Original Article

Comparison of Clinical Outcome and Anal Manometry following Laparoscopic-assisted Anorectoplasty and Posterior Sagittal Anorectoplasty in Patients with High and Intermediate Anorectal Malformation: A Randomised Controlled Trial

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Abstract

Introduction: High and intermediate types of anorectal malformations (ARMs) may be managed by either open posterior sagittal anorectoplasty (PSARP) or by laparoscopic-assisted anorectoplasty (LAARP). Most of the literature favours one approach over the other based on retrospective analysis. We performed this study with the aim to compare the short-term outcomes of both procedures. **Materials and Methods:** All paediatric patients with high and intermediate ARM were enrolled and randomised into two groups: open PSARP group and LAARP group. Outcome parameters such as faecal continence using Kelly's scoring system, anal manometric parameters and post-operative complications were compared between the groups. **Results:** A total of 16 patients were included with equal distribution in the open PSARP and LAARP group. Patient's variables were comparable in both the groups. Five patients developed immediate post-operative complications, three in the LAARP and two in the open group. The mean Kelly's score was 3.63 ± 1.6 versus 2.57 ± 1.9 (P = 0.132) for LAARP and PSARP group, respectively. The mean resting pressure was 34.71 ± 6.26 cm of H_2O and 35 ± 6.16 cm of H_2O (P = 0.384) in LAARP and open group, respectively. Rectoanal inhibitory reflex was demonstrated in 6/7 patients in LAARP group and 5/7 patients in open group. **Conclusion:** Faecal continence in patients undergoing either of the procedure is comparable. However, wound-related complications are lesser in LAARP procedure.

Keywords: Anorectal malformation, anorectal manometry, laparoscopic-assisted anorectoplasty, posterior sagittal anorectoplasty

Introduction

Management of high anorectal malformation (ARMs) has evolved over the century. The aim for development of the varied approaches was to achieve good faecal continence in these patients. It was in 1982 when deVries and Pena described the posterior sagittal anorectoplasty (PSARP) and need for placement of rectum within the muscle complex.[1] Minimally invasive procedure laparoscopic-assisted anorectoplasty (LAARP) was first reported by Willital in late 90's.[2] Georgeson *et al*. introduced few modifications in 2000.[3] They suggested that major benefit of this technique is better visualisation of pelvic structure, accurate placement of rectum within the levator ani and muscle complex, better cosmesis, shorter hospital stay and probably better long-term faecal continence. Various retrospective and prospective studies have been published comparing the operative, post-operative and functional outcomes of these two procedures.[4-7] Our study is a randomised controlled trial designed to compare the outcomes (short term) of laparoscopic-assisted versus open anorectal pull through procedure in the patients with high and intermediate ARMs.

Materials and Methods

All diagnosed patients with high and intermediate ARM who had undergone high divided sigmoid colostomy at birth were

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included after taking informed parental consent and approval from Institutional Ethics Committee. All the patients included in the study were aged <5 years. Patients with rectal atresia, congenital pouch colon and redo anorectoplasty were excluded from the study. The study subjects were randomised using lottery system pre-operatively into PSARP group and LAARP. Patients were investigated to detect other anomalies (echocardiography, ultrasonogram of abdomen and spine, X-ray lumbosacral spine). Distal colostogram was done to locate the level of malformation and presence of fistula. Intraoperative details and complications were filled in a preformed pro forma.

Post-operative short-term complications (during hospital stay after definitive surgery [PSARP/LAARP]) were documented according to modified Clavien-Dindo classification.[8] Anal manometry was done with Phoenix V3 model, and resting pressure, voluntary squeeze (in children >36 months age), rectoanal inhibitory reflex (RAIR) and sensory threshold were measured in both groups at 6 months after colostomy closure.

Statistical methods

The Statistical Package for the Social sciences (SPSS) version 15.0 (IBM, Armonk, New York, USA) was used for statistical analysis. Quantitative variables were compared using mean ± standard deviation (SD) and qualitative variables are expressed as frequencies/percentages. A $P < 0.05$ was considered statistically significant.

Results

Patient characteristics and surgical profile

A total of 16 patients were included with 8 patients in each PSARP and LAARP group. Both the groups were comparable with respect to age, sex and anthropological parameters [Table 1].

Renal anomaly was the most common associated anomaly seen in nearly 25% (4/16) of patients. Rectobladder neck fistula was the most common variety seen in both the groups [Table 2].

The mean time taken for surgery was 146 ± 37.39 min in open PSARP group and 198.13 ± 53.31 min in LAARP group ($P = 0.020$) which was statistically significant. There was no significant difference in blood loss during surgery in both the groups ($P = 0.454$).

The mean duration of hospital stay was 9.13 ± 3.36 days in LAARP group versus 9.63 ± 4.96 days in PSARP group ($P = 0.408$).

Anal manometry and Kelly's score

It was performed in 7 patients in each group. The mean resting pressure was 34.71 ± 6.26 cm of H_2O and 35 ± 6.16 cm of H_2O ($P = 0.384$) in LAARP and open group, respectively. RAIR was demonstrated in 6/7 patients in LAARP group and 5/7 patients in open group [Table 3]. The mean Kelly's score was 3.63 ± 1.6 versus 2.57 ± 1.9 ($P = 0.132$) for LAARP and PSARP groups, respectively.

Table 1: Patient characteristics

Parameters	LAARP ($n=8$)	PSARP ($n=8$)	*P*
Sex (male:female)	7:1	8:0	
Age of presentation (day), mean±SD	1.50±0.76	1.38±1.06	
Age at PSARP/LAARP (month), mean±SD	11.38±8.35	27.75±32.68	
Associated anomaly			
Renal	3	1	
Spinal	1	2	
Cardiac	1	2	
Musculoskeletal	1	1	
Gastrointestinal	0	1	
Other	3	2	
Hospital stay (days)	9.13±3.36	9.63±4.96	0.408

LAARP: Laparoscopic-assisted anorectoplasty, PSARP: Posterior sagittal anorectoplasty, SD: Standard deviation

Table 2: Intraoperative finding

Type of ARM	LAARP, *n* (%)	PSARP, *n* (%)
Rectobladder neck	4 (50)	4 (50)
Rectoprostatic	1 (12.50)	2 (25)
Rectobulbar	1 (12.50)	2 (25)
Rectovagina	1 (12.50)	0
No fistula - high pouch	1 (12.50)	0

LAARP: Laparoscopic-assisted anorectoplasty, PSARP: Posterior sagittal anorectoplasty, ARMs: Anorectal malformations

Complications

Five patients developed immediate post-operative complications, three in LAARP and two in open group. Persistent high-grade fever was seen in two patients and paralytic ileus in one patient in LAARP group. All were managed conservatively. In open group, Grade IIIB complication was observed in two patients requiring surgical intervention, one child with hypospadias had retention of urine requiring suprapubic catheter insertion and other child had wound dehiscence requiring secondary suturing.

Anal stenosis was found in 2/8 patients in LAARP group of which one patient required limited PSARP. Mucosal prolapse occurred in 1/8 in open group as compared to 3/8 patients in LAARP group. Post-operatively, none of the patients developed urethral diverticulum in either group.

Discussion

Since the first case of LAARP reported by Willital in 1998, LAARP has now become an accepted procedure for managing high ARM. Many authors have reported that laparoscopic surgery offers better cosmesis, shorter hospital stay, early return of bowel function and improved continence.[4,6,7,9] Various studies have theoretically attributed improved functional results of LAARP to the fact that levator ani muscle is not divided. However, objective evidence is limited in the available literature.[10]

Table 3: Anal manometry at 6-month follow-up

Variables	LAARP (*n*=7)	PSARP (*n*=7)	*P*
Resting pressure (cm of H_2O), mean±SD	34.71±6.26	35±6.16	0.384
Voluntary squeeze (>3 years)	0	2/7 absent	
Rectoanal inhibitory reflex	6/7	5/7	
Sensory threshold (ml), mean±SD	30.14±2.61	32±5.16	0.206

LAARP: Laparoscopic-assisted anorectoplasty, PSARP: Posterior sagittal anorectoplasty, SD: Standard deviation

Various studies have reported shorter post-operative hospital stay and less intraoperative bleeding with LAARP.[4,6,9] However, in the present study, there was no statistical difference in the duration of hospital stay in between the two groups. This finding can be explained by the fact that patients in both groups had indwelling urethral catheter for 7 days post-operatively. Post-operative complications described in the literature include urinary tract infection, pneumonia, rectal prolapse, urethral diverticulum, anal stenosis, etc.[6,7,9,11] In the present study, paralytic ileus was encountered in one patient. Many studies have reported an incidence of rectal prolapse of 3%–10% post-LAARP procedure.[6,9,12] Rectal prolapse seen in LAARP group was observed in the early part of the study and none occurred in the later cases. This was most probably due to excess mobilisation of the rectum. An anchoring suture from rectum to presacral fascia was not placed in either group. Ming *et al*. reported rectal prolapse in 9.4% of cases after LAARP.[6] Bischoff *et al*. speculated that excessive dissection of rectum and lack of anchoring stitch may be reasons for rectal prolapse.[13]

Posterior urethral diverticulum is one of the reported complications following LAARP, the more distal the fistula, the greater the risk. Jung *et al*. in their study reported only one case of urethral diverticulum following LAARP repair.[11] The main reason stated for this is the deep location of fistula and a long common wall between urethra and fistula. Due to this, it is difficult to dissect fistula laparoscopically. Li *et al*. encountered urethral diverticulum in 1.02% patients in their study of 330 patients. They suggested intrarectal fistula closure during LAARP as it assisted the surgeons to accurately identify the junction of urethral and rectal mucosa.[14] None of our patients developed urethral diverticulum.

Control of defecation is a complex process involving levator and sphincter muscle function, anorectal sensory feedback and rectoanal canal reflexes along with social factors. An objective evidence to faecal continence is obtained from anorectal manometry. Yang *et al*. reported a significantly higher anal canal resting pressure (ACRP) in LAARP group, though, in the present study, there was no significant difference in ACRP in anal manometry in both groups.[4]

Various scoring systems are being used for evaluating continence. Clinically, Kelly's score was evaluated at 1, 3 and 6 months after colostomy closure. The scores were consistent with those reported by Yang *et al*.[4] Kudou *et al*. also reported that post-operative anorectal function in LAARP group is similar to PSARP groups.[12] Tainaka *et al*. assessed the long-term outcome of faecal incontinence after LAARP in a retrospective study of 45 male children with high and intermediate ARM.[5] There was no significant difference in faecal incontinence score at any age in their patients. Although we have not analysed the reasons for faecal incontinence in our patients, we feel that apart from patients factors such as recurrent enterocolitis, parent's acceptance of incontinence as normal in infancy and early childhood leads to delay in consultation for the incontinence in our country.

Conclusion

We found that the results of both LAARP and PSARP for repair of ARMs were comparable. However, wound-related complications were less and cosmesis was better in LAARP group. We acknowledge the limitation of our study with smaller number of cases and also a short duration of follow-up. A long-term follow-up in a larger number of patients is required for assessing the functional outcome of patients in Indian scenario.

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Conflicts of interest

There are no conflicts of interest.

References

1. deVries PA, Pena A. Posterior sagittal anorectoplasty. J Pediatr Surg 1982;17:638-43.
2. Willital GH. Endosurgical intrapuborectal reconstruction of high anorectal anomalies. Pediatr Endosurg Innov Tech 1998;2:5-11.
3. Georgeson KE, Inge TH, Albanese CT. Laparoscopically assisted anorectal pull-through for high imperforate anus – A new technique. J Pediatr Surg 2000;35:927-30.
4. Yang J, Zhang W, Feng J, Guo X, Wang G, Weng Y, *et al.* Comparison of clinical outcomes and anorectal manometry in patients with congenital anorectal malformations treated with posterior sagittal anorectoplasty and laparoscopically assisted anorectal pull through. J Pediatr Surg 2009;44:2380-3.
5. Tainaka T, Uchida H, Tanaka Y, Hinoki A, Shirota C, Sumida W, *et al.* Long-term outcomes and complications after laparoscopic-assisted anorectoplasty vs. posterior sagittal anorectoplasty for high- and intermediate-type anorectal malformation. Pediatr Surg Int 2018;34:1111-5.
6. Ming AX, Li L, Diao M, Wang HB, Liu Y, Ye M, *et al.* Long term outcomes of laparoscopic-assisted anorectoplasty: A comparison study with posterior sagittal anorectoplasty. J Pediatr Surg 2014;49:560-3.
7. De Vos C, Arnold M, Sidler D, Moore SW. A comparison of laparoscopic-assisted (LAARP) and posterior sagittal (PSARP) anorectoplasty in the outcome of intermediate and high anorectal

malformations. S Afr J Surg 2011;49:39-43.
8. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: A new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg 2004;240:205-13.
9. Tong QS, Tang ST, Pu JR, Mao YZ, Wang Y, Li SW, *et al.* Laparoscopically assisted anorectal pull-through for high imperforate anus in infants: Intermediate results. J Pediatr Surg 2011;46:1578-86.
10. Peña A, Amroch D, Baeza C, Csury L, Rodriguez G. The effects of the posterior sagittal approach on rectal function (experimental study). J Pediatr Surg 1993;28:773-8.
11. Jung SM, Lee SK, Seo JM. Experience with laparoscopic-assisted anorectal pull-through in 25 males with anorectal malformation and recto-urethral or recto-vesical fistulae: Postoperative complications and functional results. J Pediatr Surg 2013;48:591-6.
12. Kudou S, Iwanaka T, Kawashima H, Uchida H, Nishi A, Yotsumoto K, *et al.* Midterm follow up study of high-type imperforate anus after laparoscopically assisted anorectoplasty. J Pediatr Surg 2005;40:1923-6.
13. Bischoff A, Martinez-Leo B, Peña A. Laparoscopic approach in the management of anorectal malformations. Pediatr Surg Int 2015;31:431-7.
14. Li L, Ren X, Ming A, Xu H, Sun R, Zhou Y, *et al.* Laparoscopic surgical technique to enhance the management of anorectal malformations: 330 cases' experience in a single center. Pediatr Surg Int 2020;36:279-87.