

Comparative Outcomes in Staged Reconstruction of Proximal Hypospadias

Reconstruction of
Proximal
Hypospadias

Asif Aziz

ABSTRACT

Objective: To report the overall incidence and spectrum of complications in a pooled cohort of 87 patients undergoing staged repair for proximal hypospadias and to evaluate outcomes based on number of stages required and the impact of different graft sources, as procedural risk factors.

Study Design: Retrospective observational study

Place and Duration of Study: This study was conducted at the Department of Plastic Surgery, Mufti Mehmood Memorial Teaching Hospital, Dera Ismail Khan, Pakistan from January 2023 to December 2024.

Methods: This retrospective observational study analysed 87 male patients with proximal hypospadias who underwent staged repair (63 two-stage, 24 three-stage) at a tertiary plastic surgery unit over an eight-years period (2017–2024). The primary outcome was the incidence and spectrum of all postoperative complications in the collective cohort.

Results: Overall, complications occurred in 21 patients (24%). The most common events were urethra-cutaneous fistula in 11 (12.6%) and residual curvature in 7 (8%) and meatal stenosis in 3 patients (3.4%). There was no statistically significant difference of complications between two or three staged repairs, but when analysed with regard to the sources of grafts (preputial vs labial), a very significant difference was noted, favouring preputial graft a far better substitution of urethral plate.

Conclusion: Preputial skin graft should be the preferred choice for urethral substitution in proximal hypospadias cases, whenever possible, while labial mucosal graft should only be used when preputial graft is not available.

Key Words: Proximal hypospadias; staged repair; urethroplasty; dehiscence; paediatric reconstructive surgery; surgical outcomes

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INTRODUCTION

Though hypospadias represents a very common congenital anomaly of the male external genitalia, proximal hypospadias continues to pose major reconstructive challenge due to its anatomical severity, associated curvature, and high postoperative complication rates. The goals of surgery in any hypospadias repair are to achieve a functionally straight penis, construct a reliable neourethra, and restore a cosmetically acceptable appearance¹. However, outcomes for proximal forms remain inferior to those of distal cases, with reported overall complication rates ranging from 30% to 60%^{2,3}.

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The most frequent adverse events include urethrocutaneous fistula, recurrent curvature, meatal stenosis, and urethral stricture^{4,5}.

Over the past three decades, staged approaches for proximal or severe forms of hypospadias, first popularized by Bracka⁶, have shown improved graft integration and reduced complication rates compared to single-stage procedures. The two-stage concept involves chordee correction and graft placement in the first stage (STAG Staged Tubularized Autograft), followed by urethroplasty after graft healing, thereby reducing tissue tension and enhancing vascularization⁷. While classically described as a two-stage operation, a three-stage modification has been introduced in severe cases, when surgical manoeuvres like penile degloving and transaction and mobilization of urethra alone cannot achieve complete straightening and ventral carporotomies become necessary, which then requires to be covered with local fascial flaps in the first stage of surgery. Later after at least six months time after each stage, the second and third stages are executed, where autografts are placed in the second stage and tubularization is achieved in the third stage^{8,9}.

Current controversies among hypospadiologists involves issues like the optimal number of surgical stages and the best graft material. The most common autograft sources include preputial skin and buccal or labial mucosal grafts. Contemporary research shows

equivalent outcomes between two and three staged STAG repairs^{8,10,11} but on the other hand reveals graft source as a strong indicator of major complications^{12,13}.

METHODS

Study Design and Setting: This retrospective, comparative study was carried out in the Department of Plastic Surgery, Mufti Mehmood Memorial Teaching Hospital, Dera Ismail Khan, Pakistan, over an eight-year period (January 2023 – December 2024).

Patient Selection: A total of 87 male patients diagnosed with proximal hypospadias were included. Only primary cases were included. All surgeries were performed by the same consultant surgeon and team, ensuring technique consistency.

Surgical Correction: All patients underwent staged surgical repair for primary hypospadias.

- **Two-Stage Repair (Group A, n=63):** Performed when degloving alone or in combination with urethral plate transaction and release, achieved adequate straightening. The first stage involved chordee correction and graft placement, followed by tubularization in the second stage after at least six months.
- **Three-Stage Repair (Group B, n=24):** Indicated in patients with significant residual curvature after degloving and urethral plate transaction that ultimately required ventral carporotomies (fig. 1). This involved three distinct stages: chordee correction (Stage 1), graft placement (Stage 2), and tubularization (Stage 3).

Outcome Measures: Primary outcomes assessed were anatomical complications: fistula formation, recurrent curvature, meatal stenosis and dehiscence.

Statistical Analysis: Data were analysed using IBM SPSS Statistics. Categorical variables were analysed with the Chi-square test or Fisher's exact test. A p-value < 0.05 was considered statistically significant.

RESULTS

Patient Demographics and Baseline

Mean age of patients was 3.2 ± 1.8 years. 68 patients were not circumcised, while 19 patients were already circumcised. Out of these 19 circumcised patients, 2 had enough residual prepuce that could be used to cover the meatus to glans.

Spectrum and Incidence of Postoperative Complications

Overall, postoperative complications were observed in 21 of 87 patients, resulting in a cumulative complication rate of 24.1% for staged repair.

Table No.1: Spectrum of Postoperative Complications

Complication	n	%
Urethrocuteaneous fistula	11	12.6%
Recurrent curvature	7	8%
Meatal stenosis	3	3.4%
Any complication	21	24.1%

Table No. 2: Comparison of Complication Rates by Repair Stage

Complication	Number of Cases (n=87)	Two stages n=63 (%)	Three stages n=24(%)
Urethro-cutaneous fistula	11 (12.6%)	8 (12.7%)	3 (12.5%)
Recurrent curvature	7 (8%)	4 (6.3%)	3(12.5%)
Meatal Stenosis	3 (3.4%)	2 (3.2%)	1 (4.2%)
Any Complication	21 (24.1%)	14 (22.2%)	7 (29.2%)

A p-value of 0.5776 depicts that there is no statistically significant difference in overall complications between two and three staged hypospadias repairs.



Figure No. 1: Intra-operative clinical photographs showing Stage 1 of three staged correction of midshaft meatus, that after penile degloving and urethral transaction required ventral carporotomies for complete straightening, have converted to a scrotal meatus. Note that the prepuce has been reconstructed circumferentially to expand in area to help in substituting the urethral plate in the second or intermediate stage.

Graft source as a Risk Factor

This data clearly shows statistically significant difference in the occurrence of urethrocutaneous fistulas and recurrent curvature when preputial grafts are used than labial mucosa, and a very significant difference in terms of overall complications.

Table No. 3: Comparison of complications by Sources of Graft

Complications	Preputial graft n=68	Labial graft n=19	p-value
Urethro-cutaneous fistula	5 (7.4%)	6 (31.6%)	0.0117
Recurrent curvature	2 (2.9%)	5 (26.3%)	0.0049
Meatal stenosis	2 (2.9%)	1 (5.3%)	0.5272
Any complication	9 (13.2%)	12 (63.2%)	0.0001

DISCUSSION

Number of stages: The evolution from two-stage procedures to three-stages was steered by the speculative benefits of allowing grafts to fully heal and mature before tubularization over a well vascularised bed, potentially reducing graft contracture and the resultant recurrence of contracture of the urethral plate. Nevertheless, current comparative research has not demonstrated any statistically significant advantage of the three staged approach in overall success and long-term urethral patency^{8,10,11}. Hence, the choice between two or three stages can be customized to patient anatomy, intraoperative findings and surgeon's preferences.

Graft source as the Critical Variable: This review clearly pointed, that the source of autograft has a profound effect on major associated complications. Labial mucosa from the inner lower lip, apparently a more suitable substitute for urethra because of being hairless, pliable and wet epithelium, is associated with higher complications.

Urethrocutaneous Fistula: Preputial skin grafts, specifically the inner layer of prepuce offers superior graft take and subsequent integration on the penile shaft compared to labial mucosa, with the added advantage of being in the same region, obliterating the need of harvest from other areas, with ensuing restrictions of oral intake. Preputial skin also offers the chance of circumcision, a cultural and religious obligation specific to this region. Other studies have also shown higher fistula rate when labial mucosa was used instead of preputial skin. Deng et al. (2021), in a meta-analysis, found oral mucosa (including buccal and labial) had a significantly higher fistula rate than penile skin grafts¹². Similarly, work by Leslie et al. (2011) and Castagnetti et al. (2013) noted that labial mucosa grafts were an independent risk factor for fistula formation, likely due

to their delicate nature and different healing characteristics in a non-oral environment^{13,14}.

Recurrent Ventral Curvature: Recurrent curvature after staged hypospadias repair can result from graft contracture during healing phase or may result during growth of penis in later years of life. The dense dermal layer of preputial skin provides greater structural support and consequently more resistance to contraction than labial mucosa with its scant lamina propria. As reported by Bracka (2011) and corroborated by Springer (2013), the use of extra-genital mucosa grafts carries a higher risk of graft shrinkage, which can re-tether the ventral penile shaft, leading to recurrent chordee^{15,16}. Johal et al. (2006) also observed more re-operations for curvature in patients receiving oral mucosa grafts compared to local skin¹⁷.

The preputial skin, whenever available, offers a more compatible choice because it shares embryological origin and physical properties with the native penile skin, hence offering better healing and integration^{18,19}. On the other hand, labial mucosa remains a vital second option in circumstances when local skin may not be available (after circumcision) or in re-operative cases and its selection should be made with anticipation of its associated higher risk of complications.

CONCLUSION

The decisions in the management of proximal hypospadias, should not be driven by the number of stages required to achieve the goals set, but rather should be focused on the choice of the graft source used, because the evidence indicates that the two or three stage approaches yield equivalent outcomes, but the use of preputial graft definitely offers greater advantage over labial mucosal grafts in reducing the incidence of urethrocutaneous fistulas and recurrent curvature. This also emphasises the need for public and health personnel awareness to refrain from the practice of circumcision, whenever there is the slightest doubt of penile dysmorphism.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Asif Aziz
Drafting or Revising Critically:	Asif Aziz
Final Approval of version:	The above author
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