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Review Article

Double Faced Preputial Island Flap Tube Urethroplasty for Single Stage Repair of Proximal Hypospadias with Chordee.

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Abstract

Background: Hypospadias is a common congenital anomaly of the male urethra, characterised by an ectopic placement of the urethral meatus on the ventral aspect of the penis, rather than at its tip¹. It results from incomplete fusion of the urethral folds during embryogenesis, which typically occurs between the 8th and 14th weeks of gestation. **Objective:** To study Double Faced Preputial Island Flap Tube Urethroplasty for single stage repair of proximal hypospadias with chordee in terms of functional outcomes and cosmetic outcomes and less complications. **Methods:** The present prospective interventional study was carried out at Department of Surgery, Era's Lucknow Medical College & Hospital (ELMCH). ELMCH is a tertiary care centre with state-of-the-art infrastructure catering primarily to socio-economically underprivileged suburban and rural population of Lucknow. Duration of study was twenty four months. **Result:** A total of 30 patients, aged between 2-16 years (8.66±4.61 years). Most of the patients were aged ≥11 years (43.3%). 76.6% of the patients underwent Chordectomy while 23.3% underwent Chordectomy+Dorsal plication. In terms of complications, 20 Patients (66.66%) had no post-op complications. Most common complication was Penile oedema (as early complication), followed by Proximal Fistula found in 6.66% & 13.3% of the cases respectively. Penile Torsion and Diverticula were reported in 6.66% cases each. Secondary surgery was required in 4 (13.8%) cases. Of them 1 (25.0%) required two surgeries, while 3 (75.0%) required only 1 secondary surgery. Functional outcomes were achieved in all 100.0% cases. Cosmetics outcomes were achieved in 86.67% of the cases. **Conclusion:** the Double-Faced Preputial Island Flap Tube Urethroplasty demonstrated favourable results, with successful functional outcomes observed in all patients (100%) and satisfactory cosmetic results in the majority (86.67%). Although complications were noted in 33.3% of the cases.

Keywords: Double Faced Preputial Island Flap Tube Urethroplasty, Single Stage Repair, Proximal Hypospadias With Chordee

Introduction:

Hypospadias is one of the most frequently encountered congenital malformations in male infants, with a reported incidence ranging from 1 in 200 to 1 in 300 live male births¹. The prevalence varies by geographic region, ethnicity, and temporal trends. Additionally, there is evidence suggesting a rising incidence over recent decades, possibly attributed to increased environmental exposure to endocrine-disrupting chemicals, improved reporting, or better diagnostic practices.

The clinical spectrum of hypospadias varies depending on the location of the ectopic meatus and the presence of associated anomalies. It is typically classified based on meatal position into²:

1. Anterior (distal): glanular, coronal, or subcoronal (constituting approximately 70% of cases)
2. Middle (midshaft): Distal penile, Mid penile, Proximal penile
3. Posterior: penoscrotal, scrotal, or perineal (least common but often more severe)

Common associated features include:

1. Chordee (ventral penile curvature), particularly in more proximal forms
2. Dorsal hooded foreskin, due to incomplete ventral preputial development
3. Abnormal urinary stream, especially in midshaft or proximal cases

Undescended testes or inguinal hernias, in a minority of cases, especially when part of syndromic presentations

The goal of hypospadias management is to achieve a functionally and cosmetically normal penis, with the ability to void in a standing position and, in the future, satisfactory sexual function^{3,4}. Management typically involves surgical techniques. While, over 300 surgical techniques have been described, with choice depending on the severity and location of the defect.

Proximal hypospadias accompanied by chordee presents one of the most technically demanding reconstructive challenges in paediatric urology. The primary objective in such cases is to achieve penile straightening and reconstruction of a functional neourethra in a manner that ensures both urinary and future sexual function while maintaining acceptable cosmesis. Among the various surgical options, the Double-Faced Preputial Island Flap (DFPIF) Tube Urethroplasty has gained prominence as a reliable single-stage approach^{5,6}. This technique utilises a tubularised flap derived from the dorsal prepuce, preserving both the inner and outer epithelial layers, hence the term "double-faced." The preserved vascular pedicle enhances flap viability and reduces the risk of ischaemia-related complications such as fistulas and strictures⁷. It is preferred in patients where a single-stage reconstruction is feasible and desirable, thus avoiding the physical and psychological burden of multi-stage procedures. The advantages of this method include excellent tissue availability, preserved vascularity, and an adequate flap length that can be tailored for long-segment urethral substitution^{8,9}. Furthermore, the outer epithelial surface of the flap serves as a reinforcing layer that supports suture lines and lowers the risk of fistula formation. Studies have supported the efficacy of this technique in managing complex proximal hypospadias and have documented favourable outcomes, highlighting low complication rates and satisfactory cosmetic and functional results. When performed with meticulous attention to vascularity, suture line support, and chordee correction, the Double-Faced Preputial Island Flap Tube Urethroplasty offers a compelling, single-stage solution for one of the most complex urological anomalies in paediatric surgery. However, only limited studies have reported on the outcomes from India. The present study aims to fill this gap, and was conducted to evaluate the Double-Faced Preputial Island Flap Tube Urethroplasty for single stage repair of proximal hypospadias with chordee in terms of functional outcomes and cosmetic outcomes and less complications.

Material and Methods:

The present prospective interventional study was carried out at Department of Surgery, Era's Lucknow Medical College & Hospital (ELMCH). ELMCH is a tertiary care centre with state-of-the-art infrastructure catering primarily to socio-economically underprivileged suburban and rural population of Lucknow. Duration of study was twenty four months. Ethical clearance for carrying out the study was obtained from the Institutional Ethical Committee, Era's Lucknow Medical College & Hospital, Lucknow. An informed consent was obtained from all the patients

SAMPLING FRAME

All the patients with proximal Hypospadias with chordee admitted in paediatric surgery unit of department of surgery in Era's Lucknow Medical College & Hospital. The sampling frame of the study was bound by the following inclusion and exclusion criteria:

Inclusion Criteria for Cases

All patients presenting with proximal hypospadias with chordee in Department of General Surgery

Exclusion Criteria

Cases with perineal hypospadias or cripple hypospadias were excluded

Sample size:

The sample size was calculated at 90% power on the basis of proportion of cases without post op complications comparing was maximum possible non-complications after applying the technique from previous study by Al-Hindi et al.6 using the formula:

Where

$p_1 = 0.63$ (63.33%) expected proportion of cases without post op complications

$p_2 = 1.00$ (100%) the maximum possible proportion of cases without post op complications

Proportion difference $e = 1.1(p_2 - p_1)$ considered to be clinically significant Type I error, $\alpha=5\%$ (level of significance)

Type II error $\beta=10\%$ for setting power of study 90% The calculated sample size was $n = 30$.

Methodology

The clinical-demographical parameters of all the patients were recorded as per standard questionnaire.

All patients received general anaesthesia and supine position. The surgical procedure was Double Faced Preputial Island Flap Tube Urethroplasty for single stage repair of Proximal Hypospadias.

A simple dressing was placed around the penis consisting of gauze and an adhesive covering.

Patients were asked to follow up on 15 days, 1 month, 3 months. History and examinations were taken during follow-up appointments, and observations was be done regarding the cosmetic and functional results

Statistical Analysis

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 21.0 statistical Analysis Software. The values were represented in Number (%). Chi-square test was used to test the significance of categorical data Level of significance was $p<0.05$.

RESULTS

The present study was conducted to evaluate Double Faced Preputial- Island Flap Tube Urethroplasty for single stage repair of proximal Hypospadias with severe chordee in terms of functional, cosmetic outcomes and complications. All the patients were managed by double faced preputial Island flap tube urethroplasty for single stage repair of Proximal Hypospadias and a simple dressing was placed around the penis consisting of gauze and an adhesive covering. Patients were asked to follow up on 15 days, 1 month, 3 months. Table 1 below shows the distribution of the patients according to age of the patients: A total of 30 patients, aged between 2-16 years (8.66 ± 4.61 years). Most of the patients were aged ≥ 11 years (43.3%). 76.6% of the patients underwent Chordectomy while 23.3% underwent Chordectomy+Dorsal plication. In terms of complications, only 20 (66.66%) had no post-op complications. Most common complication was Penile oedema (as early complication), followed by Proximal Fistula found in 6.66% & 13.3% of the cases respectively. Penile Torsion and Diverticula were reported in 6.66% cases each. Secondary surgery was required in 4 (13.8%) cases. Of them 1 (25.0%) required two surgeries, while 3 (75.0%) required only 1 secondary surgery. Functional outcomes were achieved in all 100.0% cases. Cosmetics outcomes were achieved in 86.67% of the cases.

Table 1: Age profile of the patients (N=30)

SN	Age Group	Number of cases	%
1	≤ 1	0	0.0
2	2-5 yrs	8	26.6
3	6-10 yrs	9	30.0
4	≥ 11 yrs	13	43.3
	Mean Age in years $\pm$ SD (Range)	8.66 $\pm$ 4.61 (2-16)	

Table 2: Distribution of study population based on Chordee Approach (N=30)

SN	Approach	Number of cases	%
1	Chordectomy	23	76.6
2	Chordectomy + Dorsal Plication	7	23.3

Table 3: Distribution Based on Post Surgery Complication

Post Surgery Complications	Number of cases	%
Penile edema (after 3 weeks)	2	6.66
Proximal urethro- cutaneous fistula	4	13.3
Penile Torsion	2	6.66
Glans dehiscence	0	0

Urethral Stricture	0	0
Diverticula	2	6.66
No complication	20	66.66

Table 4: Distribution of study population according to Req. of Secondary Surgery (N=30)

SN	Secondary Surgery	Number of cases	%
1	Not Required	26	86.2
2	Required	4	13.8

Table 5: Distribution of number of secondary surgeries required (n=4)

SN	No. of Secondary Surgery	Number of cases	%
1	One	3	75.0
2	Two	1	25.0

Fig.1: Proximalpenile Hypospadias with Severe Chordee**Fig.2: Figure Showing Chordee After Degloving of Penile Skin****Fig.3: Figure Showing Severe Chordee After Degloving of Penile Skin**



Fig.4: Figure Showing Pedicle Flap Brought Ventrally Without Torsion

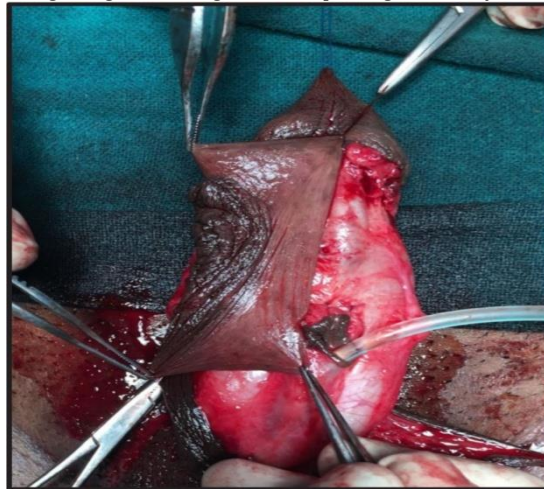


Figure5: Showing Completed Repair After DFPIF Tube Urethroplasty



DISCUSSION

Double-faced preputial island flap tube urethroplasty has emerged as a reliable single-stage surgical option for the repair of proximal hypospadias associated with chordee. The double-faced preputial island flap technique builds upon the principles of the transverse preputial island flap popularised by Asopa & Duckett, with a key innovation: it utilises both the inner and outer preputial skin. The inner preputial layer is tubularised to form the neourethra, while the outer skin is preserved to provide penile shaft coverage. This dual-purpose design not only

ensures an adequate length of hairless, vascularised tissue for urethral substitution but also maintains robust penile skin coverage, eliminating the need for additional grafts or skin flaps.

The procedure is ideally suited for children with proximal penile or penoscrotal hypospadias who have adequate preputial tissue and in whom a single-stage correction is preferred.

Surgical steps begin with complete de-gloving of the penis to assess and correct chordee, often with excision of the urethral plate and any ventral fibrotic tissue. An artificial erection test is employed to determine

residual curvature. Chordee correction may involve ventral corporotomies or dorsal plication, depending on severity. Most of the Patient in this Study, chordee was corrected by dorsal midline Plication stitches, following chordee correction, a double-faced preputial island flap is harvested. The inner surface is tubularised over a catheter to construct the neourethra, while the outer skin layer remains intact. The flap is rotated ventrally without tension or torsion, and the neourethra is anastomosed distally at the glans to create a slit-like meatus.

The outer preputial skin is then used to cover the neourethra and entire penile shaft, typically in a wrap-around or ventral patch configuration. The key advantage of this technique lies in its use of well-vascularised preputial tissue, which offers excellent healing potential and reduces the likelihood of necrosis. Additionally, by providing a one-stage solution, the procedure reduces the overall number of anaesthetic exposures and hospital visits, which is particularly important in paediatric patients. Cosmetically, the method ensures uniform skin coverage and a neomeatus that is typically located at the tip of the glans, satisfying both functional and aesthetic goals.

Despite its advantages, the double-faced preputial island flap urethroplasty is technically demanding and associated with certain complications. These may include urethrocuteaneous fistulas, meatal stenosis, diverticulum formation, and, in some cases, stricture at the anastomotic sites. Reported complication rates vary in the literature, with fistula formation observed in 5–20% of cases and urethral stricture in 2–10%. Most complications, however, are manageable and occur less frequently in experienced hands. Proper selection of patients and meticulous surgical technique particularly avoiding flap torsion and ensuring adequate vascularity are essential for reducing these risks.

Functional outcomes are generally favourable, with patients achieving a good urinary stream and normal voiding patterns within a few months postoperatively. Cosmetic outcomes are equally satisfactory, with a penile shaft free of curvature, well-aligned meatus, and symmetrical glans. Studies, including those by Cendron et al. and Braga et al., have demonstrated high success rates and low re-operation needs when the technique is executed carefully. These results validate the procedure as a dependable alternative to staged repairs in selected patients with proximal hypospadias.

All the patients were managed by Double faced preputial flap tube urethroplasty for single stage repair of Proximal Hypospadias and a simple dressing was placed around the penis consisting of gauze and an adhesive covering. Patients were asked to follow up on 15 days, 1 month, 3 months.

Our cohort had a mean age of 8.66 years (range 2-16 years), with 43.3% of patients being 11 years or older. This contrasts sharply with most other studies that primarily examined younger children, such as Gonzalez10 who reported the median age of 10 months, while El-Dahshoury et al.11 reported the mean age of patients was 3.03 years. In another study more recent study, Blanc et al.5 and Huen et al.12 reported median ages around 1.1 years.

The older age of our patient population likely contributed to several observed differences in surgical outcomes. Older children present unique surgical challenges, including larger anatomical structures requiring more extensive reconstruction, potential scar tissue from delayed intervention, and more developed erectile tissues that complicate chordee correction. These factors may explain our overall complication rate of 33.33% compared to rates of 30-58% in studies with younger cohorts5,6,8,12. Specifically, we observed increased postoperative oedema (after 3 weeks) (6.66%) and fistula formation (13.3%), complications that tend to be more prevalent in older patients due to greater tissue tension and altered wound healing responses.

The present study investigated the outcomes of Double-Faced Preputial Island flap Tube Urethroplasty (DFPIF) for proximal hypospadias with severe

chordee, demonstrating excellent functional results (100% success) and satisfactory cosmetic outcomes (86.67%), albeit with a notable complication rate of 76.7%.

The high functional success rate observed in the present study is consistent with multiple earlier reports. For instance, Gonzalez10 and El Dahshoury et al.11 documented success rates exceeding 95%, reinforcing the reliability of DFPIF in restoring normal urinary function. Similarly, cosmetic outcomes in the present study (86.67%) fall within the range reported by other researchers, such as Singhal et al.13 and Daboos et al.14, who noted cosmetic success in 83–90% of cases. However, some studies, particularly those involving less severe hypospadias or stricter patient selection criteria, reported even higher cosmetic satisfaction—up to 100%. This discrepancy may be attributed to differences in the severity of cases, patient age (older children in the present study), or surgical refinements in later techniques.

The present study reported complications in 33.28% of patients, with penile oedema (after 3 weeks) (6.66%) being the most common, followed by fistulas (13.3%) and diverticula (6.66%). While this rate was much higher compared to studies like El Dahshoury et al.11 who

reported the incidence to be 3.29% or Gonzalez10 who reported the incidence of 22.2%, it aligns closely with findings from Blanc et al.5, who observed a 48% complication rate in severe hypospadias cases. This suggests that complication rates are inherently higher in complex repairs, particularly those involving proximal hypospadias with chordee. Re-operation rates in the present study (13.8%) were comparable to those in Al- Hindi & Khalaf6 and Singhal et al.13 both of whom reported a 12% re-operation rate, indicating that while complications are frequent, many can be addressed with minor secondary procedures.

Despite these challenges, our study demonstrated excellent functional outcomes (100% success rate) in older children, matching the high success rates reported in studies of younger patients. However, our slightly lower cosmetic satisfaction rate (86.67%) compared to some studies with younger cohorts may reflect both the technical difficulties of operating on more developed genitalia and the heightened cosmetic expectations of older children and their families. This finding underscores the importance of preoperative counselling regarding realistic outcome expectations when performing hypospadias repair in older patients.

The age differences between our study and contemporary literature highlight ongoing debates about optimal timing for hypospadias repair. While most current evidence supports earlier intervention (typically between 6 months and 3 years of age), our results provide valuable data demonstrating that successful repair remains possible in older children, albeit with increased technical demands and higher complication risks. These findings are particularly relevant for cases of delayed presentation or prior failed repairs.

Surgical teams operating on older children should be prepared to modify their techniques, using larger flaps and more robust chordee correction methods, while implementing aggressive postoperative management strategies to address the increased risk of oedema and other complications. Future research should further explore age-specific outcomes to refine surgical approaches across different paediatric age groups.

The present study's limitations such as a limited small sample size and short follow-up period (3 months) makes direct comparisons with larger, long- term studies challenging. For instance, Huen et al.12 followed patients for a median of 3 years and included uroflowmetry data, providing a more comprehensive assessment of functional outcomes. Future research should prioritise longer follow-up durations and standardised outcome measures, such as objective voiding parameters, to better evaluate the durability of DFPIF repairs. Additionally, comparative studies between one-stage and two-stage approaches, as explored by Huen et al.12, could help clarify the trade-offs between initial complication rates and the need for secondary surgeries.

In summary, the present study's findings reinforce the established role of DFPIF in proximal hypospadias repair, particularly in achieving functional success. However, the higher complication rates observed especially in severe cases highlight the inherent challenges of these complex repairs. Contemporary literature suggests that technical refinements, such as dartos layer reinforcement and hybrid flap designs, may mitigate some risks, but patient selection and surgical expertise remain critical factors. Moving forward, prospective studies with standardised techniques and long-term follow-up will be essential to optimise outcomes and refine best practices for hypospadias repair.

Conclusion

The present study concluded that the Double-Faced Preputial Island Flap Tube Urethroplasty demonstrated favourable results, with successful functional outcomes observed in all patients (100%) and satisfactory cosmetic results in the majority (86.67%). Although complications were noted in 33.3% of the cases, most were minor, with penile oedema (6.66%) being the most frequent, followed by proximal fistula (13.3%), penile Torsion (6.66%), and diverticula (6.66%). Notably, secondary surgical intervention was required in only 13.8% of cases. These findings suggest that the Double Faced Preputial Island Flap Tube Urethroplasty technique is an effective single-stage approach for managing proximal hypospadias with chordee, offering reliable functional restoration and acceptable aesthetic outcomes, with a manageable complication profile.

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