Short-term surgical and functional outcome of laparoscopic ventral mesh rectopexy for management of complete rectal prolapse

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Background
There is no clear treatment of choice for the problem of complete rectal prolapse (CRP). The treatment of CRP in adults is essentially surgical. Surgical management is aimed at restoring physiology by correcting the prolapse and improving continence and constipation with acceptable mortality and recurrence rates.
Objectives
The aim of this study was to determine the safety and outcome of laparoscopic ventral mesh rectopexy (LVMR) for the management of patients with CRP.
Patients and methods
The study included 33 patients with CRP: 20 females and 13 males. Female patients were significantly obese than male patients were; however, male patients were significantly older. A total of four female patients had associated vaginal vault prolapse. All patients underwent LVMR. Surgical outcome included intraoperative, postoperative, and follow-up data. Functional outcome was assessed at 6- and 12-month postoperatively and compared versus preoperative evaluation for severity of fecal incontinence (FI) using Vaizey score, frequency, and severity of constipation using Cleveland Clinic Constipation score, and effect of FI on patient's quality of life (QOL) using the Fecal Incontinence Quality of Life Scale score.
Results
All patients passed smooth uneventful operative and immediate postoperative course. No patient required conversion to laparotomy. Mean operative time was 151.9±31.6 (range: 120–240)min, and mean amount of intraoperative blood loss was 75.2±16 (range: 50–130)ml. Laparoscopic surgery provided its usual advantages concerning low postoperative pain score, and early ambulation, oral intake, and hospital discharge. Only three (9.1%) patients developed immediate postoperative complications. All patients showed significant functional improvement manifested as a significant decrease of Vaizey FI and Cleveland Clinic Constipation scores with a significant increase of Fecal Incontinence Quality of Life Scale score at 6-month postoperatively, and these scorings were progressively improved till 12-month postoperatively. Throughout the course of the 12-month postoperative follow-up, two female patients developed recurrent rectal prolapse for a frequency of 6.1%.
Conclusion
LVMR is a safe procedure for management of CRP within reasonable operative time and with minimal immediate postoperative morbidities. LVMR provided significant improvement of CRP-associated FI and constipation and its effect on patients' QOL. LVMR was associated with low frequency of postoperative recurrence throughout the 12-month follow-up.

Keywords:
complete rectal prolapse, functional outcome, laparoscopic ventral mesh rectopexy, quality of life

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Introduction

The term rectal prolapse (RP) includes three different entities: full-thickness RP, mucosal prolapse, and internal prolapse (rectal intussusception).

Complete rectal prolapse (CRP) is defined as the circumferential full-thickness protrusion of the rectal wall through the anus [1]. Straight rectum, a lack of rectal fascial attachments to the sacrum, a redundant sigmoid colon, levator ani diastasis, an abnormally deep Douglas pouch, and a patulous anus may be considered either anatomical predisposing factors for the development of CRP or the result of prolapsing rectum [2,3].

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The treatment of CRP in adults is essentially surgical. Surgical management is aimed at restoring physiology by correcting the prolapse and improving continence and constipation with acceptable mortality and recurrence rates [4].

Numerous surgical procedures have been suggested to treat RP; however, the controversy regarding 'which operation is appropriate?' cannot be answered definitely [5]. According to the approach used to repair the RP, surgical treatments can be divided into two categories: abdominal procedures, which are generally better for young fit patients, and perineal procedures, which are preferable for patients who are not fit for abdominal procedures, such as elderly frail patients with significant comorbidities. The abdominal procedures have a lower recurrence and a higher morbidity rate than the perineal procedures [4].

Laparoscopic RP surgery including both rectopexy and resection rectopexy can cure prolapse with good results and can be performed safely in older and debilitated patients [6]. Although both techniques offer significant improvements in functional symptoms, laparoscopic resection rectopexy had a higher complication rate than laparoscopic rectopexy did. [7].

Because of the acceptable anatomical results, fewer complications, low recurrence rate, good functional results, and low mesh-related morbidity in the short to medium term, laparoscopic ventral mesh rectopexy (LVMR) has been popularized in the past decade. LVMR is performed for patients with CRP and internal prolapse [8].

The current study aimed to determine the safety and outcome of LVMR for the management of patients presented with CRP.

Patients and methods

The current prospective study was conducted at Department of General Surgery, Benha University Hospital, and Al-Adwani General Hospital, Taif, KSA, after obtaining approval from the local ethical committee and after fully informed written consent was signed by the patients. This study was carried out on 33 consecutive adult patients with CRP since January 2012 till June 2016.

All patients underwent clinical examination including collection of demographic data and past medical history and obstetric history for female patients. All patients underwent laboratory and radiological workup for assuring the diagnosis and defining other prolapsed organs, and also to assure inclusion criteria and fitness for surgery. Then, patients were prepared and underwent preoperative flexible colonoscopy.

Patients with recurrent RP, colorectal malignancy, ulcerative colitis, previous laparotomy for any previous cause, contraindication for abdominal insufflation, or bleeding diathesis were excluded from the study.

Operative procedure

All patients received general inhalational anesthesia with endotracheal intubation. Using the 4-port technique, the camera is placed at the umbilicus, and two 5-mm trocars are placed in the left and right lower quadrants at the midclavicular lines. A 12-mm trocar is inserted in the suprapubic region just to the right of the midline. After pneumoperitoneum conduction up to 15 mmHg, patients were positioned in Trendelenburg position, and the small intestine is retracted cephalad. The rectosigmoid junction was identified and retracted to the left. A peritoneal incision was performed extending from the right side of the sacral promontory to the anterior peritoneal reflection distally (Fig. 1a); then, the right hypogastric nerve and ureter were identified and safeguarded (Fig. 1b). Using combined blunt and sharp dissections, a wide plane was developed in the rectovaginal/rectovesical space (Fig. 1c). Prolapsed rectum was reduced, but no posterior rectal mobilization or lateral dissection was conducted (Fig. 1d). After completion of dissection (Fig. 1e), a strip of Prolene Mesh (Ethicon Endosurgery, Blue Ash, Ohio, USA), ~3×17 cm, was prepared and inserted into the pelvic cavity through the 12-mm trocar site. One end of the mesh was fixed to the anterior surface of the most distal part of the rectum and to pelvic floor muscle laterally using polypropylene sutures (Fig. 1f). Full-thickness bite into the rectal wall was avoided to prevent mesh contamination. Finally, the proximal end of the mesh was fixed to the sacral promontory using Tackers (Covidien, Dublin, Ireland). During fixation of the mesh, proximal traction on the rectum is avoided, as the rectum should not be placed under tension. In female patients, the distal part of the mesh was also fixed to the posterior vaginal fornix for correction of vaginal vault prolapse if present. The peritoneum was then reapproximated to completely cover the mesh (Fig. 1g).

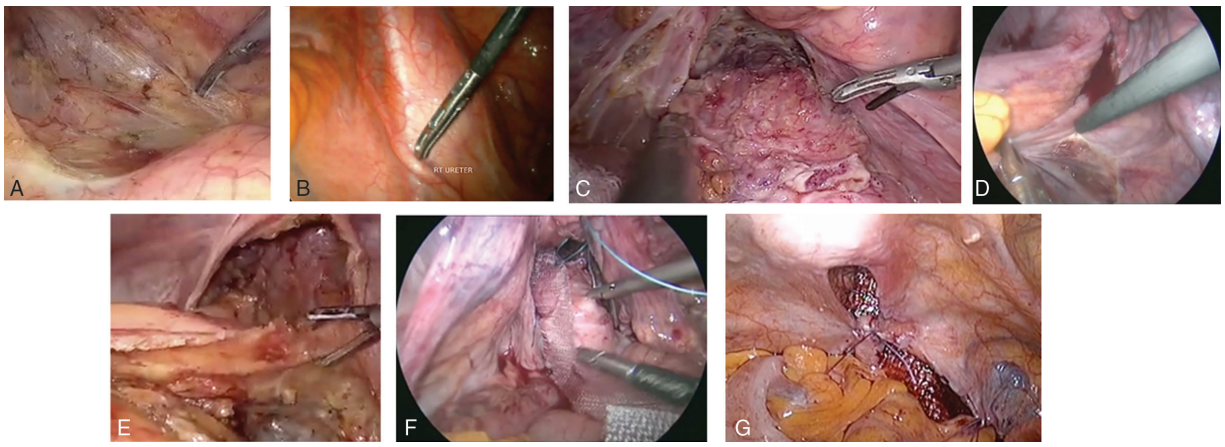
Study outcome

(1) Surgical outcome
   (a) Intraoperative collected data included conversion rate to laparotomy, operative time, intraoperative blood loss, and frequency of intraoperative complications.
   (b) Postoperative data included pain assessment using 1–10 pain visual analogue scale scoring, time till first ambulation and oral feeding resumption, postoperative hospital stay, and frequency of postoperative complication.
   (c) Postoperative follow-up extending for 12 months for frequency of recurrence, partial or complete
(2) Functional outcome was assessed at 6- and 12-month postoperatively and compared versus preoperative evaluation for the following:
   (a) The severity of fecal incontinence (FI) was evaluated using Vaizey score [9] for a total score ranging between 0 (perfect continence) and 24 (total incontinence). Details of Vaizey score are shown in Table 1.
   (b) Evaluation of frequency and severity of constipation was done using Cleveland Clinic Constipation (CCC) score [10] for a total score ranging between 0 (no constipation) and 25 (severe constipation since long duration). Details of items are shown in Table 2.
   (c) The effect of FI on patient's quality of life (QOL) was done using the Fecal Incontinence Quality of Life Scale (FIQL) [11], which consists of four subscales – lifestyle, coping/behavior, depression/self-perception, and embarrassment – including 29 questions. Responses to the questions are graded from 1 'strongly agree' to 4 'strongly' disagree. The obtained numerical values of all responses were added and then divided by the number of items. Higher scores indicate a better QOL.

Statistical analysis

Obtained data were presented as mean±SD, median, range, numbers, and percentages. Results were analyzed using one-way analysis of variance with post-hoc Tukey's honest significant difference test

Figure 1



(a) Peritoneal dissection down to the sacral promontory. (b) Dissection of the right ureter. (c) Dissection of the peritoneal reflection of the rectovesical pouch. (d) Reduction of the prolapsed rectum. (e) Complete peritoneal dissection down to the sacral promontory and preparation of the cavity. (f) Application and spreading of the Prolene Mesh to the rectum. (g) Closure of the peritoneal reflection after assurance of fixation and hemostasis.

Table 1 Vaizey incontinence score [9]

Items	Never	Rarely	Sometimes	Weekly	Daily
Incontinence for solid stool	0	1	2	3	4
Incontinence for liquid stool	0	1	2	3	4
Incontinence for gas	0	1	2	3	4
Alteration in lifestyle	0	1	2	3	4
Items	No	Yes			
Need to wear a pad	0	2			
Taking constipating medicines	0	2			
Lack of ability to defer defecation for 15 min	0	4			

Never, no episode in the past 4 weeks; rarely, one episode in the past 4 weeks; sometimes, more than one episode in the past 4 weeks, but less than one /week; weekly, more than or equal to one episode/week, but less than one episode/day; daily, more than or equal to one episode/day; minimum score=0 (perfect continence); maximum score=24 (totally incontinent).

and c^2 test. Statistical analysis was conducted using the SPSS (version 15, 2006) for Windows statistical package. *P*-value less than 0.05 was considered statistically significant.

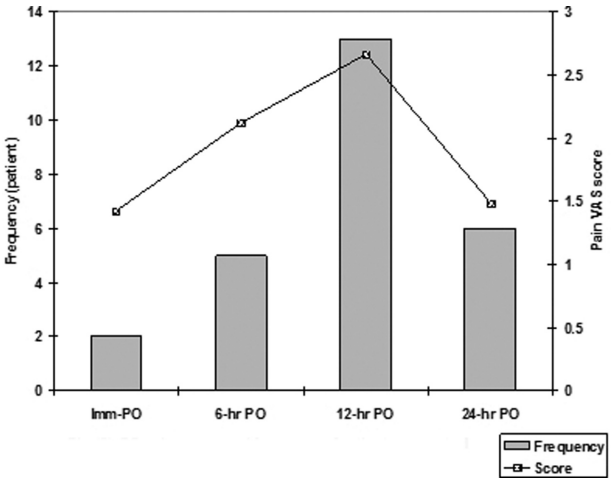
Results

The study included 33 patients who had CRP with a mean age of 59.5±14.5 (range: 25–78) years. There were 20 females and 13 males, with mean BMI of 27.4±2 (range: 23.4–30.8)kg/m^2. Female patients were significantly obese than male patients were; however, male patients were significantly older. A total of four female patients had associated vaginal vault prolapse. Overall, 10 patients had additional morbidity with nonsignificantly higher frequency in female than in male patients. Details of patients' enrollment data are shown in Table 3.

All patients passed smooth uneventful operative and immediate postoperative course. No patient required conversion to laparotomy. All surgeries were conducted through a mean operative time of 151.9±31.6 (range: 120–240)min. Laparoscopic surgery provided its usual advantages regarding low postoperative pain scores and a minimal number of patients requesting rescue analgesia (Fig. 2), and early ambulation, first oral intake, and hospital discharge as shown in Table 4.

Only three (9.1%) patients developed immediate postoperative complications: one diabetic patient developed hyperosmolar ketoacidotic coma on the second postoperative day and required admission to general ICU to receive intensive insulin therapy. She was discharged from the ICU after 3 days after proper adjustment of her blood glucose and was discharged uneventfully on the eighth postoperative day. Another 67-year-old patient developed acute myocardial infarction, which necessitated immediate ICU admission; fortunately, the patient responded well to thrombolytic therapy and stayed for 2 days and completed his immediate postoperative care free of complications and was discharged on the ninth

Figure 2



Postoperative pain scores and frequency of patients requested rescue analgesia throughout the first 24 hours postoperatively.

Table 2 Cleveland Clinic Constipation score [10]

Items	0	1	2	3	4	5
Frequency (times of bowel movements)	1–2/1–2 days	2/weeks	1/weeks	<1/weeks	<1/month	–
Difficulty (painful evacuation effort)	Never	Rarely	Sometimes	Usually	Always	–
Feeling incomplete evacuation	Never	Rarely	Sometimes	Usually	Always	–
Abdominal pain	Never	Rarely	Sometimes	Usually	Always	–
Time (min in lavatory/attempt)	<5	5–10	10–20	20–30	>30	–
Assistance (type of assistance)	Without	Laxative	Digital/enema	–	–	–
Failure (unsuccessful evacuation attempts/24 h)	Never	1–3	3–6	6–9	>9	–
Duration of constipation (years)	–	0	1–5	5–10	10–20	>20

Table 3 Patients' enrollment data categorized according to sex

	Total	Males	Females	*P*-value
n (%)	33 (100)	13 (39.4)	20 (60.6)	–
Age (years)	59.5±14.5	66±11.3	55.4±15	0.037
Body weight (kg)	81.1±5.8	78±5.4	83.2±5.2	0.010
Body height (cm)	172±4.1	173.7±4.3	170.9±3.6	NS
BMI (kg/m^2)	27.4±2	25.9±1.8	28.5±1.5	0.001
Associated comorbidities				
Vaginal vault prolapse	4 (12.1)	0	4 (20)	NS
Diabetes mellitus	7 (21.1)	2 (15.4)	5 (25)	
Hypertension	3 (9.1)	2 (15.4)	1 (5)	

Data are presented as numbers and mean±SD; percentages are in parenthesis.

postoperative day. The third patient had a delayed return of intestinal motility and developed manifestations of intra-abdominal infection. Computed tomography imaging defined pelvic collection that was drained laparoscopically. The patient was maintained on intravenous fluid and supportive therapy with appropriate antibiotic therapy; he responded to the applied therapy, and constitutional manifestations completely resolved. He was discharged on the tenth postoperative day to be re-evaluated for his prolapse. No operative or immediate postoperative mortality was reported.

All patients showed progressive improvement of their functional complaints. FI evaluated using Vaizey incontinence score showed a progressive significant decrease compared with the preoperative scoring. At the end of the 12-month postoperative follow-up, only five (15.2%) patients were still complaining of liquid and gas incontinence, which occurred rarely, but for the fear of soiling, they were still taking constipating drugs and wore pads. Details of frequency among incontinence scores determined at 6- and 12-month postoperative compared with preoperative frequency are shown in Table 5. Total incontinence scores calculated at 6- and 12-month postoperatively were significantly decreased compared with preoperative score, with significantly lower 12-month postoperative score compared with 6-month score as shown in Fig. 3.

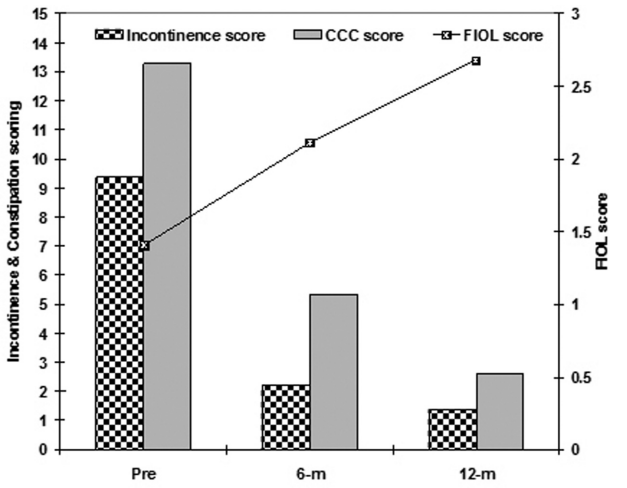
Table 4 Operative and immediate postoperative data

Data	Findings
Operative time (min)	
≤180	26 (78.8)
>180	7 (21.2)
Total	151.9±31.6
Operative blood loss (ml)	
≤100	31 (93.9)
>100	2 (6.1)
Total	75.2±16
Time till first ambulation (h)	
<6	5 (15.1)
6–12	25 (75.8)
>12	3 (9.1)
Total	10±2.3
Time till first oral intake (h)	
24–36	17 (51.5)
12–24	9 (27.3)
<12	7 (21.2)
Total	40.7±13.4
PO pain	
Immediate PO	
Median (range) VAS score	1 (0–4)
n (%)[a]	2 (6.1)
6-h PO	
Median (range) VAS score	2 (0–4)
n (%)	5 (15.2)
12-h PO	
Median (range) VAS score	3 (0–4)
n (%)	13 (39.4)
24-h PO	
Median (range) VAS score	1 (0–4)
n (%)	6 (18.2)
PO hospital stay (days)	
2–3	26 (78.8)
4–6	4 (12.1)
>6	3 (9.1)
Total	3.6±1.9

Data are presented as numbers and mean±SD; percentages are in parenthesis. PO, postoperative; VAS, visual analogue scale.
[a]Number of patients requested rescue analgesia.

A total of 23 (69.7%) patients complained of preoperative constipation with varying degrees of difficulty in evacuation and sense of incomplete evacuation since a median duration of constipation of 3 years (range: 0–13) years. Postoperatively, all patients showed progressive improvement of their constipation. At the end of 12-month follow-up, only 14 (42.4%) patients still had constipation of score 1, and 10 (30.3%) of them still had an occasional failure of evacuation and six (18.2%) of them were still using laxatives. Details of frequency among CCC scores determined at 6- and 12-month postoperatively compared with preoperative frequency are shown in Table 6. Total CCC scores calculated at 6- and 12-month postoperatively were significantly decreased compared with preoperative score, with significantly lower 12-month postoperative score compared with 6-month score as shown in Fig. 3.

Figure 3



Mean functional evaluation scoring of studied patients at 6- and 12-month postoperatively compared with preoperative scoring. CCC, Cleveland Clinic Constipation; FIQL, Fecal Incontinence Quality of Life Scale.

Table 5 Patients' frequency according to Vaizey incontinence score determined at 6- and 12-month postoperatively compared with preoperative frequency

Score items	Items											
	Solid stool incontinence			Liquid stool incontinence			Incontinence for gas			Lifestyle alteration		
	Preoperative	6 months	12 months	Preoperative	6 months	12 months	Preoperative	6 months	12 months	Preoperative	6 months	12 months
Never	21	33	33	5	26	28	0	14	23	4	19	24
Rarely	12	0	0	6	7	5	13	13	10	14	13	8
Sometimes	0	0	0	7	0	0	10	6	0	8	1	1
Weekly	0	0	0	5	0	0	10	0	0	7		0
Daily	0	0	0	10	0	0	0	0	0	0		0

Items	Items											
	Need for pad			Taking constipating medicines						Inability to defer defecation		
	Preoperative	6 months	12 months	Preoperative	6 months	12 months				Preoperative	6 months	12 months
	20	27	28	12	26	28				23	33	33
Yes	13	6	5	21	7	5				10	0	0

CRP-associated FI and constipation had a bad effect on patient's QOL; however, the applied surgical procedure induced significant improvement of patient's QOL as manifested by significantly higher FIQL score determined at 6- and 12-month postoperatively compared with preoperative FIQL score, with significantly higher score at 12-month compared with score determined at 6-month postoperative as shown in Fig. 3.

Throughout the 12-month postoperative follow-up, two patients developed recurrent RP for a frequency of 6.1%. One female patient developed recurrent vaginal vault prolapse, cystocele, and partial rectocele secondary to committing an obstructed labor despite the instruction not to have a vaginal delivery. Another female patient developed recurrence of CRP secondary to getting excessively obese owing to her sedentary life. One male patient died secondary to developing acute myocardial infarction that failed to respond to treatment.

Discussion

The current study reported a significantly higher frequency of female patients among the studied patients, and four (20%) female patients had an associated vaginal vault prolapse. The reported higher frequency of CRP among female patients could be attributed to previous obstetric trauma-inducing weakness of pelvic floor with subsequent laxity of suspensor ligaments leading to pelvic descent and organ prolapse. The reported association of vaginal vault prolapse and CRP goes in hand with Adjoussou *et al.* [12] who reported that colorectal symptoms, such as defecation dysfunction and anal incontinence occurred in 25.1 and 18.5% of women with genital prolapse, respectively. Also, Meister *et al.* [13] identified the duration of pushing during vaginal delivery and infant births weight as significant risk factors for sustaining laceration and obstetric anal sphincter injury, predisposing to genitourinary and RP.

Interestingly, studied females were more obese with significantly higher BMI than males; this implies a relationship between obesity and development and/or aggravation of RP. In support of this concept, Cuicchi *et al.* [14] found that after a mean BMI reduction of 10 kg/m^2, the prevalence of pelvic floor dysfunction decreased to 48%, and the rates of resolution of urinary incontinence, FI, and pelvic organ prolapse were 84, 85, and 74%, respectively. Also, multiple recent studies [15–17] documented that urinary incontinence, FI,

Table 6 Patients' frequency according to Cleveland Clinic Constipation score determined at 6- and 12-month postoperatively compared with preoperative frequency

Items	Score																	
	0			1			2			3			4					
	Preoperative	6 months	12 months	Preoperative	6 months	12 months	Preoperative	6 months	12 months	Preoperative	6 months	12 months	Preoperative	6 months	12 months	Preoperative	6 months	12 months
Frequency	12	11	19	10	16	14	11	6	0	0	0	0	0	0	0	0	0	0
Difficulty	0	16	16	16	11	15	8	6	2	9	0	0	0	0	0	0	0	0
Incomplete evacuation	0	6	18	15	19	12	9	5	3	6	3	0	3	0	0	0	0	0
Abdominal pain	15	8	25	0	17	8	18	4	0	12	4	0	3	0	0	0	0	0
Time (min/attempt)	18	16	23	12	17	10	3	0	0	0	0	0	0	0	0	0	0	0
Assistance	12	10	27	8	23	6	13	0	0	0	0	0	0	0	0	0	0	0
Failure of evacuation	15	17	22	11	16	10	7	0	0	0	0	0	0	0	0	0	0	0
Duration of constipation	10	–	–	13	–	–	6	–	–		–	–	4	–	–		–	–

and sexual dysfunction are more prevalent in patients with obesity, and weight loss by surgical and nonsurgical methods plays a major role in the improvement of these symptoms in such patients.

All surgeries were conducted uneventfully with no intraoperative morbidities, mortality, or conversion to laparotomy within appropriate operative time (151.9±31.6 min) and with minimal blood loss (75.2± 16 ml). Moreover, laparoscopic surgery provided its usual advantages concerning low postoperative pain score, and early ambulation, oral intake, and hospital discharge. Similarly, Magruder *et al.* [18] reported that patients who undergo laparoscopic rectopexy have a shorter length of hospital stay and lower surgical site infection rate than patients who undergo other abdominal procedures for RP repair. Bjerke and Mynster [19] reported a median operative time of 135 min (range: 90–215)min, a median length of stay of 2 days (range: 1–14) days, and 30-day morbidity and mortality rates of 15 and 4%, respectively, after LMVR.

The reported surgical data coincided with that recently reported by Chandra *et al.* [20] who reported a median operative time of 200 min (range: 180–350)min, median postoperative hospital stay of 4 days (range: 3–12) days, and no operative mortality or mesh-related complication was encountered after LVMR. Also, Pucher *et al.* [21] documented that LVMR had safety learning course and is an effective and safe treatment for RP with in-hospital morbidity and mortality rates of 3.2 and 0%, respectively. Keskin *et al.* [22] also documented that laparoscopic rectopexy should be considered as the first option in the treatment RP owing to its favorable early-term outcomes and acceptable rate of long-term recurrence.

In support of the favorable outcome of LMVR, Liu *et al.* [23] retrospectively compared laparoscopic versus open mesh rectopexy for total RP and reported insignificant intergroup differences in operative duration, postoperative complication, rate of long-term recurrence, and improvement of incontinence and constipation, but perioperative blood loss, time to first flatus, and hospital stay were significantly shorter in the laparoscopic rectopexy group.

Moreover, the applied surgical procedure induced significant functional improvement manifested as a significant decrease of FI and CCC scores with significant increase of FIQL score at 6-month postoperatively, and these scorings were progressively improved till 12-month postoperatively. The reported

functional improvement is similar to that stated by Consten *et al*. [24] in their report where the rates of FI and obstructed defecation decreased significantly after LVMR compared with the preoperative incidence (11.1 vs. 37.5% for FI and 15.6 vs. 54.0% for constipation); they concluded that LVMR is safe and effective for the treatment of different RP syndromes.

The obtained results are also in line with that recently documented in literature, wherein Chandra *et al*. [20] reported that at a median follow-up of 22 months, Wexner constipation score improved significantly from 17 to 6 and FI severity index score from 24 to 2 with no de-novo constipation or FI during the follow-up, and all patients expressed satisfaction with the outcome of their treatment; therefore, Chandra *et al*. [20] concluded that LVMR is an effective surgical option for CRP especially in patients having a bulky redundant colon. Also, Tsunoda *et al*. [25] reported improved incontinence and constipation in 77 and 59% of patients, respectively; significantly reduced FI severity index and Constipation Scoring System scores; and significantly improved scale scores on the three kinds of QOL instruments compared with the preoperative scores at 1 year after LVMR, and they concluded that LVMR improves both generic and symptom-specific QOL with good functional results. Moreover, Horisberger *et al*. [26] documented that 2 years after LVMR, constipation and QOL improve significantly in patients with complex pelvic organ prolapse.

In support of the reported advantages of LVMR, Bloemendaal *et al*. [27] documented that laparoscopic RP correction following emergency admission is both feasible and safe, so it can be considered for both recurring cases and cases with multiple comorbidities. Also, Ahmed[28] reported improvement in incontinence and constipation in 60 and 75% of patients, respectively, with no recurrence detected 6 months after single-port LVMR.

From the obtained results, we conclude that LVMR is a safe procedure for the management of CRP within reasonable operative time and minimal immediate postoperative morbidities. LVMR provided significant improvement of CRP-associated FI and constipation and its effect on patients QOL. LVMR is associated with low frequency of postoperative recurrence throughout the 12-month follow-up.

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Nil.

Conflicts of interest
There are no conflicts of interest.

References

1 Jones OM, Cunningham C, Lindsey I. The assessment and management of rectal prolapse, rectal intussusception, rectocele, and enterocele in adults. BMJ 2011; 342:c7099.

2 Lacima G, Espuña M. Pelvic floor disorders. Gastroenterol Hepatol 2008; 31:587–595.

3 Rodrigo N, Shek KL, Dietz HP. Rectal intussusception is associated with abnormal levator ani muscle structure and morphometry. Tech Coloproctol 2011; 15:39–43.

4 Madiba TE, Baig MK, Wexner SD. Surgical management of rectal prolapse. Arch Surg 2005; 140:63–73.

5 Schiedeck TH, Schwandner O, Scheele J, Farke S, Bruch HP. Rectal prolapse: which surgical option is appropriate? Langenbecks Arch Surg 2005; 390:8–14.

6 Carpelan-Holmström M, Kruuna O, Scheinin T. Laparoscopic rectal prolapse surgery combined with short hospital stay is safe in elderly and debilitated patients. Surg Endosc 2006; 20: 1353–1359.

7 Formijne Jonkers HA, Maya A, Draaisma WA, Bemelman WA, Broeders IA, Consten EC, Wexner SD. Laparoscopic resection rectopexy versus laparoscopic ventral rectopexy for complete rectal prolapse. Tech Coloproctol 2014; 18:641–646.

8 van Iersel JJ, Paulides TJ, Verheijen PM, Lumley JW, Broeders IA, Consten EC. Current status of laparoscopic and robotic ventral mesh rectopexy for external and internal rectal prolapse. World J Gastroenterol 2016; 22: 4977–4987.

9 Vaizey CJ, Carapeti E, Cahill JA, Kamm MA. Prospective comparison of faecal incontinence grading systems. Gut 1999; 44:77–80.

10 Agachan F, Chen T, Pfeifer J, Reissman P, Wexner SD. A constipation scoring system to simplify evaluation and management of constipated patients. Dis Colon Rectum 1996; 39:681–685.

11 Rockwood TH, Church JM, Fleshman JW, Kane RL, Mavrantonis C, Thorson AG, *et al*. Fecal incontinence quality of life scale: quality of life instrument for patients with fecal incontinence. Dis Colon Rectum 2000; 43:9–17.

12 Adjoussou SA, Bohoussou E, Bastide S, Letouzey V, Fatton B, de Tayrac R. Functional symptoms and associations of women with genital prolapse. Prog Urol 2014; 24: 511–517.

13 Meister MR, Cahill AG, Conner SN, Woolfolk CL, Lowder JL. Predicting obstetric anal sphincter injuries in a modern obstetric population. Am J Obstet Gynecol 2016; 215:310; e1–7.

14 Cuicchi D, Lombardi R, Cariani S, Leuratti L, Lecce F, Cola B. Clinical and instrumental evaluation of pelvic floor disorders before and after bariatric surgery in obese women. Surg Obes Relat Dis 2013; 9:69–75.

15 Ramalingam K, Monga A. Obesity and pelvic floor dysfunction. Best Pract Res Clin Obstet Gynaecol 2015; 29:541–547.

16 de Sam Lazaro S, Nardos R, Caughey AB. Obesity and pelvic floor dysfunction: battling the bulge. Obstet Gynecol Surv 2016; 71:114–125.

17 Knepfler T, Valero E, Triki E, Chilintseva N, Koensgen S, Rohr S. Bariatric surgery improves female pelvic floor disorders. J Visc Surg 2016; 153: 95–99.

18 Magruder JT, Efron JE, Wick EC, Gearhart SL. Laparoscopic rectopexy for rectal prolapse to reduce surgical-site infections and length of stay. World J Surg 2013; 37:1110–1114.

19 Bjerke T, Mynster T. Laparoscopic ventral rectopexy in an elderly population with external rectal prolapse: clinical and anal manometric results. Int J Colorectal Dis 2014; 29:1257–1262.

20 Chandra A, Kumar S, Maurya AP, Gupta V, Gupta V, Rahul K. Laparoscopic ventral mesh rectopexy for complete rectal prolapse: a retrospective study evaluating outcomes in North Indian population. World J Gastrointest Surg 2016; 8:321–325.

21 Pucher PH, Mayo D, Dixon AR, Clarke A, Lamparelli MJ. Learning curves and surgical outcomes for proctored adoption of laparoscopic ventral mesh rectopexy: cumulative sum curve analysis. Surg Endosc 2016; 31: 1421–1426.

22 Keskin M, Gönüllü D, Karip B, Balik E, Bulut MT. Laparoscopic Rectopexy: First Option for Rectal Prolapse? Chirurgia (Bucur) 2016; 111:131–7.

23 Liu J, Huang P, Zheng Z, Chen T, Huang J, Wei H. Laparoscopic versus open mesh rectopexy for total rectal prolapse. Zhonghua Yi Xue Za Zhi 2014; 94:3008–3010.

24 Consten EC, van Iersel JJ, Verheijen PM, Broeders IA, Wolthuis AM, D'Hoore A. Long-term outcome after laparoscopic ventral mesh rectopexy: an observational study of 919 consecutive patients. Ann Surg 2015; 262:742–747.

25 Tsunoda A, Takahashi T, Ohta T, Kusanagi H. Quality of life after laparoscopic ventral rectopexy. Colorectal Dis 2016; 18:O301–O310.

26 Horisberger K, Rickert A, Templin S, Post S, Kienle P. Laparoscopic ventral mesh rectopexy in complex pelvic floor disorder. Int J Colorectal Dis 2016; 31:991–996.

27 Bloemendaal AL, Mishra A, Nicholson GA, Jones OM, Lindsey I, Hompes R, Cunningham C. Laparoscopic rectopexy is feasible and safe in the emergency admission setting. Colorectal Dis 2015; 17: O198–O201.

28 Ahmed GM. Single port laparoscopic mesh rectopexy. Prz Gastroenterol 2016; 11: 123–126.