



SURGICAL OUTCOMES OF HYPOSPADIAS REPAIR: EXPERIENCE FROM A TERTIARY CARE CENTRE IN NORTH INDIA

Surgery

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ABSTRACT

Introduction: Hypospadias is among the most common congenital anomalies in boys, presenting with abnormal ventral urethral opening and penile curvature. Despite advances in surgical techniques, complications remain frequent, especially in proximal variants. **Aim:** To study the post-operative results of hypospadias surgery. **Methodology:** This prospective hospital-based observational study included 50 consecutive patients undergoing primary hypospadias repair at Shri Mahant Indresh Hospital, Dehradun, from January 2017 to January 2021. Children aged 2–5 years with hypospadias were enrolled, excluding those with ambiguous genitalia or prior failed repair. Data regarding clinical profile, meatal location, testosterone therapy, surgical procedure, and postoperative outcomes were collected. Complications such as fistula, stenosis, and stricture were recorded, along with need for re-operation. Analysis was done using SPSS v21 with descriptive and inferential statistics. **Results:** Mean age at surgery was 3.74 years; 54% of children were between 3–4 years. Distal hypospadias was most frequent (56%), followed by proximal (26%) and midshaft (18%). TIP urethroplasty was performed in 90% cases, while 10% underwent flap repair. Testosterone was given preoperatively in 16%. Postoperative complications occurred in 16% of cases: stenosis (10%), stricture (4%), and fistula (2%). Proximal meatus had higher complication rate (23.1%) compared with distal (14.3%) and midshaft (11.1%), though not statistically significant ($p=0.36$). Re-operations were required in 6%, primarily for stricture and fistula. No significant association was observed between surgical technique and complication or re-operation rates. **Conclusion:** Hypospadias repair using TIP urethroplasty yields satisfactory results with low complication and re-operation rates, though proximal hypospadias continues to present challenges, underscoring the need for individualized surgical planning and long-term follow-up.

KEYWORDS

Hypospadias, TIP Urethroplasty, Complications, Surgical Outcomes, Re-operation

INTRODUCTION

Hypospadias is the second most frequent congenital anomaly of the male genitalia after cryptorchidism, with an estimated incidence of 1 in 200 live male births worldwide (1,2). It is characterized by ectopic placement of the urethral meatus on the ventral aspect of the penis, often accompanied by chordee and ventral curvature. The deformity may result in functional limitations including abnormal urinary stream and difficulties during sexual intercourse later in life, along with significant psychological distress related to cosmesis (3).

The condition is traditionally classified according to meatal location as distal, midshaft, or proximal, a distinction that is crucial not only for surgical planning but also for prognosis. Distal forms are more common and generally associated with better surgical outcomes, whereas proximal variants often pose greater technical challenges and carry higher risk of complications (4). The objectives of hypospadias repair extend beyond restoration of urinary function to encompass straightening of the penile shaft, creation of a slit-like orthotopic meatus at the glans tip, reconstruction of a conical glans, and achievement of acceptable cosmetic results acceptable to both patient and parents (5).

Surgical correction of hypospadias has been described for centuries, yet more than 200 operative techniques have been reported, underscoring the complexity of the condition and the lack of universal consensus (6). Common procedures include the tubularized incised plate (TIP) urethroplasty popularized by Snodgrass, the transverse island flap (TVIF) onlay, and various preputial island flap techniques (7–9). TIP urethroplasty has emerged as the most widely practiced technique due to its relative simplicity and favorable outcomes, though flap-based procedures remain valuable for proximal or complex cases (10).

Despite significant progress, postoperative complications remain a concern. Early complications typically occur within the first 7–10 days and include bleeding, infection, and flap necrosis, while delayed complications may manifest months to years later, especially after puberty. Fistula formation, meatal stenosis, stricture, residual chordee, and cosmetic dissatisfaction are among the most frequently reported problems (11). Rates vary widely in literature, ranging from 5–30%, depending on patient selection, surgeon experience, and type of repair (12). Long-term follow-up is essential, as urethral fistulae or curvature recurrence may present after years of apparent success (13).

Internationally, studies have emphasized that outcomes depend significantly on meatal position, urethral plate quality, chordee severity, and surgeon expertise (14–16). Comparative studies between TIP and flap repairs have yielded mixed results, with some showing equivalence while others highlight higher complication rates in flap repairs (17,18). Meta-analyses suggest that TIP may have an edge in distal cases, but proximal hypospadias continues to be a surgical challenge (19).

In India, hypospadias surgery is commonly performed at tertiary care centers, yet literature from this region remains limited, particularly regarding long-term outcomes. Most available data originate from Western cohorts, where patient demographics and healthcare systems differ. Hence, reporting regional experience is essential to inform surgical practice and improve patient care in our setting.

The present study was therefore undertaken at a tertiary care hospital in North India to evaluate postoperative outcomes of hypospadias surgery, with particular emphasis on complication rates, re-operation requirements, and their associations with meatal location and surgical technique.

Aim

To study the post-operative results of hypospadias surgery.

Methodology

This was a prospective observational study conducted in the Department of Surgery, Shri Guru Ram Rai Institute of Medical and Health Sciences, Shri Mahant Indresh Hospital, Dehradun, between January 2017 and January 2021. After obtaining approval from the Institutional Ethics Committee, 50 consecutive boys aged between 2 and 5 years presenting with hypospadias were recruited. Informed written consent was obtained from parents or guardians. Patients with ambiguous genitalia or prior failed hypospadias repair were excluded. Clinical evaluation included recording of age, meatal position, presence of chordee, and history of testosterone therapy. All patients underwent primary urethroplasty using either the tubularized incised plate (TIP) technique or flap repair, based on meatal position, urethral plate quality, and surgeon's discretion. Postoperatively, patients were followed for early (≤ 3 months) and delayed (> 3 months) complications, including fistula, stenosis, and stricture. Re-operations, when required, were noted. Quantitative data were expressed as mean

± standard deviation, categorical variables as percentages, and associations between categorical variables assessed by chi-square test, with $p < 0.05$ considered statistically significant. Analysis was performed using SPSS version 21.

RESULTS

Table 1. Clinical Profile of Patients (n=50)

Parameter	Categories	n (%)
Age group	2–3 years	8 (16.0)
	3–4 years	27 (54.0)
	4–5 years	15 (30.0)
Meatal position	Distal	28 (56.0)
	Midshaft	9 (18.0)
	Proximal	13 (26.0)
Testosterone therapy	Yes	8 (16.0)
	No	42 (84.0)

Mean age was 3.74 years, majority between 3–4 years. Distal hypospadias was most common. Testosterone pre-treatment was given in 16%.

Table 2. Distribution of Surgical Procedures Performed

Procedure	n (%)
TIP urethroplasty	45 (90.0)
Flap repair	5 (10.0)

TIP urethroplasty was the predominant procedure, reflecting surgeon preference and meatal distribution.

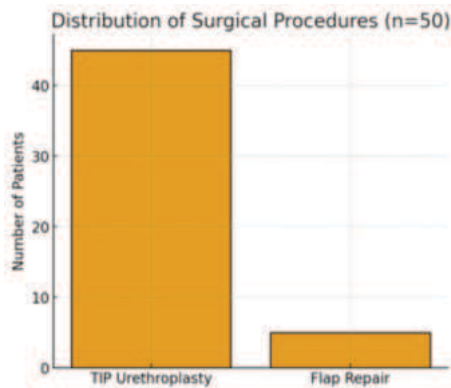


Table 3. Postoperative Complications

Complication	n (%)
None	42 (84.0)
Stenosis	5 (10.0)
Stricture	2 (4.0)
Fistula	1 (2.0)

Overall complication rate was 16%, with stenosis being most common.

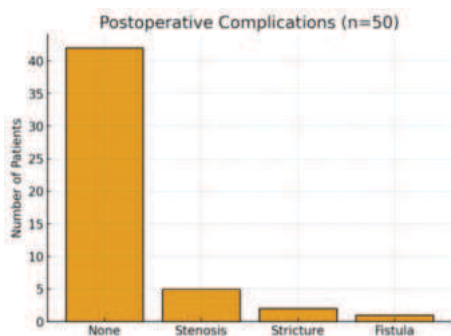


Table 4. Complications by Meatal Position

Meatal position	No complication n (%)	Complication n (%)	Total
Distal (n=28)	24 (85.7)	4 (14.3)	28
Midshaft (n=9)	8 (88.9)	1 (11.1)	9
Proximal (n=13)	10 (76.9)	3 (23.1)	13

$p=0.36$

Complications were more frequent in proximal hypospadias (23.1%) compared to distal and midshaft, though statistically not significant.

Table 5. Complications by Type of Surgery

Surgery type	No complication n (%)	Complication n (%)	Total
TIP (n=45)	38 (84.4)	7 (15.6)	45
Flap (n=5)	4 (80.0)	1 (20.0)	5

$p=0.79$

Complication rates were comparable between TIP and flap repairs, with no significant difference.

Table 6. Re-operation Rates

Group	Re-operation n (%)	No re-operation n (%)	Total
Overall (n=50)	3 (6.0)	47 (94.0)	50
Distal (n=28)	2 (7.1)	26 (92.9)	28
Midshaft (n=9)	0 (0.0)	9 (100.0)	9
Proximal (n=13)	1 (7.7)	12 (92.3)	13

$p=0.40$

Re-operations were required in 6% cases, mainly due to stricture and fistula, with slightly higher rates in distal and proximal cases.

DISCUSSION

The present study evaluated postoperative results of hypospadias surgery in 50 consecutive patients at a tertiary care hospital in North India, with emphasis on age distribution, meatal position, surgical procedure, postoperative complications, and re-operation rates. The findings provide important insights into the practical outcomes of hypospadias repair in our regional context and allow comparison with international literature.

The mean age at surgery was 3.74 years, with more than half the children undergoing repair between 3 and 4 years of age. Only 16% were operated before the age of three years. This contrasts with the American Academy of Pediatrics (AAP) guidelines, which recommend repair between 6 and 18 months to minimize psychological trauma and optimize tissue pliability (12). Khan et al. (13) reported a mean age of 5.3 years in their single-centre experience from Pakistan, reflecting similar delays to those seen in our cohort. Liang et al. (14) from China documented a mean age of 3.1 years, closer to our results but still above the AAP recommendation. The late presentation in our setting may be attributed to sociocultural factors, delayed referrals, and limited awareness, which are common challenges in South Asian populations. Thus, while surgery is increasingly performed earlier in developed nations, in our region the average age remains considerably higher.

Distal hypospadias was the most common variant, seen in 56% of our patients, followed by proximal in 26% and midshaft in 18%. This distribution is consistent with the global pattern, where distal variants account for nearly two-thirds of cases (3). Nagla et al. (15) in a multicentric Egyptian study reported 62% distal, 22% midshaft, and 16% proximal cases, broadly comparable to our findings. Liang et al. (14) also observed predominance of distal variants, accounting for 59% of their series. The slightly higher proportion of proximal cases in our study could reflect referral bias, since tertiary centres are more likely to receive complex presentations. Recognition of this distribution is important, since proximal forms are consistently associated with poorer surgical prognosis.

Preoperative testosterone therapy was administered in 16% of our patients, usually in cases with small glans or poor vascularity. The practice remains controversial, with proponents suggesting it enhances penile size and tissue vascularity, thereby improving surgical outcomes, while others highlight the potential risk of increased bleeding and fibrosis. Braga et al. (5) reported improved outcomes with preoperative hormonal stimulation in selected proximal cases, though Xu et al. (10) did not find any statistically significant difference in complication rates. In our series, the number of patients receiving testosterone was small and no clear advantage could be demonstrated, highlighting the need for randomized controlled trials in this area.

With respect to surgical technique, tubularized incised plate (TIP) urethroplasty was the predominant procedure, performed in 90% of patients, while 10% underwent flap repairs. This distribution reflects the global popularity of TIP, which has become the gold standard for distal hypospadias due to its technical simplicity, low morbidity, and reproducible outcomes. Wilkinson et al. (18), in a systematic review of distal hypospadias, concluded that TIP achieved superior cosmetic

results with comparable complication rates to the Mathieu repair. Xu et al. (10), in a comparative study of TIP and transverse island flap onlay for proximal cases, reported similar complication rates but shorter operative time with TIP. Our findings align with these reports, with TIP being the preferred option except in proximal or complex cases requiring additional tissue.

The overall complication rate in our cohort was 16%, with stenosis being the most common (10%), followed by stricture (4%) and fistula (2%). These rates compare favourably with international literature, where complication frequencies of 15–25% are commonly cited. Braga et al. (5) reported a complication rate of 22% for TIP and 28% for onlay flap repairs in penoscrotal hypospadias, higher than in our study. Stanasel et al. (16), in a large multicentre review of staged flap repairs, documented complication rates exceeding 30%, largely due to fistula and stricture. In contrast, Wilkinson et al. (18) in distal hypospadias repairs noted rates as low as 10–12%. Our findings therefore lie within the reported range and underscore that outcomes are influenced by meatal location, surgical technique, and surgeon expertise.

When analyzed by meatal position, proximal hypospadias had the highest complication rate (23.1%) compared with distal (14.3%) and midshaft (11.1%) variants, although this difference did not reach statistical significance. This trend is well established in literature. Prat et al. (8), reviewing three decades of repairs, found significantly higher re-operation and complication rates in proximal cases irrespective of technique. Castagnetti et al. (9) similarly observed that proximal hypospadias carried almost twice the risk of fistula formation compared with distal variants. Our results echo these findings, demonstrating that proximal hypospadias continues to be surgically challenging and warrants careful counselling of families regarding expectations.

Complication rates by type of surgery were 15.6% in TIP and 20% in flap repairs, with no statistically significant difference. Xu et al. (10) found comparable results in their study, with 18% complications in TIP and 21% in flap onlay, reinforcing the view that both techniques are broadly equivalent when appropriately applied. Xiao et al. (11), in a systematic review and meta-analysis, also reported no significant difference in fistula or stenosis rates between TIP and flap repairs for proximal hypospadias. However, Moursy (7) reported higher complication rates with tubularized preputial flap compared to TIP in severe proximal cases. In our study, the small number of flap repairs limits definitive conclusions, but the overall similarity in outcomes suggests that surgeon selection of technique remains key.

Re-operation was required in 6% of patients, mainly for fistula and stricture. This is consistent with re-operation rates of 5–15% reported internationally. Prat et al. (8) observed re-operation in 12% of cases in their long-term series, while Castagnetti et al. (9) documented rates between 8–20% depending on technique. Our lower figure may be explained by predominance of distal cases, shorter follow-up period, and careful patient selection. Wang et al. (17), with a 15-year experience in proximal hypospadias repairs, reported re-operation rates of nearly 25%, highlighting the long-term challenges of complex cases. Thus, while our short-term outcomes appear favorable, extended follow-up into adolescence is required to confirm durability.

Overall, the results of this study reinforce several key observations. First, distal hypospadias managed with TIP urethroplasty remains the most reliable combination, with low complication and re-operation rates. Second, proximal hypospadias continues to carry higher risk of adverse outcomes, irrespective of the surgical technique, necessitating meticulous planning, possible staged approaches, and long-term follow-up. Third, while flap repairs remain valuable in selected cases, they do not clearly outperform TIP and may be associated with higher morbidity when applied indiscriminately. Finally, the age at surgery in our cohort remains higher than international recommendations, reflecting systemic barriers to early intervention that need to be addressed through improved awareness and referral practices.

CONCLUSION

Hypospadias repair at our tertiary care centre demonstrated favorable outcomes with an overall complication rate of 16% and re-operation rate of 6%. Distal hypospadias managed with TIP urethroplasty yielded the best outcomes, whereas proximal variants remained challenging. Long-term follow-up is essential to detect delayed complications and to optimize patient outcomes.

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