



HYPOSPADIAS SURGERY AND ITS OUTCOMES: A SINGLE CENTRE STUDY

Paediatric Surgery

Dr Siddharth Singh Rathore*

Associate Professor, Department Of Paediatric Surgery, Mahatma Gandhi Medical College And Hospital, Jaipur, Rajasthan. *Corresponding Author

Dr Sourabh Singh

Associate Professor, Department Of Neonatology, Mahatma Gandhi Medical College And Hospital, Jaipur, Rajasthan.

ABSTRACT

This study retrospectively examines the outcomes of hypospadias surgery over a decade at Mahatma Gandhi Medical College and Hospital. The aim was to assess the long-term success rates and complications associated with different surgical techniques and to evaluate factors such as age at surgery, type of hypospadias, and associated anomalies in relation to surgical outcomes. The findings highlight the most common types of hypospadias, the preferred surgical techniques, and the associated complications, providing valuable insights for optimizing treatment strategies.

KEYWORDS

Hypospadias repair, urethrocutaneous fistula, complications, Urethroplasty

INTRODUCTION

Hypospadias is one of the most common congenital anomalies, occurring in approximately 1 in 150 to 300 live births [1]. The term Hypospadias is derived from the Greek word “Hypo” means under and “Spadon” meaning a rent or fissure. It results from an arrest in the normal development of the urethra, leading to an ectopic urethral opening on the ventral aspect of the penis, within the scrotum, or even in the perineum, often accompanied by a dorsally hooded foreskin due to a ventral preputial defect. In many cases, this anomaly is associated with a ventral curvature of the penis, known as chordee.

Over 300 surgical techniques have been described for the correction of hypospadias, reflecting the complexity of the condition and the higher complication rates compared to other reconstructive surgeries.[2] Among these, the Tubularised Incised Plate Urethroplasty (TIPU), popularized by Snodgrass, has become the preferred technique for anterior hypospadias in most centres.[3] Some use MAGPAI and Mathieu's in anterior Hypospadias. Although two-stage repair was described much earlier for Hypospadias surgery it was subsequently abandoned as technical developments, such as the incorporation of the urethral plate in the repair and the use of dorsal plication for penile straightening, allowed a safe single-stage repair in most of the cases.[4]

Nowadays, there is a resurgence in the two-stage repair, as it reduces morbidity and improves cosmesis in the correction of the most severe forms of hypospadias.[5–9]

The aim of this study is to analyze the outcomes of hypospadias surgeries performed at Mahatma Gandhi Medical College and Hospital over the last 10 years, focusing on the long-term success rates, complications, and the influence of factors such as age at surgery, type of hypospadias, and associated anomalies.

Aims and Objectives

1. Assess the long – term success rates and complications of different surgical techniques used for hypospadias repair
2. Evaluate factors such as age at surgery, type of hypospadias, and associated anomalies in relation to surgical outcomes.

MATERIAL AND METHODS

Study Design and Setting

This retrospective study was conducted at Mahatma Gandhi Medical College and Hospital (MGH) from September 2013 to March 2024. The study included all patients who underwent Urethroplasty, specifically Tubularised Incised Plate (TIPU) Urethroplasty and two-stage Urethroplasty, at MGH during this period. Patients who had undergone only the first stage of urethroplasty or presented with complications from urethroplasty performed elsewhere were excluded.

Data Collection

Data were collected from the Medical Records Department (MRD) and included history sheets, physical examination notes, operative

notes, discharge summaries, and outpatient follow-up records. The study focused on key variables such as type of hypospadias, age at surgery, weight at surgery, surgical technique, stent size and duration, operative time, and postoperative complications.

Outcome Measures

Outcomes were assessed based on:

1. Immediate and Early Complications: Including bleeding, haematoma, local edema, wound infection, wound dehiscence, glans necrosis, skin necrosis, urethrocutaneous fistula, penile torsion, stent blockage, inadvertent stent removal, and bladder spasms.
2. Long-term Complications: Including urethrocutaneous fistula, meatal stenosis, urethral strictures, and urethral diverticula.

Statistical Analysis

Descriptive statistics were used to summarize the data. The relationship between surgical outcomes and factors such as age, type of hypospadias, and surgical technique was analysed using appropriate statistical tests. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 387 cases of hypospadias repair were included in the study. These were classified according to the Duckett and Hadidi classifications of hypospadias [10,11]: The most common type in Duckett classification was Middle hypospadias (50.6%), with Distal Penile being the most prevalent (30%) (Table 1). Distal hypospadias being the most common 56.6% in Hadidi classification (Table 2). The Average Age at Surgery was 6.2 yr (SD, ± 3.75) (Table 3). The maximum number of patients were in the age group of 1–4 yr (41.08%). Tubularised Incised Plate (TIPU) Urethroplasty was performed in 249 (64.3%) of cases, 138 (35.7%) cases underwent Staged Urethroplasty (Table 4).

The mean urethral stent size was 9.05 Fr. With 6Fr used in 13, 8Fr in 156 and 10Fr used in 218 cases. The average duration of stent in TIPU was 9 days. It was 7 days in 1st stage Urethroplasty and 12 days in 2nd stage Urethroplasty. The operative duration in TIPU was 98 minutes (Range, 78–125) and for the 1st stage of Staged Urethroplasty it was 82 minutes (Range, 75–105) while for the Final Stage of Staged Urethroplasty it was 106 minutes (Range, 90–145).

The most common early post operative complications were Local Edema, Urethrocutaneous fistula and bladder spasm in both types of surgical repairs (Table 4). Urethrocutaneous fistula was the most common complication in both TIPU (12.8%) and Staged Urethroplasty (21.01%). There is a statistically significant difference in the occurrence of certain complications between the two surgical techniques – Among Immediate and early complications Bladder spasm was more common in staged Urethroplasty (6.4% vs 14.04) ($p < 0.05$). While occurrence of Penile torsion (3.6% vs 8.6%) was marginally not significant ($P = 0.58$). Among Long-term Post operative complications – Occurrence of Urethrocutaneous fistula, Urethral

strictures, and Urethral diverticula was significantly more in Staged Urethroplasty vs TIPU ($p < 0.05$) (Table 5).

There is no statistically significant difference in the occurrence of fistulas across the different age groups between the two surgical techniques. The result for the 1-4 years age group is close to significance but still does not meet the standard threshold of $p < 0.05$ (Table 6). But the data suggests that the fistula rate increases with age (Table 7). Although there is a slight decrease in the rate for the 13-16 years group, it remains higher than the rates for the younger age groups. The chi-square test for trend yields a p-value of 0.030. The observation that fistula rates increase with age, especially notable around the 9-12 years age group, is statistically significant. This suggests that age is an important factor influencing the likelihood of developing fistulas, irrespective of the type of surgery performed.

Fistula occurrence varies significantly across different types of hypospadias. Glanular hypospadias had the lowest rate of fistulas 3.7%. Distal hypospadias has a moderate rate 14.1%. Proximal hypospadias has the highest fistula occurrence, with 20.56%. The p-value (0.054) is slightly above the conventional threshold of 0.05 for statistical significance. This suggests that the differences in fistula occurrence among the types of hypospadias (glanular, distal, proximal) are marginally not statistically significant. While the results indicate a trend toward a higher incidence of fistula as the severity of the Hypospadias increases but they are not statistically significant at the 95% confidence level.

Table 1-Duckett Classification

Type of hypospadias		Number of patients		Percentage	
Anterior	Glanular	27	90	6.9	23.2 %
	Subcoronal	63		16.2	
Middle	Distal Penile	118	196	30.4	50.6%
	Midshaft	38		9.8	
	Proximal Penile	40		10.3	
Posterior	Penoscrotal	65	101	16.7	26.2%
	Scrotal	19		4.9	
	Perineal	17		4.3	

Table 2-Hadidi Classification

Type of hypospadias	Number of patients	Percentage
Glanular	27	6.9%
Distal	219	56.6%
Proximal	141	36.4%

Table 3 – Age at surgery

Age group	Number of patients	% of total
1-4	159	41.08%
5-8	123	31.78%
9-12	79	20.41%
13-16	26	6.71%

Table 4 – Comparison of Immediate and early Complications Between Surgical Techniques (TIPU vs. Staged Urethroplasty)

Immediate and early complications	Tubularised incised plate urethroplasty n=249	Staged Urethroplasty n=138	Significance p<0.05
1. Bleeding and haematoma	4 (1.6%)	5 (3.6%)	0.29
2. Local edema	27 (10.8%)	18 (13.04%)	0.51
3. Wound infection	8 (3.2%)	5 (3.6%)	1.0
4. Wound dehiscence	10 (4.01%)	11 (7.9%)	0.11
5. Skin necrosis	5 (2.07%)	3 (2.17%)	1.0
6. Glans necrosis	0	0	0
7. Urethrocutaneous fistula	26 (10.4%)	22 (15.8%)	0.15
8. Penile torsion	9 (3.6%)	12 (8.6%)	0.058 marginally not significant
9. Stent blockage	6 (2.4%)	5 (3.6%)	0.53
10. Inadvertent removal of urethral stent	2 (0.8%)	0 (0)	0.54
11. Bladder spasm	16 (6.4%)	18 (13.04%)	0.038(S)

Table 5 – Comparison of Late Complications Between Surgical Techniques (TIPU vs. Staged Urethroplasty)

Long term complications	Tubularised incised plate Urethroplasty n=249	Staged Urethroplasty n=138	Significance p<0.05
1. Urethrocutaneous fistula	32(12.8%)	29 (21.01%)	0.041(S)
2. Meatal stenosis	27 (10.8%)	19 (13.7%)	0.41
3. Urethral strictures	0	5 (3.6%)	0.005(S)
4. Urethral diverticula	0	4 (2.9%)	0.016(S)

Table 6 – Fistula occurrence in different age groups and hypospadias repairs

Age Group (Years)	Total number of patients	Type of Surgery	Number of Patients	Fistula Present	significance
1-4	159	TUIP	129	12	0.069
1-4		Staged	30	7	
5-8	123	TUIP	74	9	0.945
5-8		Staged	49	7	
9-12	79	TUIP	28	7	1.0
9-12		Staged	51	13	
13-16	26	TUIP	18	4	1.0
13-16		Staged	8	2	

Table 7 – Fistula occurrence in different age groups irrespective of type of urethroplasty

Age Group (Years)	Total number of patients	Fistula Present (Yes/No)	% of patients developing fistula
1-4	159	19	11.95%
5-8	123	16	13.01%
9-12	79	20	25.32%
13-16	26	6	23.08%

Table 8 – Fistula occurrence in different types of Hypospadias

Type of Hypospadias	Number of patients	Fistula Present	% of patients developing fistula
Glanular	27	1	3.7%
Distal	219	21	14.1%
Proximal	141	29	20.56%

DISCUSSION

The present study provides a comprehensive review of hypospadias surgeries performed over a decade at Mahatma Gandhi Medical College and Hospital, focusing on the outcomes of different surgical techniques, age at surgery, and the type of hypospadias. Our findings contribute to the understanding of the effectiveness and complications associated with Tubularised Incised Plate Urethroplasty (TIPU) and Staged Urethroplasty, offering insights for optimizing treatment strategies in this patient population.

The study showed that TIPU remains the preferred technique for hypospadias repair, being used in 64.3% of cases. This is consistent with existing literature that highlights TIPU as a standard for anterior hypospadias due to its relatively lower complication rates and simplicity(14). Results indicate that TIPU had a significantly lower rate of long-term complications, particularly urethrocutaneous fistula, urethral strictures, and urethral diverticula, compared to Staged Urethroplasty ($p < 0.05$). This aligns with studies by Snodgrass et al., which suggest that a single-stage repair can often be effective and may reduce morbidity(15).

Staged Urethroplasty was associated with higher rates of both immediate and long-term complications, notably bladder spasms (13.04% vs. 6.4%, $p < 0.05$) and urethrocutaneous fistula (21.01% vs. 12.8%, $p < 0.05$). This may be attributable to the complexity of the cases selected for staged repair, which often involve more severe forms of hypospadias and greater anatomical challenges, requiring more extensive reconstruction(16).

Age at surgery was found to be a significant factor influencing the development of fistulas. Our data indicated that younger patients (1-4 years) had a lower fistula rate (11.95%) compared to those in the 9-12 years age group (25.32%, $p = 0.030$), suggesting that earlier intervention might be beneficial. Although the fistula rate decreased slightly in the 13-16 years group, it remained higher than in younger age groups. Surgical repair at an older age may increase the risk of

postoperative complications and that is attributable to the larger quantity of urethral secretions and overnight erections(17).

While previous studies have differing views on the influence of age on hypospadias surgery outcomes (18,19), our findings support the argument for performing surgery at a younger age to minimize complications and enhance surgical outcomes.

Our analysis revealed that the severity of hypospadias influenced the likelihood of postoperative complications, particularly fistula formation. Glanular hypospadias had the lowest rate of fistula occurrence (3.7%), whereas proximal hypospadias showed the highest (20.56%). Although the p-value (0.054) was slightly above the threshold for statistical significance, the trend towards increased fistula rates with more severe hypospadias types aligns with previous studies (16). This suggests that anatomical complexity plays a crucial role in determining surgical outcomes, emphasizing the need for careful preoperative planning in patients with proximal hypospadias.

The findings of this study underscore the importance of choosing the appropriate surgical technique based on the type and severity of hypospadias. TIPU appears to be a safer and more effective option for anterior hypospadias, while Staged Urethroplasty should be reserved for more complex cases where a single-stage repair may not be feasible. Additionally, early surgical intervention (ideally between 1-4 years of age) is recommended to minimize the risk of complications such as urethrocutaneous fistula. The trend observed with age and fistula rates further emphasizes the benefit of early intervention.

The study is limited by its retrospective nature, which may introduce biases related to data collection and patient selection. Additionally, the sample was limited to a single centre, which may affect the generalizability of the results. Future prospective, multicentre studies with larger sample sizes are warranted to validate these findings and explore the impact of other factors, such as surgical expertise and postoperative care, on long-term outcomes.

CONCLUSION

The study demonstrates that hypospadias repair, particularly TIPU and Staged Urethroplasty, can achieve satisfactory outcomes with careful patient selection and surgical planning. However, complications remain a significant concern, especially in cases of proximal hypospadias. Age at surgery and severity of hypospadias are independent factors influencing outcome. Future research should focus on refining surgical techniques and identifying predictors of successful outcomes to further reduce complication rates.

REFERENCES

- 1) Elliot et al., 2011; springer et al., 2015
- 2) Smith ED. The history of hypospadias. *Paediatric Surgery Int.* 1997; 12:81-5. [PubMed:9069203]
- 3) Snodgrass W. Tubularised incised plate Urethroplasty for distal hypospadias. *J Urol.* 1994;151:464-5. [PubMed:8283561] Baskin LS, Duckett JW. Dorsal tunica plication for hypospadias curvature. *J Urol.* 1994;151:1668-71. [PubMed] [Google Scholar]
- 4) Bracka A. Hypospadias repair: The two-stage alternative. *Br J Urol.* 1995;76:31-41. [PubMed] [Google Scholar]
- 5) Ferro F, Zaccara A, Spagnoli A, Lucchetti MC, Capitanucci ML, Villa M. Skin graft for 2-stage treatment of severe hypospadias: Back to the future? *J Urol.* 2002;168:1730-3. [PubMed] [Google Scholar]
- 6) Snodgrass W, Elmore J. Initial experience with staged buccal graft (Bracka) hypospadias reoperations. *J Urol.* 2004;172:1720-4. [PubMed] [Google Scholar]
- 7) Johal NS, Nitkunan T, O'malley K, Cuckow PM. The two-stage repair for severe primary hypospadias. *Eur Urol.* 2006. Jan 25 [Epub ahead of print] [PubMed]
- 8) Nitkunan T, Johal NS, O'malley K, Cuckow PM. Secondary hypospadias repair in two stages. *J Pediatr Urol.* 2006;2:559-63. [PubMed] [Google Scholar]
- 9) Bracka A. Hypospadias repair: The two-stage alternative. *Br J Urol.* 1995;76:31-41.
- 10) Duckett JW. "Hypospadias." *Pediatric Surgery International.* 1996.
- 11) Hadidi AT. "Hypospadias Surgery: An Illustrated Guide." Springer-Verlag Berlin Heidelberg. 2004.
- 12) Snodgrass WT. "Hypospadias Repair: Science and Clinical Outcome." *J Pediatr Urol.* 2010;6(1):81-87.
- 13) Baskin LS, Ebbers MB. "Hypospadias: Anatomy, Etiology, and Technique." *J Pediatr Surg.* 2006;41(3):463-472.
- 14) Braga HLP, Lorenzo AJ, Pippi Salle JL. Tubularized incised plate urethroplasty for distal hypospadias: a literature review. *Indian J Urol.* 2008;24(2):219-225. doi:10.4103/0970-1591.4061913.
- 15) Snodgrass W, Koyle M, Manzoni G, Hurwitz R, Caldameone A, Ehrlich R. Tubularized incised plate hypospadias repair: results of a multicenter experience. *J Urol.* 1996 Aug;156(2 Pt 2):839-41. doi: 10.1097/00005392-199608001-00082. PMID: 8683797.
- 16) Chung JW, Choi SH, Kim BS, Chung SK. Risk factors for the development of urethrocutaneous fistula after hypospadias repair: a retrospective study. *Korean J Urol.* 2012 Oct;53(10):711-5. doi: 10.4111/kju.2012.53.10.711. Epub 2012 Oct 19. PMID: 23136632; PMCID: PMC3490092.
- 17) Dale J, Woodward B, Elagami H. Age-dependent early complications of hypospadias repair: a single institutional experience. *Pediatr Surg Int.* 2023;39(1). doi:10.1007/s00383-023-05388-z8.
- 18) Fang YW, Sun N, Song HC, et al. A multicenter study on surgical procedure selection and risk factor analysis of postoperative complications after TIP and Duckett

- hypospadias repair. *BMC Urol.* 2022;22(1). doi:10.1186/s12894-022-01051-29.
- 19) Kim JK, Shiff M, Chua ME, et al. Time to event analysis for post-hypospadias repair complications: a single-surgeon experience. *World J Urol.* 2021;39(10):3913-3919. doi:10.1007/s00345-021-03689-3