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ORIGINAL ARTICLE

New-onset rectoanal intussusception may not result in symptomatic improvement after laparoscopic ventral rectopexy for external rectal prolapse

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Abstract
Background This study was designed to assess defecatory function in patients who underwent laparoscopic ventral rectopexy (LVR) for external rectal prolapse (ERP).
Methods Thirty-one patients who underwent evacuation proctography 6 months postoperatively were assessed. Preoperative proctography had been performed in 21 patients of these patients. Defecatory function was evaluated using the constipation scoring system (CSS) and fecal incontinence severity index (FISI).
Results The findings of postoperative proctography revealed no full-thickness ERP in any patient, although in 10 patients the ERP was replaced by rectoanal intussusception (RAI). Of the 31 patients, 30 presented with fecal incontinence preoperatively. Ten of 30 had new-onset RAI. Six months postoperatively, a reduction of at least 50 % in the FISI score of the patients with new-onset RAI tended to be significantly smaller than in the patients without RAI (6/10 vs. 18/20, $p = 0.141$). Seventeen patients presented with obstructed defecation preoperatively. Seven of them had new-onset RAI. Six months postoperatively, a reduction of at least 50 % in their CSS score in the patients with new-onset RAI was significantly smaller than in patients without RAI (0/7 vs. 8/10, $p = 0.002$).
Conclusions Evacuation proctography showed new-onset RAI in some patients with ERP who underwent LVR, which was associated with a lack of symptomatic improvement.

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Keywords Laparoscopic ventral rectopexy · External rectal prolapse · Evacuation proctography

Introduction

The ideal surgical treatment for external rectal prolapse (ERP) should correct the anatomical abnormalities and associated symptoms, which range from fecal incontinence (FI) to obstructed defecation (OD). Abdominal rectopexy is preferable to a perineal procedure, because the former is known to be associated with much less long-term recurrence and better recovery of continence [1]. However, it is well known that the abdominal procedure is not very effective and frequently results in new-onset constipation. The cause of this postoperative constipation remains unclear, but nerve injuries during extensive posterior rectal mobilization leading to complete denervation might be involved [2].

In 2004, D'Hoore and Penninckx [2] proposed using laparoscopic ventral rectopexy (LVR) for the treatment of ERP. This anterior approach, limiting rectal mobilization without lateral dissection, reduced the incidence of postoperative constipation, as compared to posterior rectopexy. Other authors have reproducibly demonstrated the safety of this minimally invasive abdominal procedure and its ability to provide a long-term cure of ERP with little surgical morbidity [3–9]. LVR may also help correct pelvic floor descent during defecation by providing vertical support via the perineal body. It also provides distinct benefits to the middle pelvic compartment by supporting and reinforcing the rectovaginal septum and, at the same time, it corrects any associated genital prolapse, rectocele and enterocele.

To date, however, there have been no studies analyzing the results of LVR using pelvic floor imaging, which is

important when interpreting postoperative symptoms in patients with ERP. The present study assessed outcomes in patients who underwent LVR for ERP, with special reference to the postoperative findings on evacuation proctography.

Materials and methods

Data for all patients who underwent LVR for ERP between September 2011 and June 2014 were prospectively entered into a pelvic floor database. Fifty-four patients with LVR were included, and only one premenopausal woman was offered Delorme's procedure for ERP in this period. Eleven patients who were incapable of assessing anorectal function because of senile dementia or schizophrenia and 12 patients who did not undergo postoperative proctography were excluded from the analysis. The remaining 31 patients were evaluated in this study. This was a retrospective study of prospective collected data.

The diagnosis of ERP was made clinically, and where not possible, on evacuation proctography. A history of fecal incontinence (FI) and/or obstructive defecation (OD) was recorded. Symptoms of OD include incomplete evacuation, straining, digitation, sensation of anorectal obstruction and repeated visits to the toilet. Anorectal function was evaluated using two different scores: the fecal incontinence severity index (FISI) [10] and the constipation scoring system (CSS) [11]. No patient underwent a colonic transit study. All patients were reviewed in the outpatient clinic 3, 6 and 12 months after their procedure and assessed for recurrence and morbidity. CSS and FISI were reported at those visits. Evacuation proctography was also performed 6 months after the procedure. Informed consent including consent to radiation exposure during postoperative proctography was obtained from all patients included in the study. Patients were informed that the length of their stay after surgery would be 1–2 nights.

Surgical technique

The surgical procedure for LVR was basically carried out as described by D'Hoore and Penninckx [2]. Dissection was performed only anterior to the rectum, preserving the lateral ligaments, and the rectovaginal septum was carefully dissected down to the pelvic floor, with the distal extent, usually 2–3 cm from the anal verge, confirmed by digital rectal examination. The hypogastric nerves and parasympathetic nerves from the lateral ligaments were spared, and mobilization of the mesorectum was avoided.

A strip of polypropylene (3 × 18 cm) mesh was introduced, provisionally attached to the anterior rectum using an endofascial stapler (Endopath^{TM} EMS; Ethicon Endo-Surgery, USA) and sutured as distally as possible onto the rectal wall using six interrupted, non-absorbable sutures (2-0 Tycron, Covidien, Japan). The posterior wall of the vagina was fixed to the mesh with two additional sutures of the same type. The mesh was then secured tension-free to the sacral promontory using the endofascial stapler and was peritonealized by suturing the free edge of the previously divided peritoneum over the mesh, which avoided small bowel adhesion to the mesh.

Postoperatively, an enhanced recovery program was employed, with early mobilization and resumption of normal diet, and oral administration of magnesium dioxide. On the morning after surgery, the epidural catheter and urethral catheter were removed and intravenous fluids were stopped.

Evacuation proctography

A standardized proctography technique was used. To achieve this, the small bowel was opacified with a mixture containing 100 ml of Barister^{TM} (barium sulfate 100 % w/w; Fushimi Health Care Ltd., Japan) and 10 ml of Urografin (60 % w/w; Bayer Pharmaceutical Ltd. Japan), which was ingested 30 min prior to the procedure. The patient was then placed in the left lateral position on the fluoroscopic table, and barium installation (50 ml) and air insufflation were performed to improve the quality of the contrast images. A synthetic stool consisting of barium sulfate, porridge oats and water (total of 150 ml) was inserted into the rectum using a 50-ml bladder syringe. The patient was then seated on a radiolucent commode on a fluoroscopic X-ray table, and lateral radiographs of the pelvis were taken in resting, squeezing and pushing positions. Finally, the patient was asked to bear down maximally during evacuation. Images from proctography were analyzed by one of the authors (T. T.), who is experienced in this investigation [12] and was blinded at that time to the symptomatology of individual patients. Measurements were taken using an X-ray flat panel detector (Toshiba Ultimax, Toshiba Medical System, Japan) calibrated to a metal globe or paper clip of known dimensions and included in the image field during the proctography. Proctograms were evaluated using the criteria proposed by Shorvon et al. [13]. Rectoanal intussusception (RAI) was diagnosed when the apex of the rectal intussusception impinged on the internal anal orifice or was intra-anal, based on the images taken during maximal straining to defecate. Rectorectal intussusception (RRI) was differentiated from RAI if the apex remained intrarectal and did not impinge on the internal anal orifice. ERP was diagnosed when full-thickness rectal wall protruded through the anal orifice. Pelvic floor descent during defecation was estimated based on the extent of the anorectal junction relative

to the inferior margin of the ischial tuberosity [13]. The presence of rectocele was classified as grade 1 (<2 cm in depth), grade 2 (2–4 cm in depth) or grade 3 (>4 cm in depth) [14]. The size was calculated in standard fashion (anterior–posterior) by measuring the distance between the actual most ventral part of the anterior rectal wall and an extrapolated line indicating the expected position of the rectal wall [15]. Enterocele was diagnosed when the extension of the loop of the small bowel was located between the vagina and rectum.

Statistical analysis

Quantitative data are expressed as the median and range. Analysis was performed using the Mann–Whitney *U* test for unpaired data. A nonparametric Friedman's two-way analysis of variance test was used to identify all overall significant differences between scores at different time points for each variable. When the overall *p* value indicated statistical significance, a Wilcoxon's signed rank test for paired data was used to compare pairs of functional scores (two-tailed test). Categoric variables were compared using the Chi-squared test or Fisher's exact test.

Results

The median age of the 31 patients was 76 years (range 40–94 years), and 26 (84 %) were females. The median duration of follow-up was 25 months (range 6–45 months). Seventeen patients (55 %) had mixed FI and OD, 13 had FI alone, and 1 did not have either FI or OD. Eleven patients had associated urinary incontinence, and 3 had pelvic organ prolapse. Overall, 13 (42 %) patients had undergone previous abdominal or pelvic surgery, including perineal procedures for ERP ($n = 3$), cholecystectomy ($n = 3$), appendectomy ($n = 3$), oophoro-salpingectomy ($n = 2$), transvaginal surgery for pelvic organ prolapse ($n = 2$), hemorrhoidectomy ($n = 2$), segmental colectomy ($n = 1$), transurethral resection of a bladder tumor ($n = 1$) and Caesarian section ($n = 1$).

There was no conversion to open surgery and no surgical reintervention during the index surgery admission. The median length of the postoperative stay was 1 day (range 1–8 days). There was no postoperative mortality or major morbidity. Minor complications occurred in 2 patients: port-site infection ($n = 1$) and subcutaneous hemorrhage ($n = 1$).

Evacuation proctography

Preoperative evacuation proctography was performed in 21 patients. The findings other than ERP revealed enterocele in three women and sigmoidocele in two women, one of whom had undergone previous sigmoid colectomy. Six months after surgery, proctography was performed in 31 patients including the 21 patients evaluated preoperatively. The findings revealed no ERP in any patient (Fig. 1), although in 10 patients ERP was replaced by RAI (Fig. 2) and in 3 patients by RRI. All the enteroceles ($n = 3$) and 2 of the sigmoidoceles had disappeared. Grade 1 rectocele (median 10 mm) was found in 6 patients. Pelvic floor descent was not significantly reduced (median preoperatively 21 vs. 16 mm postoperatively, $p = 0.931$) (Table 1).

Fecal incontinence

Of the 31 patients, 30 patients (97 %) presented with FI preoperatively. The FISI score was significantly reduced at 3 months (median preoperatively 34 vs. postoperatively 12, $p < 0.0001$, Table 2) and remained so at 6 and 12 months. Ten of the 30 patients had new-onset RAI. Six months after surgery, a reduction of at least 50 % in the FISI score was observed in 6 of 10 patients (60 %) with new-onset RAI, and 18 of 20 patients (90 %), without RAI. The reduction rate tended to be smaller in the former group ($p = 0.141$) (Fig. 3). In 3 patients with new-onset RRI, the changes in FISI scores (preoperatively: 49, 55, 31 vs. 6 months postoperatively: 0, 14, 7, respectively) were excellent. The patient without FI and OD preoperatively did not develop new-onset FI.

Obstructed defecation

Of the 31 patients, 17 patients (55 %) presented with OD preoperatively. The CSS scores were significantly reduced at 3 months (median preoperatively 13 vs. postoperatively 8 months, $p = 0.001$, Table 1) and remained significant at 6 or 12 months. Seven of the 17 patients had new-onset RAI. Six months after surgery, a reduction of at least 50 % in their CSS score in the patients with new-onset RAI and without RAI was observed in 0 of 7 patients (0 %) and 8 of 10 patients (80 %), respectively. The reduction rate was significantly smaller in the former group ($p = 0.002$) (Fig. 4). In 3 patients with new-onset RRI, the change in the CSS score (preoperatively: 18, 15, 10 vs. 6 months postoperatively 5, 7, 6, respectively) was satisfactory. The remaining 14 patients without OD preoperatively did not develop new-onset OD.

Reoperation

Of the 10 patients with new-onset RAI, 3 underwent reoperation. In 2 of the 3 patients, plain X-ray imaging showed that the staples were not fixed at the sacral promontory and seemed to have slipped downward in both

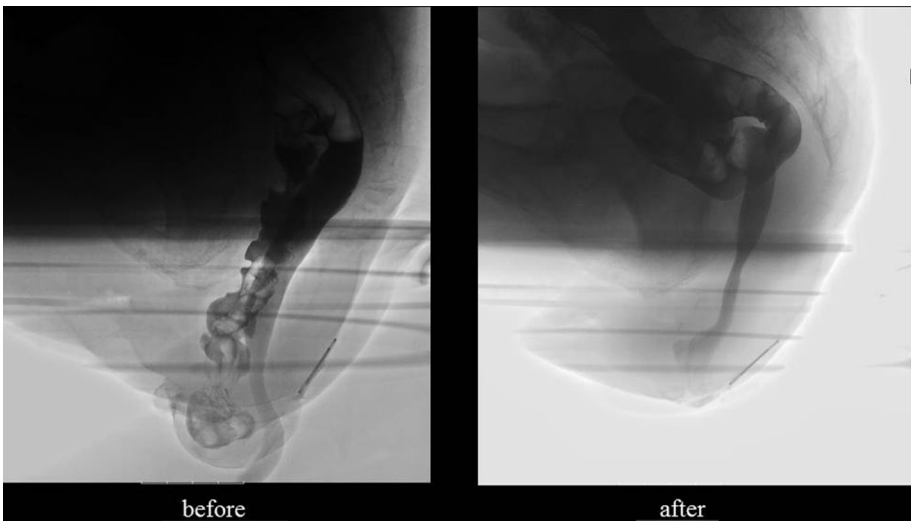

Fig. 1 External rectal prolapse with sigmoidocele was corrected after surgery

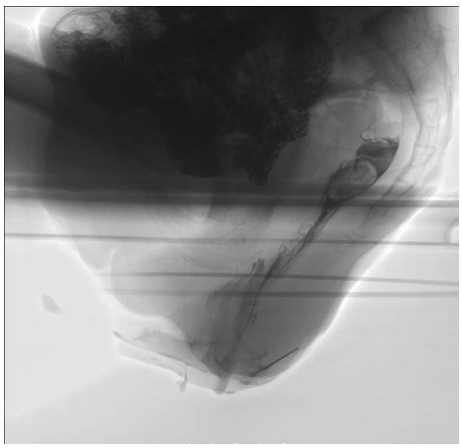

Fig. 2 Rectoanal intussusception appeared after surgery

Table 1 Evacuation proctography findings

	Pre-op ($n = 21$)	6 months ($n = 31$)
External rectal prolapse	21	0
Rectoanal intussusception	0	10
Rectorectal intussusception	0	3
Enterocele	3	0
Sigmoidocele	2	0
Grade 1 rectocele	NA	6
Pelvic floor descent[a] (mm)	21 (−14 to 51)	16 (−16 to 47)*

NA not assessed. Values are presented as *n* or median (range)

* $p = 0.931$, versus preoperatively (Wilcoxon signed rank test)

[a] The extent of the anorectal junction relative to the inferior margin of the ischial tuberosity during defecation

cases. Reoperation revealed that the mesh was actually detached in both cases. Re-LVR using another mesh fixed at the sacral promontory was performed, 17 and 31 months after the primary surgery, respectively. FI symptoms were improved (median FISI score pre-reoperation 29 vs. 6M post-reoperation 12), but OD symptoms persisted in both cases after reoperation. New-onset RAI was not completely corrected in either of the patients, as shown on proctography. The remaining patient underwent Delorme's transrectal excision for RAI [16] 10 months after the initial surgery. Mucus discharge was reduced after reoperation. Her OD and FI symptoms had improved after the primary surgery, and the status quo was maintained after reoperation.

Discussion

To the best of our knowledge, this is the first report presenting pelvic floor imaging after LVR for ERP. Successful anatomical correction of ERP was achieved in all 31 patients who were evaluated by evacuation proctography postoperatively. Notably, new-onset RAI appeared after LVR in 10 patients. This may be attributable to the motion of the posterior rectal wall and the anterior rectal wall above the peritoneal reflection, which were infolded during proctography, while the anterior wall of the low rectum remained fixed and suspended by the mesh. The rectum is usually redundant and mobile in patients with ERP. The posterior rectal wall may not be fixed to the presacral fascia and may descend easily on straining. New-onset RAI was probably not due to recurrence below the mesh, because the distal extent of dissecting the rectovaginal septum was usually 2–3 cm from the anal verge, and the mesh was sutured as distally as possible onto the rectal wall.

A significant rectocele was absent after LVR in this study, although its preoperative size was uncertain in most of the patients. LVR has been demonstrated to be effective

Table 2 Defecatory function scores

	Preoperative	3 months	6 months	12 months	p^a
FISI score	34 (10–61) ($n = 30$)	12 (0–29)* ($n = 30$)	12 (0–31)* ($n = 30$)	11 (0–33)* ($n = 21$)	<0.0001
CSS score	13 (9–18) ($n = 17$)	8 (0–16)$^{\#}$ ($n = 17$)	6 (1–15)$^{\#}$ ($n = 17$)	6 (1–12)$^{\$}$ ($n = 11$)	<0.0001

Values are presented as *n* or median (range)

FISI fecal incontinence severity index, *CSS* constipation scoring system

* $p < 0.0001$, $^{\#}$ $p = 0.001$, $^{\$}$ $p = 0.005$, versus preoperative (Wilcoxon signed rank test)

[a] Friedman's two-way analysis of variance test

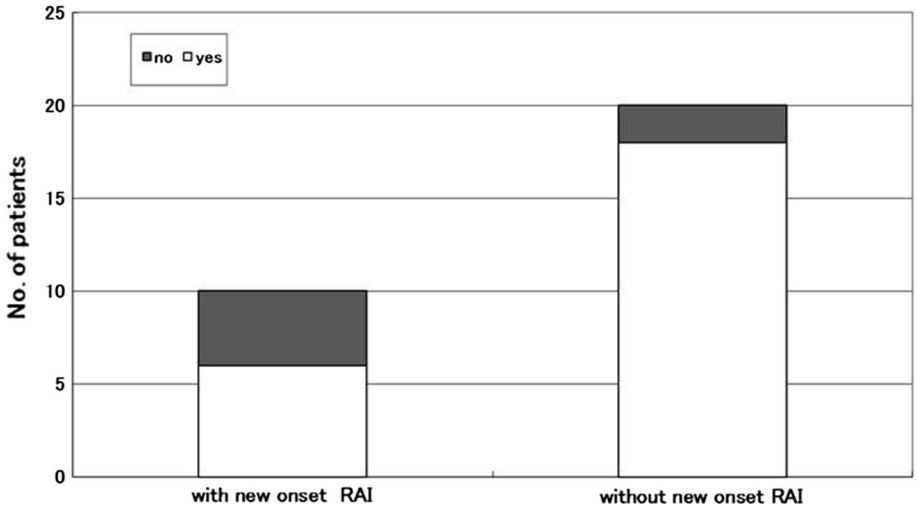

Fig. 3 Patients with a reduction of at least 50 % in the fecal incontinence severity index score after laparoscopic ventral rectopexy. *RAI* rectoanal intussusception. The reduction rate in patients with and without new-onset RAI was 60 % (6/10) and 90 % (18/20), respectively ($p = 0.141$)

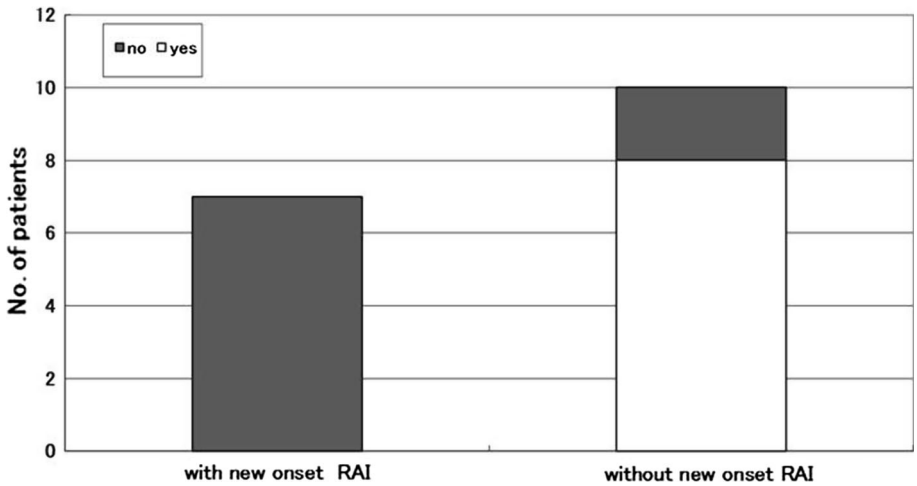

Fig. 4 Patients with a reduction of at least 50 % in the constipation scoring system scores after laparoscopic ventral rectopexy. *RAI* rectoanal intussusception. The reduction rate in patients with and without new-onset RAI was 0 % (0/7) and 80 % (8/10), respectively ($p = 0.002$)

in treating large rectocele [17]. Pelvic floor descent when straining was not significantly reduced. This may reflect our surgical technique for mesh fixation, which avoided any traction on the rectum [2].

Current literature on LVR for ERP is limited, but significant improvement in FI and OD symptoms in patients with ERP has been reported by several studies [2–7, 18, 19]. Boons et al. [4] reported that among 65 patients who underwent LVR for ERP, FI symptoms were improved or cured in 83 % of patients, and OD symptoms in 72 % of patients. In this study, postoperative continence was satisfactory, with significant improvement over time (Table 2). Although our assessment of the improvement in symptoms was different from that of other authors (significant improvement defined as a reduction of at least 50 % in FISI or CSS scores), our data compare favorably to previously published literature, which reported a mean postoperative improvement in continence ranging from 80 to 90 % [1].

This is entirely consistent with the abdominal approach and is not specific to a ventral rectopexy. The mechanisms of postoperative improvement in OD are unclear but might be related to autonomic nerve-sparing surgery [2]. LVR does not require posterior and lateral rectal mobilization, and thus, the risk of sympathetic nerve damage is avoided.

However, FI did not resolve in 10 % of the patients, and OD did not resolve or new-onset OD appeared in 20–30 % of the patients who underwent LVR [2, 4, 5]. These results are also supported by our study and may be related to the appearance of new-onset RAI while correcting ERP, because the patients with RAI frequently have either FI or OD symptoms [20–22]. The cause of FI is often multifactorial; thus, patients who did not improve after surgery may have had other underlying factors causing the FI, such as anal sphincter failure or a colonic transit disorder [23, 24]. Three patients with new-onset RRI experienced improvement in their presenting symptoms. An earlier proctographic study also found that patients with RAI were more likely to experience symptoms of OD and FI than patients with rectorectal intussusception [25].

Laparoscopic ventral rectopexy (LVR) has also been reported to be effective for the treatment of patients with RAI and rectocele [17, 25, 26]. The distal position of the mesh on the pelvic floor allows repair of large rectoceles. The mesh also elevates the pouch of Douglas and corrects a concomitant enterocele and sigmoidocele. These theoretical features are supported by postoperative proctography in the present study, which showed that no significant rectocele appeared, enterocele disappeared, and sigmoidocele was corrected unless detachment of mesh occurred.

Our complication rate was comparable to the previously reported rates of 5–21 % [2–4] and mainly reflected minor complications such as port-site infection. LVR does carry a risk of mesh detachment, infection or erosion into the rectum or vagina [27], although no patient in our series experienced either of these complications. Two patients with new-onset RAI in our series did require reoperation due to mesh detachment, although the full-thickness recurrence was not evident on postoperative proctography. A low recurrence rate of ERP and a small percentage of reoperations due to failure has been reported previously [1–8].

This study was limited by the preliminary observational design, small sample size, lack of control group and short follow-up.

Conclusions

LVR for ERP is associated with a low recurrence and low morbidity rate and produces excellent functional results in the majority of patients. Successful anatomical correction of ERP was confirmed by postoperative evacuation proctography. However, adequate (>50 %) symptomatic improvement was achieved in only 50 % of patients with OD and 80 % with FI, implying that new-onset RAI after LVR in patients with ERP may lead to insufficient symptomatic improvement. Evacuation proctography was a useful means of confirming the consequences of LVR, and this imaging technique could help clinicians to interpret the postoperative symptoms in patients treated for ERP. Further studies will be necessary to confirm and expand these results.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This study was approved by the Ethical Committee of Kameda Medical Center.

Informed consent Informed consent was obtained from all individual participants included in the study.

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