Laparoscopic resection rectopexy versus laparoscopic mesh rectopexy for rectoanal intussusception

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Background and aim
Rectoanal intussusception (RI) can be treated by laparoscopic rectopexy successfully following different techniques. This study aims to compare laparoscopic resection rectopexy with laparoscopic ventral mesh rectopexy in patients with RI.

Patients and methods
From February 2012 to February 2014, 28 patients with RI were admitted to the Colorectal Surgery Unit, Mansoura University. The patients were divided into two groups: the ventral mesh rectopexy group and the resection rectopexy group. Postoperative improvement in clinical symptoms, symptoms scores, anorectal manometry, and defecography were evaluated over 12 months.

Results
Eleven (39.3%) patients were male and 17 (60.7%) were female, with a mean age of 43.42 years. Improvement in obstructed defecation symptoms was observed in 22 (78.5%) patients overall: 85.7% in the resection rectopexy group and 71.4% in the ventral mesh rectopexy group (P = 0.648). The mean Wexner score dropped from 15.57 to 4.8 at 3 months (P = 0.0025). The mean operative time was 2.97 h in the resection rectopexy group versus 2.14 h in the ventral mesh rectopexy group (P = 0.0003). Minor morbidities were detected in five cases and no mortality was reported. Recurrence was diagnosed in six (21.4%) patients at 1 year.

Conclusion
Laparoscopic resection rectopexy is superior to ventral mesh rectopexy despite longer operative time, longer hospital stay, and higher risk of complications

Keywords:
rectoanal intussusception, resection rectopexy, ventral mesh rectopexy

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Introduction

Rectoanal intussusception (RI) is defined as the circumferential full thickness infolding of the midrectum during straining that extends into the anal canal, without reaching the anal orifice [1]. Patients most frequently present with constipation, excessive straining on defecation, a sensation of incomplete evacuation, and sometimes fecal incontinence (FI) [2].

The treatment of rectal intussusception associated with obstructed defecation (OD) remains challenging. Conservative management and biofeedback yield disappointing results. Surgical treatment is divided into transanal and abdominal approaches, with transanal approaches tending to have lower morbidity and abdominal approaches having lower recurrence rates [3].

Laparoscopic resection and mesh rectopexy have proven short-term benefits and economic savings compared with their open counterparts. Resection rectopexy has recurrence rates from 2 to 8%, but with additional morbidity of an anastomosis [4].

The current study aims to compare laparoscopic ventral mesh rectopexy with resection rectopexy as regards improvement in clinical symptoms, symptoms scores, and defecography and anorectal manometry. Operative time, hospital stay, postoperative complications, recurrence, and patients' quality of life were also evaluated.

Patients and methods

The present study is a prospective study conducted after approval of the local ethical committee of Mansoura University on 28 patients (17 women and 11 men) with a mean age of 43.42 years who underwent laparoscopic surgery for symptomatic RI in the Colorectal Surgery Unit, Mansoura University, between February 2012 and February 2014. Patients were divided into two equal groups: group I (n = 14) underwent lap ventral mesh rectopexy and group II (n = 14) underwent lap resection rectopexy.

The exclusion criteria were the following: being unfit for general anesthesia or having contraindications

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for laparoscopic procedures; having other colorectal pathologies such as neoplasm, inflammatory bowel disease, or diverticular disease; having OD due to anismus or descending perineum syndrome; having colonic inertia; and having undergone abdominal procedures for RI or rectal prolapse previously.

All patients had symptoms of OD. Among them two patients had mixed symptoms of OD and FI, two patients had an additional complaint of bleeding per rectum, and three patients complained of mucus discharge.

The decision for operation was based on the fitness of the patients for long procedures and the length of the sigmoid colon, as patients who were fit for long procedures with redundant long sigmoid colon were chosen for laparoscopic resection rectopexy.

Preoperative workup included defecography with application of the Oxford grading system [5], anorectal manometry, endoanal ultrasound, and colon transit time and colonoscopy or barium enema.

Preoperative preparation

Patients were prepared 24 h preoperatively following standard methods for colonic preparation such as rectal enemas every 6 h, restriction of oral intake to clear fluids, and using stimulant laxatives once or twice.

All patients wore antiembolic stockings and received a prophylactic dose of low-molecular-weight heparin on the night of the operation. All patients received a single intravenous dose of third-generation cephalosporin and metronidazole at induction.

Written informed consent with respect to the nature of surgery was obtained from all patients.

Preoperative and postoperative questionnaires

All patients included in the study were personally interviewed and were asked to apply for Wexner constipation score [6] and Pescatori score for FI [7].

Quality of life was assessed by the Patient Assessment of Constipation-Quality of Life (PAC-QoL) questionnaire [8]. The PAC-Qol is a self-reported questionnaire composed of 28 items grouped into four subscales: physical discomfort, psychosocial discomfort, worries and concerns, and satisfaction.

Patient satisfaction was graded as follows: grade I – very good with almost no defecatory problems; grade II – good with some but not significant defecatory problems; grade III – fair with several defecatory problems; grade IV – poor with severe defecatory problems significantly affecting the quality of life [1].

Operative techniques

Laparoscopic ventral mesh rectopexy

The standardized, stepwise procedure includes the following:

After induction of general anesthesia, the patient is placed in a modified lithotomy position with careful padding of the lower extremities. Both arms are tucked and the patient is secured to the table. Using a four-port technique, the camera is placed at the umbilicus and 5-mm trocars are inserted in the left and right lower quadrants at the midaxillary lines. A 12-mm trocar is placed in the suprapubic region just to the right of the midline.

Steep Trendelenburg positioning is used to expose the pelvic organs, and the small bowel is retracted cephalad. Hysteropexy may be performed as needed for exposure. The rectosigmoid is retracted toward the spleen to expose the peritoneum. The right ureter is identified along the right pelvic sidewall.

The right side of the peritoneum is then incised at the level of the sacral promontory and the peritoneal dissection continues downward in the midpoint between the rectum and sidewall to the level of the pelvic floor. If a symptomatic rectocele is present, the dissection can be carried down to the perineal body and pubococcygeus muscles for additional support (Fig 1).

A polypropylene mesh measuring 6×11 cm is introduced though the 12-mm trocar site. We use a 2-0 polypropylene suture to secure the mesh to the pelvic floor muscle laterally and the anterior rectal wall using six to eight laparoscopic sutures, avoiding full-thickness rectal bites (Fig 2).

The sacral lateral anterior ligament is exposed at the sacral promontory and two laparoscopic tacks are used to secure the mesh to the sacrum. The rectum should not be placed under tension. The peritoneum is closed over the mesh and an intraperitoneal drain is inserted if needed (Fig 3).

Laparoscopic resection rectopexy [10]

The patient is in lithotomy position. The surgeon and first assistant stand on the right side of the patient with the monitor at the patient's left leg. The 10-mm camera trocar is inserted 2 cm cranial of the umbilicus via minilaparotomy. Two additional 10-mm trocars are inserted in the left and right lower quadrants,

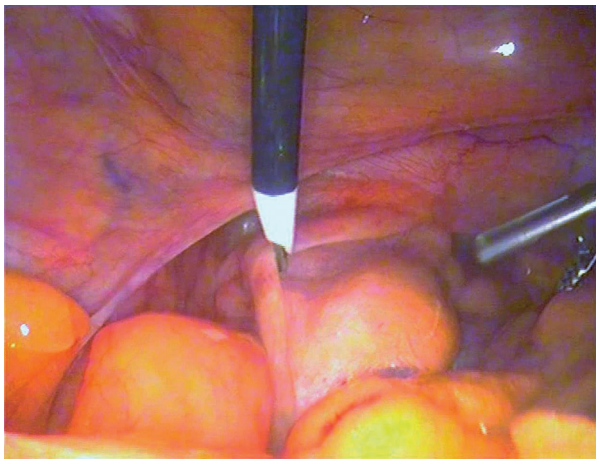
respectively. These two trocars should be positioned ~2 cm medial and distal to the anterior iliac spine to allow for good access to the small pelvis. A 5-mm trocar is inserted in a virtual semicircular line between the trocars in the midline and the right lower quadrant to guarantee proper triangulation.

The procedure starts with the mobilization of the left colon by dissecting the left paracolic gutter toward the splenic flexure on the plane of Gerotas' fascia in a lateral to medial manner. The ureter should always be identified but left untouched under the plane of Gerotas' fascia. The splenic flexure is generally left immobilized which allows for 'stretching' and elevation of the rectum.

We then change the level of dissection and open up the retrorectal space from the right side. Meticulous care is given to the preservation of the superior rectal artery to maintain excellent perfusion of the anastomosis, also preserving the hypogastric plexus and nerves. The mesorectum is then mobilized down to the pelvic floor (retrorectal dissection) under preservation of the lateral rectal ligaments and the branches of the hypogastric nerves. It is crucial to perform the mobilization to the pelvic floor to allow for sufficient straightening of the rectum. The aim of this straightening and lifting is to restore the pelvic anatomy and thus ameliorate the functional interaction of the components of the pelvic floor compartments.

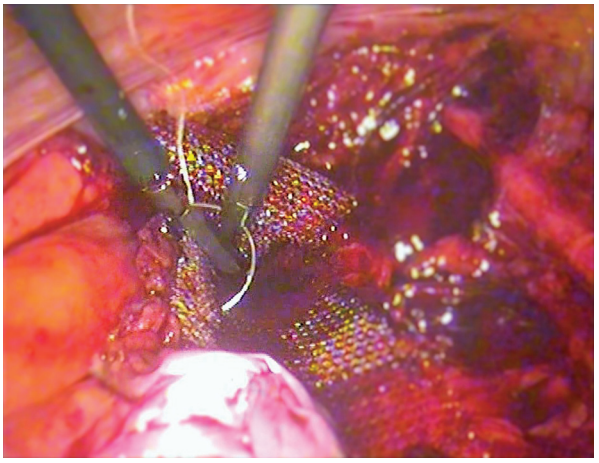
We then fenestrate the sigmoid mesentery and expose the mesentery by using an angulated retractor (Fig 4), elevating the sigmoid to the ventral abdominal wall. The mesentery is dissected close to the colonic wall

Figure 1



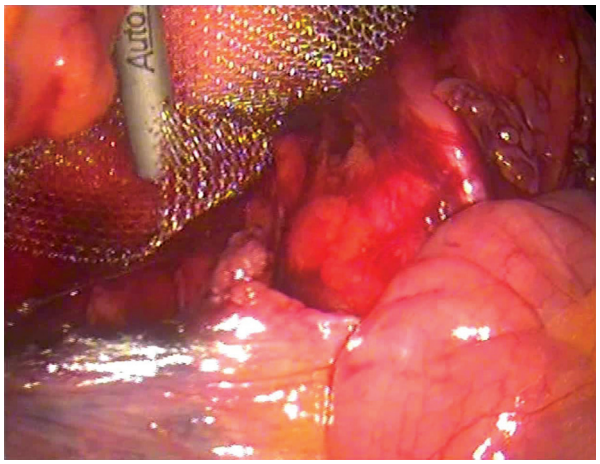
Starting anterior dissection with laparoscopic hook in ventral mesh rectopexy.

Figure 2



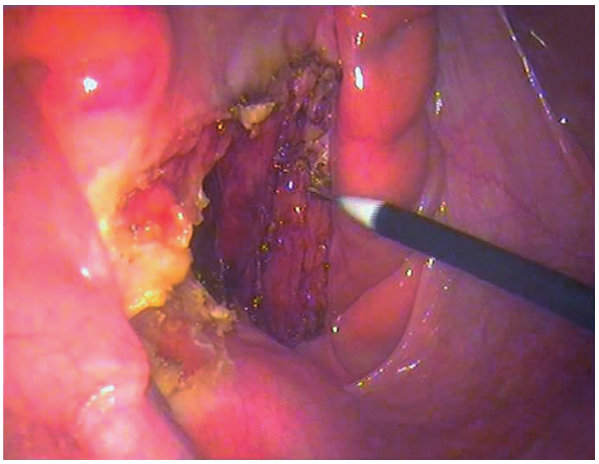
Suturing the polyprolene mesh to the anterior rectal wall with laparoscopic suture.

Figure 3



Fixing the polyprolene mesh to sacral promontory using a laparoscopic tacker.

Figure 4



Dissection of the sigmoid mesocolon to create a mesenteric window in laparoscopic resection rectopexy.

to preserve the superior rectal artery pedicle. The dissection is performed down to the upper third of the rectum; then the rectum is transected by a linear endostapler after rectal washout (Fig 5).

Finally, the incision of the left lower trocar is enlarged according to the diameter of the colon (3–5 cm) and the specimen extracted. The sigmoid colon is then resected, and the head of the stapler is inserted in the descending colon. A purse-string suture is tied.

The colon is replaced into the abdominal cavity, and the mini-laparotomy wound is closed.

Now, the circular stapling device is introduced into the rectum. The tip of the center rod is placed directly above or below the center of the endostapler suture line. After the stapler head has been connected to the center rod and the instrument has been approximated, the stapler is fired. It is important to slightly pull back the stapling device to achieve a wide anastomosis. A pneumatic test verifies the absence of any primary leakage.

The pexy is performed by three running sutures, creating an inverted 'Y'. The first suture closes the peritoneal defect anteriorly and fixates the rectum ventrally on the peritoneal edge to elevate the peritoneal reflection. This avoids a cul-de-sac phenomenon. The remaining running sutures fixate the mobilized and elevated rectum on the left and right lateral wall of the peritoneal edge. An intraperitoneal drain is put in all patients (Fig 6).

Postoperative care

Vital signs and output of drains and urinary catheter were measured and recorded. Third-generation cephalosporins and metronidazole were administered to all patients for 36 h postoperatively and proper pain management with analgesics was achieved as needed.

Early ambulation was advocated in all patients within 8 h of the procedure. Starting of oral fluid intake varied. For patients with ventral mesh rectopexy, oral fluid intake started as soon as bowel sounds were heard, whereas in patients who underwent resection rectopexy oral fluid intake was delayed until the fourth postoperative day.

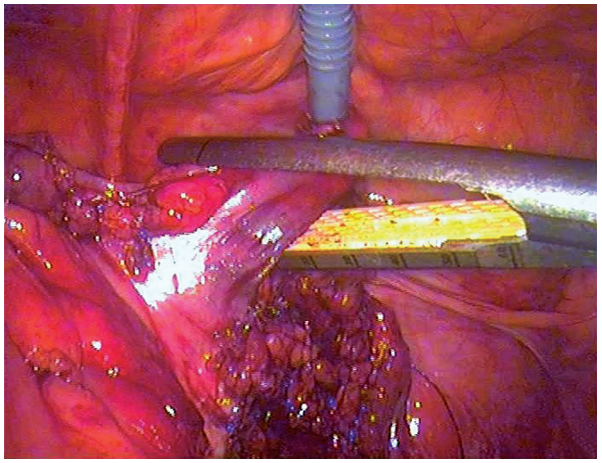
Follow up

Follow-up was conducted at 3 months, 6 months, and 1 year postoperatively and included postoperative symptoms review, Wexner constipation score, Pescatori continence score, clinical recurrence, postoperative manometry, defecography, and patient satisfaction.

Statistical analysis

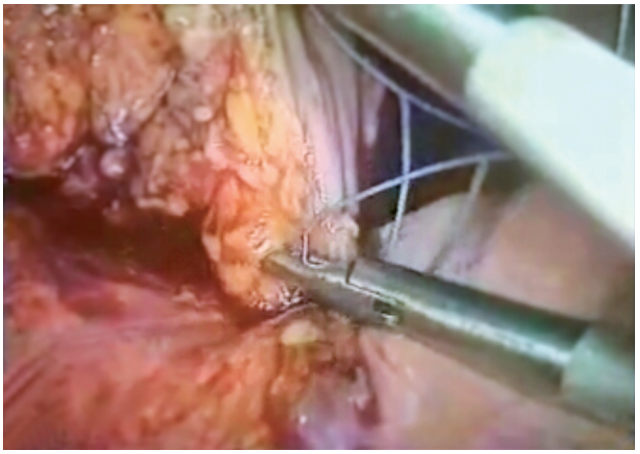
Data were analyzed using Excel and SPSS (Statistical Package for Social Science, Bristol University, UK) version 16 under Microsoft Windows. The description of data was in the form of mean ± SD for quantitative data and frequency and proportion for qualitative data. The analysis of data was carried out to test the statistically significant difference between groups. The Student *t*-test was used to compare quantitative data (mean ± SD) between two groups. *P* values less than 0.05 were considered significant. OD was considered if Wexner score was more than 5. Significant improvement in OD or FI was considered as a reduction in Wexner or Pescatori score of at least 25%.

Figure 5



Application of a linear stapler to the sigmoid colon in laparoscopic resection rectopexy.

Figure 6



Suturing the rectum after reanastomosis to lateral peritoneal folds in laparoscopic resection rectopexy.

Results

The demographic data of all patients are shown in Table 1. All patients had symptoms of OD mainly in the form of sense of outlet obstruction and straining. Two (7%) patients had mixed symptoms of OD and FI, two patients had an additional complaint of bleeding per rectum, and three patients complained of mucus discharge. Nine (32.14%) female patients were discovered to have anterior rectocele in association.

At 3 months postoperatively, 22 (78.5%) patients reported improvement as regards OD symptoms and six (21.5%) patients had persistent OD symptoms. Of the 22 patients whose condition improved, 16 patients were cured and six showed improvement but were not totally cured. Among the 22 patients who showed improvement, 12 patients were from the resection rectopexy group (85.7% of the group) and 10 patients were from the ventral mesh rectopexy group (71.4% of the group) (P = 0.648). No patient experienced worsening of OD. At 3 months postoperatively, the Wexner constipation score was significantly reduced (P = 0.0025) from a mean preoperative of 15.57 ± 2.3 to a mean postoperative of 4.8, which declined at 1 year postoperatively to 3.27 ± 1.58 [confidence interval (CI) = 95% at ± 0.59] (Table 2).

Two of the 28 patients with RI complained of mixed FI/OD preoperatively. At 3 months postoperatively, one (50%) patient showed improvement in FI and the other patient still complained of persistent FI. Among the two patients who had FI, the patient who did not show improvement was in the ventral mesh rectopexy group, and the patient whose condition had improved was in the resection rectopexy group. No patient experienced worsening or new onset of FI. The overall Pescatori score for incontinence decreased from a mean preoperative score of 0.32 to a mean postoperative score of 0.17 (P = 0.49). For the patients with FI, the score dropped from a mean of 4.5 preoperatively to a mean of 2.5 at 1 year postoperatively.

All patients had a visible RI during straining in the defecogram. According to the Oxford grading system, 11 (39.2%) patients were grade IV, 13 (46.5%) patients were grade III, two (7.14%) patients were grade II, and two (7.14%) patients were grade I (Table 3). Anterior rectocele less than 2 cm was detected in four (14.28%) patients and anterior rectocele more than 2 cm was detected in five (17.85%) patients; 22 (78.5%) patients showed no RI in the postoperative defecogram. Twelve (85.7%) patients of the resection rectopexy group and 10 (71.4%) patients of the ventral mesh rectopexy group had disappearance of RI in defecography at 3 months postoperatively. As for the nine patients who had coexisting anterior rectocele, the postoperative defecogram of six (66.6%) of them (five in the resection group and one in the ventral mesh group) did not reveal a rectocele, whereas three patients (one in the resection group and two in the ventral mesh group) were seen to have persistent rectocele.

The mean anal pressure during rest changed from 60.2 ± 13.3 mmHg preoperatively to 63.4 ± 11.7 mmHg at 3 months postoperatively (P = 0.655; CI = 95% at ±

Table 1 Demographic data of 28 patients

Patients	*n*	Mean age	Obstructed defecation [*n* (%)]	Fecal incontinence [*n* (%)]	Other symptoms	Mean Wexner score
Male	11	41.16	11 (100)	0 (0)	Bleeding/rectumMucus discharge	14.85 ± 3.13
Female	17	45.68	17 (100)	2 (11.76)	Bleeding/rectumMucus discharge	16.28 ± 1.47

Table 2 Epidemiology and postoperative symptom improvement in both groups

Patients	Laparoscopic ventral mesh rectopexy	Laparoscopic resection rectopexy	*P* value
Age	44.62	42.2	
Sex (female : male)	10 : 4	7 : 7	0.44
Duration of symptoms (years)	1.39	1.43	
Improvement in OD [*n* (%)]	10 (71.4)	12 (85.7)	0.648
Improvement in FI [*n* (%)]	0 (0)	1 (100)	1.00
Mean Wexner score			
Preoperative	15.48 ± 2.4	15.66 ± 2.2	0.863
Postoperative	4.27 ± 1.7	2.28 ± 1.46	0.0025
Mean Pescatori score			
Preoperative	0.35 ± 1.87	0.28 ± 1.39	0.911
Postoperative	0.35 ± 1.87	0	0.49

FI, fecal incontinence; OD, obstructed defecation.

4.33). The mean anal pressure during maximal squeeze dropped from 139.9 ± 25.2 mmHg preoperatively to 114.85 ± 6.4 mmHg at 3 months postoperatively (P = 0.244; CI = 95% at ± 2.37). RAIR was intact in all patients (Table 4).

The mean operative time in the ventral mesh rectopexy group was 2.14 h, whereas the mean operative time in the resection rectopexy group was 2.97 h (P = 0.0003). Conversion to open procedure was implemented in five (17.8%) patients (P = 1). Minor morbidity occurred in five (17.8%) patients but there were no mesh-related complications. One (3.5%) patient developed a major complication in the form of dehiscence of anastomosis and leakage. No female patients complained of sexual dysfunction and no male patient complained of ejaculatory or erectile difficulties postoperatively. There was no postoperative mortality.

Clinical recurrence was diagnosed in six (21.4%) patients at 3 months postoperatively (four patients after ventral mesh rectopexy and two patients after resection rectopexy). Two of the recurrent cases were of Oxford grade I, another two cases were of grade II, one case was of grade III, and one case was of grade IV.

Fifteen (53.57%) patients reported grade I satisfaction, seven (25%) patients reported grade II, six (21.4%) patients reported grade III, and two (7.14%) patients reported grade IV satisfaction. As for the quality of life assessed by PAC-QoL, 14 (50%) patients were in the excellent subscale, five (17.8%) patients in the good subscale, four (14.28%) patients in the fairly good subscale, and only three (10.7%) patients were in the poor subscale.

Discussion

RI presents with a spectrum of related complaints ranging from constipation to FI. The most common complaints are rectal pressure with constipation in mild and moderate intussusception, and straining at bowel movement with constant rectal pain in severe intussusception [11].

Doubts have been raised about the relationship of RI to external rectal prolapse and a possible shared common pathophysiology, which has brought focus on the effect of rectopexy surgery for RI [12].

The aim of surgery for rectal intussusception is to correct the anatomical defect, alleviate bowel dysfunction, and avoid functional sequelae. Abdominal rectopexy appears to be more effective than perineal procedures in controlling RI [13].

Laparoscopic ventral rectopexy became popular as a result of both impressive functional results in external rectal prolapse [14] and the advantages of a laparoscopic approach. Because it avoids posterior rectal mobilization and thus rectal denervation inertia, it improves OD symptoms in about 80% of patients without worsening or inducing new-onset constipation symptoms [15]. This is in distinct contrast to traditional posterior rectopexy for external rectal prolapse, after which about 50% of patients complain of new or worse constipation [16].

In our study we compared ventral mesh rectopexy and resection rectopexy for correction of RI. Choosing the laparoscopic approach as a minimally invasive approach had its advantages as it entails a smaller surgical incision; thus, there is less postoperative pain and better cosmetic appearance, with less incidence of postoperative ileus and wound complication [17].

The dominant symptom in all our patients was sense of outlet obstruction and straining similar to what was reported in another study on RI [18]. FI was a secondary complaint in 7.25% of patients, which might be attributed to widening of the anal canal, alteration of the sensory mechanisms and sphincter muscles, and also pudendal neuropathy resulting from long-standing, excessive straining to defecate [19]. Sometimes distention of the lower rectum by the intussusceptum activates the

Table 3 Oxford grading of rectoanal intussusception

Grades	Definition	Percentage (%)
I	High rectorectal	7.14
II	Low rectorectal	7.14
III	High rectoanal	46.5
IV	Low rectoanal	39.2

Table 4 Changes in mean anal pressure after both procedures

Manometric results	Laparoscopic ventral mesh rectopexy	Laparoscopic resection rectopexy	P value
Mean resting anal pressure			
Preoperative	58.7 ± 12.2	61.7 ± 14.4	0.557
Postoperative	62.4 ± 11.3	64.4 ± 12.1	0.655
Mean squeeze anal pressure			
Preoperative	137.5 ± 24.7	142.3 ± 25.56	0.617
Postoperative	113.4 ± 5.7	116.3 ± 7.1	0.244

rectoanal inhibitory reflex, resulting in relaxation of the internal anal sphincter and producing an overflow incontinence [20].

As for symptoms, 22 (78.5%) patients with OD showed improvement overall, with 16 patients reporting complete cure of symptoms. The improvement was higher in the resection rectopexy group (85.7%), similar to the result obtained in a recent study [21], compared with the ventral mesh rectopexy group (71.4%), but is less than the 86% seen in another study [12]. Two patients, both female, had mixed complaints of OD and FI; only one of them, from the resection rectopexy group, reported improvement (Table 2).

Defecography revealed RI in 100% of patients, with 46.5% of them in Oxford grade III. Postoperative defecography showed disappearance of RI in 22 (78.5%) patients overall, similar to Johnson's study [21]. Resection rectopexy showed better results than ventral mesh rectopexy (85.7 vs. 71.4%). Interestingly, the four cases showing recurrence in the ventral mesh rectopexy group were of Oxford grade I and grade II, which might imply that, the higher the intussusception, the lower the success rate of ventral mesh rectopexy.

Anterior rectocele was observed as an associated finding in almost one-third of the patients, all of whom were female. About two-third of these rectoceles disappeared postoperatively, mostly in the resection rectopexy group, which is concordant with the report of Laubert *et al*. [22] that the combination of sigmoid resection and rectopexy results in the highest rates of improvement in OD syndrome.

Mean resting and squeeze anal pressures were within the normal range, as observed by Christiansen *et al*. [23]. Postoperative anorectal manometry showed mild increase in the mean resting anal pressure in both groups and decrease in the mean squeeze anal pressure also in both groups; yet, both results were statistically insignificant (P = 0.592 and 0.162, respectively) (Table 4).

Comparison of the two groups revealed a longer mean operative time, more intraoperative blood loss, longer hospital stay, and a higher conversion to open procedure in the resection group (Table 5). One major operative complication was detected in the resection group with dehiscence of the anastomosis and leakage, which was detected in the third postoperative day and managed by laparotomy, peritoneal toilet, and end colostomy (Hartmann's procedure). Minor complications such as wound infection and urinary tract infection were detected and managed properly. No mortality was reported in the study.

In six patients (two males and four females) with persistent complaint, clinical recurrence was diagnosed by Digital Rectal Examination (DRE) in the outpatient clinic at 3 months' follow-up; four of these patients were in the ventral mesh group. All six patients showed persistent or recurrent RI in the postoperative defecography, correlating with the clinical findings.

The overall patient satisfaction graded from I to IV showed that more than half of the patients reported no defecatory problems (grade I), and 7.14% of them reported severe defecatory problems affecting their quality of life (grade IV)

Conclusion

Laparoscopic rectopexy is a unique approach for RI. Both the ventral mesh method and the resection method give excellent early functional outcomes such as improving OD symptoms and/or associated FI with minimal morbidity, due to the benefits of minimally invasive surgery.

While resection rectopexy proved to be superior as regards symptom improvement, with the lowest recurrence rate, it has its drawbacks, such as longer

Table 5 Operative data of both procedures

Data	Laparoscopic ventral mesh rectopexy	Laparoscopic resection rectopexy	*P* value
Number of patients (*n*)			
Male	4	7	0.44
Female	10	7	
Mean operative time (h)	2.14 ± 0.635	2.97 ± 0.371	0.0003
Average blood loss (ml)	143 ± 57.98	228.3 ± 129.61	0.033
Conversion	2	3	1
Complications			
Minor	2	3	0.648
Major	0	1	
Postoperative hospital stay (days)	2.4 ± 0.7	5.9 ± 0.99	0.0001
Recurrence	4	2	0.648

operative time and hospital stay, which increase both potential morbidity and healthcare costs. Ventral mesh rectopexy, although not as efficient as resection rectopexy in controlling the symptoms, proves to be safer, easier, and less time-consuming. Thus, the choice between the two procedures should be made carefully and tailored to each individual patient.

Acknowledgements

Conflicts of interest

None declared.

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