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Comparison of Laparoscopic and Open Surgery for Total Rectal Prolapse

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Abstract
Purpose. Total rectal prolapse is a devastating disorder causing constipation and anal incontinence. We compared open and laparoscopic surgical approaches in a limited series.
Methods. The subjects of this study were 23 patients who underwent laparoscopic procedures (LP group) and 17 patients who underwent open procedures (OP group) for rectal prolapse. We assessed the preoperative colonic transit time, postoperative pain scoring, pre- and postoperative anal functions, and changes in constipation and related symptoms.
Results. The median operation time was 140.8 min for the LP group and 113.1 min for the OP group (P = 0.037). The median postoperative hospital stay was 4.8 days after the LPs and 9.6 days after the OPs (P = 0.001). Less analgesia was needed in the early postoperative period after the LPs (P = 0.007). While more than 70% improvement in continence was seen in the patients who underwent OPs, it was about 85% in those who underwent LPs. Improvement in constipation and related symptoms were similar in both groups. More than 30% of patients still suffered from hard stools and other symptoms of constipation. The colonic transit times were reduced in about 50% of patients who had suffered constipation in both groups. There was no incidence of recurrence in the median follow-up period.
Conclusion. Although transabdominal rectopexy has been performed conventionally for rectal prolapse for many years, laparoscopic rectopexy and laparoscopic resection rectopexy are associated with lower morbidity and less postoperative pain. We eliminated the total prolapse and cured incontinence in almost all patients, with a short hospital stay.

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Key words Rectal prolapse · Laparoscopy · Rectopexy · Anal function

Introduction

Total rectal prolapse with chronic constipation and anal incontinence is a debilitating disorder, which is conventionally treated by rectopexy performed through the abdomen, with or without sigmoid resection. This procedure usually achieves total elimination of the rectal prolapse with a recurrence rate of 0%–9%,[1–4] but up to 45%–50% of patients still suffer from constipation postoperatively.[5–7] Perineal procedures are usually done for elderly and high-risk patients, but they are associated with a high recurrence rate and minimal improvement in functional status.[2] During the last 5 years, with the advent of laparoscopic surgical procedures, posterior mesh rectopexy and hand-assisted laparoscopic resection rectopexy have become more common.[1,6,8–12] The purpose of this study was to compare the postoperative complications, pain management, hospital stay, constipation, and anal function in patients undergoing laparoscopic surgical approaches and those undergoing open surgery in the short term.

Patients and Methods

Between 1997 and 2000, 17 patients (3 women and 14 men) underwent open modified Ripstein rectopexy, and 23 patients (2 women and 21 men) underwent laparoscopic repair for total rectal prolapse (Table 1). The median ages were 29.4 (±11.3) years for those undergoing laparoscopic procedures (LP) and 41.4 (±18.8) years for patients undergoing open procedures (OP) (χ^2 = 5.989, P = 0.014). None of the LPs were converted to OP. The follow-up period was 15.7 (±5.7)

Table 1. Demographic data of the 40 patients who underwent laparoscopic or open procedure for total rectal prolapse

	Laparoscopic procedure ($n = 23$)	Open procedures ($n = 17$)	P value
Age (years)	29.4 (±11.3)	41.4 (±18.8)	$P = 0.014$
Sex (M/F)	21/2	14/3	
Total prolapse (years) (mean ± SD) (range)	4.5 (±1.9) (2–8)	7.0 (±2.4) (3–12)	$P = 0.002$
Median length of prolapsed bowel (cm) (range)	9 (7–13)	11 (5–15)	
Solitary rectal ulcer	2	1	
Rectocele	—	1	
Previous pelvic surgery	1	2	
Episiotomies at childbirth	1	3	
Additional procedures	1	—	
Family history for prolapse	2 (8.7%)	3 (17.6%)	
Follow-up (months) (mean ± SD) (range)	15.7 (±5.7)	36.3 (±19.3)	$P < 0.001$

Table 2. Fecal Incontinence Severity Index (FISI)

	2 or more a day	Once a day	2 or more a week	Once a week	1–3 a month	Never
Gas	12	11	8	6	4	0
Mucus	12	10	7	5	3	0
Liquid	19	17	13	10	8	0
Stool	18	16	13	10	8	0

Lower scores indicate less severity. Adapted from Rockwood et al.[5] and taken from Cavanaugh et al.[13]

months (range 4–24) for the patients who underwent LP (LP group) and 36.3 (±19.3) months (range 17–73) for the patients who underwent OP (OP group) ($\chi^2 = 16.684$, $P < 0.001$). All patients had undergone preoperative diagnostic evaluation, including physical examination, detailed history of bowel function, rectal digital examination, rectosigmoidoscopy, and barium-contrast enema.

Evaluation of Anal Function

Continence was evaluated with the Fecal Incontinence Severity Index (FISI) scoring system (Table 2), which reflected both severity and frequency.[5,13] Pre- and postoperative anal manometry (Albyn Medical & Mui Scientific, Mississauga, Canada) was done in patients with a FISI score of more than 8 or those reporting any degree of liquid soiling more than twice per week. In the LP group, 13 patients evaluated pre- and postoperatively. The FISI scoring system was readapted for the patients who underwent OP according to data from their records. Only 11 of the OP group patients were evaluated postoperatively and none were evaluated preoperatively. Minimal resting pressure (MRP), maximal squeezing pressure (MSP), and minimal sensible volume (MSV) were measured and the rectoanal inhibitory reflex (RAIR) was evaluated. The evacuation of a balloon filled with 60 ml air test was also done.

Evaluation of Constipation

Constipation was defined as two or fewer bowel movements in a week and straining for more than 25% of the defecation time. The severity of constipation was determined by the pressure of hard stools, the use of laxatives, the absence of urgency to defecate, a feeling of blockade, an incompleteness of evacuation, and the need for digitally assisted defecation. This was assessed in all patients pre- and postoperatively. In patients complaining of constipation, the colonic transit time was also preoperatively measured with radio-opaque markers (Time Marker, Sapimed, Alessandria, Italy). The upper limit for the colonic transit time was 93 h.[14] The activity of the puborectalis muscle was evaluated by digital examination. Defecography was also done in patients who had a puborectalis muscle with low activity to evaluate the anorectal angle and evacuation difficulty.

Resolving Postoperative Pain

A standardized protocol for analgesia was followed pre- and postoperatively. During the operation bupivacaine HCl 2 ml (Marcaine 0.5%, Astra-Zeneca, Istanbul, Turkey) was injected around the edges of each incision. Pethidine HCl (Aldolan flc. 100 mg/2 ml, Liba, Turkey) 1 mg/kg was given intramuscularly (i.m.) within the first 2 h postoperatively and a nonsteroidal anti-inflammatory drug (Ibuprofen — IBU-600, Yeni Ilac, Istanbul, Turkey) 600 mg twice daily was given orally from postoperative days (PODs) 2 to 5. The severity of postoperative pain was assessed after 2, 4, 8, 16, 36, and 72 h, then after 7 days, using the visual analog scale (VAS) with 0 indicating no pain and 10 indicating extreme pain.

Quality of Life Assessment

The postoperative general health of patients was evaluated by the quality of life questionnaire (QoL-FI) for colorectal disorders.[5,15] (Table 5). Routine follow-up was started in the sixth week after surgery and the anastomosis was examined by sigmoidoscopy at the first follow-up.

Laparoscopic Procedure

Mechanical bowel cleansing was done the day before surgery, prophylactic antibiotic (second-generation cephalosporin) was given at the time of the induction of anesthesia, and low-molecular-weight heparin 0.4 ml/day was started 2 h before surgery for each patient. While the patient was on the operation table, the rectum was irrigated with 10% povidone iodine in 500 ml of 0.9% warm saline. After the creation of a pneumoperitoneum with 14 mmHg CO_2, four trocars were introduced. The rectum was mobilized up to the anorectal junction without dividing the lateral ligaments. After placing a 5 × 8–10-cm piece of propylene mesh on the posterior rectal wall, the distal part of the mesh was sutured to the rectum with 2/0 polypropylene sutures (Ethibond 2/0, Ethicon, Edinburgh, UK) intracorporeally. The upper part of the mesh was anchored on the promontory with a titanium tacker (Protack, Autosuture, Tyco, Mansfield, MA, USA).

In resection rectopexy, sigmoid resection was done using a hand-assisted LP. A 7-cm infraumbilical midline incision was made to place the hand-assisted apparatus (Intromid, Medtech, Ireland). After performing mobilization of the rectum as described above, the sigmoid colon was dissected and resection of the proximal rectum was done using an endoscopic stapler (Proximate ILS, Curved Intraluminal Stapler, Ethicon Endo-Surgery, Cincinnati, OH, USA). The redundant sigmoid colon was taken out and segmental resection was done. Finally a double-stapled colorectal anastomosis was fashioned intracorporeally. After the anastomosis the rectal wall was suspended on the promontory using polypropylene mesh as described above.

Open Procedure

The preoperative preparation was the same as that described for the LP. Classical sigmoid resection was done by mobilizing the rectum up to the anorectal junction, without dividing the lateral ligaments. A 5 × 10-cm piece of propylene mesh was sutured to the posterior wall of the rectum with 2/0 polypropylene sutures and the mesh was stitched on the presacral fascia at the promontory. After closing the pelvic peritoneum, a drain was placed in the pelvis.

Statistical Analysis

Statistical analysis was done by comparing the variables in the two groups. Results are expressed as mean ± SD. The chi-square test was used to compare the variables and the Wilcoxon test was used when comparing the pre- and postoperative variables of the LP. $P < 0.05$ was considered significant.

Results

Laparoscopic procedures were completed in 23 patients. In one of these patients cholecystectomy was performed as an additional procedure. The mean operation time was 140.8 (±50.3) min (range 92–325) in the LP group and 113 (±37.6) min (range 65–190) (χ^2 = 4.339, P = 0.037) in the OP group. In the patients who underwent laparoscopic resection rectopexy, about 29 cm (range 21–39) was resected. The first bowel movement was passed 26.9 (±14.6) h (range 19–48), after the LP and 45.9 h (±19.1) (range 36–72) after the OP (χ^2 = 10.493, P = 0.001). The hospitalization was 4.8 (±3.4) days after the LP and 9.6 (±4.4) days after OP (χ^2 = 11,851, P = 0.037) (Table 3).

Pain Management

The VAS score was assessed at 4- and 8-h intervals. The mean of VAS scores for the LP and OP groups were 5 and 7, respectively, in the first 24 h, which decreased significantly in both groups from PODs 2 to 5 (χ^2 = 7.206, P = 0.007) (Table 3). Most of the patients (85%) who underwent LP had no further need for pethidine HCl. None of the LP group patients, but five of the OP patients, needed analgesia in the second postoperative week.

Table 3. Clinical characteristics after laparoscopic and open procedures for total rectal prolapse

	P value	Open procedure ($n = 17$)	Laparoscopic procedures ($n = 23$)
Mean op. time (min) (mean ± SD) (range)	$P = 0.037$	113 (±37.6) (65–190)	140.8 (±50.3) (92–325)
Resected bowel segment (cm)		—	29 (21–39)
First bowel movement (hours after surgery)	*P = 0.001*	45.9 (±19.1)	26.9 (±14.6)
Hospitalization (days)	*P = 0.001*	9.6 (±4.4) (2–17)	4.8 (±3.4) (2–17
Postoperative VAS score			
In first 24 h		7	5
POD 2–5	*P = 0.007*	4.2 (±2.6) (0–9)	2.0 (±1.7) (0–6)
No. of patients needing painkiller in 2nd week		5	0

POD, postoperative day; VAS, Visual analog scale

Table 4. Postoperative complications in this limited series

Complications	Open procedure ($n = 17$)	Laparoscopic procedures ($n = 23$)
Major	*1 (5.9%)*	*4 (17.4%)*
Minor	2 (11.8%)	3 (15%)
Pulmonary infection, atelectasis	0	1
Upper GIS bleeding	0	1
Sacral venous bleeding	1	0
Port site hernia	NA	1
Retrograde ejaculation	0	1
Urinary retention	2	2
Port site infection	NA	1

NA, not applicable; GIS, gastrointestinal system

Postoperative Complications

Four (17.4%) of the LP group patients suffered major complications, as atelectasis in one, a port-site hernia after resection rectopexy requiring surgery in the third postoperative month in one, upper gastrointestinal system bleeding needing blood transfusion and medical therapy in one, and retrograde ejaculation diagnosed at the first control examination in one patient, who had still not recovered completely by the time this paper was submitted. Only one (5.9%) of the OP group patients suffered a major complication, as sacral venous bleeding needing reoperation and hemostasis. Minor complications developed in three (15%) of the LP group patients and two (11.8%) of the OP group patients (Table 4).

Evaluation of Anal Function

During preoperative evaluation, 13 of the LP group patients, including 3 who underwent resection rectopexy, had anal incontinence, with a mean FISI score of 14.2 (±4) and liquid or stool leakage, or both. The pre- and postoperative MRP, MSP, and MSV in the LP group were 24 (±7.1) mmHg and 47.7 (±14.3) mmHg ($P < 0.001$), 48.7 (±14.1) and 80.6 (±26.0) mmHg ($P < 0.001$), and 65.6 (±16.4) and 41.1 (±8.7) ml air ($P < 0.001$), respectively. Mucous, liquid, and stool soiling of varying severity was reported by 13 patients (56.5%) preoperatively. Eleven (85%) patients with a preoperative mean FISI score of 14.2 regained near normal anal continence after LP (FISI 2.36). On the other hand, by the first year after LP, two (8.7%) patients remained incontinent (FISI scores 13 and 16, respectively). The postoperative anal continence of 11 of the OP group patients was measured by anal manometry. The postoperative MRP, MSP, and MSV in the OP and LP groups were 36.1(±11.4) mmHg and 47.7 (±14.3) mmHg ($P = 0.008$), 83.9 (±33.1) and 80.6 (±26.0) mmHg ($P = 0.924$), and 38.5 (±9.5) and 41.1 (±8.7) ml air ($P = 0.352$), respectively. Three (27.3%) of the OP group patients with preoperative incontinence of varying severity remained unimproved postoperatively, but eight (72%) reported gaining near normal anal function. Six of the OP group patients were lost to follow-up (Table 5).

Characteristics of Constipation

Before the LP, 15 (65.2%) patients suffered from severe constipation, the characteristics of which are shown in Table 6. In these patients, the mean colonic transit time

Table 5. Outcomes of anal manometry scaled according to pre- and postoperative measurements

	P (pre vs postop. for LP)	Lap. procedure ($n = 13$)		Open procedure ($n = 11$)	*P* (Postop. LP vs OP)
		Preoperative	Postoperative	Postoperative	
Maximal resting pressure (MRP), mmHg	*P < 0.001*	24 (±7.1) (9–33)	47.7 (±14.3) (18–63)	36.1 (±11.4) (11–57)	*P = 0.008*
Minimal squeezing pressure (MSP), mmHg	*P < 0.001*	48.7 (±14.1) (32–76)	80.6 (±26.0) (44–129)	83.9 (±33.1) (45–156)	*P = 0.924*
Minimal sensible volume (MSV), ml air	*P < 0.001*	65.6 (±16.4) (40–110)	41.1 (±8.7) (30–60)	38.5 (±9.5) (25–60)	*P = 0.352*
RAIR (rectoanal inhibitory reflex)		+	+	+	
Incontinence					
No. of patients	13	2	3/11		
FISI score	14.2 (7–19)	13–16	15.7 (13–18)		
Gas	+	−	−		
Mucus/liquid	+	>2/week	>2/week		
Stool	+	>1/day	>1/day		

FISI, Fecal Incontinence Severity Index; LP, laparoscopic surgery; OP, open surgery

Table 6. Frequency of bowel movements pre- and postoperatively

		Postoperative		
	Preoperative	Laparoscopic surgery postop. 1st year	Open procedure ($n = 11$)	
No. of constipated patients	15	7 (30.4%)	4 (36.4%)	*P* = 0.095
Hard stool	9	5	4	
Need for laxatives	13	4	4	
Incomplete evacuation	8	1	1	
Use of digitation	2	1	0	
Bleeding	3	0	1	
Abdominal pain	9	2	3	
CTT (h)				
Constipated	134.2 (±51.8)	117.4 (±17.1)	131.3 (±28.2)	
Non-constipated		47.8 (±23.2)	38.6 (±18.9)	
QoL-S36 questionnaire				
No. of patients		19	11	
General health condition				
Perfect		3	1	
Good		7 63.2%	6 63.4%	
Fair		2	—	
Bad		7 36.8%	4 36.6%	

CTT, colonic transit time; QoL, quality of life

(CTT) was 134.2 (±51.8) h preoperatively. By the end of the first year, seven (30.4%) patients remained constipated. The mean colonic transit time in these seven patients was 117.4 (±17.1) whereas it was 47.8 (±23.2) in eight patients with improved anal function. In the OP group, 11 patients were evaluated for constipation preoperatively. Although 4 (36.4%) of these 11 patients still suffered from constipation and related symptoms postoperatively, the remaining 7 achieved almost complete relief of constipation. The mean CTT in the patients who remained constipated was 131.3 (±28.2), whereas it was only 38.6 (±18.9) in the improved patients.

Evaluation of Quality of Life

We evaluated postoperative quality of life changes in 19 of the LP group patients and 11 of the OP group patients, by giving them a questionnaire about fecal incontinence. Twelve (63.2%) of the 19 patients in the LP

group and 7 (63.4%) of the 11 patients in the OP group stated that their health had improved to "good" or "perfect" since the surgical procedure (Table 6).

Discussion

Posterior rectopexy and resection rectopexy with mesh seem to be feasible surgical procedures for alleviating constipation and related symptoms and curing anal incontinence in patients with total rectal prolapse, despite the fact that since 1902 no unique treatment has been identified. During the last 5 years, transabdominal procedures have been performed laparoscopically with lower morbidity and no mortality, even in elderly patients, and several studies have shown that laparoscopic rectopexy can restore continence and improve constipation.[1,3,6,7,9,16,17] Surgeons now prefer to perform LPs, which are associated with less pain, shorter hospital stay, and lower recurrence rates.[5,6,9,17] In our series, patients who underwent LPs required much less postoperative analgesia. The patients who underwent an OP had a higher VAS score and needed more analgesia than those who underwent an LP. The shorter hospital stay is another advantage of LPs. According to various reports, the average hospital stay for a patient undergoing laparoscopic rectopexy was 5 days, whereas it was 7 days for a patient undergoing OP surgery.[2,6,7,10] In the present series, the mean hospital stay was 4.7 (±2.0) days for LPs, which was significantly lower than that for OPs. The operation times for both procedures was as long was 2–2.5 h, in accordance with other reports.[2,3,6,7,9,17] However, as we gained experience, the time for each laparoscopic rectopexy decreased, until the last five procedures took about 15 min less than the initial ones.

Abdominal rectopexy was associated with a low recurrence rate (0%–12%) in this series, although conventional resection rectopexy is associated with a low recurrence rate of 0%–9%.[2,18] None of our patients suffered recurrence during the follow-up, which was about 15.7 months for LP and 36.3 months for OP. However, some major and minor complications developed in the early postoperative period, most of which were seen in the first 15 patients with a higher incidence in the LP. This was apparently correlated with the surgeon's experience, and the complication rate will possibly decrease as more patients undergo LPs.

Most of our patients with total rectal prolapse suffered from constipation and related symptoms before and after sugery.[3,4,17,19–24] Frykman and Goldberg stated that the length of the colon was the only factor able to be controlled by surgery,[25] but there is still controversy about the mechanism of chronic constipation. Some patients with total rectal prolapse have an excessively long sigmoid colon and dysfunction of the pelvic floor musculature. About 75% of these patients experience problems with evacuation because of the obstructing segment.[19] Denervation by full rectal mobilization causing dysmotility of the rectum, rectal wall thickness resulting from rectal mobilization, the redundant sigmoid colon filling the space of Douglas, and prosthetic material fixing the rectum on the presacral fascia are some of the reasons why patients with total rectal prolapse experience constipation pre- and postoperatively. The theory of mechanical obstruction causing constipation after surgery is explained by the fixation of the rectum on the posterior wall of the sacrum and division of its lateral ligaments, resulting in impaired motility and the rectum acting as a functional obstructing segment.[3,19,24,25] This theory was supported by Poen, Scaglia, Kellokumpu, Speakman, and others, who all stated that full mobilization of the rectum with division of its lateral ligaments made the rectum a functionally obstructing segment, which could be the reason for postoperative constipation being experience postoperatively.[2,3,7,19,20,23] Conversely, Duthie and Bartolo stated that the etiology of postoperative constipation in these patients was not clear,[21] and favored resection rectopexy.[3,19–23] In our series, 15 (65.2%) of the LP group patients were constipated before surgery, and 1 year after LP, 30.4% remained constipated. Moreover, about 36% of the OP group patients still suffered hard stools, incomplete evacuation, abdominal pain, and needed laxatives postoperatively.

Rectoanal inhibition and abnormal anorectal sensation cause anal incontinence in the patients with total rectal prolapse.[3,17,20,21,26] In addition to the impaired internal anal sphincter (IAS), pelvic floor muscle dysfunction and abnormal somatic nerve stimulation were observed in these patients.[21,27] The function of the IAS is accepted to be a major factor for improving anal function. Rectopexy improves internal anal sphincter function and anorectal sensation,[2,3,7,19–21] although Keighley et al. reported no improvement in sphincter function in their series.[28] Duthie and Bartolo also reported no improvement in resting sphincter pressures in the patients after surgery with Ivalon and Marlex mesh. They stated that the prosthetic mesh could explain why patients had no sphincter recovery after surgery. It is possible that mesh causes a dense tissue reaction, blocking improvement of the IAS.[21] In 11 (85%) of 13 LP group patients in this series, the mean FISI score decreased from 14.2 to 2.4 ($P = 0.003$) by the end of the first year and 72% of the OP group patients had improved continence (Table 5). In fact, about 60% of the patients overall were satisfied with their operative results (Table 6). Poor rectal sensation is the major cause for incontinence. Our patients reported reduced awareness of rectal sensation. Although each patient had an improve-

ment in MSV after surgery, it was not significant ($P = 0.352$).

Although this study was limited by the small number of patients, it showed that laparoscopic rectopexy procedures for total rectal prolapse are safe and associated with less complication than OPs. Moreover, none of our patients suffered recurrence. As with other LPs the patients had less postoperative pain and consequently fewer analgesic needs during the early postoperative period than those who underwent open rectopexy, with shorter hospitalization. Although the constipation and its related symptoms did not recover to the desired degree, postoperative anal function improved almost completely.

We conclude that LPs are safe and associate with a lower complication rate, less postoperative pain, and shorter hospital stay. Thus, LPs should be the operative treatment of choice for patients with total rectal prolapse and we think that the results will improve with experience in the near future.

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