Short-term outcome of suture rectopexy in children with rectal prolapse: laparoscopic versus posterior sagittal approach

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Context
Innumerable surgical options addressing persistent rectal prolapse are available. This study compared the short-term outcome of laparoscopic suture rectopexy (LSR) with posterior sagittal rectopexy (PSR).

Patients and methods
A prospective randomized study was carried out on patients requiring rectal prolapse surgery. Patients were randomly allocated into LSR and PSR groups. Patients with neurological/musculoskeletal deficits, lower gastrointestinal tract anomalies and those with previous pelvic or perineal surgeries were excluded.

Results
A total of 66 patients, who had suture rectopexy done, were followed up for a minimum of 6 months following surgery. There were 33 LSR and 33 PSR. The mean duration of symptoms was 19 months (range: 6 months to 7.5 years). The mean age at operation was 5.9 years (range: 2.5–12 years), with a slight female predominance (54.5%). The mean operative time was 87.2 and 51.3 min for LSR and PSR, respectively. The mean postoperative hospital stay was 41.18 and 31.87 h for PSR and LSR, respectively. LSR had better Manchester Scar Scale scores compared with PSR (mean: 6.45 and 10.09, respectively). LSR patients resumed unrestricted activities earlier than those of PSR (mean: 9.84 and 15.15 days, respectively). Both groups showed comparable improvements in bowel functions and quality of life. Complications were a transient partial recurrence in one LSR patient (3.1%) and two wound infections in PSR group (6.2%). There was one conversion to laparotomy in LSR group (3.1%).

Conclusion
Both techniques seemed equally effective in eliminating rectal prolapse. Without longer operative times and conversion to laparotomy, LSR would have been absolutely superior to PSR.

Keywords:
laparoscopic, paediatric, posterosagittal, rectopexy

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Introduction

Rectal prolapse is a frequent encounter in paediatric surgery practice, resulting in significant distress to the children and the parents. Prolapse ranges from a partial mucosal prolapse that accompanies defecation and reduces spontaneously to complete prolapse of the rectum, requiring manual reduction [1]. Paediatric rectal prolapse is generally a self-limiting condition responding to conservative measures. Only in minority of cases, especially those older than 4 years, prolapse is persistent and symptomatic causing bleeding, pain and defecation disorders like tenesmus. This type of rectal prolapse is usually associated with persistent straining from diarrhoea and constipation in addition to other conditions like cystic fibrosis [2].

Surgery is indicated if persistent rectal prolapse causes bleeding, pain, recurrent manual reductions or defecatory troubles. Surgery is also justified if prolapse does not spontaneously resolve before the school age. In cases with secondary rectal prolapse owing to myelomeningocele, bladder/cloacal exstrophy or anorectal malformation, spontaneous cure is usually unexpected, and surgery remains the treatment of choice [3].

The posterior sagittal approach has been known since the 20th century to address a variety of pelvic problems. The posterior sagittal rectopexy (PSR) is a useful surgical alternative in treating the idiopathic cases of rectal prolapse [4].

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There has been a growing interest in laparoscopic approaches for addressing paediatric rectal prolapse [5–7]. Laparoscopic suture rectopexy (LSR), though simple from the technical point of view, anatomically corrects prolapse whilst not jeopardizing the integrity of the abdominal wall or pelvic floor. Apart from a few sutures, prosthetic materials are not necessary [8].

This work provides an assessment of the short-term outcome of LSR compared with that of PSR approach with an aim to identify whether one technique is superior to the other.

Patients and methods

This study was carried out in the Paediatric Surgery Department, Zagazig University Hospitals, during the period from December 2014 through March 2018. Procedures, including obtaining informed consent, were conducted in accordance with the ethical standards of the Institutional Review Board with the approval number ZU-IRB #1729-8-12-2014. Based on the recurrence rates following LSR and PSR in previous publications, at 80% power and 95% confidence interval, the estimated sample size was set to 33 patients for each group using EPI-Info (Centers for Disease Control and Prevention, Atlanta, USA) [9]. The study included 66 patients presented with persistent rectal prolapse for which they were operated upon by either LSR or PSR and followed up for a minimum of 6 months. Patients enroled in this study were serially numbered and randomly allocated into either of two groups: group A included 33 patients with odd numbers who underwent LSR and group B included 33 patients with even numbers who underwent PSR.

We excluded patients with known neurological or pelvic musculoskeletal deficits, lower gastrointestinal tract anomalies and patients with previous pelvic or perineal surgeries thought to confound the study results. Patients with underlying recalcitrant idiopathic constipation with marked dolichocolon were also excluded. However, Thiersch stitch did not exclude patients from the study.

Patients were studied regarding age, sex, duration of prolapse, prior interventions, co-morbidities and baseline modified Bai's Clinical Bowel Function (CBF) scores [10] and Bai's Quality of Life (QOL) scores [11]. The Bai scale was modified in our study by the addition of an 'absent' criterion to the 'incontinence' item in the original Bai scoring systems, with two points for absence of incontinence. Contrast enema, abdominopelvic ultrasound and stool analysis were done for all patients. Routine screening for cystic fibrosis was not done based on the exquisitely low incidence in the Egyptian population [12,13].

Preoperative management of co-morbidities, if any, like diarrhoeal disease, chronic constipation, parasitic infestation and malnutrition, was properly carried out so that all patients with persistent rectal prolapse were cleared for surgery.

We have opted for a mechanical bowel preparation regimen consisting of lactulose syrup 1–3 ml/kg/day 1 week before surgery with the dose being adjusted to ensure passage of soft stool 1–2 times daily. Following surgery, lactulose was continued for 2 weeks with an aim to avoid constipation and straining during defecations as much as possible. In the day before surgery, a normal saline enema was administered every 8 h and only clear enteral liquids were allowed.

All patients had a single dose of intravenous cefotaxime sodium 50 mg/kg before shifting the patient to the operating room. All cases underwent general anaesthesia with endotracheal intubation.

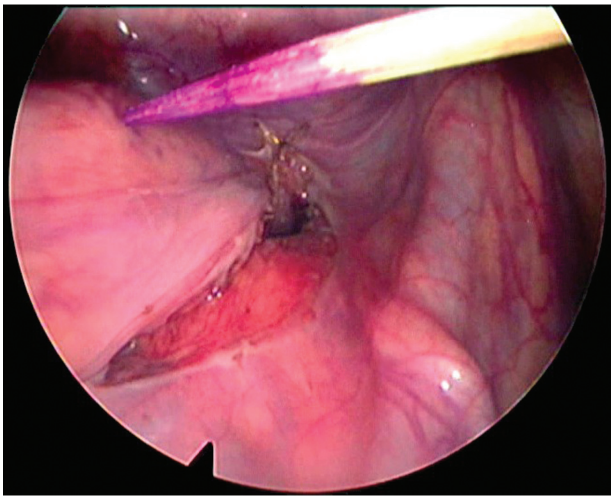
Laparoscopic suture rectopexy technique

Three 5-mm ports were generally enough for visualization, mobilization, presacral dissection, rectal fixation and sigmoidopexy. We used an umbilical port for the telescope and two mid-clavicular line working ports at the same horizontal level of the umbilicus or a bit lower, whichever permitted a proper triangulation. However, a forth port was required only in six patients, in whom tissue manipulations were deemed difficult to carry on using only three ports.

Retrorectal dissection was carried out on both sides starting from the level of the sacral promontorium down to the pelvic floor without dividing the lateral rectal ligaments [12–15].

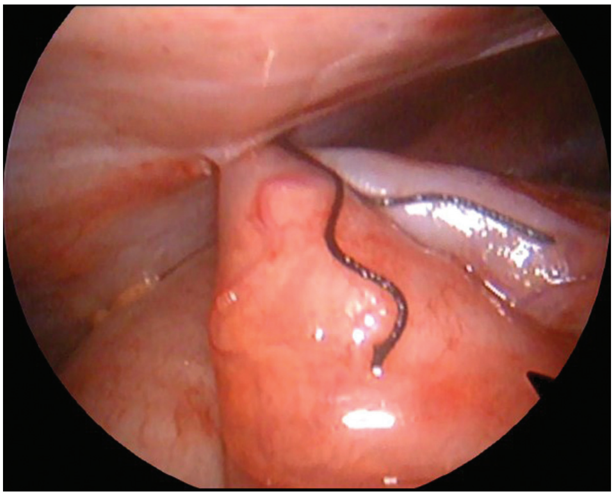
Mobilization was performed using a combination of sharp, blunt and monopolar cautery dissections. A sterile, Gentian violet-tipped wooden stick (Fig. 1) was introduced to mark the rectum at the level of proposed suture rectopexy opposite the sacral promontory while the rectum was pulled taut by the hand grasper. The posterior wall of the rectum was then fixed to the fascia over the sacral promontory using two (right and left) 2/0 silk sutures. A third seromuscular sigmoidopexy suture was used to fix the sigmoid colon to the left lateral peritoneum of anterior abdominal wall (Fig. 2), about two fingers breadth

Figure 1



Introducing the wooden marker. Note the dissected retrorectal space, right ureter and iliac vessels.

Figure 2



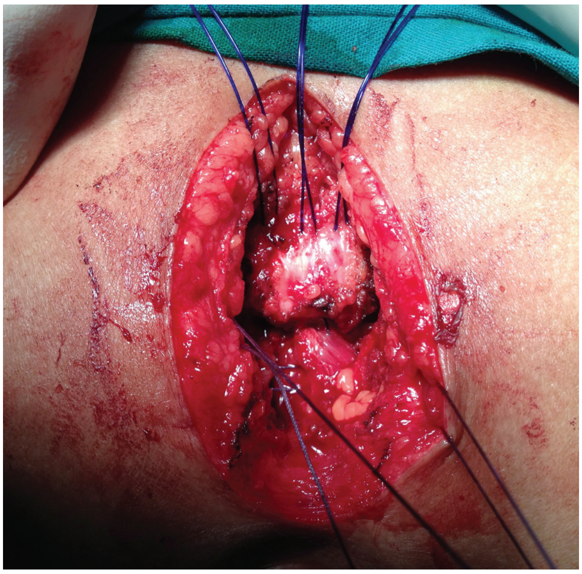
Lateral sigmoidopexy.

above and medial to the anterior superior iliac spine. Suture placement on the sigmoid was positioned so that no colonic redundancy is left between the two fixed points: sigmoidopexy and rectopexy. The sigmoidopexy suture was passed via the right port with the knot being tied extra-corporeally then slid using a knot pusher.

Posterior sagittal rectopexy technique

With the patient in prone position and the pelvis elevated, a midline incision was initiated through the natal cleft starting from above the level of coccyx down to the external anal sphincter. The parasagittal fibres and the levator muscles were divided in the midline using monopolar cauterization, followed by excision of the coccyx to provide a better exposure.

Figure 3



PSR before knot tying. Above: completed row of rectopexy sutures before knot tying. Below: PGA sutures through levator muscle on both sides, further incorporating the muscular wall of the rectum. PGA, polyglycolic acid; PSR, posterior sagittal rectopexy.

Dissection around both the posterior and lateral rectal walls was carried out and continued cephalad within the presacral space until the rectum was free enough to allow suture fixation.

A horizontal row of three successive 3/0 polypropylene sutures was then created through the sacral bone, consisting of a right, middle and left sutures based on their relative position on the sacrum (Fig. 3). Each suture had an inlet and an exit through the sacrum with the polypropylene loop anchoring the muscular layer of the rectal wall on the right side, back, and left side, correspondingly. The muscular bites within the rectum were horizontally spaced so that they provide a plication action on the rectum when tied. These sutures were then sequentially tied while an appropriately sized for age Hegar dilator was placed into the rectum. Approximation of the levator fibres in the midline was done using interrupted 3/0 polyglycolic acid (PGA) sutures further incorporating the muscular wall of the back of the rectum with every suture. Afterwards, approximation of the parasagittal fibres using 3/0 PGA followed, obliterating dead spaces.

Both procedures were compared regarding operative time, duration of hospital stay, Manchester Scar Scale (MSS) [16], modified Bai's CBF scores, Bai's QOL scores, time interval before return to unrestricted daily activities, postoperative complications and overall parental satisfaction. Data were then imported into statistical package for the social sciences [17] software for analysis (SPSS Inc., Chicago, Illinois, USA), with the *P* value being set at less than 0.05 for significant results.

Results

Patient ages ranged between 2.5 and 12 years, with a mean of 5.9 and 6.59 years for LSR and PSR groups, respectively. Both of LSR and PSR groups showed a slight female predominance, 51.5 and 57.6%, respectively. Duration of prolapse ranged from 6 months to 7.5 years with a mean of 17 and 20.96 months for LSR and PSR groups, respectively. Overall, 27% of our patients had prior interventions. Thiersch stitch was performed in five (15.1%) patients of LSR group and seven (21.2%) patients in PSR group. Additional three (9% patients from each group had manual reduction under general anaesthesia. The associated conditions included malnutrition (51.5%), constipation (7.5%), diarrhoea (21.2%) and parasitic infestations (22.7%) collectively.

The operative time required for LSR was 60–142 with mean time of 87.2 min and that for PSR was 45–65 with mean time of 51.3 min (P=0.035). Almost all cases of both groups were discharged in less than 48 h postoperatively. However in PSR group, the mean postoperative hospital stay was 41.18 h which was significantly longer that of LSR group, which was 31.87 (P=0.042). Postoperative scar scores, according to the MSS, recorded 6 months after surgery were significantly lower (better) in LSR group compared with PSR group, with means of 6.45 and 10.09, respectively (P=0.034).

Postoperative CBF scores, according to the modified Bai's scale, showed a slight improvement 6 months following surgery. CBF scores did not, however, differ significantly between LSR and PSR groups. Postoperative QOL scores, according to the modified Bai's scale, recorded 6 months after surgery showed a remarkable improvement in both groups, which again was not statistically significant in favour of either technique. Most cases returned to full activities (running, school attendance) within 2 weeks postoperatively. The mean time interval before return to unrestricted activities was 9.84 days in LSR group, which was significantly shorter (P=0.038) than that of PSR group (15.15 days).

No persistent or serious postoperative complications were recorded in our study. A transient partial recurrence was seen in one patients of LSR group (3.1%) which resolved on conservative measures over a period of 2.5 months. Wound infection was confirmed by swab cultures in two patients following PSR (6.1%), both of whom responded to antibiotic treatment with no sequelae. Only one LSR patient (3.1%) had conversion to laparotomy. This was the only patient whose parents expressed their overall dissatisfaction with the procedure based on the laparotomy scar.

Discussion

A multitude of procedures have been proposed for rectopexy in children. With classic procedures, an average cure rate of 90% has been reported for PSR, Delorme operation and Ekehorn's rectosacropexy collectively [18]. Table 1 summarizes collective results of paediatric rectal prolapse surgery series using the posterior sagittal approach and LSR.

The current study focused on comparing the short-term outcome of PSR and LSR. Bearing in mind that PSR has been our institution's standard of care for years to address persistent rectal prolapse in children [19], a major concern was to find whether the newly introduced LSR would carry significant differences in outcome, if any.

Patient characteristics

Our study had a selected population that was strictly free of known functional or anatomical factors thought to confound the study results. This seems a bit biased at the first glance taking into consideration that we compared our outcome with others who had slightly different patient characteristics. Actually, we had the opportunity to make such a selection owing to the big

Table 1 Collective results of rectal prolapse surgery in children

References	Cases	Technique	Success (%)
Ashcraft *et al.* [18]	46	Posterior sagittal (levator repair +suspension)	89
Saleh [19]	20	PSR	100
Hashish [20]	22	PSR	95.4
Koivusalo *et al.* [3]	16	LSR=6 cases; PSR=10 cases	100; 75
Laituri *et al.* [8]	15	LSR=5 cases; PSR=10 cases	100; 30
Potter *et al.* [14]	19	LSR	84
Awad *et al.* [12]	20	LSR	78
Ismail *et al.* [15]	40	LSR+sigmoidopexy	100
Mokhtar *et al.* [13]	12	LSR+sigmoidopexy	91.7
This study	66	LSR+sigmoidopexy=33 cases; PSR=33 cases	96.9; 100

LSR, laparoscopic suture rectopexy; PSR, posterior sagittal rectopexy.

volume of rectal prolapse cases referred to our institution.

The age range of patients in our series was similar to that of Awad *et al.* [12] who performed LSR on patients aged 2–11 years. Conversely, Mokhtar *et al.* [13] operated upon relatively younger patients whose mean age was 3.32 years, with the youngest patient presented at the age of 2 months. Likewise, Hashish [20] did PSR in patient aged from 1 to 7 years.

One more difference in population characteristics was the sex distribution. The current study had a female predominance (54.5%) compared with a male predominance in the studies of Mokhtar *et al.* [13] (66.7%), Koivusalo *et al.* [3] (68.7%), Hashish [20] (61%), Ismail *et al.* [15] (55%) and Laituri *et al.* [8] (83.3%). Actually, we had a bigger sample size than the aforecited publications, which should be more representative of the rectal prolapse population.

The median duration of prolapse in our study (12 months) was actually longer than that of Mokhtar *et al.* [13] (5.5 months). Most of our patients were residents of rural areas remote from central cities, which may explain such long durations of symptoms, reflecting regional variations, hence the delayed referral to specialized surgeons. Another contributing factor might be the cutoff limit for the period of proposed conservative management, that is largely debatable and almost always a surgeon's preference rather than a nation-wide guideline.

A total of 18 (27.3%) patients had prior interventions for rectal prolapse. Thiersch stitch ranked first with five (15.1%) cases in LSR group and seven (21.2%) cases in PSR group, whereas manual reduction under general anaesthesia was done for three (9%) patients in every group. Hashish [20] and Mokhtar *et al.* [13] reported 44 and 33.3% of their patients, respectively, had circlage surgery before. This difference clearly reflects an institutional preference as we were recently more inclined to limit the use of Thiersch stitch, together with other simple endoluminal procedures, based on their high recurrence rates and complications in our previous experiences.

We could identify 16 (48%) patients with co-morbidities in LSR group; all of 16 were malnourished, including five with nonparasitic diarrhoea, two with constipation and nine with parasitic infestation. Eighteen (54.6%) patients in PSR group had malnutrition, including nine with nonparasitic diarrhoea, three with constipation and six with parasitic infestation.

Protozoal infestation was diagnosed in the stool of 15 (22.7%) patients, which is in concordance with both Awad *et al.* [12] series and the nation-wide prevalence of such parasites among the Egyptian children [21]. Such patient characteristics are also consistent with Freeman [22] and Laituri *et al.* [8] observations regarding the socioeconomic and geographical factors affecting rectal prolapse distribution. On the contrary to developing world, contributing diseases in the industrialized countries are cystic fibrosis, constipation, polyps, and pertussis.

Technical points of interest

In the current PSR series, we employed a horizontal row of rectopexy sutures, compared with the vertically oriented row of sutures used in Hashish [20] study. Moreover, we used no stand-alone rectal plication sutures, depending solely on the plication action exerted by the three rectopexy sutures. Doing so saved the operative time whilst not affecting the success rate.

Adding to technical variations, fixing the rectum to the sacrum differs among LSR studies regarding type, number and placement of sutures. We employed two 2/0 silk sutures on either sides at the level of sacral promontory. Mokhtar *et al.* [13] used one or two 2/0 Ethibond (Ethicon US, Johnson & Johnson, Piscataway, New Jersey, USA) sutures. Awad *et al.* [12] did rectopexy with polypropylene sutures. Potter *et al.* [14] used three nonabsorbable sutures in a row extending from down upwards.

Based on high success rates in Koivusalo *et al.* [3] and Laituri *et al.* [8] series, a standard LSR without sigmoidopexy seems enough in eliminating prolapse. However, as we were building our initial experience, we have resorted to LSR with sigmoidopexy, which theoretically achieves a three-point fixation: rectopexy, sigmoidopexy and retrorectal adhesions. It may be reasonable to study whether omitting the lateral sigmoidopexy step at all is of any jeopardy to a successful rectal prolapse surgery.

Outcome

Upon comparing our results with other studies, PSR mean operative time (51.3 min) ranked in the middle between that of Koivusalo *et al.* [3] (40 min) and Hashish [20] (65 min).

On the contrary, our LSR mean operative time (87.2 min) was actually longer than all cited series (Table 2). However, this was our preliminary experience with LSR, and the duration of surgery was actually getting shorter towards the end of the series.

There is a considerable variability in hospital stay among different studies (Table 3). This can be owing to a multitude of confounding factors like counting preoperative stay and local admission/discharge policies.

MSS scores were significantly different between both groups in the favour of LSR (P=0.034). This is expected when comparing a 5–10 cm linear perineal scar of PSR to 5-mm port site scars of LSR. The question is whether an 'ugly' perineal scar with a poor MSS score really matters. A PSR scar is inconspicuous and, apart from psychological effect, would almost never be noticed by the public when compared with abdominal scars of LSR. It might be too sophisticated to compare MSS for both procedures. However, these results may provide reference data someday.

We have resorted to the modified Bai's scale as a way to compare the overall effect of PSR and LSR on CBF and patients' QOL, with scores that are easier to interpret than to compare an extensive list of individual parameters. Interestingly, none of the cited studies used a scoring system to trace QOL changes, which proved significant after rectal prolapse surgery.

Table 4 summarizes complications among several LSR and PSR series. Laituri *et al.* [8] reported an exceptionally high recurrence rate (70%) following PSR. They attributed this to a more proximal origin of the prolapse, but PSR only addresses the distal rectum [18].

One patient from the LSR group (3.1%) had an exactly similar recurrence scenario to that of Awad *et al.* [12] and Mokhtar *et al.* [13] series where a recurrent prolapse following LSR had gradually disappeared with conservative measures alone. In an attempt to interpret this scenario, two explanations may prove right. First, progressive resolution of a recurrent prolapse might be attributed to maturing of the retrorectal adhesions over a few weeks. Moreover,

Table 2 Mean operative time for different laparoscopic suture rectopexy and posterior sagittal rectopexy series (min)

References	LSR	PSR
Ismail *et al.* [15]	60 (range: 50–70)a	–
Potter *et al.* [14]	72 (range: 28–117)	–
Awad *et al.* [12]	77.5 (range: 30–150)	–
Mokhtar *et al.* [13]	58.42±22.75a	–
Koivusalo *et al.* [3]	80 (range: 62–90)	40 (range: 25–70)
Hashish [20]	–	65 (range: 45–80)
This Study	87.2 (range: 60–142)a	51.3 (range: 45–65)

LSR, laparoscopic suture rectopexy; PSR, posterior sagittal rectopexy. [a]With sigmoidopexy.

Table 3 Mean hospital stay for different laparoscopic suture rectopexy and posterior sagittal rectopexy series

References	LSR	PSR
Ismail *et al.* [15]	3 days	–
Awad *et al.* [12]	1 day	–
Mokhtar *et al.* [13]	2.50 days	–
Koivusalo *et al.* [3]	6 days	6 days
This study	31.87 h	41.18 h

LSR, laparoscopic suture rectopexy; PSR, posterior sagittal rectopexy.

Table 4 Complications for different laparoscopic suture rectopexy and posterior sagittal rectopexy series

References	LSR	PSR
Ismail *et al.* [15]	None	–
Potter *et al.* [14]	Recurrence 5% (full) Recurrence 11% (Partial)	–
Awad *et al.* [12]	Recurrence 11% (full) Recurrence 11% (partial)	–
Mokhtar *et al.* [13]	Stitch sinus 8.3% Recurrence 8.3% (Partial)	–
Koivusalo *et al.* [3]	Constipation 33%	Recurrence 25%
Laituri *et al.* [8]	None	Recurrence 70%
Saleh [19]	–	Wound infection 20% Constipation 15%
Hashish [20]	–	Wound infection 9% Constipation 22% Recurrence 16.7% (Partial)
This study	Recurrence 3.1% (Partial)	Wound infection 6.1%

LSR, laparoscopic suture rectopexy; PSR, posterior sagittal rectopexy.

mechanically preventing the prolapse even partially or temporarily might have helped the pelvic floor musculature regain some of its strength, contributing to success of surgery later on. However, proving or refuting either of these theories is beyond the scope of the current study.

Fortunately, none of our patients developed new-onset postoperative constipation or was laxative dependent beyond the proposed 2 weeks of routine postoperative laxatives. After rectopexy, Ashcraft *et al.* [18] noted worsening in constipation in two (4%) patients. New-onset constipation was reported in Koivusalo *et al.* [3] and Hashish [20] series. It remains unclear whether this is related to the surgical manoeuvre or the patient selection. The current study avoided the percutaneous route for sigmoidopexy in an attempt to eliminate the possibility of developing stitch sinuses. We made so based on the findings of Mokhtar *et al.* [13] where they had a patient with a persistent stitch sinus following percutaneous sigmoidopexy.

We had to convert to laparotomy during one of our LSR surgeries (3.1%) owing to an unexpected instrumental failure (broken needle holder). Unfortunately, it was not possible to perform rectopexy suturing using instruments other than a dedicated needle holder, which led to conversion to laparotomy employing a Pfannenstiel incision.

Conclusion

From the present study, it is obvious that there are absolute advantages of LSR over PSR because of significantly better MSS, shorter hospital stay, fewer wound infections and faster return to full physical activities. Conversely, this should be weighed against the longer operative time as well as the inherent higher cost and complications of laparoscopy itself. Nevertheless, both techniques seemed equally effective in eliminating rectal prolapse at the end of a follow-up period of 6 months. Without longer operative times and conversion to laparotomy, we would have established the absolute superiority of LSR over PSR.

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Conflicts of interest

There are no conflicts of interest.

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