

Immediate and Long-term Outcomes in High Anorectal Malformations in Males: A Prospective Observational Study

Dr. Kashyap Pandya¹, Dr. Samir Kacheriwala², Ananyaa Pandya³

¹Consultant Neonatal & Paediatric Surgeon Department of Surgery SSGH

²Associate Professor Department of Surgery SSGH

³2nd year Medical Student GMERS Medical College, GOTRI

Cite this paper as: Dr. Kashyap Pandya, Dr. Samir Kacheriwala, Ananyaa Pandya, (2025) Immediate and Long-term Outcomes in High Anorectal Malformations in Males: A Prospective Observational Study, *Journal of Neonatal Surgery*, 14 (25s), 963-968

ABSTRACT

Background:

High anorectal malformations (ARMs) represent a complex subset of congenital anomalies requiring staged surgical correction. While early survival has improved with advances in neonatal care, long-term functional outcomes such as fecal continence and urinary control remain critical markers of surgical success.

Objectives:

To evaluate immediate postoperative complications and long-term functional outcomes in male patients with high ARMs undergoing staged surgical management at a tertiary centre.

Methods:

This prospective observational study included 50 male neonates with high ARMs treated between January 2020 and January 2025 at SSGH, Vadodara. Patients underwent initial colostomy, posterior sagittal anorectoplasty (PSARP), and delayed colostomy closure. Outcomes assessed included stoma complications, continence status, constipation, urinary dysfunction, and mortality. Associations were analyzed using chi-square tests.

Results:

Stoma-related complications occurred in 48% of cases, while 34% experienced PSARP-related issues. At follow-up (2–5 years), 56% had good fecal continence, 28% experienced severe constipation, and 14% had urinary complications. No significant association was found between fistula type and continence ($\chi^2 = 6.798$, $p = 0.1469$). The mortality rate was 12%.

Conclusion:

Staged PSARP remains an effective surgical strategy for high ARMs, with acceptable complication rates and encouraging long-term functional outcomes. However, constipation and urinary issues warrant continued multidisciplinary follow-up...

Keywords: Anorectal malformations, Posterior sagittal anorectoplasty, Fecal continence, Pediatric surgery, Long-term outcomes

1. INTRODUCTION

Anorectal malformations (ARMs) are a spectrum of congenital anomalies characterized by abnormal development of the distal hindgut, affecting the anus and rectum. They present with variable anatomic patterns, particularly in males, where high-type lesions often involve fistulous communication with the urinary tract. Globally, the estimated prevalence of ARMs ranges from 1 in 1,500 to 1 in 5,000 live births, with significant regional variation across low- and middle-income countries [1,2]. In India and other parts of the developing world, delayed presentation, limited access to neonatal surgical care, and associated anomalies compound the challenges in managing these complex cases [3,4].

Several classification systems have been proposed for ARMs, with the Krickenbeck classification gaining widespread clinical acceptance due to its correlation with surgical planning and long-term functional outcomes [2]. High-type anomalies, particularly those involving recto-bladder neck and recto-prostatic fistulae, typically require a staged surgical approach beginning with protective colostomy followed by definitive reconstruction—most commonly posterior sagittal anorectoplasty (PSARP)—and subsequent colostomy closure [5,6].

Despite advances in paediatric surgery and neonatal care, ARMs remain associated with considerable morbidity. Multiple studies have reported that while early survival has improved, many children experience long-term issues such as fecal

incontinence, constipation, and urinary dysfunction [7,8]. Additionally, coexistent anomalies, including urological or spinal defects, may adversely affect outcomes [6]. In resource-limited settings, factors such as delayed referral, suboptimal nutrition, and infection risk during postoperative recovery can further influence both immediate and long-term results [3,5,9].

This study aims to evaluate the short- and long-term outcomes of male patients with high anorectal malformations managed at a tertiary care teaching hospital in western India. By examining surgical complications and functional sequelae over a five-year period, the study contributes to the growing body of literature on ARM outcomes in the South Asian context.

Aims and Objectives

Aim:

To evaluate the immediate and long-term outcomes in male patients with high anorectal malformations managed at a tertiary care centre in India.

Objectives:

1. To assess the short-term postoperative outcomes following staged surgical correction, including complications after colostomy, posterior sagittal anorectoplasty (PSARP), and colostomy closure.

To evaluate the long-term functional outcomes, including faecal continence, constipation, and urinary complications, during follow-up of up to five years post-definitive repair

2. MATERIALS AND METHODS

Study Design and Setting

This was a prospective observational study conducted at the Department of Pediatric Surgery, Sir Sayajirao General Hospital (SSGH), Vadodara, Gujarat. The study spanned five years, from January 2020 to January 2025, and aimed to evaluate both immediate surgical outcomes and long-term functional results in male patients diagnosed with high anorectal malformations (ARMs).

Study Population

The study included 50 consecutive male neonates with high ARMs, defined according to the Krickenbeck classification, who presented within the neonatal period and underwent staged surgical correction at the institution.

Inclusion Criteria

- Male neonates diagnosed with high-type anorectal malformations.
- Patients who underwent a standard three-stage surgical approach: initial colostomy, definitive posterior sagittal anorectoplasty (PSARP), and delayed colostomy closure.
- Availability of follow-up data for a minimum of two years post-definitive repair.

Exclusion Criteria

- Patients with low or intermediate-type ARMs.
- Female patients.
- Incomplete surgical management at the institution.
- Lost to follow-up before two years post-definitive repair.

Data Collection and Variables

Clinical data were collected prospectively using structured case sheets and follow-up records. The following variables were analyzed:

- Demographics: Age at presentation, birth weight.
- Anatomical subtype: Fistula type (recto-bulbar, recto-prostatic, recto-bladder neck).
- Surgical data: Timing and type of procedures (colostomy, PSARP, colostomy closure).
- Immediate outcomes: Stoma-related complications, wound infection, anal stenosis, dehiscence.
- Long-term outcomes: Faecal continence, constipation severity, and urinary complications (UTI, incontinence).
- Mortality: Early and late mortality within the study duration.

Outcome Assessment

- Immediate postoperative complications were assessed within 30 days of surgery.

- Long-term functional outcomes were assessed using clinical examination, parental reporting, and continence scoring systems during follow-up visits at 6 months, 1 year, and annually thereafter up to 5 years.

Statistical Analysis

Data were entered in Microsoft Excel and analyzed using IBM SPSS version 25. Descriptive statistics were presented as mean $\pm$ standard deviation (SD) for continuous variables and frequency with percentages for categorical variables.

Associations between categorical variables (e.g., type of fistula vs. fecal continence) were tested using the Chi-square test. A p-value of < 0.05 was considered statistically significant. Where applicable, effect sizes such as Cramer's V were reported to assess the strength of association.

3. RESULTS

Section 1: Baseline Characteristics

The study cohort comprised 50 male neonates diagnosed with high anorectal malformations. The most commonly observed fistula type was recto-bulbar (42%), followed by recto-bladder neck (40%) and recto-prostatic (18%).

All patients underwent initial sigmoid colostomy. Stoma-related complications were observed in 48% of cases, with stoma prolapse and skin excoriation each affecting 16% of patients. Following posterior sagittal anorectoplasty (PSARP), the most frequent postoperative complication was anal stenosis (16%), while wound infections occurred in 10% of patients. Two-thirds (66%) had no PSARP-related complications.

Regarding long-term bowel outcomes, fair continence was reported in over half the patients (56%), while good continence was observed in 32%. Severe constipation affected 28%, while mild or no constipation was reported in the remainder.

Table 1: Baseline Characteristics of Study Participants (n = 50)

Variable	Category 1	Category 2	Category 3	Category 4
Fistula Type	20 (40.0%)	9 (18.0%)	21 (42.0%)	
Stoma Complication	8 (16.0%)	26 (52.0%)	8 (16.0%)	8 (16.0%)
Post-PSARP Complication	5 (10.0%)	4 (8.0%)	33 (66.0%)	8 (16.0%)
Fecal Continence	16 (32.0%)	28 (56.0%)	6 (12.0%)	
Constipation	14 (28.0%)	22 (44.0%)	14 (28.0%)	
Urinary Complications	7 (14.0%)	32 (64.0%)	11 (22.0%)	
Mortality	44 (88.0%)	6 (12.0%)		

Section 2: Immediate Postoperative Outcomes

Among the 50 patients with high anorectal malformations, stoma-related complications were observed in 24 patients (48%). The most frequent issues included stoma prolapse (16%) and peristomal skin infection (16%), while 52% experienced no colostomy-related complications.

Following the posterior sagittal anorectoplasty (PSARP) procedure, 66% had no postoperative issues, while 10% developed anal stenosis, 8% experienced wound dehiscence, and a smaller proportion encountered other complications.

These findings highlight the relatively common occurrence of minor complications in the early post-surgical period, most of which were managed conservatively without need for reoperation.

Table 2: Immediate Postoperative Outcomes (n = 50)

Complication Type	Stoma Complications	Post-PSARP Complications
Anal stenosis		5 (10.0%)
Dehiscence		4 (8.0%)

Infection	8 (16.0%)	
None	26 (52.0%)	33 (66.0%)
Prolapse	8 (16.0%)	
Skin excoriation	8 (16.0%)	
Wound infection		8 (16.0%)

Section 3: Long-term Functional Outcomes

At a median follow-up of 3.5 years (range: 2–5 years), fecal continence outcomes were generally favorable, with good continence observed in 56% of the cohort and fair continence in 32%. However, 12% were classified as having poor continence, often associated with complex fistula anatomy or postoperative complications.

Constipation was a frequent morbidity, affecting 28% of patients severely, while 44% reported no symptoms and 28% had mild, diet-manageable symptoms. Urinary issues were relatively uncommon but clinically significant; 14% developed complications, including recurrent urinary tract infections (UTIs) or incontinence, often seen in patients with recto-bladder neck variants.

These findings underscore the need for continued follow-up and multidisciplinary management in children undergoing staged repair for high anorectal malformations.

Table 3: Long-term Functional Outcomes (n = 50)

Outcome Category	Fecal Continence	Constipation	Urinary Complications
Fair	16 (32.0%)		
Good	28 (56.0%)		
Incontinence			7 (14.0%)
Mild		14 (28.0%)	
No		22 (44.0%)	
None			32 (64.0%)
Poor	6 (12.0%)		
Severe		14 (28.0%)	
UTI			11 (22.0%)

Section 4: Mortality and Predictive Associations

During the follow-up period, 6 out of 50 patients (12%) succumbed to complications either in the early postoperative period or due to associated comorbidities. The overall survival rate was 88%. A chi-square test was conducted to examine the relationship between fecal continence status and type of fistula. While there appeared to be some variation across fistula types, the association was not statistically significant:

- Chi-square (χ^2) = 6.798
- Degrees of freedom (df) = 4
- p-value = 0.1469

This suggests that fistula type may not be a strong predictor of long-term continence outcomes in this sample, though further studies with larger samples may be required to validate this finding.

Table 4: Mortality Summary (n = 50)

Mortality Status	n (%)
No	44 (88.0%)
Yes	6 (12.0%)

4. DISCUSSION

This prospective observational study evaluated both immediate surgical complications and long-term functional outcomes in male patients with high anorectal malformations (ARMs) managed at a tertiary care center over a five-year period. The findings align with established literature while offering insight into the Indian clinical context where resource limitations often influence outcomes.

The majority of patients in this cohort underwent the standard three-stage approach involving initial colostomy, posterior sagittal anorectoplasty (PSARP), and delayed colostomy closure. This staged protocol remains the most commonly employed strategy in high-type ARMs in India due to its reliability in minimizing septic complications and preserving sphincter anatomy [10,11].

Our observed complication rates—stoma-related in 48% and post-PSARP in 34%—were broadly consistent with existing studies. In particular, the incidence of wound infections and anal stenosis mirrors prior reports by Kaselas et al. and Peña, where short-term morbidity was attributed to operative complexity and tissue healing in neonates [11,14]. Notably, Peña's foundational work reported excellent outcomes in a large cohort using PSARP, but emphasized the steep learning curve and need for meticulous technique to avoid complications [14].

Long-term bowel function remains a crucial outcome domain in ARM research. In our study, 56% of patients achieved good continence, with an additional 32% demonstrating fair continence—findings that align closely with those reported by Liem and Hau (2001), who followed a similar staged approach and noted that functional improvement often continues with age [15]. The improvement of continence during adolescence, as described by Rintala and Lindahl, supports the concept that continence in ARM patients may evolve over time, often correlating with the resolution of early constipation [12].

Constipation affected 56% of patients in our study (mild in 28%, severe in 28%), reinforcing its position as a persistent challenge in post-PSARP care. Kyrklund et al. have highlighted that despite anatomically successful repairs, many patients continue to struggle with dysmotility or outlet obstruction, which can significantly affect quality of life [16].

In contrast to bowel function, urinary complications were less frequent but not insignificant. Fourteen percent of our patients experienced urinary issues—most commonly urinary tract infections or incontinence. These findings echo the results of Bjoersum-Meyer et al., who noted that urinary and sexual dysfunction, although underreported in early childhood, often manifest during adolescence or adulthood in patients with high ARMs [17].

Interestingly, no statistically significant association was found between fistula type and fecal continence outcomes in our cohort. Although Ming et al. and Tainaka et al. noted that fistula level and surgical modality (e.g., laparoscopic-assisted anorectoplasty or LAARP) may influence outcomes, our uniform use of PSARP may have homogenized the surgical variable, reducing the potential for observable differences [10,13].

Overall, our findings are in line with international data that suggest while survival in ARM has significantly improved, functional outcomes continue to vary. The results support the use of PSARP as a safe and effective approach for high-type anomalies while underscoring the need for structured, multidisciplinary long-term follow-up.

5. CONCLUSION

This prospective observational study highlights that staged surgical correction using posterior sagittal anorectoplasty (PSARP) provides favourable long-term outcomes in male patients with high anorectal malformations. While the majority of patients achieved good faecal continence, a significant subset continued to experience constipation and urinary complications, emphasizing the need for long-term follow-up and supportive care. These findings reinforce the utility of PSARP as the standard approach in resource-limited settings and underscore the importance of structured postoperative surveillance to optimize functional outcomes.

6. LIMITATIONS

This study was limited by its single-centre design and relatively small sample size, which may restrict generalizability. The absence of a comparative group (e.g., laparoscopic-assisted repairs) limits broader surgical outcome comparisons. Additionally, continence and quality-of-life assessments relied partly on parental reporting, introducing potential recall bias. Further multicentric studies with objective scoring systems and longer follow-up into adolescence are warranted to validate these findings.

REFERENCES

- [1] Cassina, M., et al. (2019). Prevalence and survival of patients with anorectal malformations: a population-based study. *Journal of Pediatric Surgery*, 54(10), 1998–2003.
- [2] Levitt, M. A., & Peña, A. (2007). Anorectal malformations. *Orphanet Journal of Rare Diseases*, 2(1), 33.
- [3] Lawal, T. A. (2019). Overview of anorectal malformations in Africa. *Frontiers in Surgery*, 6, 7.
- [4] Kancherla, V., et al. (2023). Prevalence and mortality among children with anorectal malformation: a multi-country analysis. *Birth Defects Research*, 115(3), 390–404.
- [5] Nisar, M. U., et al. (2020). Factors affecting the outcome of neonates with anorectal malformation in a developing country. *Journal of Pediatric and Adolescent Surgery*, 1(2), 66–69.
- [6] Hohlschneider, A. M., & Hustson, J. M. (2006). Genetics, pathogenesis and epidemiology of anorectal malformations and caudal regression syndrome. In *Anorectal Malformations in Children* (pp. 31–48).
- [7] Mirza, B., et al. (2011). Anorectal malformations in neonates. *African Journal of Paediatric Surgery*, 8(2), 151–154.
- [8] Springford, L. R., et al. (2016). Prevalence of active long-term problems in patients with anorectal malformations: a systematic review. *Diseases of the Colon & Rectum*, 59(6), 570–580.
- [9] Cuschieri, A., & EUROCAT Working Group. (2001). Descriptive epidemiology of isolated anal anomalies: a survey of 4.6 million births in Europe. *American Journal of Medical Genetics*, 103(3), 207–215. □ Ming, A. X., et al. (2014). Long term outcomes of laparoscopic-assisted anorectoplasty: a comparison study with posterior sagittal anorectoplasty. *Journal of Pediatric Surgery*, 49(4), 560–563.
- [10] Kaselas, C., et al. (2011). Evaluation of long-term functional outcomes after surgical treatment of anorectal malformations. *International Journal of Colorectal Disease*, 26, 351–356.
- [11] Rintala, R. J., & Lindahl, H. G. (2001). Fecal continence in patients having undergone posterior sagittal anorectoplasty procedure for a high anorectal malformation improves at adolescence, as constipation disappears. *Journal of Pediatric Surgery*, 36(8), 1218–1221.
- [12] Tainaka, T., et al. (2018). Long-term outcomes and complications after laparoscopic-assisted anorectoplasty vs. posterior sagittal anorectoplasty for high-and intermediate-type anorectal malformation. *Pediatric Surgery International*, 34, 1111–1115.
- [13] Peña, A. (1988). Posterior sagittal anorectoplasty: results in the management of 332 cases of anorectal malformations. *Pediatric Surgery International*, 3, 94–104.
- [14] Liem, N. T., & Hau, B. D. (2001). Long-term follow-up results of the treatment of high and intermediate anorectal malformations using a modified technique of posterior sagittal anorectoplasty. *European Journal of Pediatric Surgery*, 11(04), 242–245.
- [15] Kyrklund, K., et al. (2017). Long-term bowel function, quality of life and sexual function in patients with anorectal malformations treated during the PSARP era. *Seminars in Pediatric Surgery*, 26(5), 336–342.
- [16] Bjoersum-Meyer, T., et al. (2021). Long-term functional urinary and sexual outcomes in patients with anorectal malformations—a systematic review. *European Urology Open Science*, 25, 29–38.