postoperative incontinence scores. Statistical significance was taken to be a value of $p < 0.05$ in each analysis (StatView IV Abacus Concepts Inc., Berkeley, CA).

RESULTS
Manometric Results

The pre- and postoperative mean resting pressures, respectively, were 70.9 ± 23.9 and 50.3 ± 18.7 mmHg in group I, 67.3 ± 25.0 and 54.3 ± 11.0 mmHg in group II, and 73.1 ± 25.0 and 56.9 ± 30.0 mmHg in group III. The pre- and postoperative maximum resting pressures, respectively, were 98.9 ± 28.2 and 74.4 ± 32.8 mmHg in group I, 93.8 ± 31 and 74.9 ± 15.3 mmHg in group II, and 97.8 ± 36.4 and 83.5 ± 53.2 mmHg in group III. There were no significant differences among any groups. However, the overall postoperative mean and maximum resting pressures were significantly reduced *versus* preoperative values (postoperative, 55.9 ± 23.1 and 81.8 ± 34.0 mmHg *vs.* preoperative, 70.0 ± 24.3 and 96.8 ± 30.6 mmHg; $p < 0.001$) (Fig. 1). Similarly, there were no significant differences among the groups relative to

Mean Resting Pressure

(mmHg)

Older aged group
Middle aged group
Younger aged group

[Pre-op.]   [Post-op.]
[Pre-ileostomy closure]

Pre-Op.	Post-Op.
70.0 ± 24.3	55.9 ± 23.1

(p<0.01)

Maximum Resting Pressure

(mmHg)

[Pre-op.]   [Post-op.]
[Pre-ileostomy closure]

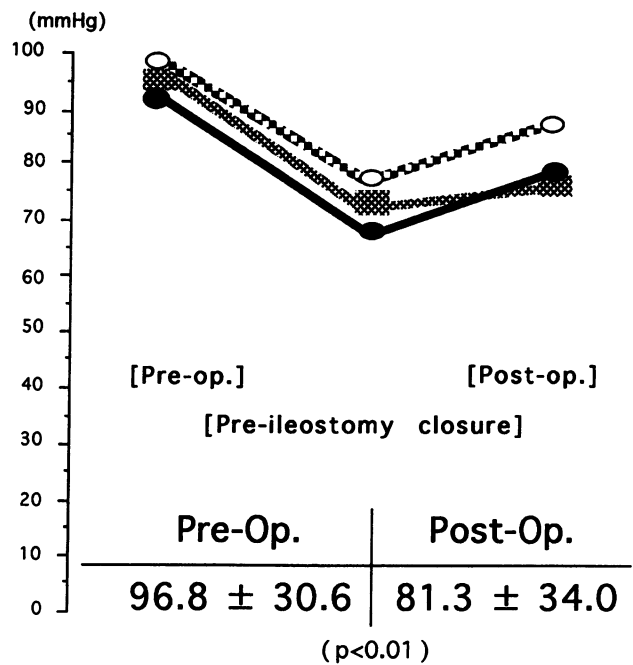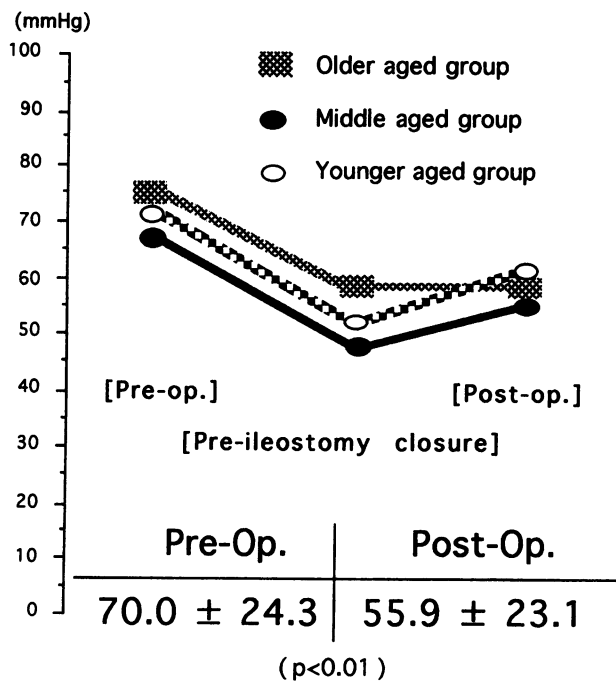| Pre-Op.	Post-Op.
96.8 ± 30.6	81.3 ± 34.0

(p<0.01)

Figure 1. Pattern of perioperative changes in resting pressures. The overall postoperative mean and maximum resting pressures were significantly reduced compared to preoperative values.
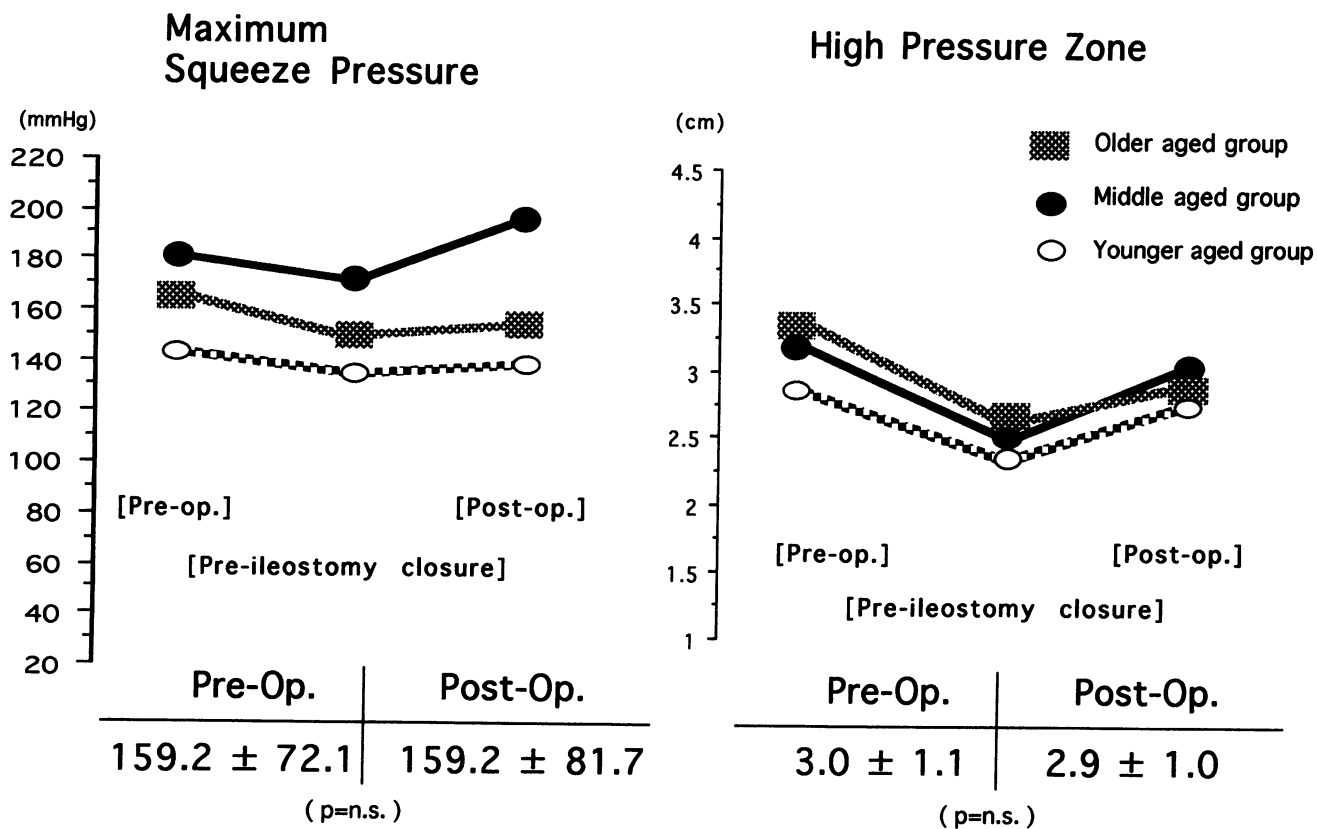
Maximum
Squeeze Pressure

(mmHg)

Pre-Op.	**Post-Op.**
159.2 ± 72.1	159.2 ± 81.7

(p=n.s.)

High Pressure Zone

(cm)

▓ Older aged group

● Middle aged group

○ Younger aged group

Pre-Op.	**Post-Op.**
3.0 ± 1.1	2.9 ± 1.0

(p=n.s.)

Figure 2. Pattern of perioperative changes in maximum squeeze pressure and high-pressure zone length. There were no significant changes between pre- and postoperative values.

maximum squeeze pressure, length of high-pressure zone, sensory threshold, or pouch capacity at any time point. However, sensory threshold and capacity were increased in all groups after closure of the temporary ileostomy (p < 0.01). There was no significant change in the length of the high-pressure zone from preoperative values either before or after closure of the ileostomy (Figs. 2 and 3).

Subjective Results

The mean daily frequency of bowel movements was 6.5 in group I, 5.9 in group II, and 5.2 in group III (Table 3). There were no significant differences among the groups with respect to incontinence scores. The mean preoperative incontinence score for all groups combined was 0.8 (range 0–6). This rose to a mean of 2.5 (range 0–10) at 1 or more years after surgery (p < 0.001) (Fig. 4). The factor that most influenced the score was the use of a pad, often because of nocturnal spotting. Even in the absence of episodic spotting, women in particular preferred to use a pad at night, although this use was more often due to fear of urinary incontinence rather than actual fecal leakage. Interestingly, although the incontinence score was not different between the older patients (group

I) and the other two groups, more patients in the older group wore a protective pad. Lastly, there were no statistically significant differences among the groups relative to overall satisfaction (see Table 3). Importantly, no patients in the older age group reported a postoperative deterioration in function.

DISCUSSION

Restorative proctocolectomy with IPAA is the procedure of choice for patients with mucosal ulcerative colitis who require surgery.[1,2] However, the effect of age on functional outcome after IPAA is poorly understood. Furthermore, significant leakage of stool or mucus has been reported in up to half the patients in early series of IPAA.[4,10] Therefore, IPAA in older patients may occasionally be denied because of anticipated poor functional results, even in the presence of strong anal sphincter function, especially because preoperative sphincter pressures have been found not to be predictive of postoperative functional outcome.[11]

The double-stapling technique is still controversial because the distal rectal mucosa may be at risk of future dysplasia or inflammation, although IPAA without muco-
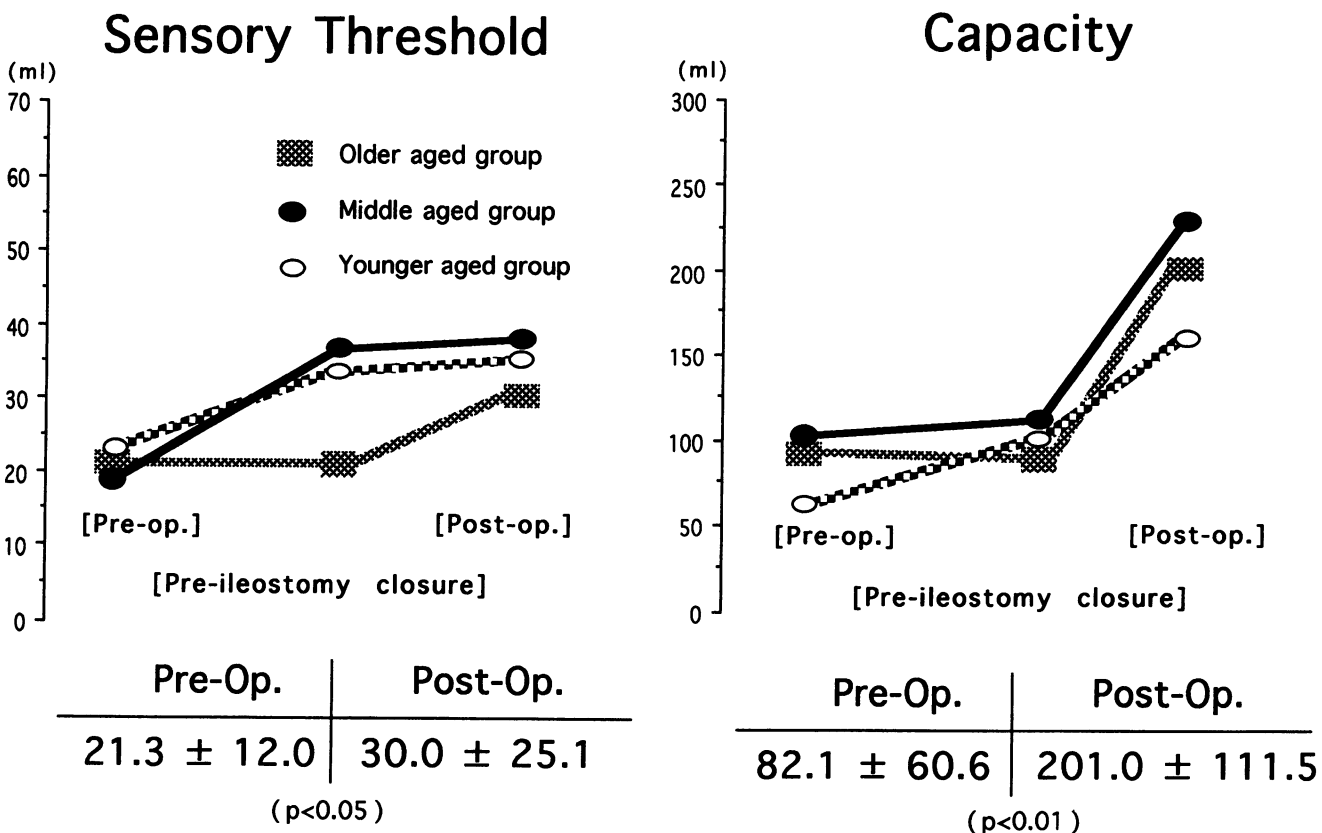
Sensory Threshold

(ml)

- ▨ Older aged group
- ● Middle aged group
- ○ Younger aged group

[Pre-op.]   [Post-op.]

[Pre-ileostomy closure]

Pre-Op.	Post-Op.
21.3 ± 12.0	30.0 ± 25.1

(p<0.05)

Capacity

(ml)

[Pre-op.]   [Post-op.]

[Pre-ileostomy closure]

Pre-Op.	Post-Op.
82.1 ± 60.6	201.0 ± 111.5

(p<0.01)

Figure 3. Pattern of perioperative changes in sensory threshold and capacity. The overall postoperative sensory threshold and capacity were significantly increased compared to preoperative values.

sectomy has become increasingly popular.[6,12] This procedure avoids sphincter stretch, thus preserving better continence than does the IPAA with mucosectomy.[3,6,13–15] By

Table 3. PATIENT SATISFACTION

	Bowel Movements per Day (mean ± SD)	Patient Satisfaction	N (%)
Group I (>60 yr)	6.5 ± 1.6	Worse	0 (0)
		No change	5 (29)
		Improved	12 (71)
Group II (40–60 yr)	5.9 ± 2.5	Worse	1 (2)
		No change	11 (23)
		Improved	35 (75)
Group III (<40 yr)	5.2 ± 2.4	Worse	2 (3)
		No change	12 (21)
		Improved	44 (76)
p value	NS	NS	

NS = not significant.

using this technique, the incidence of fecal leakage has decreased from 50%.[14,15] Thus, the double-stapled IPAA without mucosectomy may be more appropriate than mucosectomy, particularly for older patients. However, the age limit has not been clearly defined, because the effect of age on sphincter function after this procedure had never been clearly elucidated. Two previous studies[7,11] from this center have demonstrated that safety and functional results are comparable between older and younger patients.

Atrophy and sclerosis of various muscles, including the anal sphincters and other pelvic muscles, and neuronal damage are well-recognized features of aging.[11,16,17] Decreased anal pressure and increased perineal descent resulting in prolonged pudendal nerve terminal motor latencies and decreased rectal compliance have been described with aging.[16–20] These changes begin during middle age and progress with aging. Klosterhalfen et al.[21] found a high correlation between the degree of sclerosis and age. According to their results, the average degree of sclerosis is often modest until the third decade of life and then increases rapidly until the sixth decade. Thereafter, the process appears to slow. However, both rectal sensation and the anorectal angle seem to be preserved in older

Incontinence Score Investigation

	Pre-Op.	**Post-Op.**
Group I (Older aged)	0.9 (0-3)	2.3 (0-8)
Group II (Middle aged)	1.1 (0-6)	3.5 (0-10)
Group III (Younger aged)	0.4 (0-4)	1.8 (0-9)

(p<0.01)
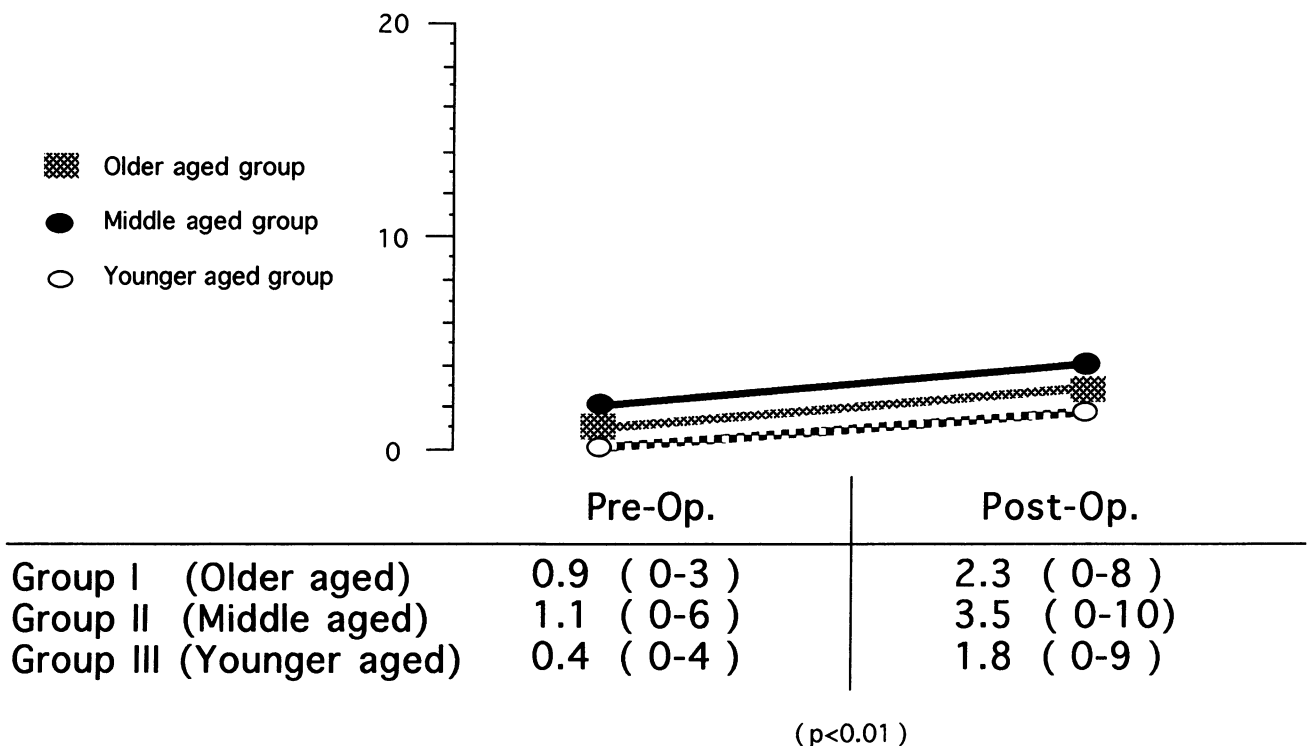
Figure 4. Pattern of perioperative incontinence score changes. The postoperative score was increased from the preoperative score. However, the mean incontinence score after surgery was <5, indicating acceptable continence.

patients.[18,19] The decreased elasticity of the sphincters may result in increased damage at the time of surgery that may be slower to recover in older patients.

Although the effects of aging on the sphincter mechanism remain equivocal, age has been considered a guideline for the performance of IPAA. Few clinical studies have evaluated postoperative function from the point of view of age. Some studies confirmed that older patients had significantly lower resting tones,[13] higher bowel frequency, and a higher incidence of minor incontinence[22] than did younger patients. However, these results have been disputed by other authors.[7,11,23]

In the current study, no significant difference between older and younger patients was noted for any parameter. Because neither mean nor maximal squeeze pressures changed, the preservation of a satisfactory resting pressure after surgery is thought to be an essential factor in the maintenance of fecal continence.[6,24-27] Approximately 60% to 85% of the resting pressure is derived from the internal anal sphincter. At the time of surgery, damage to the internal anal sphincter is greater than that to the external anal sphincter, which explains the decrease in basal tone.[28] Thus, preservation of adequate resting pres-

sures seems dependent on preservation of the integrity of the internal sphincter.[6,24,29] In other studies, anal manometry has demonstrated a decrease in mean resting pressure after IPAA, followed by recovery after ileostomy closure,[30] a finding confirmed in this study. Thus, even though mucosectomy was not performed, the minimal dilatation of the anal canal during insertion of the stapler may still cause damage to the internal sphincter, resulting in a transient decrease in resting pressure.[24,31,32] Although there were no significant differences among the groups relative to postoperative mean and maximum resting pressures, recovery from the injury appears to be more prolonged than previously suspected. The reason for the delay in recovery relative to earlier studies is in part due to the larger number of patients in this study as compared to previous studies.[7,11,30,31,33] Secondly, the third pressure measurement in the current study was a combination of a variety of points in time. We have clearly shown that resting pressures do significantly change among the time intervals commencing 1 year after surgery. Within 2 years, these pressures generally return to levels not significantly different from those before surgery. The last reason for differences between the current and previous

studies is the exclusion of patients with familial adenomatous polyposis from the current investigation.

Several authors have demonstrated that higher sensory threshold volumes are related to fewer bowel movements.[24,27,34,35] Others have shown that a higher total capacity volume improves continence and reduces stool frequency.[6,10,24,36-40] Pouch volume significantly increases during the first year after ileostomy closure.[24,41,42] Postoperative sensory threshold and capacity were increased in all groups. However, the recovery pattern of the sensory threshold in the oldest patient group was different from the other two groups. Before ileostomy closure, the sensory threshold volume had already reached a relative plateau in the patients in groups II and III. Conversely, the threshold volume continued to increase in group I patients, so that there was no difference among the groups 1 or more years after surgery. This finding may result from differences in muscle elasticity and sensory perception in older patients.[16,17,21]

The subjective outcome of IPAA arises not only from sphincter function but also from other factors affecting continence and stool frequency, such as diet, antidiarrheal medications, stool consistency, and compliance.[25] Stool frequency was 5 to 7 per 24 hours, including 1 at night. These results are similar to many other reported series.[6,10,39]

CONCLUSION

There were no statistically significant differences between older patients and the other groups relative to objective manometric data, including mean squeeze pressure, sensory threshold, and capacity. Thus, although there are no objective physiologic parameters by which IPAA should be denied to older patients, they should be counselled that their sphincter recovery may be somewhat slower than that expected by younger patients.

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