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COMPLICATIONS OF POSTERIOR SAGITTAL ANORECTOPLASTY IN PATIENTS WITH ANORECTAL MALFORMATIONS REVIEW OF 50 CASES

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ABSTRACT

Background: Anorectal malformations (ARMs) are among the most common congenital anomalies, occurring in approximately 1 in every 4,000 to 5,000 live births. Posterior sagittal anorectoplasty (PSARP) is considered the standard surgical technique for the correction of ARMs. **Objectives:** To evaluate the early postoperative complications following PSARP in patients diagnosed with anorectal malformations. **Patients and Methods:** This prospective observational study was conducted at Central Child's Teaching Hospital, Baghdad, over 27 months (Oct 2011–Dec 2013), involving 50 ARM patients with divided loop sigmoid colostomy. The cohort included 41 males (82%) and 9 females (18%), with a mean age of 16.5 months. All underwent PSARP. Assessed variables included demographics, ARM type, associated anomalies, and early postoperative complications. General and specific complications were recorded; late issues like incontinence and constipation were excluded. **Results:** General complications included fever in 40%, respiratory issues in 24%, cardiac complications in 4%, and postoperative vomiting in 12%. Specific complications included wound infection (42%), stenosis (8%), retraction (4%), rectal prolapse (4%), recurrent fistula (2%), urethral injury (2%), and wound dehiscence (2%). Associated anomalies were found in 46% of patients. **Conclusion:** PSARP remains a reliable surgical approach for ARMs with favorable outcomes when executed with appropriate diagnosis, surgical skill, and patient preparation. However, early complications can occur and should be managed with vigilant postoperative care.

KEYWORDS: Anorectal malformation, posterior sagittal anorectoplasty, early complications.

INTRODUCTION

Anorectal malformations (ARMs) represent a diverse group of congenital anomalies affecting the distal rectum and anus, with or without fistulous communication to the genitourinary tract. Historically, these anomalies posed a significant challenge to early surgeons. The earliest recorded interventions involved rudimentary attempts to rupture obstructing membranes using fingers or sharp instruments.^[1] Progressively, surgical approaches evolved—such as incisions through the perineum or sacrum to access the bowel.^[2] In 1783, the first inguinal colostomy was performed, although the procedure was often fatal, and colostomy was seen as a last resort.^[3] A major advancement occurred in 1835 when Amussat performed the first documented anoplasty, mobilizing the rectum through a perineal incision and suturing it to the skin, thereby preventing the strictures common in prior techniques.[4] By the mid-20th century,

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abdominoperineal approaches gained popularity^[5], culminating in Stephens' advocacy for rectal positioning within the puborectalis sling.^[6] The need for improved visualization led to the introduction of posterior sagittal anorectoplasty (PSARP) in the early 1980s, which remains the standard approach.^[7] The global incidence of anorectal malformations is estimated at 1 in every 4,000 to 5,000 live births, with a slightly higher prevalence in males.^[8] The recurrence risk in subsequent offspring is approximately 1%.^[9] Understanding the embryology of these defects provides insights into their complexity. The cloaca-formed around the 21st day of gestationreceives input from the hindgut, allantois, and mesonephric ducts. By the 7th week, the cloacal membrane ruptures to establish the separate urogenital and anal openings.^[10] Muscle development around the rectum also occurs during this period^[11], while external genitalia differentiation remains incomplete until later

gestational stages. ARM classification has evolved beyond the traditional "low," "intermediate," and "high" designations, favoring more therapeutically and prognostically relevant categorizations.^[12] In males, defects range from cutaneous perineal fistulas to rectourethral, rectovesical, and rare cases of rectal atresia.^[13] In females, the most frequent type is vestibular fistula^[14], often associated with favorable functional outcomes. Cloacal malformations represent the most complex female ARM variant. More than 50% of ARM patients have associated anomalies. Cardiovascular anomaliesfound in approximately one-third of cases-include atrial septal defects and patent ductus arteriosus, while gastrointestinal anomalies such as tracheoesophageal fistulas and duodenal atresia occur less frequently.^[15] Vertebral and spinal anomalies, including the Currarino triad, are also common.^[16] The sacral ratio, an objective marker of sacral development, correlates closely with functional prognosis; values below 0.3 are associated with poor bowel control.^[17] Additionally, genitourinary anomalies such as vesicoureteric reflux, renal agenesis, and cryptorchidism are frequent, with incidence increasing alongside ARM severity.^[18] In female patients, gynecologic anomalies like hydrocolpos and Müllerian defects may complicate adolescence and reproductive health.^[19] In light of these complexities, careful preoperative evaluation and tailored surgical planning, including PSARP, have significantly improved outcomes. However, surgical correction of ARMs remains challenging and is not without potential complications.

OBJECTIVES: To evaluate the early postoperative complications following PSARP in patients diagnosed with anorectal malformations.

METHOD

This prospective study was conducted in the Department of Pediatric Surgery at the Central Child's Teaching Hospital, Baghdad, over a 27-month period from October 1, 2011, to December 31, 2013. Fifty patients diagnosed with anorectal malformations (ARMs) who had undergone sigmoid colostomy during the neonatal period were selected. The study included 41 male patients (82%) and 9 female patients (18%), with a male-to-

female ratio of 4.5:1 and a mean age of 16.5 months. All patients were admitted to the pediatric surgical ward and evaluated through personal interviews and follow-up examinations. Preoperative evaluation included a detailed clinical history and physical examination. Imaging studies such as abdominal ultrasound and intravenous urography (IVU) were performed in 18 patients to detect genitourinary anomalies, while echocardiography was conducted in 8 patients with suspected cardiac defects. Additional laboratory tests included complete blood count, urine analysis, and chest radiographs to assess readiness for general anesthesia and rule out infections. Distal colostogram (lateral view) was used to identify the presence and level of fistula with the urinary tract and to determine the length of the rectal pouch.

All patients received preoperative intravenous broadspectrum antibiotics-ceftriaxone or cefotaxime along with metronidazole. Blood was crossmatched, and distal pouch irrigation was performed prior to surgery. PSARP was carried out in all cases. The sphincter complex was identified using a Pena stimulator under light anesthesia. Dissection continued to mobilize the rectal pouch and separate it from the genitourinary tract. The rectum was then positioned within the muscle complex, and anoplasty was completed. A urethral catheter was placed for 7 days postoperatively. Anal dilatation began two weeks after surgery and continued daily until colostomy closure. In 8 patients, laparotomy was needed to mobilize the rectal pouch. Early postoperative complications were recorded and analyzed using SPSS version 22. Chi-square test was applied to determine statistical significance, with a p-value of ≤ 0.05 considered significant.

RESULTS

The majority of patients (62%) were between 9 to 12 months of age, indicating that most underwent surgical evaluation within the first year of life. A smaller proportion (38%) were older than 12 months, which may reflect delays in referral, diagnosis, or surgical planning. Early intervention, ideally before one year of age, is generally associated with better postoperative outcomes. As in table 1.

 Table 1: Age Distribution of Patients with Anorectal Malformations.

Age Group (months)	Number of Patients	Percentage (%)
9–12 months	31	62%
12-23 months	19	38%
Total	50	100%

Rectobulbar fistula was the most common type of anorectal malformation, accounting for 46% of cases, exclusively seen in males. Vestibular fistula was the most frequent anomaly in females (16%). Rectoprostatic (16%) and rectobladder-neck fistulas (12%) were also observed, all in males. A small number of patients (8%) had no fistula, and rectal atresia was rare (2%). These findings reflect the known gender distribution and

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anatomical variants of anorectal malformations. As in table 2.

	Male	Female	Total	Percentage (%)
Rectobulbar	23	-	23	46%
Rectoprostatic	8	-	8	16%
Rectobladder-neck	6	-	6	12%
Rectal atresia	1	-	1	2%
Vestibular fistula	-	8	8	16%
Without fistula	3	1	4	8%
Total	41	9	50	100%

Table 2: Distribution of Types of Anorectal Malformations at Presentation.

Fever was the most common general postoperative complication, affecting 40% of patients. Respiratory complications related to anesthesia occurred in 24%, followed by nausea and vomiting (12%), and cardiac issues (4%). Among specific complications, wound infection was the most frequent (42%), with other

notable issues including stenosis (8%), mucosal prolapse (4%), and retraction (4%). Less common complications were wound dehiscence, recurrent urethral fistula, and urethral injury, each occurring in 2% of patients. As in table 3(A, B).

Table 3: Postoperative Con	mplications in Patients Undergoing PSARP.
A. General Complications	

Complications	Number	Percentage (%)
Fever	20	40%
Respiratory (Anesthesia-related)	12	24%
Cardiac (Anesthesia-related)	2	4%
Nausea and Vomiting	6	12%

B. Specific Complications

Complications	Number	Percentage (%)
Wound infection	21	42%
Retraction	2	4%
Stenosis	4	8%
Mucosal prolapse	2	4%
Wound dehiscence	1	2%
Recurrent urethral fistula	1	2%
Urethral injury	1	2%

This table illustrates the distribution of early postoperative complications in relation to the type of anorectal malformation. Wound infection was most common in recto bladder-neck (66.6%) and recto-prostatic (50%) malformations. Stenosis and mucosal prolapse were more frequent in patients with no fistula.

Statistical analysis using Chi-square test revealed a significant association between the type of malformation and occurrence of complications (Chi-square = 49.497, df = 30, p = 0.0139), suggesting that higher or more complex malformations tend to be associated with increased complication rates. As in table 4.

Table 4: Relationshi	o Between Type	of Anorecta	l Malformation	and Early I	Postoperative (Complications.

	Recto-	Recto-	Recto	Rectal	Vestibular	Without
	bulbar	prostatic	bladder-neck	atresia	fistula	fistula
Wound infection	8 (34.7%)	4 (50%)	4 (66.6%)	-	3 (37.5%)	2 (50%)
Retraction	-	1 (12.5%)	1 (16.6%)	-	-	-
Stenosis	1 (4.3%)	1 (12.5%)	-	-	1 (12.5%)	1 (25%)
Mucosal prolapse	1 (4.3%)	-	-	-	-	1 (25%)
Wound dehiscence	-	-	1 (16.6%)	-	-	-
Recurrent urethral	1 (4 20%)					
fistula	1 (4.3%)	-	-	-	-	-
Urethral injury	-	1 (12.5%)	-	-	-	-
Total Cases	23	8	6	1	8	4

This table highlights the distribution of early postoperative complications by age group. Patients younger than 1 year (9–12 months) had fewer complications, particularly lower rates of wound

infection (25.8%) compared to those older than 1 year (68.4%). Other complications such as retraction, stenosis, and rectal prolapse showed slightly higher percentages in older children. The Chi-square analysis

revealed a statistically significant relationship between age group and complication rate (Chi-square = 14.318, df = 6, p = 0.0263), indicating that younger age at surgery is

associated with fewer postoperative complications. As in table 5.

	(9-12 months)	(12-23 months)	Total
	[< 1 year]	[>1 year]	Total
Wound infection	8 (25.8%)	13 (68.4%)	21
Retraction	1 (3.2%)	1 (5.2%)	2
Stenosis	2 (6.4%)	2 (10.5%)	4
Rectal prolapse	1 (3.2%)	1 (5.2%)	2
Wound dehiscence	-	1 (5.2%)	1
Recurrent urethral fistula	-	1 (5.2%)	1
Urethral injury	-	1 (5.2%)	1
Total Cases	31	19	50

 Complexity
 Complexity

 Table 5: Relationship Between Age Group and Early Postoperative Complications.

 (0, 12 months)

 (12, 23 months)

Associated malformations were observed in 46% of patients, with genitourinary anomalies being the most common (26%), including vesico-ureteric reflux and renal agenesis. Cardiovascular anomalies accounted for 10%, predominantly ventricular septal defects. Skeletal anomalies (hemisacrum), tracheoesophageal fistula, and

Down's syndrome were also noted. Three cases were suspected to have VACTERL association. There was one mortality (2%) unrelated directly to surgery; the patient had a congenital heart defect and died postoperatively from apnea. As in table 6.

Table 0: Associated Manormations in Fatients with Anorectal Manormations	ith Anorectal Malformations.
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Associated Anomalies	Number	Percentage (%)
Genitourinary:	13	26%
Vesico-ureteric reflux	8	16%
Renal agenesis	3	6%
Undescended testis	2	4%
Cardiovascular:	5	10%
Ventricular septal defect	3	6%
Patent ductus arteriosus	1	2%
Atrial septal defect	1	2%
Skeletal, hemisacrum	3	6%
Gastrointestinal: Tracheoesophageal fistula	1	2%
Down's syndrome	1	2%
Total (with associated anomalies)	23	46%

DISCUSSION

In our study, the majority of patients were male (82%), which is higher than the 65% male predominance reported in Pena's series.^[20] While our hospital is a specialized center for pediatric surgery and receives cases from a wide catchment area, the sample may not reflect the true population-based incidence. Most patients were aged between 9 and 12 months (62%), with the remaining between 12 and 23 months (38%). This older age distribution is likely due to delays in diagnosis, poor nutritional status, and lack of early referral or follow-up. Fever was the most common general postoperative complication, noted in 40% of cases. This rate is consistent with Kovac et al., who reported an incidence ranging between 8.9% and 42%.^[21] Respiratory complications related to general anesthesia were seen in 24% of patients, and included post-intubation stridor, hypoxia, aspiration, and apnea. Cardiac complications (4%) and postoperative nausea/vomiting (12%) were also observed. Excluding general and superficial wound complications, our specific complication rate was 30%,

slightly higher than the 26% reported by Nakayama et al.^[22] Among specific complications, wound infection was most frequent, observed in 42% of patients. This is markedly higher than Pena's report of 0.45%^[64], but the presence of colostomy likely minimized the severity. Retraction of the neo-rectum was seen in 4% of patients, aligning with Nakayama's observations of retraction as a significant complication due to inadequate mobilization or poor vascular supply.^[23] Anal canal stenosis occurred in 8% of cases, managed successfully by repeated dilatations. This rate is lower than Nixon's 30%^[24], but comparable to Sowande's 12.7% and Khaleghnejad-12.7%.^[25] Poor compliance with Tabari's the postoperative dilatation regimen is a known risk factor. Rectal prolapse occurred in 4%, with only one patient requiring surgical correction. Boocock et al. reported a mucosal prolapse incidence of 23%, particularly in patients with higher malformations or poor muscle tone.^[15,26] A single case of urethral injury (2%) occurred, managed with tube cystostomy. This aligns with Hong et al., who reported urethral injuries in 2.5% of ARM

repairs.^[27] One patient developed a recurrent rectourethral fistula and required redo PSARP, reinforcing the need for meticulous technique. Statistical analysis revealed significant associations between postoperative complications and both age and type of ARM. Younger age at surgery (9-12 months) was associated with fewer complications (Chi-square = 14.318, p = 0.0263), supporting Pena's recommendation for early intervention, preferably at 3 months of age.^[28] Similarly, higher-type malformations correlated with more complications (Chi-square = 49.497, p = 0.01398). Associated anomalies were present in 46% of patients, consistent with other reports.^[29] These included cardiovascular, gastrointestinal, and skeletal anomalies. One mortality (2%) was recorded, secondary to appea in a patient with a ventricular septal defect, which is lower than the 10% mortality reported by Rintala et al.^[30] This highlights the importance of preoperative evaluation, especially for life-threatening associated malformations.

CONCLUSION

Anorectal malformations are more common in males (4.5:1), with rectourethral (bulbar) fistula being the most frequent type. Genitourinary anomalies are the most commonly associated defects. Early surgery reduces postoperative complications, while higher malformations are linked to more complications. PSARP remains the standard treatment with favorable outcomes when performed with careful technique and proper preparation.

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