

Review Article

Surgical Treatment of Rectal Prolapse in the Laparoscopic Era; A Review of the Literature

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Abstract

Rectal prolapse is associated with debilitating symptoms including the discomfort of prolapsing tissue, mucus discharge, hemorrhage, and defecation disorders of fecal incontinence, constipation, or both. The aim of treatment is to eliminate the prolapse, correct associated bowel function and prevent new onset of bowel dysfunction. Historically, abdominal procedures have been indicated for young fit patients, whereas perineal approaches have been preferred in older frail patients with significant comorbidity. Recently, the laparoscopic procedures with their advantages of less pain, early recovery, and lower morbidity have emerged as an effective tool for the treatment of rectal prolapse. This article aimed to review the current evidence base for laparoscopic procedures and perineal procedures, and to compare the results of various techniques. As a result, laparoscopic procedures showed a relatively low recurrence rate than the perineal procedures with comparable complication rates. Laparoscopic resection rectopexy and laparoscopic ventral mesh rectopexy had a small advantage in the improvement of constipation or the prevention of new-onset constipation compared with other laparoscopic procedures. However, the optimal surgical repair has not been clearly demonstrated because of the significant heterogeneity of available studies. An individualized approach is recommended for every patient, considering age, comorbidity, and the underlying anatomical and functional disorders.

Keywords

rectal prolapse, laparoscopic procedure, perineal procedure, recurrence, fecal incontinence, constipation

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Introduction

Rectal prolapse is defined as a protrusion of the full-thickness of the rectum through the anal canal. When the rectal wall is prolapsed but does not protrude through the anus, it is called an internal rectal prolapse or a rectal intussusception. Mucosal prolapse, in which there is protrusion of only the rectal or anal mucosa, should be distinguished from full-thickness rectal prolapse. The definite etiology is unclear. Some have hypothesized that an intussusception of the rectum 6-8 cm from the anal verge is the preceding point by which prolapse originated[1]. The most common

coexisting anatomical abnormalities are a redundant sigmoid colon, diastasis of the levator ani, a deep cul-de-sac, a patulous anal sphincter, and the lack of rectal-sacral attachments.

Women are more commonly affected; the female/male ratio is approximately 10:1[2,3]. The incidence in the female population peaks in the seventh decade, with 50% of female patients being over the age of 70 years[4]. Although it is commonly thought that rectal prolapse is a consequence of multiparity, approximately one-third of female patients with rectal prolapse are nulliparous[5].

Patients with rectal prolapse have various symptoms such as anal incontinence, constipation, mucus discharge, and

Table 1. Results of Laparoscopic Suture Rectopexy for Rectal Prolapse.

Authors	No. of patients	Design	Morbidity (%)	Mortality (%)	Improvement of continence (%)	Improvement of constipation (%)	New onset of constipation (%)	Recurrence No. (%)	Follow-up (month)
Kesser et al. 1999[18]	28	Retrospective	11	0	NS	NS	NS	2 (7)	33 [#]
Bruch et al. 1999[19]	32	Prospective	NS	0	NS	NS	0	0 (0)	30*
Heah et al. 2000[20]	25	Prospective	16	0	50	0	8	1 (0)	26 [#]
Kellokumpu et al. 2000[21]	17	Prospective	41	0	82	70	14	2 (12)	24 [#]
Benpist et al. 2001[22]	16	Retrospective	19	0	77	0	40	0 (0)	24*
Hsu et al. 2007[23]	12	Prospective	17	0	50	NS	17	0 (0)	38*
Wilson et al. 2011[24]	72	Retrospective	6	0	NS	NS	NS	6 (8)	48 [#]

NS, not stated; *mean; [#] median

hemorrhage. Approximately 50% to 75% of patients with rectal prolapse report fecal incontinence, and 25% to 50% of patients report constipation[6,7]. Incontinence may be explained by the presence of the prolapse, which leads to the chronic stretch of the sphincter, and continuous stimulation of the rectoanal inhibitory reflex by the prolapse tissue[8]. Patients with incontinence often have a pudendal neuropathy resulting in weakness of the external sphincter[9]. Constipation may result from intussusception of the rectum, which leads to narrowing bowel lumen and creating a blockage, which is deteriorated with excessive straining and colonic dysmotility[6,7]. Hemorrhage occurs frequently when the prolapsed rectum is left unrestored. Pelvic organ prolapse, including bladder prolapse, uterine prolapse, or rectocele, may also be combined[10].

The aim of treatment is to eliminate the prolapse, correct associated functional abnormalities of incontinence or constipation, and prevent de novo bowel dysfunction. This goal can be achieved by (1) fixation of the rectum to the sacrum and/or (2) resection or plication of the redundant bowel. The approach can be transanal/perineal or transabdominal. Abdominal operations seem to result in lower recurrence rates compared with the perineal procedure, but a 2015 systematic Cochrane database review comparing 1,007 patients in 15 randomized controlled trials reported no significant difference in recurrence rates between the two approaches[11]. Perineal procedures avoid laparotomy and may have a lower operative risk. They may be more suitable for high-risk patients, although there is no definite evidence to support this[12].

Recently, an abdominal approach via laparoscopy has emerged as an effective tool for the treatment of rectal prolapse. Previous studies have suggested that laparoscopic surgery has many short-term advantages over open surgery, including less pain and blood loss, shorter hospital stays, and faster recovery[11-13]. A meta-analysis of the literature comparing laparoscopic rectopexy with open repair showed no statistical difference in recurrence, incontinence, or con-

stipation between the two groups[14]. This was consistent with the subsequent meta-analysis carried out by Cadeddu et al[15]. These meta-analyses supported the use of laparoscopic rectopexy in providing a safe and effective alternative to the conventional open approach.

In contrast to other previous reviews, this literature review analyzes the current evidence base for laparoscopic procedures and perineal repairs. Then, the results of various techniques for the repair of rectal prolapse were compared. Regarding the literature on perineal repairs, a search for the published studies from 2000 to 2018 was made.

Laparoscopic Abdominal Procedures

The abdominal procedures, either laparoscopic or open approach, differ mainly in the extent of rectal mobilization, the methods used for rectal fixation, and the additional sigmoid resection.

Laparoscopic suture rectopexy (LSR)

This method includes a complete mobilization of the rectum down to the level of the levator muscles. The rectum is then fixed to the sacral promontory by using suture or staples. The posterior dissection causes scarring and fibrosis which keeps the rectum fixed in an elevated position[2]. In the literature reviewed, there was no reported mortality, and the recurrence rates ranged from 0% to 12%, with most of the reports showing an improvement in fecal incontinence (Table 1). The impact of LSR on constipation was variable, with different studies showing improvement, aggravation, or no effect on constipation. New-onset constipation in 0% to 17% of patients was reported. The worsening or new onset of constipation may be attributed to the division of efferent nerves in the lateral ligaments and subsequent autonomic denervation[25,26]. Liyanage et al.[27] published their results of rectal mobilization with minimal dissection of the lateral rectal ligaments and showed a 7% recurrence rate and no worsening of constipation.

Table 2. Results of Laparoscopic Posterior Mesh Rectopexy for Rectal Prolapse.

Authors	No. of patients	Design	Morbidity (%)	Mortality (%)	Improvement of continence (%)	Improvement of constipation (%)	New onset of constipation (%)	Recurrence No. (%)	Follow-up (month)
Darzi et al. 1995[34]	29	Prospective	10	0	NS	NS	NS	0 (0)	8*
Himpens et al. 1999[35]	37	Prospective	5	0	92	0	29	0 (0)	NS
Zittel et al. 2000[36]	29	Prospective	14	0	77	0	20	1 (4)	22 [#]
Benoist et al. 2001[22]	14	Retrospective	14	0	100	0	44	0 (0)	47*
Dulucq et al. 2007[37]	77	Prospective	4	0	90	36	30	1 (1)	34*
Makineni et al. 2014[38]	17	Prospective	17	0	100	NS	NS	0 (0)	14*
Dyrberg et al. 2015[39]	81	Prospective	20	1	74	65	13	9 (11)	24 [#]
Madbouly et al. 2018[40]	33	Retrospective	12	0	57	48	0	1 (3)	46*
Matsuda et al. 2019[41]	10	Retrospective	0	0	NS	NS	NS	0 (0)	25 [#]

NS, not stated; *mean; [#] median

Mesh rectopexy

Insertion of a mesh while performing rectopexy is commonly performed, on the assumption that this material induces more adhesion and fibrosis than suture rectopexy does. Used materials include non-absorbable synthetic meshes and absorbable meshes. The mesh can be placed anteriorly, posteriorly, laterally, or around the rectum.

Laparoscopic anterior mesh rectopexy (Ripstein)

Anterior mesh rectopexy was first described by Ripstein[28] in 1952. After complete mobilization of the rectum, the graft is placed around the anterior rectal wall and sutured to the promontory. There are only two case reports on this procedure using a laparoscopic approach[29,30].

Laparoscopic lateral mesh rectopexy (Orr-Loygue)

This procedure involves complete mobilization of the rectum with two mesh strips sutured laterally to the rectal wall on both sides, and they were suspended to the promontory[31]. There are several studies on this procedure using a laparoscopic approach. Lechaux et al.[32] performed laparoscopic Orr-Loygue rectopexy in 35 patients. Incontinence improved in 27% of patients, and constipation improved in 19% but worsened in 27%. The recurrence rate was 3% (1/35) after a mean follow-up of 36 months. A study on 46 patients with laparoscopic Orr-Loygue procedure with posterior mobilization found a significant reduction in incontinence score after 1 year, but there were no changes in the use of laxatives. The recurrence rate was 4% after a median follow-up of 1.5 years[33].

Laparoscopic posterior mesh rectopexy (Wells or LPMR)

After complete rectal mobilization, a mesh is inserted between the sacrum and the posterior rectum, sutured into the rectum, and fixed to the promontory. The mortality rates ranged from 0% to 1.2%, and recurrence rates ranged from 0% to 11% (Table 2). There was an overall improvement in continence (74%-100%), with conflicting results regarding constipation. New-onset constipation in 5% to 44% of patients was reported.

Laparoscopic ventral mesh rectopexy (D'Hoore or LVMR)

D'Hoore described this technique in 2004[42]. Dissection is exclusively anterior to the rectum, preserving the lateral ligaments, and the rectovaginal septum is dissected down to the pelvic floor. The dissection performed in this procedure spares the hypogastric nerves and parasympathetic nerves from the lateral ligaments and avoids mobilization of the mesorectum. The rectum is attached to the sacrum by a mesh, which is sutured to the anterior side of the rectum as distally as possible. Then, the posterior wall of the vagina is fixed to the mesh by sutures. This technique has several advantages: (1) The rectovaginal septum is reinforced, which can correct rectocele and prevent an anterior rectal intussusception, which may be one of the mechanisms to rectal prolapse; (2) a colpopexy is performed; (3) an enterocele can be corrected; and (4) autonomic nerves are preserved. This procedure also offers the potential to address a sacrocolpopexy for concomitant genital prolapse[50].

There was no reported mortality, with the exception of one series with a mortality of 1% (2/190)[45], and recurrence rates ranged from 0% to 8% (Table 3). There was an overall improvement in continence (67%-93%). Constipation

Table 3. Results of Laparoscopic Ventral Mesh Rectopexy for Rectal Prolapse.

Authors	No. of patients	Design	Morbidity (%)	Mortality (%)	Improvement of continence (%)	Improvement of constipation (%)	New onset of constipation (%)	Recurrence No. (%)	Follow-up (month)
D'Hoore et al. 2004[42]	42	Prospective	5	0	90	74	0	2 (5)	61 [#]
Slawik et al. 2007[43]	44	Prospective	NS	0	NS	NS	NS	0 (0)	54 [*]
Boons et al. 2010[44]	65	Prospective	17	0	85	72	0	1 (2)	19 [#]
Randall et al. 2014[45]	190	Prospective	6	1	93	NS	NS	6 (3)	60 [*]
Formijne Jonkers et al. 2014[46]	40	Retrospective	8	0	73	59	6	0 (0)	42 [*]
Faucheron et al. 2015[47]	175	Prospective	5	0	NS	NS	NS	2 (1)	74 [#]
Emile et al. 2017[48]	25	Randomized	20	0	75	63	0	2 (8)	18 [*]
Madbouly et al. 2018[40]	41	Retrospective	17	0	67	59	0	1 (2)	46 [*]
Tsunoda et al. 2020[49]	58	Prospective	10	0	77	75	0	1 (2)	49 [#]

NS, not stated; *mean; [#] median

was also improved in most of the patients (59%-75%), which may be attributable to the preservation of autonomic nerves or the prevention of rectoanal intussusception after surgery[51]. New-onset constipation was found in 0% to 6% of patients (Table 3). Although the incidence was low, complications peculiar to this procedure include mesh erosions, pelvic pain, dyspareunia, and rectovaginal fistula[52,53]. A recent systematic review of 728 patients in 12 case series, of which, 7 case series included a procedure with posterior rectal mobilization, suggested that patients undergoing ventral rectopexy reported a recurrence rate of 3.4%, and a weighted decrease in the postoperative constipation rate is estimated to be 23%[53].

Laparoscopic resection rectopexy (Frykman-Goldberg or LRR)

Resection rectopexy was described by Frykman in 1955[54]. This procedure combines sigmoid resection with suture rectopexy. After rectal mobilization, the rectum is elevated as high as possible. The sutures are placed prior to bowel resection and tied after colorectal anastomosis. This procedure is recommended for patients with an elongated sigmoid colon with significant constipation. Conversely, in patients whose main symptom is fecal incontinence, sigmoidectomy is unnecessary[55]. The mortality rates ranged from 0% to 6%, with an associated recurrence rate of 0% to 11% (Table 4). With the exception of two small series[32,60], there was an overall improvement in continence (61%-100%) and constipation (63%-100%). The improvement of constipation may be ascribed to the resection of the redundant sigmoid colon. The incidence of new-onset constipation was variable and ranged from 0% to 67% (Table 4).

Perineal Procedures

There are two frequently reported perineal procedures: the Delorme procedure and perineal rectosigmoidectomy (Altemeier procedure). The Gant-Miwa procedure, which is the plication procedure for herniated rectal mucosa followed by narrowing the anal canal using a prosthesis (the Thiersch procedure), used to be popular in Japan. Yamana et al.[62] reported multi-institutional data indicating that the recurrence rate was 23% without significant morbidity. The results of this procedure are rarely found in the English literature.

Delorme procedure

This operation was described by Delorme in 1900[63]. The herniated rectal mucosa is peeled off, the exposed rectal muscular layer is plicated, and anorectal mucosa is sutured. It may be suitable in patients with a short segment of prolapse and in patients who have a history of prolapse repairs, previous pelvic surgery, or pelvic radiotherapy. The mortality rates ranged from 0% to 5% with associated recurrence rates of 8% to 34%, with the exception of one small series with a recurrence rate of 53% (8/15). There was an overall improvement in continence (25%-88%). Constipation was also improved in most patients (38%-100%). New-onset constipation was not reported, except for one small series[71] (Table 5).

The addition of postanal repair and levatoplasty may have contributed to a further improvement in continence[70,73]. Youseff et al.[73] reported that the Delorme procedure combined with levatoplasty improved continence and constipation with associated lower recurrence rate compared with the Delorme procedure alone. In the patients associated with traumatic fecal incontinence, sphincteroplasty can be com-

Table 4. Results of Laparoscopic Resection Rectopexy for Rectal Prolapse.

Authors	No. of patients	Design	Morbidity (%)	Mortality (%)	Improvement of continence (%)	Improvement of constipation (%)	New onset of constipation (%)	Recurrence No. (%)	Follow-up (month)
Stevenson et al. 1998[56]	30	Prospective	13	3	70	64	NS	0 (0)	18 [#]
Xynos et al. 1999[57]	10	Prospective	10	0	71	NS	NS	0 (0)	12*
Kellokumpu et al. 2000[21]	17	Prospective	6	0	80	64	67	0 (0)	24 [#]
Benoist et al. 2001[22]	18	Retrospective	11	0	100	100	0	0 (0)	20*
Rose et al. 2002[58]	97	Prospective	26	0	NS	NS	NS	NS	NS
Lechaux et al. 2005[32]	13	Prospective	8	0	38	8	NS	1 (8)	36 [#]
Ashari et al. 2005[59]	117	Prospective	9	1	62	69	0	2 (3)	62 [#]
Kim et al. 2012[60]	18	Retrospective	11	6	0	0	NS	2 (11)	40 [#]
Laubert et al. 2012[61]	154	Prospective	20	1	61	74	NS	10 (10)	56*
Formijne Jonkers et al. 2014[46]	28	Retrospective	32	0	94	63	8	0 (0)	57*

NS, not stated; *mean; [#] median**Table 5.** Results of the Delorme Procedure for Rectal Prolapse.

Authors	No. of patients	Design	Morbidity (%)	Mortality (%)	Improvement of continence (%)	Improvement of constipation (%)	New onset of constipation (%)	Recurrence No. (%)	Follow-up (month)
Watts et al. 2000[64]	113	Prospective	30	4	89	NS	NS	38 (34)	36*
Tsunoda et al. 2003[65]	31	Retrospective	13	0	63	38	0	4 (13)	39 [#]
Watkins et al. 2003[66]	52	Retrospective	25	0	83	NS	NS	5 (10)	61
Marchal et al. 2005[67]	60	Retrospective	20	5	42	54	0	14 (23)	73*
Montero et al. 2006[68]	21	Prospective	5	0	88	NS	0	2 (10)	34*
Lieberth et al. 2009[69]	76	Retrospective	25	0	79	57	NS	11 (15)	43*
ElGadaa et al. 2010[70]	20	Prospective	20	0	73	100	0	2 (10)	65 [#]
Lee et al. 2012[71]	19	Retrospective	0	5	75	NS	NS	3 (16)	54*
Mahmoud et al. 2012[72]	37	Retrospective	51	0	64	70	NS	6 (16)	27*
Youssef et al. 2013[73]	82	Randomized	6	0	71-98	47-63	NS	7 (9)	12*
Senapati et al. 2013[74]	99	Randomized	0	2	improved score	NS	NS	31 (31)	36 [#]
Makineni et al. 2014[75]	10	Prospective	10	0	75	NS	0	1 (10)	14*
Osman et al. 2015[76]	13	Prospective	77	0	NS	NS	NS	1 (8)	12
Placer et al. 2015[77]	42	Prospective	10	0	NS	NS	0	5 (12)	85 [#]
Warwick et al. 2016[78]	55	Retrospective	7	0	NS	NS	NS	12 (22)	6 [#]
Emile et al. 2017[48]	25	Randomized	12	0	59	65	0	4 (16)	18*
Gleditsch et al. 2018[79]	15	Retrospective	13	0	NS	NS	NS	8 (53)	9 [#]

NS, not stated; *mean; [#] median

Table 6. Results of the Altemeier Procedure for Rectal Prolapse.

Authors	No. of patients	Design	Morbidity (%)	Mortality (%)	Improvement of continence (%)	Improvement of constipation (%)	New onset of constipation (%)	Recurrence No. (%)	Follow-up (month)
Kimmis et al. 2001[81]	63	Retrospective	11	0	28	51	0	4 (6)	21*
Chun et al. 2004[82]	120	Retrospective	22	1	improved score	NS	NS	18 (17)	29*
Boccasanta et al. 2006[83]	40	Randomized	0	0	improved score	75	NS	5 (13)	29*
Habr-gama et al. 2006[84]	44	Retrospective	9	0	86	NS	NS	2 (5)	49*
Glasgow et al. 2008[85]	103	Retrospective	9	1	42	10	NS	9 (9)	36*
Altomare et al. 2009[86]	93	Retrospective	23	0	47	NS	NS	17 (18)	41*
Kim et al. 2010[87]	38	Prospective	18	3	improved score	38	NS	1 (3)	24 [#]
Cirocco et al. 2010[88]	103	Retrospective	14	0	85	94	NS	0 (0)	43*
Lee et al. 2011[89]	123	Retrospective	14	NS	NS	NS	NS	14 (11)	13*
Ris et al. 2012[90]	60	Prospective	12	2	62	NS	NS	8 (13)	48 [#]
Ding et al. 2012[91]	136	Retrospective	17	0	NS	NS	NS	29 (21)	43*
Senapati et al. 2013[74]	106	Randomized	4	2	improved score	NS	NS	24 (24)	36 [#]
Tiengtianthum et al. 2014[92]	518	Retrospective	9	0.4	NS	NS	NS	118 (23)	16
Mik et al. 2015[93]	45	Retrospective	4	0	NS	NS	NS	6 (13)	32
Elagili et al. 2015[94]	22	Retrospective	23	0	NS	NS	NS	2 (9)	13 [#]
Pinheiro et al. 2016[95]	33	Retrospective	9	0	NS	NS	NS	8 (27)	50*
Trompetto et al. 2019[96]	34	Retrospective	38	0	32	62	NS	12 (35)	49 [#]

NS, not stated; *mean; [#] median

bined with the Delorme procedure and satisfactory results were reported[76].

Perineal rectosigmoidectomy (Altemeier)

This procedure was first performed by Mikulicz in 1889 and popularized by Altemeier in the 1970s[80]. The prolapsed rectum is resected 2 cm above the dentate line, the mesentery of the sigmoid colon is pulled and divided, the rectum and, if possible, the distal sigmoid colon is resected, and a coloanal anastomosis is carried out. The reported mortality and recurrence rates ranged from 0% to 3% and 0% to 35%, respectively. The potential complications include hemorrhage in the suture line and pelvic sepsis due to anastomotic leakage. There was an overall improvement in continence (32%-86%) (Table 6), but this technique may worsen fecal incontinence, potentially owing to the loss of the rectal reservoir. This procedure can be done in combination with levatoplasty to tighten pelvic floor muscles and improve continence[82,96]. Recurrence rates after perineal rectosigmoidectomy may be decreased using a levatoplasty.

Comparative Studies of Different Procedures (Table 7)

Studies comparing different laparoscopic procedures and perineal procedures are scant (Table 7). Sahoo et al.[97] compared 38 patients with LPMR to 32 patients with LSR retrospectively. No recurrence was found in both groups after a mean follow-up of 12 months. The improvement of constipation (LPMR 47% vs. LSR 61%) and incontinence (LPMR 80% vs. LSR 90%) was not significantly different, respectively.

LVMR was compared with LPMR prospectively by Madbouly et al.[40] in 74 patients. After a mean follow-up of 46 months, the recurrence rate was reported in 1 patient in each group, with no significant difference. There were more patients with improved constipation in the LVMR group.

Hidaka et al.[98] compared 34 patients with LVMR to 30 patients with LSR in a randomized study. After a median follow-up of 6.1 years, fewer recurrences were seen in patients with LVMR (9%) compared with patients with LSR (23%), but the difference was not statistically significant (*P*

Table 7. Comparison of Techniques for Laparoscopic and Perineal Repair for Rectal Prolapse.

Study	Procedure	No. of Patients	Design	Results	Recurrence (%)	Follow-up (month)
Kellokumpu, 2000[21]	LSR	16	Prospective	No difference in morbidity, recurrence, and functional results.	13	24 [#]
	LRR	12			0	
Lechaux, 2005[32]	LRR	13	Prospective	Significantly more patients with worsening constipation in the LOR group (28% vs. 8%). No difference in morbidity and improvement of continence.	8	36*
	LOR	35			3	
Lee, 2011[89]	LSR	8	Retrospective	No difference in morbidity and recurrence.	13	7*
	Altemeier	123			11	13*
Senapati, 2013[74]	Altemeier	106	Randomized	No difference in morbidity, recurrence, and functional results.	24	36 [#]
	Delorme	107			31	
Sahoo, 2014[97]	LPMR	38	Retrospective	No difference in morbidity, recurrence, and functional results.	0	12*
	LSR	32			0	
Formijne Jonkers[46] 2014	LVMR	40	Retrospective	LRR had a higher complication rate than did LVMR. No significant difference in recurrence and functional outcome.	0	42*
	LRR	28			0	57*
Emile, 2017[48]	LVMR	25	Randomized	No difference in morbidity, recurrence, and functional results.	8	18*
	Delorme	25			16	
Hidaka, 2019[98]	LSR	30	Randomized	More patients with improved constipation in the LVMR group.	23	73 [#]
	LVMR	34			9	
Madbouly, 2018[40]	LVMR	41	Prospective	More patients with improved constipation in the LVMR group.	2	46*
	LPMR	33			3	

LSR, laparoscopic suture rectopexy; LRR, laparoscopic resection rectopexy; LOR, laparoscopic Orr-Loygue rectopexy; LPMR, laparoscopic posterior mesh rectopexy; LVMR, laparoscopic ventral mesh rectopexy

= 0.11).

Although not all the patients were performed laparoscopically, suture rectopexy (n=38) was compared with resection rectopexy (n = 40) within a multi-center randomized trial[74]. There were fewer recurrences with resection rectopexy than suture rectopexy [13%(4/32) vs. 26%(9/35)] after a median follow-up of 36 months, but the difference was not statistically significant. Functional results were not also significantly different between the two procedures. Within this randomized trial, the Delorme procedure (n = 107) was compared with the Altemeier procedure (n =106). There were no significant differences in the recurrence and functional results between the two procedures.

Formijne Jonkers et al.[46] compared 40 patients with LVMR to 28 patients with LRR, retrospectively. No recurrence was found in a median follow-up of 42 to 57 months. More complications occurred after LRR than after LVMR, significantly [32%(9/28) vs. 8%(3/40)]. Both groups showed a significant improvement in fecal incontinence (LVMR 73% vs. LRR 94%) and constipation (LVMR 59% vs. LRR 63%). New-onset constipation was reported in 1 patient in each group.

Lechaux et al.[32] compared 13 patients with LRR to 35 patients with laparoscopic Orr-Loygue rectopexy, prospectively. More patients with worsening constipation occurred after the Orr-Loygue group than after the LRR group, sig-

nificantly [28%(10/35) vs. 8%(1/13)]. There were no significant differences in morbidity, recurrence, and improvement of continence in a mean follow-up of 36 months.

Emile et al.[48] compared 25 patients with LVMR to 25 patients with Delorme in a randomized study. After a mean follow-up of 18 months. There were no significant differences in morbidity, recurrence, and functional results between the two procedures.

Comparisons of Different Procedures Reviewed (Table 8)

The full text of 70 English literatures was reviewed. Overall, the studies included were 32 retrospective, 31 prospective observational, and 7 randomized controlled trials. A total of 4,175 patients were included in the review.

Recurrence was reported to occur in 52/1,697 (3%) patients after the laparoscopic approach and 432/2,464 (18%) patients after the perineal approach. The recurrence rates after different laparoscopic procedures were 2% to 5%, and those after different perineal procedures were 16% to 20%. Laparoscopic procedures had a lower recurrence rate compared with perineal procedures. The mortality rate after each operative approach was similar (laparoscopic 0.5% vs. perineal 0.7%). There was no recorded mortality after LSR. The complication rate after laparoscopic procedures and

Table 8. Comparison among the Results of Different Procedures Reviewed.

	Laparoscopic					Perineal		
	Total	LSR	LPMR	LVMR	LRR	Total	Delorme	Alteimeier
No. of studies	35	7	9	9	10	35	17	18
Total number of patients	1,711	202	327	680	502	2,464	770	1,694
Morbidity, %	12 (202/1,635)	14 (23/170)	11 (37/327)	9 (55/636)	17 (87/502)	14 (350/2,464)	18 (135/770)	13 (216/1,694)
Mortality, %	0.5 (8/1,711)	0 (0/202)	0.3 (1/327)	0.3 (2/680)	1 (5/502)	0.7 (18/2,464)	1 (10/770)	0.5 (8/1,694)
Recurrence, %	3 (52/1,711)	5 (10/202)	4 (12/327)	2 (15/680)	3 (15/502)	18 (432/2,464)	20 (154/770)	16 (278/1,694)
Improvement of continence, %	71 (391/548)	64 (28/44)	81 (106/131)	76 (134/176)	64 (123/197)	63 (353/562)	74 (188/253)	53 (165/309)
Improvement of constipation, %	57 (237/413)	28 (7/25)	40 (35/87)	68 (95/139)	62 (100/162)	57 (198/305)	58 (51/88)	68 (147/217)
New onset of constipation, %	16 (52/334)	17 (9/54)	22 (39/178)	3 (1/32)	4 (3/70)	0 (0/94)	0 (0/72)	0 (0/22)
Follow up in months (range)	34 (8-74)	30 (24-48)	24 (8-46)	49 (18-74)	36 (12-62)	36 (6-85)	36 (6-85)	34 (13-50)

LSR, laparoscopic suture rectopexy; LPMR, laparoscopic posterior mesh rectopexy; LVMR, laparoscopic ventral mesh rectopexy; LRR, laparoscopic resection rectopexy; parentheses, number of applicable patients/ population, otherwise indicated.

perineal procedures was 12% and 14%, respectively. Forty-three studies that evaluated postoperative bowel symptoms reported an improvement of fecal incontinence in 71% of patients after laparoscopic procedures and 63% after perineal procedures. Improvement of constipation was reported in 57% after either laparoscopic or perineal approaches. Although the number of evaluated patients was relatively small, the incidence of improvement in constipation was low after LSR (28%). New-onset constipation was not reported after perineal procedures. There were more patients with new-onset constipation after LSR (17%) or LPMR (22%).

Conclusions

This literature review with limited data may allow the author to conclude that (1) laparoscopic approach showed a relatively lower recurrence rate than the perineal approach, with comparable complication rates; (2) recurrence rates and improvement of fecal incontinence were not significantly different between the laparoscopic procedures; (3) LRR and LVMR had a small advantage in the improvement of constipation or in the prevention of new-onset constipation compared with other laparoscopic procedures. In the laparoscopic era, it seems reasonable that patients who are fit for general anesthesia should be offered laparoscopic procedures, and frail patients with extensive comorbidity who are unfit for general anesthesia may be suitable for perineal procedures. Meanwhile, a perineal procedure may be preferable in young male patients to reduce the potential risk of injury to the autonomic nerves.

Definitive conclusions on the advantage of one approach or one procedure over another, concerning recurrence and complication rates and functional outcomes, could not be

drawn because of the significant heterogeneity of available studies. The absence of the uniform assessment of bowel function does not lead to a meaningful comparison between the studies. Multi-institutional randomized controlled trials with long follow-up assessing the use of laparoscopic procedures or perineal repairs would bring reliance to the current evidence. An individualized approach is recommended for every patient, considering age, comorbidity, and the underlying anatomical and functional disorders. Ultimately, both laparoscopic and perineal approaches should be learned by a surgeon.

Conflicts of Interest

There are no conflicts of interest.

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