Original Research Article

Evaluation of the Safety and Efficacy of Modified Laparoscopic Suture Rectopexy for Rectal Prolapse

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Abstract

Objectives: There are many surgical options for the treatment of rectal prolapse. To date, the efficacy of mesh-free laparoscopic suture rectopexy remains unclear due to the limited number of reports. This study aimed to evaluate the safety and efficacy of laparoscopic suture rectopexy.

Methods: This observational cohort study is a retrospective cross-sectional analysis of a continuously maintained database. All patients underwent laparoscopic suture rectopexy for rectal prolapse between April 2012 and March 2018. The primary outcomes measured were recurrence rates and complications of laparoscopic suture rectopexy.

Results: A total of 268 patients (29 male and 239 female) underwent laparoscopic suture rectopexy. Their mean age was 77 (19-95) years, and the mean prolapse length was 6.4 (3.5-20) cm. One patient suffered an intraabdominal abscess. Spondylitis developed in another patient following surgery. The median follow-up period was 45 (12-82) months. A total of 22 patients (8.2%) developed recurrence. The average time to recurrence was 15.6 (1-44) months. Multivariate analysis revealed a significant correlation between recurrence and prolapse length >7.0 cm (OR: 1.26, 95% CI: 1.38-1.42, $P < 0.01$).

Conclusions: Laparoscopic suture rectopexy for complete rectal prolapse is a minimally invasive and safe procedure that may lead to lower recurrence rates.

Keywords

laparoscopic suture rectopexy, pelvic floor disorder, rectal prolapse

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Introduction

Rectal prolapse imposes a heavy physical and mental burden on patients and significantly impairs their quality of life, although it is not directly fatal. Surgical procedures for rectal prolapse can be divided into three approaches: transanal, perianal, and transabdominal. As each approach has advantages and disadvantages, the selection should be based on individual circumstances[1,2].

Transanal procedures, such as the Delorme and Altemeier operations, do not require general anesthesia, making them minimally invasive compared with transabdominal approaches; thus, they are safer for the elderly. However, transanal operations may lead to minor postoperative complications or defecatory issues; such surgeries also have higher recurrence rates[3-5].

Transabdominal procedures, on the other hand, require general anesthesia. Nonetheless, the postoperative recurrence rates are lower than with transanal surgery[6,7]. Transabdominal approaches involve lifting the rectum and fixing it
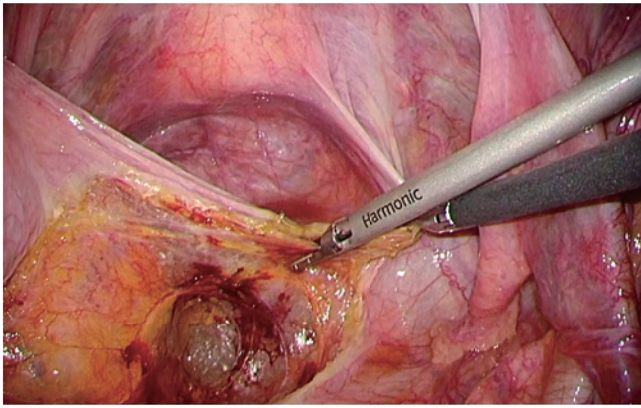
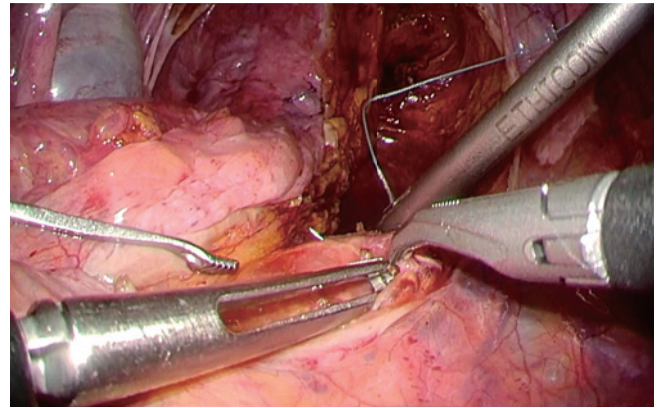**Figure 1.** The posterior wall is detached from the right side of the mesorectum to the pelvic floor.

Figure 2. The periosteum is sutured with a non-absorbable thread.

to the sacrum. Recently, laparoscopic rectopexy has become the gold standard due to the widespread adoption of laparoscopic techniques for other colorectal surgeries[2,6,7]. Conventionally, laparoscopic ventral mesh rectopexy has been performed, although possible concerns are that the use of mesh may cause complications such as infection, rectal stenosis, or erosion[8-10]. In addition, patients sometimes require rectal cancer operations following rectal prolapse surgery, and mesh may present difficulties with rectal dissection. Thus, we prefer mesh-free laparoscopic suture rectopexy to mesh. To date, the efficacy of mesh-free laparoscopic suture rectopexy remains unclear due to the limited number of reports. To this end, this study aimed to evaluate the safety and efficacy of laparoscopic suture rectopexy.

Methods

Study design

This observational cohort study is a retrospective cross-sectional analysis of a continuously maintained database. It included patients who had undergone laparoscopic suture rectopexy for rectal prolapse at our hospital between April 2012 and March 2018. After the study had been reviewed and approved by the institutional review board of our institution, data were collected and analyzed. All patients provided written informed consent to laparoscopic suture rectopexy for rectal prolapse prior to surgery.

Evaluation

The data points included patient demographics such as gender, age, body mass index (BMI), and other relevant medical history. The patients were examined *via* defecography, and the length of the rectal prolapse was measured. Surgical details comprised operation time, blood loss, and intraoperative complications. Postoperative outcomes encompassed complications and recurrences. The Clavien-Dindo

classification (Grade II or higher) was used for the evaluation of postoperative complications (<30 days). Recurrent prolapse was defined as full-thickness prolapse or symptomatic mucosal prolapse.

Surgical technique

The operation was performed under general anesthesia with the patient in the Trendelenburg position. After peritoneal insufflation, the intraabdominal pressure was maintained at 12 mmHg. We used a one-port system for this procedure, meaning one 12-mm port, three 5-mm ports, and one 10-mm umbilical port. In women, the uterus is suspended to the abdominal wall using a single suture. The peritoneum is incised over the sacral promontory. Then, the incision is extended in the caudal direction at the right side of the rectum. The presacral space is bluntly dissected down to the pelvic floor (Figure 1). While the rectum is pulled up, the true peritoneal reflection is incised, preserving the peritoneum to the left of the rectum. The presacral tissue is divided to expose the periosteum.

A needle with non-absorbable braided threads (2-0 Ethibond™, Ethicon, Somerville, NJ) is driven through the presacral periosteum at the sacral promontory (Figure 2). The position of the anus is confirmed while pulling up the rectum to make sure the rectal fixation level is correct and has adequate tension. The needle is then passed through the seromuscular layer of the rectal wall (Figure 3). Two threads of the first suture are covered using a soft catheter to prevent any tangling with the threads of the second suture in the port. Then, the second suture is placed in the same manner, just cephalad to the first suture at the promontory and the anterior tenia of the rectum. The sutures are tied down using the Roeder knot, an extracorporeal knot-tying technique (Figure 4). Care must be taken to pull on the sacral promontory side of the thread when the Roeder knot is completed. The peritoneum is closed with a continuous suture using an absorbable monofilament thread (3-0 Maxon™,
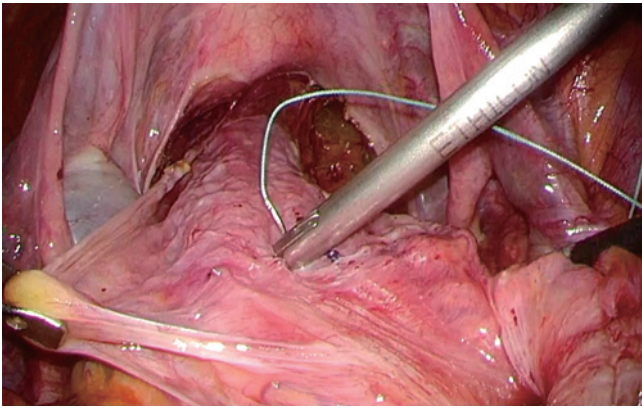
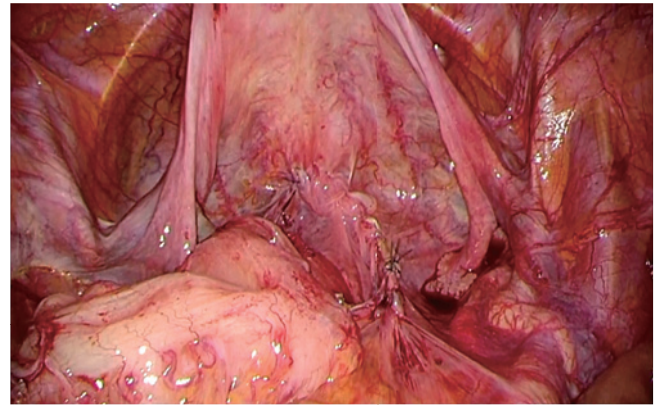**Figure 3.** The anterior wall of the rectum is sutured.

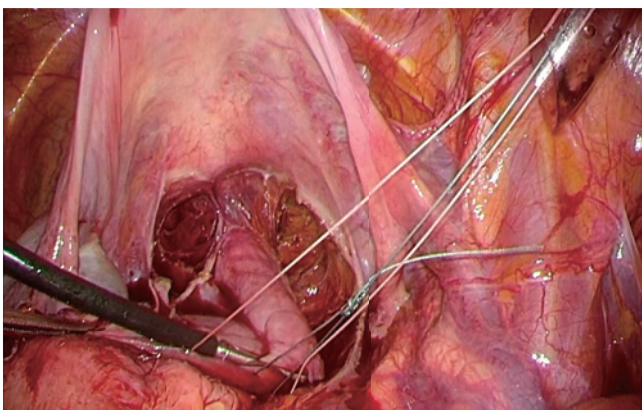**Figure 5.** The peritoneum is closed with an absorbable thread.

Figure 4. The Roeder knot is used for fixation.

Covidien, Minneapolis, MN) (Figure 5). All ports are removed, and the port sites are closed routinely. The indications for this procedure are cases in which the length of the prolapse is more than 5 cm and in cases where general anesthesia is tolerable. Cases of recurrence that have undergone previous rectal prolapse surgery are also indicated, even if the prolapse length is less than 5 cm.

Statistical analysis

Data are expressed as mean ± standard deviation, median (min, max), or median (25th percentile, 75th percentile) for continuous variables and as frequency and percentage for categorical and ordinal variables. Both univariate and multivariate analyses were conducted to compare recurrent and nonrecurrent cases. Fisher's exact and Wilcoxon's tests were used as categorical factors. The time elapsed from surgery to recurrence was examined using the Kaplan-Meier method. Receiver-operating characteristic curve analysis was employed to address the optimum cutoff point, and area under the curve analysis was employed to test the statistical significance. The cutoff value was determined using the Youden index. All analyses were conducted using the JMP software (version 14; SAS Institute, Cary, NC), and P values < 0.05

were considered statistically significant.

Results

Patient demographics

There were 268 patients (29 male and 239 female) who underwent laparoscopic suture rectopexy. Their mean age was 77 (19-95) years, the median BMI was 20.8 (15.4-34.2) kg/m^2, and the median prolapse length was 6.4 (3.5-20) cm. Among the patients, 74 (27.6%) had undergone previous rectal prolapse treatment (transanal surgery: 60, transabdominal surgery: 14). American Society of Anesthesiologists physical status (ASA-PS) class 1 was 64 (23.9%); class 2, 176 (65.7%); and class 3, 28 (10.4%). Comorbidities and medical history included psychiatric disorders in 22 (8.2%), diabetes in 11 (4.1%), and use of oral steroids in eight (3.0%) (Table 1).

Operative details

The median surgical time was 131 (75-269) min, and the median amount of blood loss was 9.2 (1-590) mL. In one case, conversion to laparotomy was required due to bleeding from the anterior surface of the sacrum. There were no other adverse events or organic injuries.

Postoperative outcomes

Postoperative complications occurred in five patients (1.9%). One patient suffered an intraabdominal abscess related to diverticulitis, requiring a diverting colostomy (Grade IIIb). As the abscess was far from the fixed point, we could not remove the thread. Spondylitis (Grade II) developed in another patient, resulting in the need for long-term antibiotics. There was each one case of urinary tract infection (Grade II), pneumonia (Grade II), and small bowel obstruction due to internal hernia (Grade II). No deep vein thrombosis or cardiopulmonary complications occurred during the perioperative period; there were also no postoperative fatali-

Table 1. Patient Population and Demographics.

Gender (%)	Male	29 (10.8)
	Female	239 (89.2)
Age (range) (y.o.)		77 (19–95)
BMI (range) (kg/m^2)		20.8 (15.4–34.2)
Length of prolapse (range) (cm)		6.4 (3.5–20)
Previous prolapse treatment (%)		74 (27.6)
	Transanal surgery	60 (22.4)
	Transabdominal surgery	14 (5.2)
ASA (%)	1	64 (23.9)
	2	176 (65.7)
	3	28 (10.4)
Comorbidity (%)	Psychiatric disorders	22 (8.2)
	Diabetes	11 (4.1)
	Taking steroids	8 (3.0)

Table 2. Postoperative Complications.

Clavien-Dindo classification (Grade)		n (%)
II	Spondylitis	1 (0.4%)
	Urinary tract infection	1 (0.4%)
	Pneumonia	1 (0.4%)
	Internal hernia	1 (0.4%)
IIIa	-	-
IIIb	Intraabdominal abscess related to diverticulitis	1 (0.4%)
IV	-	-
V	-	-

All patients	268	253	194	143	95	50	22
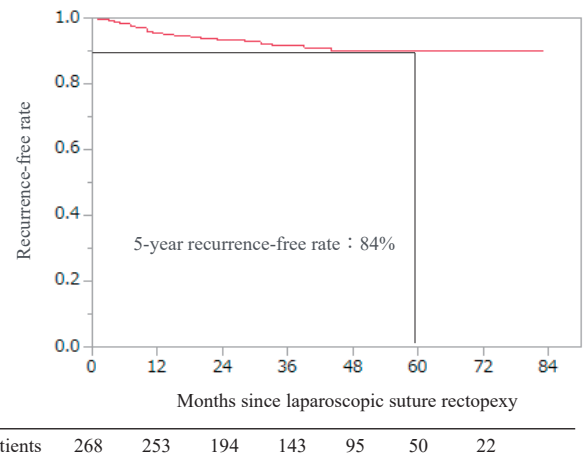
Figure 6. The average time to recurrence based on the Kaplan-Meier method.

ties (Table 2).

Recurrences

The median follow-up period was 45 (12-82) months. A total of 22 patients (8.2%) developed recurrence during follow-up. The average time to recurrence was 15.6 (1-44) months, and the 5-year recurrence-free rate was 84% (Figure 6). Of these patients, five underwent re-do laparoscopic suture rectopexy. The Thiersch operation was performed on nine, Delorme operation on five, and Gant-Miwa operation on two. One patient refused reoperation. After the continuous variables were divided into two groups on the receiver-operating characteristic analysis, the clinical factors were analyzed on univariate and multivariate analyses. A significant correlation was observed between recurrence and prolapse length of >7 cm (OR: 1.26, 95% CI: 1.38-1.42, $P < 0.01$) (Table 3).

Discussion

The main finding of this study was that laparoscopic suture rectopexy led to few complications and a low recurrence rate of 8.2%.

High recurrence after suture rectopexy is a concerning issue. Previous studies reported that suture rectopexy had higher recurrence rates (7.0%-15%) than ventral mesh rectopexy (5.0%-8.8%)[11-13]. Furthermore, a recurrence rate of 20%-23% in a long-term follow-up of more than 6 years was reported[14,15]. The conventional reported general suture rectopexy method is suturing or tuckering the mesorectum to the sacrum. Suturing or tuckering the mesorectum to the sacrum may not sufficiently suspend the rectum. The mesorectum is often fragile and is accompanied by poor fixation of the rectum. Even if the mesorectum is sutured to the sacrum, it may protrude again. Because the mesorectum is lengthened by tension, we always suture through the se-

Table 3. Univariate and Multivariate Analyses of Recurrence Based on Patient Demographics.

Clinical factor	Variables	Recurrence		Univariate analysis	Multivariate analysis		
		Yes (n = 22)	No (n = 246)	p-value	OR	95% CI	p-value
Gender (%)	Male	0 (0)	29 (100)	0.14	—	—	—
	Female	22 (9.2)	217 (90.8)				
Age	<52 y.o.	8 (21.1)	30 (78.9)	<0.01	1.13	0.12–1.12	0.07
	≥52 y.o.	14 (6.1)	216 (93.9)				
BMI	<24.5 kg/m^2	17 (7.1)	224 (92.9)	0.06	—	—	—
	≥24.5 kg/m^2	5 (18.5)	22 (81.5)				
Length of prolapse	<7 cm	6 (3.5)	165 (96.5)	<0.01	1.26	1.38–1.42	<0.01
	≥7 cm	16 (16.5)	81 (83.5)				
ASA	1	9 (14.1)	55 (85.9)	0.12	—	—	—
	2	12 (6.8)	164 (93.2)				
	3	1 (3.6)	27 (96.4)				
Previous prolapse treatment (%)	Yes	8 (10.7)	67 (89.3)	0.46	—	—	—
	No	14 (7.3)	179 (92.7)				
Psychiatric disorders (%)	Yes	4 (18.2)	18 (81.8)	0.09	—	—	—
	No	18 (7.3)	228 (92.7)				
Diabetes (%)	Yes	2 (18.2)	9 (81.8)	0.22	—	—	—
	No	20 (7.8)	237 (92.2)				
Taking steroids (%)	Yes	1 (12.5)	7 (87.5)	0.50	—	—	—
	No	21 (8.1)	239 (91.9)				

romuscular layer of the rectal wall to fix it to the sacrum. Suturing to the seromuscular layer of the rectal wall is one of the most critical points of this procedure. We think that the low recurrence rate was caused by these surgical inventions.

Infection may occur if rectal sutures penetrate the mucosal layer. The most likely complication is perirectal abscess due to rectal wall erosion at the suture site.

Treatment of complications following suture rectopexy is rather difficult. We experienced a single case that required diverting colostomy due to an intraabdominal abscess. In terms of other complications, we had one case that we treated with long-term antibiotics for spondylitis. If fever and backache occur postoperatively, spondylitis should be considered. Recently, to prevent these complications, we have performed intraoperative colonoscopy to check the rectum just after suturing and before knot-tying. Spondylitis has also been reported in a few rectopexy cases using mesh[16-18]. This complication should be considered after any type of rectopexy.

Effective treatment of complications following mesh rectopexy is crucial. One study reported that projection of polypropylene mesh into the rectum 2 years after mesh rectopexy was performed. Furthermore, the appendix was inflamed with its tip densely adherent to the mesh; the patient needed excision of the mesh, appendectomy, and covering ileostomy[9]. Another study reported a patient that presented with recurrent pelvic sepsis following mesh rectopexy. It was caused by the fistulation of the mesh into the rectum. The patient underwent anterior resection and covering ileostomy[10].

We do not have experience using mesh for the treatment of rectal prolapse. Thus, it is impossible to describe the difference in the complications between laparoscopic suture rectopexy and other methods using mesh, as they are not used at our institution. However, previous systematic review reported that the overall postoperative complication rate was 26.2%, with the most common complications being urinary tract infection or port-site or incisional hernias[4,8], and the mesh-related complication rate was 1.7% following mesh rectopexy[8]. The complication rate in the present study (1.9%) was lower than the complication that not to be related to mesh in previous study, and it is more safety as we can avoid the risk of mesh-related complication.

Along with recurrence rates, prolapse length has been the focus of much discussion. A few reports have been published specifically on recurrence and the correlation with prolapse length[19]. Based on evidence, for patients with prolapses >5 cm, we prefer laparoscopic suture rectopexy, which has a lower recurrence rate than transanal surgery. In the present study, univariate, multivariate, and receiver-operating characteristic analyses all revealed a high probability of recurrence in cases in which the prolapse was >7 cm. The exact reason why longer prolapse causes higher recurrence rates is unknown. We sometimes experience edema in longer prolapses, causing inadequate tension of the rec-

tum.

There are some proprietary techniques we have found useful. We take care to suture the seromuscular layer of the rectal wall and the periosteum at accurate depths and widths to prevent recurrence. If the fat of the serosa is thick and the serosa is occluded, the fat can be incised to clear the anterior wall. Furthermore, using two different colors of thread and placing a catheter in a small port make the threads easy to identify and prevent intertwining.

The present study has some limitations. First, the sample size was small because this study examined patients from a single facility. As a result, the statistical model was unstable. Second, the defecatory function was not evaluated in all cases. Some authors have reported that the rates of fecal incontinence and constipation improved after surgery[20,21]. Conversely, other studies demonstrated that fecal incontinence may continue or constipation may worsen postoperatively[7,22]. Continence-related issues are affected not only by surgery for rectal prolapse but also by the function of stretched or weakened sphincters. Laparoscopic suture rectopexy for complete rectal prolapse is a minimally invasive and safe procedure that may lead to lower recurrence. In cases where general anesthesia is tolerable, laparoscopic suture rectopexy serves as a viable surgical option for rectal prolapse.

Conflicts of Interest
There are no conflicts of interest.

Author Contributions
R. Takahashi drafted the article. T. Yamana and K. Sakamoto provided technical support and advice. R. Nishio was involved in the perioperative management of the patient. S. Nojiri and K. Sugimoto provided advice for statistical analysis. All authors have read and approved the final manuscript.

Approval by Institutional Review Board (IRB)
This study was approved by the Ethics Committee of Tokyo Yamate Medical Center. IRB number: J-010

Informed Consent
Informed consent was obtained from all patients.

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