Research Square

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Challenging the standard: Comparison of outcomes between Laparoscopically Assisted Anorectoplasty (LAARP) and Posterior Sagittal Anorectoplasty (PSARP) in the correction of rectobulbar fistula in Pediatric Patients

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Abstract

Background:

Posterior sagittal anorectoplasty (PSARP) remains the standard surgical approach for rectobulbar fistula in patients with anorectal malformations (ARM). Laparoscopically assisted anorectoplasty (LAARP) has emerged as an alternative technique, although its role in rectobulbar fistula remains controversial.

Objective:

To compare surgical and functional outcomes of LAARP and PSARP in pediatric patients with ARM and rectobulbar fistula.

Methods:

A retrospective cohort study was conducted including male patients with rectobulbar fistula who underwent repair at a tertiary pediatric surgery center between 2000 and 2024. Patients were grouped according to surgical technique (LAARP vs. PSARP). Perioperative outcomes, postoperative complications, functional outcomes assessed using the Krickenbeck classification, and reintervention rates were analyzed.

Results:

Fifty-three patients met inclusion criteria (19 LAARP, 34 PSARP). Patients undergoing LAARP were significantly younger at the time of repair (median 8 vs. 17 months, $p = 0.006$). Overall postoperative complication rates did not differ significantly between groups (26.3% vs. 47.0%, $p = 0.158$). Functional outcomes and late complications were comparable. A non-significant trend toward fewer postoperative complications was observed in the LAARP group.

Conclusions:

LAARP and PSARP provide comparable functional outcomes for rectobulbar fistula repair. LAARP appears to be a safe alternative in selected patients when performed in experienced centers.

Introduction

Anorectal malformations (ARM) represent the most common congenital anomalies of the gastrointestinal tract, with an estimated incidence of 2.0–2.5 per 10,000 live births, predominantly

affecting male patients. Within this spectrum, approximately 7.4% of male patients present with a rectobulbar fistula (RBF) [1,2], a subtype that remains among the most surgically challenging.

Posterior sagittal anorectoplasty (PSARP), as originally described by Peña, has long been considered the standard surgical approach for rectobulbar fistula. Over the past two decades, laparoscopically assisted anorectoplasty (LAARP) has emerged as a minimally invasive alternative. However, its role in the management of rectobulbar fistula remains controversial, primarily due to concerns regarding incomplete fistula division and the potential risk of postoperative urethral diverticulum formation [3,4]. Technical challenges related to precise fistula identification and dissection during LAARP have been emphasized in previous reports.

Despite these concerns, LAARP offers theoretical advantages, including improved visualization of pelvic anatomy, reduced perineal trauma, and potentially favorable functional outcomes, particularly in anorectal manometric parameters. Nevertheless, evidence regarding its long-term clinical and functional outcomes remains limited, largely due to small sample sizes and heterogeneous patient populations in published studies [4, 5, 6].

Direct comparative studies focusing specifically on rectobulbar fistula are scarce. Therefore, the present study aims to provide a direct comparison of LAARP and PSARP in a homogeneous cohort of male patients with rectobulbar fistula, evaluating perioperative outcomes, postoperative complications, functional results, and reintervention rates in a single tertiary pediatric surgery center.

Materials and Methods

Study Design and Patient Selection

We conducted a retrospective cohort study including male patients diagnosed with anorectal malformation associated with rectobulbar fistula who underwent surgical correction at a tertiary pediatric surgery center between 2000 and 2024.

Patients were allocated into two groups according to the surgical technique employed: PSARP (performed before 2015) and LAARP (performed from 2015 onward). Exclusion criteria included surgical repair performed outside the institution, unreversed ostomy at the time of analysis, and incomplete clinical data.

Preoperative Assessment

All patients underwent standardized preoperative evaluation, including complete medical history, physical examination, abdominal ultrasound, echocardiography, and prone cross-table pelvic radiographs. Voiding cystourethrography (VCUG) was performed in all patients. Those undergoing staged repair additionally underwent high-pressure distal colostography.

The diagnosis of rectobulbar fistula on high-pressure distal colostography was based on identification of the rectal pouch located between the pubococcygeal line and a line parallel to the lowest point of the ischial tuberosity, with fistulous communication to the bulbourethral urethra.

Surgical Techniques

LAARP was performed as originally described by Georgeson et al. [7]. A 5-mm laparoscope and three additional 5-mm working ports were used. The rectum was circumferentially dissected and mobilized distally using hook diathermy. The rectobulbar fistula was transfixed and divided (Fig. 1). An electrical muscle stimulator was used to identify the center of the external sphincter complex, followed by rectal pull-through and anoplasty.

PSARP was performed according to the technique described by Peña et al. [8]. The patient was positioned prone, and a midline posterior sagittal incision was made through the sphincter complex. When present, the fistula was dissected toward the urogenital tract and divided at its insertion. The rectum was then positioned centrally within the sphincter complex and an anoplasty was performed (Fig. 2).

In all patients, cystoscopy was performed preoperatively, and a urinary catheter was placed and maintained for 48–72 hours postoperatively.

Follow-up and Outcome Measures

Follow-up and Outcome Measures
Patients were followed at 1 week, 1 month, and every 6 months thereafter, with clinical and ultrasonographic evaluations. VCUG was reserved for symptomatic patients with ultrasonographic findings suggestive of urethral diverticulum.

Variables analyzed included demographic data (age at anorectoplasty), comorbidities, operative parameters (operative time, anoplasty caliber, stoma type), perioperative outcomes (time to initiation of feeding, length of hospital stay), early postoperative complications, functional outcomes assessed using the Krickenbeck fecal continence classification in patients older than 3 years, late complications, and need for reintervention one year after ostomy closure.

Ethical Considerations

The study was approved by the Bioethics and Research Coordination Committee of Juan P. Garrahan Hospital (Protocol No. 1749). Due to the retrospective design, informed consent was waived. Patient confidentiality was strictly preserved.

Statistical Analysis

Continuous variables are presented as mean ± standard deviation or median, as appropriate. Categorical variables are expressed as absolute frequencies and percentages. The chi-square test was used to assess associations between categorical variables. A p-value < 0.05 was considered statistically significant. Odds ratios with 95% confidence intervals were calculated for selected outcomes.

Results

Between 2000 and 2024, 102 male patients with anorectal malformation and rectobulbar fistula were treated at our institution. Forty-nine patients were excluded due to incomplete data, surgery performed outside the institution, or absence of ostomy closure at the time of analysis. The final cohort consisted of 53 patients: 19 underwent LAARP and 34 underwent PSARP (Fig. 3).

Patients in the LAARP group underwent anorectoplasty at a significantly younger age than those in the PSARP group (median 8 vs. 17 months; $p = 0.006$). Baseline characteristics and perioperative parameters are summarized in Table 1, and associated comorbidities are shown in Fig. 4.

No significant differences were observed in colostomy type between groups. The lumbosacral ratio showed no significant difference, supporting baseline comparability and minimizing selection bias.

Postoperative complication rates did not differ significantly between the LAARP and PSARP groups (26.3% vs. 47.0%, $p = 0.158$). Although not statistically significant, trends toward lower odds of anal stenosis ($p = 0.299$; OR 0.38, 95% CI 0.07–2.02) and wound dehiscence ($p = 0.290$; OR 0.33, 95% CI 0.06–1.70) were observed in the LAARP group (Table 2).

During long-term follow-up after ostomy closure, incontinence was uncommon and did not differ significantly between groups ($p = 0.358$). Megarectum was not observed. Reinterventions were more frequent in the PSARP group (five cases), all related to adhesive intestinal subocclusion. The LAARP group required two reinterventions, one due to adhesive subocclusion and one to intestinal perforation. Although reintervention rates were numerically lower in the LAARP group, this difference did not reach statistical significance. Asymptomatic urethral diverticula were identified by ultrasound in two patients in the LAARP group and one in the PSARP group (Table 3).

The Krickenbeck classification results are shown in Fig. 5. No significant differences in distribution were observed between groups. 15 (78.9%) LAARP patients and 23 (67.6%) PSARP patients had no soiling, LAARP was associated with a lower incidence of Grade I soiling (21.1% vs 26.5%).There was only 1 patient with grade II soiling in the study, who presented in the PSARP group. Constipation was absent in 8 (42.1%) LAARP patients and 19 (55.8%) PSARP patients. Compared with PSARP, LAARP was associated with a lower incidence of Grade I constipation (15.8% vs 17.7%) but a higher incidence of Grade II constipation (42.1% vs 26.5%). There was no grade 3 constipation or soiling in either group.

Discussion

The optimal surgical approach for rectobulbar fistula remains a subject of ongoing debate. In this study, we compared LAARP and PSARP in a homogeneous cohort of male patients with ARM and rectobulbar fistula and found no statistically significant differences in functional outcomes, as assessed by the Krickenbeck classification. These findings suggest that both techniques provide comparable long-term functional results [9,10].

Previous studies have reported conflicting results regarding the functional superiority of LAARP. While some authors have proposed that enhanced visualization and preservation of pelvic structures during LAARP may translate into improved continence, others have found no significant differences when compared with PSARP [9]. Our findings align with the latter, reinforcing the concept that functional outcomes depend on multiple factors beyond surgical approach alone [7,11].

Although overall complication rates were similar, we observed non-significant trends toward lower rates of anal stenosis and wound dehiscence in the LAARP group. These findings are consistent with reports suggesting reduced perineal trauma associated with minimally invasive techniques [11]. The higher incidence of Grade II constipation observed in the LAARP group did not reach statistical significance and warrants further investigation, as this pattern has not been consistently reported in previous series [1, 12, 13].

Operative time was slightly longer in the LAARP group, likely reflecting the learning curve associated with the adoption of minimally invasive techniques. Early postoperative recovery parameters, including time to initiation of feeding and length of hospital stay, were comparable between groups, consistent with previously published data [14, 15, 16, 17, 18].

Limitations

This study has several limitations. Its retrospective design inherently limits control over confounding variables. Additionally, allocation of surgical technique was dependent on the time period, introducing a potential era-related bias associated with evolving surgical experience and perioperative management. Although patients undergoing LAARP were younger at the time of repair, the comparable lumbosacral ratio between groups suggests similar baseline functional potential. Furthermore, the selective use of VCUG in symptomatic patients may underestimate the true incidence of urethral diverticula [19].

Despite these limitations, this study provides meaningful comparative data in a rare and technically demanding condition.

Conclusion

In male patients with anorectal malformation and rectobulbar fistula, LAARP and PSARP yield comparable functional outcomes. Although statistical significance was not achieved, LAARP demonstrated a trend toward lower postoperative complication rates. These findings support LAARP as a safe and effective alternative to PSARP in selected patients when performed in experienced centers.

Prospective multicenter studies with longer follow-up are needed to further define the role of LAARP in this patient population.

Declarations

Author Contribution

Mauricio Carreño is the lead author, and together with Javir Ruiz, he wrote the main text of the manuscript. The other authors contributed to the review, evaluation, and approval of the manuscript.

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Tables

Table 1
Demographics, associated abnormalities, and clinical characteristics of the patients

Age at anoplasty (months)	**Laparoscopy (LAARP = 1) (n = 19)**	**Conventional (PSARP = 2) (n = 34)**	**Valor de P**	**OR (IC 95)**
	8 (5–19)	**17 (11–25)**	**0.006**	
Ratio LS	0.7 (0.6–1)	0.7 (0.6–0.8)	0.946	
Comorbidities				
Vertebral	8 (42.11)	5 (14.71)	0.044	
Cardiac	3 (15.79)	1 (2.94)	0.126	
Tracheoesophageal	2 (10.53)	2 (5.88)	0.612	
Renal	8 (42.11)	17 (50)	0.775	
Anchored spinal cord	1 (5.26)	0 (0)	0.358	
Genetic syndrome	5 (26.3)	1 (2.94)	0.018	
Total comorbidities	12 (63.16)	18 (52.94)	0.569	1.52 (0.48–4.81)
Surgical time (minutes)	180 (150–210)	172.5 (120–180)	**0.0502**	
Start of feeding (days)	1 (0–1)	1 (1–2)	**0.0015**	
Hospital stays (days)	4 (3–5)	4 (4–6)	0.3275	

Table 2
Postoperative complication

Perioperative complications	Laparoscopy (LAARP)	Conventional (PSARP)	Valor de P	OR (IC95)
Surgical site infection	1 (5.26)	4 (11.76)	0.643	0.42 (0.04–4.02)
Stenosis	2 (10.53)	8 (23.53)	0.299	0.38 (0.07–2.02)
Dehiscence	2 (10.53)	9 (26.47)	0.290	0.33 (0.063 -1.70)
Prolapse	1 (5.26)	0 (0)	0.358	
Neurogenic bladder	1 (5.26)	1 (2.94)	1	1.83 (0.11–31.08)
Incontinence	1 (5.26)	1 (2.94)	1	1.83 (0.11–31.08)
Number of patients overall (%)	5 (26.32)	16 (47.06)	0.158	0.40 (0.12–1.37)

Table 3. Postoperative control

Age at ostomy closure (months)	Laparoscopy (LAARP)	Conventional (PASRP)	Valor de P	OR (IC 95)
	18 (14–35)	**23.5 (18–44)**	**0.1123**	
Time elapsed for closing	7 (5–14)	5.5 (4–10)	0.1825	
Incontinent	1 (5.26)	0 (0)	0.358	
Megarectum	0 (0)	0 (0)		
Diverticulum	2 (10.53)	1 (2.94)	0.290	3.88 (0.33–45.93)
Reinterventions	2 (10.53)	5 (14.71)	1	0.68 (0.12–3.90)
Total in General (%)	13 (68.42)	22 (64.71)	1	1.18 (0.36–3.91)

Figures

Figure 1. LAARP technique a) Transfixing point for rectobulbar fistula. b) Fistula knot.

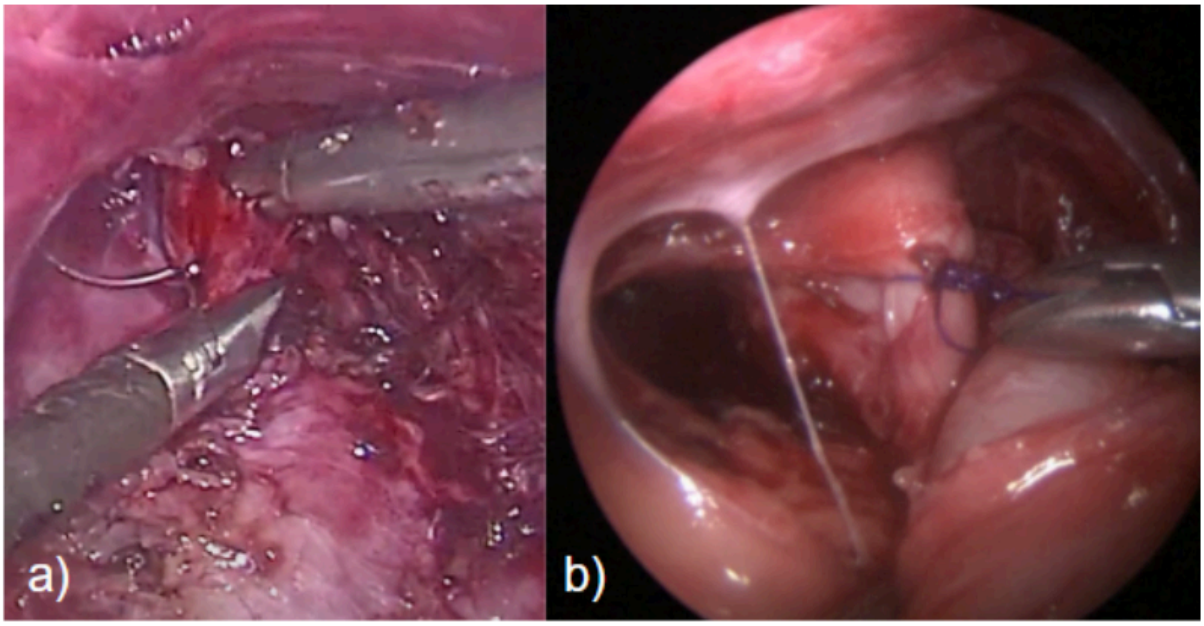


Figure 1

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Figure 2. PSARP technique.The end of the fistula was brought down and placed in the center of the external sphincter complex

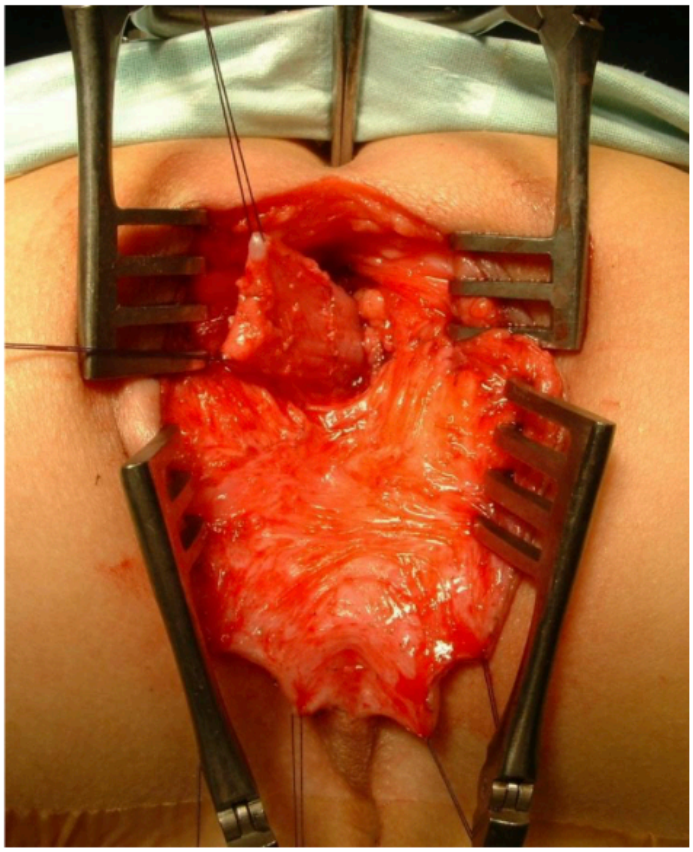


Figure 2

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Figure 3. Flowchart of patients with MAR with FRB

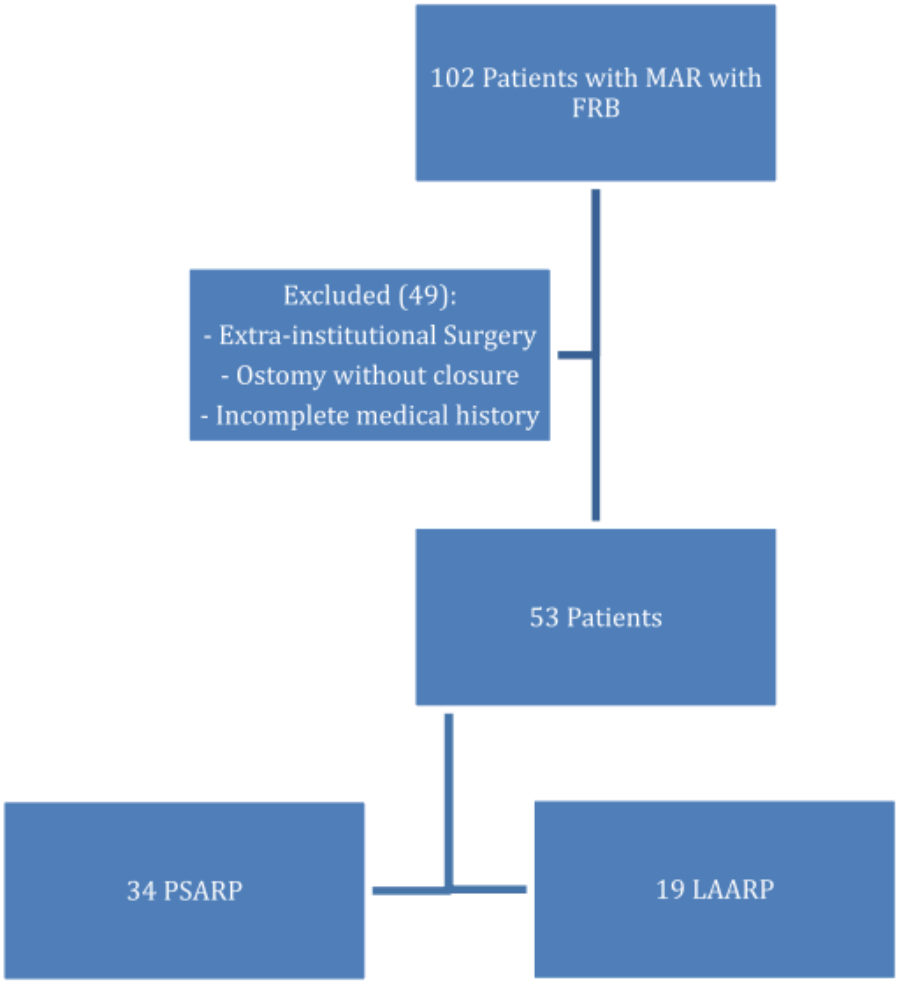


Figure 3

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Figure 4. Associated abnormalities LAARP vs PSARP [P = 0.569, OR (IC95) = 1.52 (0.48-4.81)]

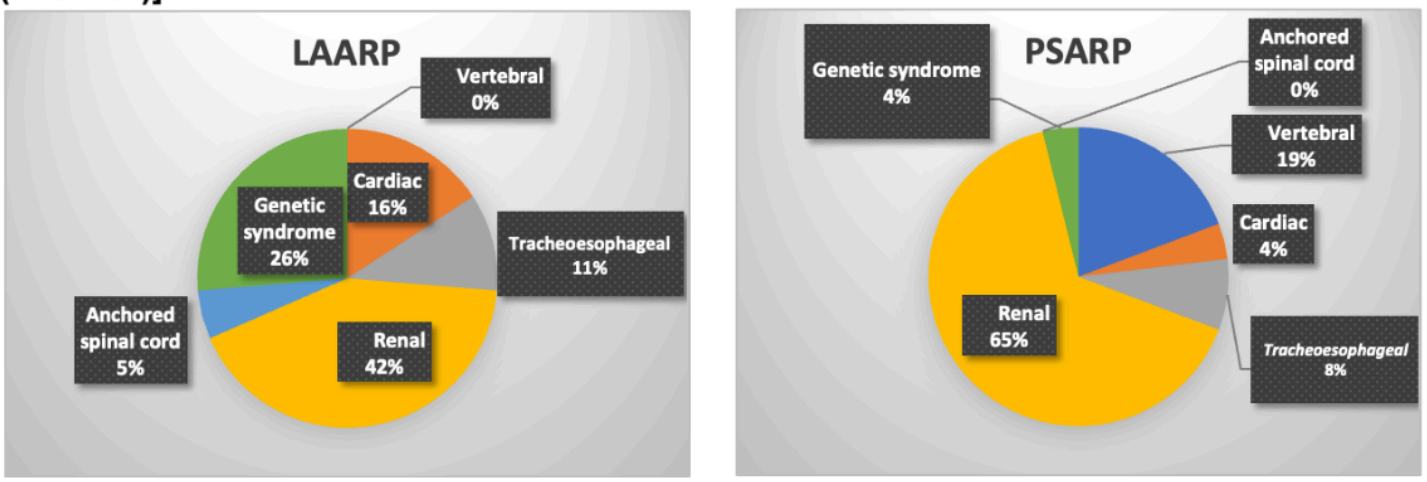


Figure 4

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Figure 5. Results of the Krickenbeck classification for ARM with rectobulbar fistula

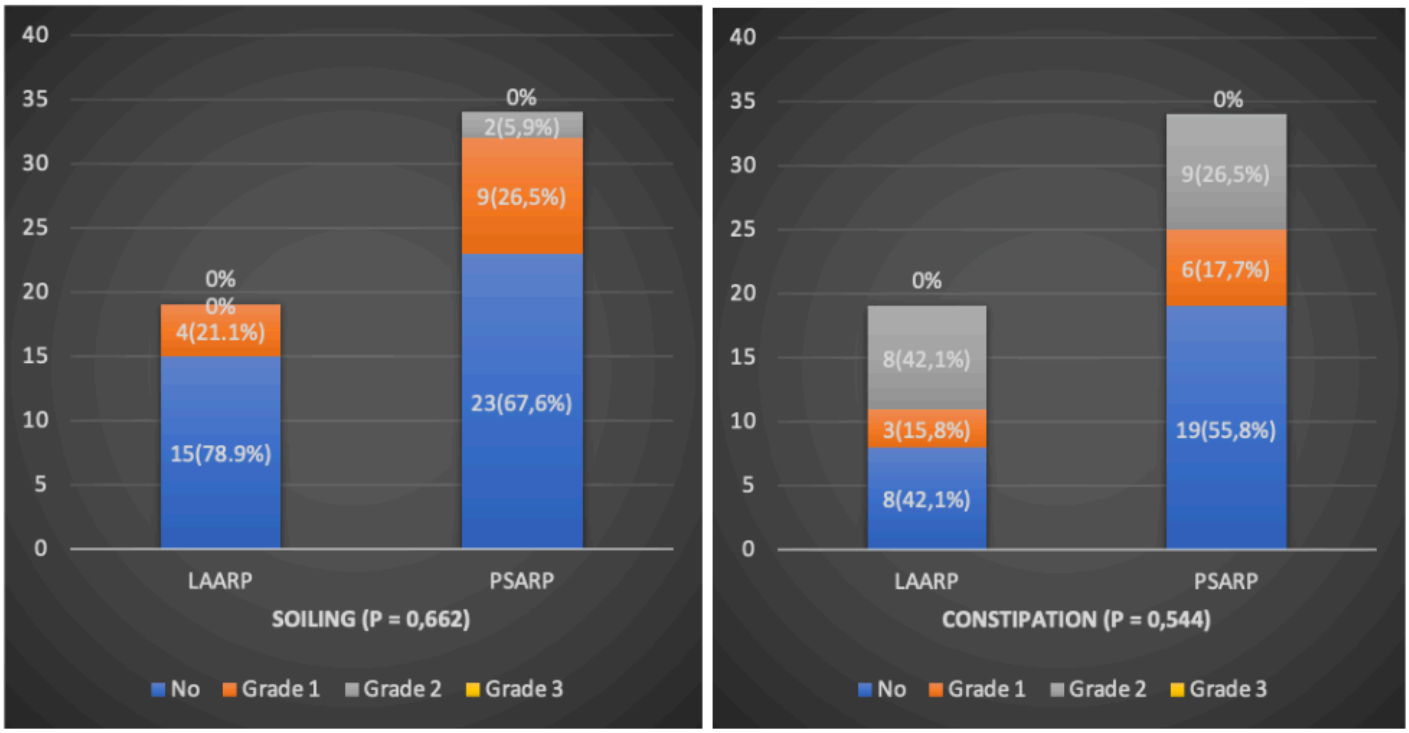


Figure 5

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