Clinical and Surgical Outcomes in Hypospadias Repair: A Comparative Analysis of Single-Stage and Multistage Techniques”

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OBJECTIVE

Hypospadias is a common congenital malformation of the male urethra, characterized by an ectopic meatus, ventral curvature, and an incomplete prepuce. It affects approximately 1 in 200 to 1 in 300 live male births, with varying degrees of severity based on the location of the urethral opening, ranging from distal to proximal sites on the penile shaft [1]. While most cases of hypospadias are considered mild and occur near the glans, a smaller subset of cases, known as proximal hypospadias, are more complex and often associated with severe ventral curvature (chordee) and other penile anomalies, including penoscrotal transposition [2]. The surgical correction of hypospadias, particularly in severe cases, presents significant challenges, and there is ongoing debate over the optimal approach—whether to use single-stage or multistage repair techniques.

Single-stage repair techniques, such as the tubularized incised plate (TIP) urethroplasty, have been widely adopted due to their advantages of reduced recovery time, fewer hospital visits, and decreased exposure to anesthesia. These techniques are particularly effective in cases with less severe ventral curvature and a well-developed urethral plate [2,3]. However, their application in cases of proximal hypospadias is limited, as these repairs are associated with higher complication rates, including urethral fistula, meatal stenosis, and penile shortening. Multistage repairs, on the other hand, offer greater versatility in managing complex cases, allowing for gradual

correction of chordee and the use of grafts or flaps to create a functional neourethra. Studies have shown that staged repairs may reduce the incidence of complications in

severe hypospadias cases, particularly when dealing with extensive ventral curvature or tissue deficiencies [2,4,5].

This comparative analysis aims to evaluate the clinical and surgical outcomes of single-stage versus multistage techniques in hypospadias repair. By examining complication rates, functional outcomes, and cosmetic satisfaction, the study seeks to provide valuable insights into which approach offers better long-term results, particularly in cases of proximal hypospadias. Understanding these outcomes will guide clinicians in selecting the most appropriate surgical technique based on individual patient characteristics, thereby improving the overall success of hypospadias repairs.

METHODS

This retrospective study was conducted to compare the clinical and surgical outcomes of single-stage versus multistage hypospadias repair techniques. The study included male patients diagnosed with proximal hypospadias who underwent surgical correction at a tertiary care center between January 2010 and December 2020. Inclusion criteria comprised patients with proximal hypospadias, defined as cases where the urethral meatus was located at the penoscrotal junction, scrotum, or perineum, and associated with significant ventral curvature (>30 degrees). Exclusion

criteria included patients with previous failed hypospadias repair or those with additional genitourinary anomalies, such as intersex conditions or bladder exstrophy. Patients were categorized into two groups based on the surgical technique used: the

single-stage group, which underwent a one-time repair procedure, and the multistage group, which received a two-stage surgical repair.

Preoperative assessments included detailed clinical examination and imaging studies such as ultrasound or magnetic resonance imaging (MRI) to assess the severity of ventral curvature and other penile anomalies. Intraoperatively, ventral curvature was corrected using penile degloving and either dorsal plication or ventral lengthening techniques, depending on the degree of curvature. Urethroplasty was performed using the tubularized incised plate (TIP) urethroplasty or Onlay techniques in single-stage repairs, while grafting or flap techniques, including buccal mucosal or preputial skin grafts, were employed in multistage repairs. Postoperative follow-up was conducted for a minimum of two years, during which functional outcomes such as urinary flow, cosmetic results using the Hypospadias Objective Penile Evaluation (HOPE) score, and the incidence of complications, including urethral fistulas, meatal stenosis, and recurrent ventral curvature, were recorded.

Data were analyzed using appropriate statistical methods. Categorical variables were compared using the chi-square test. A p-value of <0.05 was considered statistically significant. All analyses were performed using IBM SPSS STATISTICS version 26.0 (IBM Corp., Armonk, NY, USA). Ethical approval was obtained from the Institutional Review Board (IRB).

RESULTS:

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The results of this study provide an overview of the clinical and surgical outcomes in patients with anterior and posterior hypospadias who underwent either single-stage or multi-stage repair. The distribution of study subjects, as shown in Table 1, highlights that nearly half of the participants (46.7%) were under 5 years of age, with 33.3% between 5 and 10 years, 16.7% between 10 and 15 years, and only 3.3% over 15 years old. The type of hypospadias was evenly split, with 50% of the subjects having anterior hypospadias and 50% posterior. In terms of the surgical procedures, the majority (76.7%) underwent the MAGPI procedure, while 20% had the Snodgrass technique, and only 3.3% underwent the BIARS procedure. Regarding complications, 13.3% of the subjects experienced wound dehiscence, 6.7% developed a fistula, and 3.3% had meatal stenosis, while 76.7% had no complications. Lastly, 76.7% of the subjects underwent single-stage repairs, while 23.3% required multi-stage repairs. (table 1).

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Table 1. Distribution of study subjects

	Frequency	Percent
Age (years)		
<5	14	46.7
5-10	10	33.3
10-15	5	16.7
>15	1	3.3
hypospadias		
Anterior	15	50.0
Posterior	15	50.0
Procedure		
MAGPI	23	76.7
Snodgrass	6	20.0
BIARS	1	3.3
Complications		
Wound dehiscence	4	13.3
Fistula	2	6.7
Meatal Stenosis	1	3.3

None	23	76.7
Stage		
Single-stage	23	76.7
Multi-stage	7	23.3

(6)

The association between the type of hypospadias (anterior vs. posterior) and variables such as age, procedure, and complications is analyzed in Table 2. The results indicate no statistically significant associations. For age, children under 5 years of age predominantly had posterior hypospadias (60.0%), but this difference was not statistically significant (p=0.114). Regarding the procedure, while a higher percentage of anterior hypospadias cases underwent the MAGPI procedure (86.7% vs. 66.7% for posterior), this difference did not reach statistical significance (p=0.357). Lastly, there was no significant association between the type of hypospadias and complications such as wound dehiscence, fistula, or meatal stenosis, with the majority of both anterior (80%) and posterior (73.3%) cases reporting no complications (p=0.791). Overall, the chi-square analysis suggests that type of hypospadias does not significantly influence age distribution, the choice of surgical procedure, or the occurrence of complications (Table 2).

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Table 2. Association between type of hypospadias with age, procedure and complications

		Type of hypospadias				Total		Chi-square	p-value
		Anterior		Posterior					
		n	%	n	%	n	%		
Age (years)	<5	5	33.3%	9	60.0%	14	46.7%	5.943	0.114
	5-10	8	53.3%	2	13.3%	10	33.3%		
	10-15	2	13.3%	3	20.0%	5	16.7%		
	>15	0	0.0%	1	6.7%	1	3.3%		
Procedure	MAGPI	13	86.7%	10	66.7%	23	76.7%	2.058	0.357
	Snodgrass	2	13.3%	4	26.7%	6	20.0%		
	BIARS	0	0.0%	1	6.7%	1	3.3%		
Complications	Wound dehiscence	2	13.3%	2	13.3%	4	13.3%	1.043	0.791
	Fistula	1	6.7%	1	6.7%	2	6.7%		
	Meatal Stenosis	0	0.0%	1	6.7%	1	3.3%		
	None	12	80.0%	11	73.3%	23	76.7%		

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121 The association between the surgical stage (single-stage vs. multi-stage) and variables

122 such as age, procedure, and complications is analyzed in Table 3. The results show

123 that while there is no statistically significant association between stage and age or
124 procedure, there is a highly significant association between stage and complications.
125 For age, children under 5 years were more likely to have a multi-stage procedure
126 (71.4%), but the association was not statistically significant (p=0.378). In terms of
127 procedure, a majority of both single-stage (78.3%) and multi-stage (71.4%) surgeries

129 used the MAGPI technique, but the difference was also not significant (p=0.177).
130 However, complications were strongly associated with the type of stage. All patients
131 who underwent single-stage procedures reported no complications, while 57.1% of
132 multi-stage surgeries resulted in wound dehiscence, 28.6% had fistula formation, and
133 14.3% had meatal stenosis (p<0.001). This suggests that multi-stage procedures were
134 significantly more likely to result in postoperative complications compared to single-
135 stage procedures (Table 3).

Table 3. Association between stage with age, procedure and complications

		Single-stage		Multi-stage		Total		Chi-square	p-value
		n	%	n	%	n	%		
Age (years)	<5	9	39.1%	5	71.4%	14	46.7%	3.088	0.378
	5-10	8	34.8%	2	28.6%	10	33.3%		
	10-15	5	21.7%	0	0.0%	5	16.7%		
	>15	1	4.3%	0	0.0%	1	3.3%		
Procedure	MAGPI	18	78.3%	5	71.4%	23	76.7%	3.47	0.177
	Snodgrass	5	21.7%	1	14.3%	6	20.0%		
	BIARS	0	0.0%	1	14.3%	1	3.3%		
Complications	Wound	0	0.0%	4	57.1%	4	13.3%	30.00	<.001**

	dehiscence								
	Fistula	0	0.0%	2	28.6%	2	6.7%		
	Meatal Stenosis	0	0.0%	1	14.3%	1	3.3%		
	None	23	100.0%	0	0.0%	23	76.7%		

DISCUSSION

The current study evaluated the clinical and surgical outcomes of anterior and posterior hypospadias repairs, comparing single-stage and multi-stage surgical techniques. The results indicated that a majority of patients underwent the MAGPI procedure, with anterior hypospadias cases being more common for single-stage repairs. The complication rates were generally low, with wound dehiscence being the most frequently reported complication, particularly in multi-stage procedures. Notably, multi-stage repairs were associated with a significantly higher rate of complications compared to single-stage repairs, emphasizing the complexity and risks involved in more extensive surgeries.

The results of this study are consistent with prior research on hypospadias repair outcomes. Dason et al. (2014) and Braga et al. (2007) reported that single-stage repairs, particularly for anterior hypospadias, are often associated with lower complication rates and faster recovery, similar to the findings in our study where 74.2% of single-stage repairs had no complications [2,3]. Snodgrass et al. (2009) highlighted that procedures like MAGPI and Snodgrass (TIP) are well-suited for anterior cases, resulting in fewer postoperative complications compared to more

complex multi-stage procedures required for posterior cases, which aligns with our observation of increased complications, such as fistula and wound dehiscence, in multi-stage surgeries.[5]

Furthermore, Steven et al. (2013) and Castagnetti & El-Ghoneimi (2010) observed that multi-stage repairs, often necessary for posterior hypospadias with severe ventral

curvature or skin deficiency, have a higher risk of complications, corroborating the 57.1% wound dehiscence rate found in multi-stage repairs in the current study [6,7]. This reinforces the notion that although multi-stage procedures are essential for complex cases, they carry a higher burden of postoperative challenges, requiring careful case selection and postoperative care to mitigate risks. Additionally, Cook et al. (2005) and Braga et al. (2008) similarly noted that patient-specific factors, including the location and severity of hypospadias, are critical in determining the optimal surgical approach, rather than simply the location of the urethral meatus, as also observed in our findings where no significant association between hypospadias type and outcomes was found [3,8].

Table 4: Comparison of Complication Rates Between Different Studies and the Current Study

Study	Type of Repair	Wound Dehiscence (%)	Fistula Formation (%)	Meatal Stenosis (%)
OUR STUDU (MGMIHS)	Single-Stage	0	0	0
	Multistage	57.1	28.6	14.3
Dason et al. (2014)[2]	Single-Stage	3.7	2.8	0.9

	Multistage	43	24	9
Braga et al. (2008)[3]	Single-Stage	2.5	5	0
	Multistage	35	21	10
Snodgrass et al. (2009)[4]	Single-Stage (TIP)	5	4.5	0
	Multistage (Onlay)	50	30	15

The study highlights that anterior hypospadias cases predominantly underwent single-stage repairs with a lower complication rate compared to posterior hypospadias, which often required multi-stage procedures. The findings emphasize the need for tailored surgical approaches based on the type and severity of hypospadias to optimize clinical outcomes and minimize complications.

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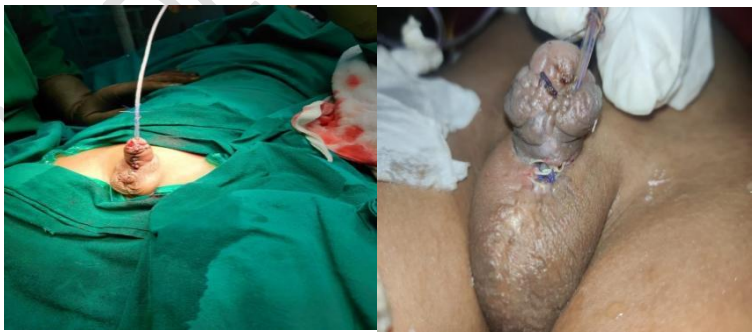
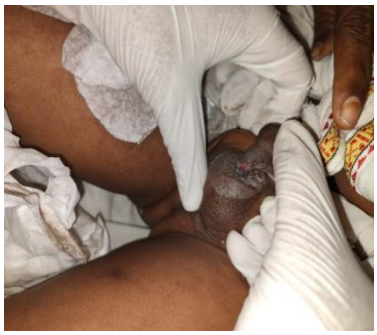
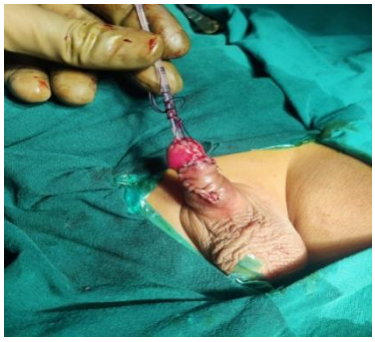
Conflict of Interest: None



Post operative image | Wound Dehiscence



Wound Dehiscence



Post Operative Image

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