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OROGINAL ARTICLE

Functional Outcome and Quality of Life after Posterior Sagittal Anorectoplasty vs. Laparoscopic-Assisted Anorectal Pull-Through for Patients with High and Intermediate Anorectal Anomalies

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ABSTRACT

Background: Anorectal malformations (ARM) are congenital anomalies requiring surgical intervention. Posterior sagittal anorectoplasty (PSARP) and laparoscopic-assisted anorectal pull-through (LAARP) are the two main procedures used for high and intermediate ARMs. This study aims to compare the functional outcome and quality of life (QOL) in children undergoing these procedures.

Methods: A retrospective study was conducted at the Department of Pediatric Surgery, Zagazig University, including pediatric patients with high and intermediate ARMs treated surgically by PSARP or LAARP between 2010 and 2019. Demographic data, type of anomaly, associated anomalies, operative details, postoperative complications, and follow-up information were collected from hospital records. Functional outcomes were assessed using the Krickenbeck score, while QOL was evaluated using a validated questionnaire.

Results: The study included 24 patients (18 males and 6 females) who underwent PSARP and 22 patients (16 males and 6 females) who underwent LAARP. The demographic characteristics of both groups showed no statistically significant differences. The age of operated patients ranged between 3 and 15 years (mean 6 years). Functional outcomes, as assessed by the Krickenbeck score, showed no significant differences between the two groups. Voluntary bowel motion was observed in 33.3% of PSARP and 31.8% of LAARP patients, soiling was noted in 45.8% and 40.9%, and constipation in 37.5% and 31.8%, respectively. Similarly, QOL scores revealed no significant differences, with good QOL reported in 79.1% of PSARP and 72.7% of LAARP patients.

Conclusion: There were no significant differences in defecation function or quality of life between children undergoing PSARP and LAARP for high and intermediate ARMs. Both procedures provide comparable long-term outcomes.

Keywords: Anorectal malformation, PSARP, LAARP, Functional outcome, Quality of life.

INTRODUCTION

The management of high and intermediate anorectal malformations (ARM) has evolved over time, with an increasing emphasis on improving functional outcomes following definitive surgical repair [1]. Despite advancements, postoperative complications such as fecal incontinence and constipation remain significant concerns, affecting patients' psychological well-being, social integration, and overall quality of life (QOL) [2].

Posterior sagittal anorectoplasty (PSARP), introduced by Peña in 1982, remains a commonly used approach in ARM correction [3]. However,

The incidence of complete continence following PSARP has been reported to range from 0% to 32%, while fecal soiling remains a

concern in 30% to 56% of individuals according to various studies.

[4]. To improve outcomes, Georgeson and colleagues introduced the laparoscopic-assisted anorectal pull-through (LAARP) in 2000, a minimally invasive alternative designed to preserve pelvic floor integrity and ensure precise placement of the rectum within the sphincter complex [5]. Given its minimally invasive nature, LAARP was anticipated to yield superior functional outcomes, though comparative studies between LAARP and PSARP have produced mixed findings without definitive conclusions [6].

This study aims to compare PSARP and LAARP in the surgical management of high and intermediate ARMs, specifically evaluating their impact on functional outcomes and patients' quality of life. Functional results will be assessed using the Krickenbeck classification system, which allows for objective comparisons across different studies [7].

For evaluation of the quality of life (QOL) for the patients, we used the QOL questionnaire established in vogue studying QOL in children with ARM [2].

METHODS

Study Design and Setting

This retrospective study was conducted in the Department of Pediatric Surgery, Faculty of Medicine, Zagazig University, to compare the functional outcomes and quality of life (QOL) In cases of high and intermediate ARM managed by PSARP or LAARP in children.

Ethical approval was obtained from the Institutional Review Board (IRB) of the Faculty of Medicine, Zagazig University. Prior to enrollment, written consent was obtained from each participant's parent or legal guardian, in compliance with the ethical guidelines of Zagazig University and the principles outlined in the Declaration of Helsinki**.**

Study Population

The study included pediatric patients of both genders who underwent PSARP or LAARP for high or intermediate ARM between 2010 and 2019. To ensure reliable assessment of continence and QOL, only patients aged three years or older at the time of evaluation were included. The mean age of participants was six years.

Exclusion Criteria

Patients with cloacal malformations were excluded, as these were not treated using the LAARP technique. Patients who had undergone redo repairs were also excluded, as their surgical outcomes might differ significantly. Children older than three years who remained dependent on diapers were not included, as their continence could not be accurately assessed.

Data Collection and Follow-Up

Patient data were retrieved from hospital medical records, including demographic details, clinical presentation, type of ARM, associated anomalies, surgical procedure details, postoperative recovery, and early and late complications.

For long-term outcome assessment, parents were contacted and invited to bring their children for a follow-up visit at the pediatric surgery outpatient clinic. During these visits, clinical evaluations were conducted, and parents completed a structured questionnaire regarding their child's functional status and overall QOL.

Assessment of Functional and Quality of Life Outcomes

Functional outcomes were assessed using the Krickenbeck classification system, which evaluates three key parameters: voluntary bowel movements (present or absent), fecal soiling (present or absent), and constipation (present or absent). Results are presented in **Table 1**.

Quality of life was evaluated using a standardized QOL scoring system, widely used for assessing the well-being of children with ARM. Results are presented in **Table 2**.

STATISTICAL ANALYSIS

Statistical analysis was conducted using SPSS Version 20. Continuous data were expressed as mean ± standard deviation (SD), while categorical data were summarized as frequencies and percentages. Comparative analysis between the PSARP and LAARP groups was performed using appropriate statistical tests, with a p-value < 0.05 considered statistically significant.

RESULTS

A total of 46 patients of both sex (34 male and 12 female) with high and intermediate ARM were included in this study. They were classified into 2 groups: 1. Group of patients treated with posterior sagittal anorectoplasty (PSARP), 24 patients (18 male and 6 female), and 2. Group of patients treated with laparoscopic-assisted anorectal pull-through (LAARP), 22 patients (16 male and 6 female). Demographics of these groups are shown in Table 3, including sex and types of ARM. There was no significant difference between the type of ARM in the two groups.

Out of the 46 patients with ARM, 24 patients (52.1%) were associated with other anomalies. Table 4 shows the types of these anomalies and their incidence.

Vertebral anomalies were observed in five patients: two in the PSARP group and three in the LAARP group. The participants' ages ranged from 3 to 15 years, with a mean of 6 years.

Two patients only had LAARP repair shortly after birth; however, all of the other patients had left sided colostomy, and definitive anorectoplasty was done at the age of 4 to 18 months under cover of the diverting colostomy.

Regarding the functional outcome:

The collected results of the functional outcome for both groups are shown in Table. 5

VBM*:*

Voluntary bowel motion (VBM) noted as being present only if the patient fulfilled all 3 criteria of Krukenbeck's score ,i.e feeling of urge, capacity to verbalize, and ability to hold stool . VBM was observed in 8 patients (33.3%) in the PSARP group and in 7 patients (31.8%) in the LAARP group, with no statistically significant difference. The remaining patients, who did not undergo VBM, were categorized among those experiencing soiling or severe constipation.

In the PSARP group, two patients and in the LAARP group, one patient with mild constipation (Grade 1) had normal VBM.

VBM was normal in two patients from the PSARP group and one patient from the LAARP group, all of whom had mild constipation (Grade 1).

Soiling*:*

Soiling was reported in 45.8% of the PSARP group and 40.9% of the LAARP group among our participants.

There were no statistical significant differences in incidence of soiling between the 2 groups. But the degree of soiling was more severe in LAARP (Grade 3 was 18.1%), while it was 12.5% in PSARP group. Three patients (one from PSARP, and two from LAARP groups) with grade 3 soiling were depended on regular rectal washout to achieve social continence.

Constipation:

Incidence of constipation is mostly similar in both groups (37.5% and 31.8% in PSARP and LAARP groups respectively) . However, grade 3 constipation ,which do not respond to laxatives was noted in LAARP group only . Two of those patients were depended on enemas to empty their loaded rectum and colon.

QOL*:*

Score for quality of life was measured by evaluation of social habit , school attendance, daily activity , relation to peers ,and feeling Overall, the long-term quality of life outcomes did not differ significantly between the two groups following the repair procedure.

However, poor QOL was noted in 2 patients with grade 3 soiling, one in each group. Good QOL was reported in 79.1% and 72.7% of patients in groups of PSARP and LAARP respectively. Patients with good QOL were included in group of patients of VBM and patient with constipation (Table 6 &7).

Table 1: Krickenbeck score (2005).

Parameter	Details
Voluntary Bowel Movement (VBM)	**Yes / No**
Feeling of Urge	
Capacity to Verbalize	
Hold the Bowel Movement	
Soiling	**Yes / No**
Grade 1	Occasionally (once or twice per week)
Grade 2	Every day, no social problem
Grade 3	Constant, social problem
Constipation	**Yes / No**
Grade 1	Manageable by change of diet
Grade 2	Requires laxatives
Grade 3	Resistant to diet and laxatives

Table 2: Quality of life questionnaire for ARM children.

Parameter	0	1	2	3
Social Habit	No social activity	Diffrent habit with problem	Irregular habit	Regular habit
School Attendance	Never	Part-time	Full-time	
Daily Activity	Restricted	Less than peers	Normal as peers	
Relation to Peers	No relation	Limited	Good	
Feeling	Feeling Afraid and depressed	Feeling Less appreciated	Feeling different	Normal

QOL Score:
Good (8–12)
Fair (7–5)
Poor (0–4)

Table 3: Demographics of PSARP and LAARP Groups.

ARM Type	Total (N=46)	PSARP (N=24)	LAARP (N=22)	X^2	P
No of patients	46	24	22		
Sex					
Male	34 (76.0%)	18 (75%)	16 (72.7%)	0.03	0.85
Female	12 (26.0%)	6 (25%)	6 (27.2%)		
Recto prostatic fistula	14 (30.4%)	8 (33.3%)	6 (27.2%)	0.58	0.44
Recto-bulbar fistula	8(17.3%)	5 (20.8%)	3 (13.6%)	0.05	0.81
Recto-vesical fistula	7 (15.2%)	2 (8.3%)	5 (22.7%)	3.17	0.07
Recto-vaginal fistula	11 (23.9%)	6 (25%)	5 (22.7%)	0.09	0.75
No fistula	3 (6.5%)	1 (4.1%)	2 (9%)	1.95	0.16

Table 4: Associated Congenital Anomalies.

Anomaly	PSARP (N=24)	LAARP (N=22)	Total (N=46)
Trisomy 21	2 (8.3%)	1 (4.5%)	3 (6.5%)
Baller-Gerold syndrome	1 (4.16%)	0	1 (2.1%)
Vertebral	2 (8.3%)	3 (13.6%)	5 (10.8%)
Cardiac	3 (12.5%)	2 (9%)	5 (10.8%)
TOF	1 (4.16%)	0	1 (2.1%)
Renal	2 (8.3%)	0	2 (4.3%)
Limbs	1 (4.1%)	0	1 (2.1%)
Hypospadias	2 (8.3%)	1 (4.5%)	3 (6.5%)
Undescended testis	1 (4.1%)	2 (9%)	3 (6.5%)
Hip dislocation	1 (4.1%)	0	1 (2.1%)
Malrotation	1 (4.1%)	1 (4.5%)	2 (4.3%)
Total with anomalies	15 (62.5%)	9 (40.9%)	24 (52.1%)

Table 5: Functional Outcome Measured by Krickenbeck Score.

Outcome	PSARP (N=24)	LAARP (N=22)	X2	P
Voluntary Bowel Movement (VBM)	Yes: 8 (33.3%)	Yes: 7 (31.8%)	0.027	0.86
	No: 16 (66.6%)	No: 15 (68.1%)		
Soiling	Grade 1: 4 (16.6%)	Grade 1: 2 (9%)	0.75	0.68
	Grade 2: 4 (16.6%)	Grade 2: 3 (13.6%)		
Outcome	**PSARP (N=24)**	**LAARP (N=22)**	**X2**	**P**
	Grade 3: 3 (12.5%)	Grade 3: 4 (18.1%)		
	Total: 11 (45.8%)	Total: 9 (40.9%)		
Constipation	Grade 1: 4 (16.6%)	Grade 1: 1 (4.5%)	4.45	0.10
	Grade 2: 5 (20.8%)	Grade 2: 4 (18.1%)		
	Grade 3: 0	Grade 3: 2 (9.09%)		
	Total: 9 (37.5%)	Total: 7 (31.8%)		

Table 6: Detailed QOL Score for Both Groups.

QOL Score	PSARP (N=24)	X2	P	LAARP (N=22)	X2, P
Poor	1 (4.1%)	0.31	0.85	1 (4.5%)	
Fair	4 (16.6%)			5 (22.7%)	
Good	19 (79.1%)			16 (72.7%)	
Total	24 (100%)			22 (100%)	

No significant difference in QOL between the 2 groups

Table 7: Overall QOL Score for Both Groups.

QOL Score	PSARP (N=24)	LAARP (N=22)	X2	P
Poor	1 (4.1%)	1 (4.5%)	0.31	0.85
Fair	4 (16.6%)	5 (22.7%)		
Good	19 (79.1%)	16 (72.7%)		
Total	24 (100%)	22 (100%)		

No significant statistical differences between the 2 groups.

DISCUSION

Anorectal malformations (ARM) are common congenital anomalies with an incidence of 1 in every 5,000 live births [7], presenting significant challenges to both social and psychological development due to complications such as incontinence and constipation post-surgery.

Despite the impact of these functional outcomes on the quality of life (QOL) in affected children, limited attention has been directed toward this area. According to the World Health Organization, quality of life (QOL) is defined as an individual's perception of their position in life, within the context of cultural values, goals, expectations, and standards [2].

Several factors influence post-surgical outcomes in children with ARM, including birth weight, gender, associated anomalies (notably vertebral anomalies), and postoperative complications like anal stenosis or rectal stricture. Makrufardi et al. (2020) observed that patients with normal birth weight tend to have a higher frequency of voluntary bowel movements (VBM) compared to those with low birth weight. Additionally, male patients have been observed to achieve better VBM outcomes than females. Vertebral anomalies, particularly spina bifida, are commonly associated with incontinence.

The severity of ARM also plays a crucial role, as higher anomalies require more extensive surgical dissection of the pelvic floor and external anal sphincter, potentially affecting long-term bowel control [9].

The PSARP technique, first described by Peña in 1982, provides excellent exposure of the pelvic anatomy through a midline posterior approach, facilitating precise placement of the rectum [3]. In contrast, the LAARP technique, introduced by Georgeson et al. in 2000, minimizes perineal dissection by utilizing laparoscopic guidance to achieve accurate rectal positioning while preserving pelvic structures [5]. LAARP was hypothesized to enhance continence and reduce complications such as anal stenosis [6]. However, there remains debate regarding whether one technique is significantly better than the other. Therefore, our study aimed to compare the functional outcomes of LAARP versus PSARP to determine their relative effectiveness in treating ARM.

The evaluation of functional outcomes after operative repair of ARM is vital for assessing patients' QOL. Scoring systems serve three primary purposes: prediction, evaluation, and description [9]. Since 1960, various scoring systems have been developed for assessing functional outcomes, both subjective and objective, including Scott's score, Kelly's score, Holschneider's score, Wingspread's score, and Rintala's score [10]. The Kelly score is based on findings from a digital rectal examination, while the Holschneider score relies on results obtained through anorectal manometry [10].

The most recent scoring system is the Krickenbeck classification (2005), which was utilized in our study. It has gained widespread acceptance for assessing functional outcomes following ARM and Hirschsprung’s procedures, as it provides semi-quantitative evaluations that allow for more objective comparisons across different clinical reports [7].

QOL has become an essential endpoint of medical care, influenced by many factors such as physical, mental, and psychosocial adjustment [8]. Although there is no universally accepted QOL scoring system [10], we utilized the questionnaire from Shankar et al.'s study on children with ARM for QOL assessment [2].

Our analysis demonstrated comparable functional outcomes and quality of life between the PSARP and LAARP cohorts, with no statistically significant differences observed. These results are consistent with the findings reported by Al Shawa et al. (2022), who reported no significant difference in defecation function between the laparoscopic and open repair groups [6]. Similar findings were documented by An-Xiao Ming et al. (2014), who evaluated both groups using the Krickenbeck classification system [12], and by Kudou et al. (2005), who applied Kelly's scoring method [13]. Additionally, Ichijo et al. (2008) employed endosonographic assessment alongside pelvic MRI in their comparative analysis and likewise reported no significant distinction between the groups [14]

Conversely, several studies have shown a preference for LAARP. Al-Hozaim et al. (2009) and Shawyer et al. (2015) proposed that LAARP could lead to superior functional outcomes in cases of high-type ARM [15,16]. Supporting this view, Han et al. (2017) conducted a meta-analysis that demonstrated improved continence scores associated with LAARP [17]. These varying conclusions highlight the need for standardized outcome reporting and further multicenter prospective studies to establish definitive recommendations.

CONCLUSION

The functional outcomes and QOL for patients with high and intermediate ARM after PSARP and LAARP were statistically similar. Further studies with larger sample sizes or multicentric studies are necessary to elucidate the differences between these two procedures.

FINANCIAL DISCLOSURE: None

No external funding was received for this study.

CONFLICTS OF INTEREST:

The authors declare no conflicts of interest.

ETHICAL APPROVAL:

This study was conducted in accordance with the ethical guidelines of Zagazig University and received institutional review board approval. IRB#(250/24-3- 2024)

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