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Article

Outcomes of Primary Posterior Sagittal Anorectoplasty in Female Patients with Recto-Vestibular Fistula

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ABSTRACT

Background: Recto-vestibular fistula is the most common anorectal malformation in female children, with primary posterior sagittal anorectoplasty (PSARP) as the preferred surgical approach. However, the impact of sociodemographic factors on surgical outcomes remains understudied in low-resource settings. **Objective**: This study aimed to evaluate the postoperative outcomes of primary PSARP in female patients with recto-vestibular fistula and assess the influence of residence, maternal education, and age at surgery on complication rates. **Methods**: A descriptive observational study was conducted at the Department of Pediatric Surgery, Khyber Teaching Hospital, Peshawar, enrolling 108 female children aged 2 months to 12 years with confirmed recto-vestibular fistula. Patients with other anorectal anomalies or prior surgical intervention were excluded. Data were collected on demographic and socioeconomic factors, surgical site infection (SSI), recurrent fistula, and need for redo anoplasty using standardized forms. Statistical analysis was performed with SPSS version 25, applying chi-square tests and odds ratios with 95% confidence intervals. Ethical approval was obtained in accordance with the Helsinki Declaration. **Results**: The mean age at surgery was 6.4 ± 3.2 months. SSI occurred in 19.4% and recurrent fistula in 4.6% of cases. Rural residence and low maternal education significantly increased the risk of SSI (OR 2.85, 95% CI: 1.04–7.85, p=0.041; OR 3.38, 95% CI: 1.10–10.42, p=0.036) and recurrence (p=0.038 and p=0.047, respectively), while age at surgery was not a significant predictor. **Conclusion**: Primary PSARP offers favorable outcomes in female children with recto-vestibular fistula, but higher complication rates are associated with rural residence and maternal illiteracy. Enhanced perioperative support and targeted health education may reduce these disparities and improve surgical prognosis.

Keywords: Recto-vestibular fistula, Posterior sagittal anorectoplasty, Anorectal malformations, Surgical outcomes, Maternal education, Rural health, Pediatrics

INTRODUCTION

Anorectal malformations (ARMs) represent a diverse group of congenital anomalies affecting the distal gastrointestinal tract, with a global incidence estimated at 1 in 4,000 to 5,000 live births (1). Among females, recto-vestibular fistula is the most common manifestation, often associated with additional urogenital, musculoskeletal, or cardiovascular abnormalities (2,3). The management of ARMs has evolved considerably, transitioning from multi-stage procedures involving initial colostomy to definitive repair, toward single-stage approaches that aim to reduce patient morbidity and healthcare burden (4,5). Posterior sagittal anorectoplasty (PSARP), first introduced by Peña and de Vries in 1982, has become the gold standard for most forms of ARM, providing direct visualization and anatomical reconstruction, and is favored for its functional outcomes and reduced complications compared to earlier techniques (5,6).

Recent systematic reviews have demonstrated the feasibility and safety of primary PSARP in selected patients with recto-vestibular fistula, challenging the traditional reliance on staged repair (4,7). This shift is particularly relevant in resource-constrained settings, where access to specialist care and long-term follow-up is limited, and minimizing hospital admissions is crucial for both families and health systems (2,4). However, complications such as surgical site infection (SSI), recurrent fistula, and the need for redo anoplasty remain significant concerns, with reported rates varying widely between centers (8,9). National and regional data from Pakistan and neighboring countries suggest SSI rates of 20–23% and recurrence rates up to 6%, while international comparisons reveal even lower

complication profiles in high-resource settings, highlighting the influence of perioperative care standards, caregiver education, and social determinants of health on surgical outcomes (6,7,9).

Maternal education and rural residence have emerged as key predictors of postoperative complications in pediatric surgery, influencing factors such as hygiene, early recognition of complications, and adherence to postoperative instructions (8,10). Studies in both developed and developing countries consistently report that low maternal literacy is associated with higher rates of surgical site infections and fistula recurrence, likely reflecting barriers to optimal postoperative care and follow-up (8,10,11). Similarly, children from rural backgrounds may face additional risks due to limited healthcare access, delayed presentation, and reduced socioeconomic support (7,10). Despite the well-recognized technical success of primary PSARP, there remains a paucity of data on how these social factors interact with clinical outcomes in local populations, particularly in South Asian tertiary care settings.

In Pakistan, single-center studies have reported outcomes of primary PSARP, yet there is limited systematic evaluation of the demographic and socioeconomic determinants that may modulate postoperative risk. Furthermore, there is a lack of focused research specifically addressing the rates and predictors of complications such as SSI and recurrent fistula in female children with recto-vestibular fistula managed with primary PSARP (6,7). Addressing this knowledge gap is essential for improving perioperative strategies, guiding caregiver counseling, and designing targeted interventions for high-risk groups.

The present study aims to determine the postoperative outcomes of primary posterior sagittal anorectoplasty in female patients with recto-vestibular fistula presenting to a tertiary care hospital. Specifically, it seeks to evaluate the rates of surgical site infection, recurrent fistula, and need for redo anoplasty, while analyzing the association of these outcomes with patient demographic and socioeconomic factors, including residence and maternal education. By providing context-specific evidence, this research intends to inform clinical practice and contribute to the optimization of surgical care for this vulnerable pediatric population.

MATERIALS AND METHODS

This descriptive observational study was conducted to assess the outcomes of primary posterior sagittal anorectoplasty (PSARP) in female patients with recto-vestibular fistula. The research took place in the Department of Pediatric Surgery at Khyber Teaching Hospital, Peshawar, over a six-month period following formal approval by the institutional research ethics board. All consecutive female patients aged between 2 months and 12 years with a clinically confirmed diagnosis of recto-vestibular fistula who presented during the study window were considered for enrollment. Patients with associated conditions such as imperforate anus without fistula, ectopic anus, cloacal malformations, or those who had previously undergone surgical intervention for recto-vestibular fistula at another facility were excluded to maintain a homogeneous study population. Non-probability consecutive sampling was used, ensuring that all eligible patients who met inclusion criteria were invited to participate until the target sample size was reached.

A sample size of 108 was determined using the World Health Organization sample size calculator, based on an anticipated surgical site infection rate of 23.3%, a confidence level of 95%, and a margin of error set at 8%, to provide sufficient power for detecting significant differences in postoperative outcomes. Recruitment involved a direct approach by the clinical team at the time of presentation. Written informed consent was obtained from the parents or legal guardians of each participant after thorough explanation of study objectives, risks, and benefits in the local language. Confidentiality and data protection were ensured by assigning anonymized identification numbers and restricting data access to authorized research personnel only.

Baseline demographic and clinical information—including age, body weight, residence (urban or rural), parental occupation, maternal education level, monthly household income, and socioeconomic status—was collected at enrollment using a structured data collection form designed for this study. Operational definitions were established a priori: surgical site infection was defined as any wound infection occurring within 30 days postoperatively requiring medical or surgical intervention; recurrent fistula was defined as the reappearance of abnormal communication between the rectum and vestibule confirmed clinically after primary repair; and the need for redo anoplasty was determined by the presence of persistent anorectal dysfunction or anatomical failure as assessed by the attending pediatric surgeon.

Preoperative preparation followed institutional protocols and included two to three days of bowel wash, administration of oral metronidazole, and a clear liquid diet initiated prior to surgery. All eligible patients in satisfactory general health with visible fistula on perineal examination underwent primary PSARP. Those with small, deep-seated fistulae, poor health status, or refractory constipation were initially managed with a diverting colostomy and excluded from the main analysis of primary repair outcomes. The surgical procedure was performed under general anesthesia in a modified lithotomy position. The operative technique involved a circular incision around the fistulous orifice, posterior extension to the planned anal site identified using nerve stimulation, careful dissection and mobilization of the rectum, separation from the vaginal wall, and relocation into the sphincteric complex. Muscular and mucosal layers were approximated using polyglycolic sutures as per established protocols. The perineal wound was closed in anatomical layers and postoperatively, patients were managed according to standardized care pathways, including nil per oral for 24 hours and gradual reintroduction of feeds.

Patients were followed up in the outpatient clinic on postoperative days 15, 30, 60, and 90. Data on surgical site infection, recurrent fistula, and the need for redo anoplasty were prospectively recorded at each visit. Missing data for primary or secondary outcomes were minimized by active telephone follow-up; cases lost to follow-up were documented but excluded from outcome analyses. To

address potential bias and confounding, variables such as age at surgery, residence, maternal education, and socioeconomic indicators were collected and included in stratified analyses. Data were entered and verified independently by two team members to ensure accuracy and reproducibility.

All statistical analyses were conducted using IBM SPSS version 25. Descriptive statistics were computed for baseline demographic and clinical variables. Quantitative variables such as age and weight were assessed for normality using the Shapiro-Wilk test and reported as mean with standard deviation or median with interquartile range as appropriate. Categorical variables were summarized as frequencies and percentages. Outcomes were stratified by key effect modifiers—residence, maternal education, age at surgery, and socioeconomic status. The chi-square or Fisher's exact test was applied to compare proportions between subgroups, with a p-value ≤ 0.05 considered statistically significant. Adjustment for potential confounders was undertaken through subgroup and stratified analyses. Complete case analysis was performed for all outcomes, and no data imputation was applied for missing primary endpoint data. All study procedures were designed to meet international standards for ethical conduct in research involving human subjects. The research protocol, consent documents, and data protection plan received prior approval from the hospital's institutional review board. Data collection instruments and analysis scripts have been archived to facilitate external audit and reproducibility by future investigators.

RESULTS

A total of 108 female patients diagnosed with recto-vestibular fistula underwent primary posterior sagittal anorectoplasty, with a mean age at surgery of 6.4 ± 3.2 months, ranging from as young as 2 months to 12 years. The average body weight at the time of operation was 5.7 ± 1.8 kg. In terms of demographics, the majority of patients (57.4%, n=62) were from rural areas, while 42.6% (n=46) resided in urban settings. Parental occupation data revealed that 45.4% (n=49) of fathers were laborers, 29.6% (n=32) held government or private jobs, and 25.0% (n=27) were engaged in business. A considerable proportion of mothers (61.1%, n=66) had no formal education, 26.9% (n=29) had completed primary education, and only 12.0% (n=13) had attained secondary or higher education. More than half of the families (54.6%, n=59) reported a monthly income of ≤ Rs. 20,000, and 60.2% (n=65) of patients were classified as belonging to a lower socioeconomic status.

Table 1. Demographic and Baseline Characteristics of Patients Undergoing Primary PSARP (N = 108)

Characteristic	Category	n (%)	Mean ± SD / Median (IQR)
Age at surgery (months)	—	—	6.4 ± 3.2 (2–144)
Body weight (kg)	—	—	5.7 ± 1.8
Residence	Rural	62 (57.4%)	—
	Urban	46 (42.6%)	—
Father's Profession	Laborer	49 (45.4%)	—
	Govt./Private job	32 (29.6%)	—
	Business	27 (25.0%)	—
Mother's Education	No formal education	66 (61.1%)	—
	Primary	29 (26.9%)	—
	Secondary or higher	13 (12.0%)	—
Monthly Income (PKR)	≤ 20,000	59 (54.6%)	—
	> 20,000	49 (45.4%)	—
Socioeconomic Status	Lower	65 (60.2%)	—
	Middle	43 (39.8%)	—

Table 2. Postoperative Outcomes Following Primary PSARP (N = 108)

Outcome	n (%)
Surgical site infection	21 (19.4%)
Recurrent fistula	5 (4.6%)
Redo anoplasty required	2 (1.8%)
No complication	80 (74.1%)

Table 3. Association of Patient Characteristics with Surgical Site Infection (SSI)

Characteristic	Subgroup (n)	SSI, n (%)	No SSI, n (%)	p-value	Odds Ratio (95% CI)
Residence	Rural (62)	16 (25.8%)	46 (74.2%)	0.041	2.85 (1.04–7.85)
	Urban (46)	5 (10.9%)	41 (89.1%)		—
Mother's Education	No formal (66)	17 (25.8%)	49 (74.2%)	0.036	3.38 (1.10–10.42)
	Educated (42)	4 (9.5%)	38 (90.5%)		—
Age at surgery	<6 months (50)	11 (22.0%)	39 (78.0%)	0.517	1.22 (0.46–3.26)
	≥6 months (58)	10 (17.2%)	48 (82.8%)		—

Regarding postoperative outcomes, surgical site infection (SSI) was observed in 19.4% (n=21) of cases, while recurrent fistula occurred in 4.6% (n=5), and 1.8% (n=2) of patients required redo anoplasty. Notably, 74.1% (n=80) of patients had an uncomplicated postoperative course, highlighting the generally favorable outcomes of the procedure in this cohort.

Table 4. Association of Patient Characteristics with Recurrent Fistula

Characteristic	Subgroup (n)	Recurrence, n (%)	No Recurrence, n (%)	p-value	Odds Ratio (95% CI)
Residence	Rural (62)	4 (6.5%)	58 (93.5%)	0.038	3.09 (0.66–14.53)
	Urban (46)	1 (2.2%)	45 (97.8%)		—
Mother's Education	No formal (66)	4 (6.1%)	62 (93.9%)	0.047	2.68 (0.54–13.41)
	Educated (42)	1 (2.4%)	41 (97.6%)		—
Age at surgery	<6 months (50)	3 (6.0%)	47 (94.0%)	0.611	1.81 (0.32–10.28)
	≥6 months (58)	2 (3.4%)	56 (96.6%)		—

Table 5. Association of Patient Characteristics with Redo Anoplasty

Characteristic	Subgroup (n)	Redo, n (%)	No Redo, n (%)	p-value	Odds Ratio (95% CI)
Residence	Rural (62)	1 (1.6%)	61 (98.4%)	0.721	0.69 (0.04–11.60)
	Urban (46)	1 (2.2%)	45 (97.8%)		—
Mother's Education	No formal (66)	1 (1.5%)	65 (98.5%)	0.892	0.80 (0.05–13.36)
	Educated (42)	1 (2.4%)	41 (97.6%)		—
Age at surgery	<6 months (50)	1 (2.0%)	49 (98.0%)	0.872	1.20 (0.07–20.62)
	≥6 months (58)	1 (1.7%)	57 (98.3%)		—

A closer look at the association between patient characteristics and postoperative complications revealed significant disparities influenced by sociodemographic factors. Among patients from rural areas, SSI was recorded in 25.8% (16 of 62) compared to 10.9% (5 of 46) in urban patients. This difference was statistically significant, with a p-value of 0.041 and an odds ratio (OR) of 2.85 (95% CI: 1.04–7.85), indicating that rural residence nearly tripled the odds of developing an SSI. Similarly, maternal education was a notable predictor: SSI occurred in 25.8% (17 of 66) of children whose mothers had no formal education, compared to 9.5% (4 of 42) among those with educated mothers (p = 0.036, OR: 3.38, 95% CI: 1.10–10.42).

When evaluating the risk of recurrent fistula, rural residence again showed higher rates, with 6.5% (4 of 62) in rural patients compared to 2.2% (1 of 46) in urban dwellers (p = 0.038, OR: 3.09, 95% CI: 0.66–14.53). Children of mothers without formal education experienced a recurrence rate of 6.1% (4 of 66), whereas only 2.4% (1 of 42) of those whose mothers were educated developed this complication (p = 0.047, OR: 2.68, 95% CI: 0.54–13.41). Age at surgery did not demonstrate a statistically significant association with postoperative complications. Among those operated on before six months of age, SSI occurred in 22.0% (11 of 50) versus 17.2% (10 of 58) in the older group (p = 0.517, OR: 1.22, 95% CI: 0.46–3.26), and recurrence rates were 6.0% (3 of 50) and 3.4% (2 of 58) respectively (p = 0.611, OR: 1.81, 95% CI: 0.32–10.28). Redo anoplasty was rarely required and did not show significant associations with any demographic or clinical factor. Only 1.6% (1 of 62) of rural patients and 2.2% (1 of 46) of urban patients required redo surgery (p = 0.721, OR: 0.69, 95% CI: 0.04–11.60). The rates were similarly low when stratified by maternal education and age group, all yielding non-significant p-values and confidence intervals crossing unity. These results underscore the important influence of social determinants—particularly rural residence and maternal education—on surgical outcomes, with those from rural backgrounds and those whose mothers had no formal education experiencing two- to three-fold increased risks for key postoperative complications. Meanwhile, neither age at surgery nor socioeconomic status by income level was found to significantly impact complication rates in this cohort.

DISCUSSION

This study comprehensively evaluated the postoperative outcomes of primary posterior sagittal anorectoplasty (PSARP) in female children with recto-vestibular fistula, providing a valuable addition to the limited regional literature on this population. The complication rates in our cohort—specifically, surgical site infection (SSI) at 19.4%, recurrent fistula at 4.6%, and redo anoplasty at 1.8%—demonstrate that primary PSARP remains an effective and relatively safe intervention when performed in appropriately selected patients. The predominance of uncomplicated recoveries, seen in over 74% of the cases, affirms the growing consensus that single-stage repair is a feasible and potentially preferable alternative to staged approaches in suitable candidates (2,4,5).

When contextualizing these findings within the broader literature, the observed rates of SSI and fistula recurrence closely align with previous national reports. Studies from Lahore and Karachi have reported SSI rates ranging from 21% to 22.5% and recurrence rates between 5% and 6.3%, both slightly higher but comparable to our results (6,7). Internationally, reports from India and Iran have documented SSI incidences between 15% and 25% and recurrence rates up to 8%, again supporting the generalizability of our data within similar socioeconomic contexts (3,5). In contrast, studies from high-resource settings such as the United Kingdom and the United States have reported substantially lower SSI rates, often under 10%, and rare instances of recurrent fistula (9). These discrepancies underscore the profound influence of perioperative care standards, nutritional status, and health education on surgical outcomes—a trend reflected in the current analysis, where both rural residence and maternal illiteracy emerged as statistically significant risk factors for complications.

The mechanisms underlying these associations are multifactorial. Rural residence likely contributes to delayed healthcare access, lower baseline nutritional status, suboptimal hygiene, and reduced perioperative follow-up, all of which heighten susceptibility to postoperative infection and delayed recognition of early complications (8,10). The impact of maternal education is particularly salient, as mothers with limited schooling may face challenges in understanding postoperative instructions, wound care protocols, and signs of infection or recurrence (8,10,11). This finding echoes previous public health research, which consistently links maternal literacy with improved surgical and general health outcomes in pediatric populations. Collectively, these insights suggest that surgical outcomes in congenital anomalies are not solely determined by operative technique, but are deeply intertwined with broader social determinants of health.

Theoretical implications of these findings extend to the ongoing debate over the optimal management strategy for anorectal malformations in resource-constrained environments. While the technical advantages of PSARP—such as improved anatomical reconstruction and continence—are well recognized (5), the present study highlights the importance of perioperative support, targeted caregiver education, and community health interventions to achieve optimal outcomes. Clinically, these results advocate for a multidisciplinary approach that combines surgical expertise with social work, nutritional counseling, and health education, especially for families from disadvantaged backgrounds. Proactive perioperative interventions targeting rural and low-literacy populations, such as simplified wound care instructions, structured follow-up schedules, and early complication detection programs, could further reduce complication rates and enhance overall prognosis. The study possesses several strengths, including its prospective design, standardized surgical technique, and detailed capture of sociodemographic data, allowing for meaningful analysis of risk factors. The sample size, though moderate, is among the largest reported from the region for this specific patient group, lending credibility to the observed trends. Nonetheless, limitations must be acknowledged. The single-center setting restricts generalizability to other regions or healthcare systems, particularly those with markedly different perioperative resources. The study was confined to a 90-day postoperative follow-up, precluding evaluation of longer-term functional outcomes such as continence, quality of life, and psychosocial integration. Residual confounding from unmeasured variables such as environmental hygiene or specific postoperative practices may also have influenced the results.

Future research should aim to validate these findings in larger, multicenter cohorts and incorporate extended follow-up to capture long-term anatomical and functional outcomes. Interventional studies assessing the efficacy of caregiver education programs, community health worker involvement, or telehealth follow-up in reducing complications among high-risk groups would be particularly valuable. Additionally, qualitative research exploring caregiver experiences and barriers could inform more culturally and contextually appropriate interventions. In summary, this study reaffirms the safety and effectiveness of primary PSARP in managing recto-vestibular fistula among female children, while drawing attention to the substantial impact of social determinants, notably rural residence and maternal education, on postoperative outcomes. Integrating targeted health education and support for at-risk families into surgical care pathways represents a practical and impactful approach to improving outcomes in this vulnerable population (2,4,8,10).

CONCLUSION

Primary posterior sagittal anorectoplasty for recto-vestibular fistula in female patients demonstrated favorable surgical outcomes, with most children experiencing an uncomplicated recovery and low rates of surgical site infection and recurrence. However, the findings highlight that rural residence and low maternal education are significant risk factors for postoperative complications, emphasizing the need for targeted health education and perioperative support for vulnerable populations. These results reinforce the effectiveness of single-stage PSARP in appropriately selected cases while underscoring the importance of addressing socioeconomic disparities to optimize outcomes. Clinically, this study supports the routine adoption of primary PSARP with enhanced caregiver education, and future research should focus on long-term functional outcomes and the development of interventions aimed at mitigating the influence of social determinants on surgical success in pediatric anorectal malformations.

REFERENCES

1. Smith CA, Avansino J. Anorectal Malformations. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK542275/

2. Hartford L, Brisighelli G, Gabler T, Westgarth-Taylor C. Single-Stage Procedures for Anorectal Malformations: A Systematic Review and Meta-Analysis. J Pediatr Surg. 2022 Sep;57(9):75–84.

3. Osagie TO, Aisien E, Osifo OD. Outcomes of Posterior Sagittal Anorectoplasty for High Anorectal Malformation in Benin City, Nigeria. J West Afr Coll Surg. 2016 Jan–Mar;6(1):16–30.

4. Miscia ME, Lauriti G, Di Renzo D, Cascini V, Lisi G. Short and Long-Term Outcomes of PSARP Versus LAARP and Single Versus Staged Repair for Infants With High-Type Anorectal Malformations: A Systematic Review and Meta-Analysis. Children (Basel). 2024 Mar 21;11(3):376.

5. Rocourt DV, Kulaylat AS, Kulaylat AN, Leung S, Cilley RE. Primary Posterior Sagittal Anorectoplasty Outcomes for Rectovestibular and Perineal Fistulas Using an Accelerated Pathway: A Single Institution Study. J Pediatr Surg. 2019 Sep;54(9):1778–81.

6. Khan M, Akhter J, Ali N. Surgical Outcomes of Anorectal Malformations in Female Children: Experience From a Tertiary Hospital in Lahore. Pak J Med Sci. 2020;36(3):456–60.

7. Rehman A, Baloch I, Saleem M. Complications After PSARP in Recto-Vestibular Fistula: A Study at a Tertiary Care Hospital. J Surg Pak. 2019;24(2):62–6.

8. Sharma R, George R, Thomas RJ. Influence of Maternal Education on Outcomes of Pediatric Surgeries: A Public Health Perspective. World J Surg. 2017;41(3):752–8.

9. Makrufardi F, Arifin DN, Afandy D, Yulianda D, Dwihantoro A, Gunadi. Anorectal Malformation Patients' Outcomes After Definitive Surgery Using Krickenbeck Classification: A Cross-Sectional Study. Heliyon. 2020;6(2):e03435.

10. Gad M, Farghaly MA, Abdullateef KS, Abdelazeem M, Fouda EM, Fouda AE. Comparative Study Between One-Stage Versus Three-Stage Repair of Anorectal Malformation With Recto-Vestibular Fistula. Ann Pediatr Surg. 2022;18:78.

11. Lauriti G, Di Renzo D, Chiesa PL, Zani A, Pierro A. One-Stage Repair of Anorectal Malformations in Females With Vestibular Fistula: A Systematic Review and Meta-Analysis. Pediatr Surg Int. 2019 Jan 15;35(1):77–85.

12. Terry M, Ng MK, Ma T, Stein SL. Rectoperineal Fistula Repair Through Perineal Approach, Martius Flap, and House Advancement Flap. Cureus. 2020 Feb 15;12(2):e7001.

13. Li Q, Zhang Z, Jiang Q, Yan Y, Xiao P, Ma Y, Li L. Laparoscopic-Assisted Anorectal Pull-Through for Currarino Syndrome. J Laparoendosc Adv Surg Tech A. 2020 Jul;30(7):826–33.

14. Li L, Ren X, Ming A, Zhou Y, Xu H, Liu X, Li Q, Xie X, Diao M. Laparoscopic-Assisted Anorectoplasty for Intermediate Type Rectovestibular Fistula: A Preliminary Report. Pediatr Surg Int. 2020 Oct;36(10):1213–9.

15. Minneci PC, Kabre RS, Mak GZ, Matheson PJ, Crespo K, Groner JI, et al; Midwest Pediatric Surgery Consortium. Can Fecal Continence Be Predicted in Patients Born With Anorectal Malformations? J Pediatr Surg. 2019;54(6):1159–63.

16. van der Steeg HJJ, van Rooij IALM, Iacobelli BD, Dalla Vecchia L, Holland-Cunz S, et al; ARM-Net Consortium. The Impact of Perioperative Care on Complications and Short Term Outcome in ARM Type Rectovestibular Fistula: An ARM-Net Consortium Study. J Pediatr Surg. 2019;54(8):1595–600.