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 PEDIATRIC SURGERY IN TROPICS www.pediatricsurgeryintropics.com editor@pediatricsurgeryintropics.com	
Pediatric surgery in tropics- Oct-2026	
ISSN 3049-3404 (online)	DOI : https://doi.org/10.70947/PST2026.39
Title	Modified Transverse Preputial Island Flap urethroplasty for hypospadias in children - A short-term outcome in 42 cases
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Keywords	Abstract
Hypospadias, TPIFU,	Background: Proximal hypospadias with severe chordee presents a significant surgical challenge, with higher complication rates than distal

Duckett's procedure, urethroplasty, urethral fistula, chordee, single-stage repair Abbreviations Insert here	variants. While single-stage urethroplasty offers advantages in cost and recovery, complication rates remain a concern. This study evaluates a modified Transverse Preputial Island Flap Urethroplasty (TPIFU) technique aimed at reducing complications and improving outcomes. Methods: A retrospective analysis was conducted over 20 months (May 2023–December 2025) at a tertiary center. Forty-two boys with mid or proximal hypospadias underwent single-stage TPIFU. Modifications included oblique proximal anastomosis, wide slit meatoplasty, 10-day catheterization, and neourethral fixation to corpora. Patients were followed at 1, 3, and 6 months postoperatively. Complications such as meatal stenosis, urethrocutaneous fistula (UCF), stricture, diverticula, and torsion were recorded. Results: The mean age was 3.67 ± 1.7 years. Hypospadias was proximal in 71.43% and midshaft in 28.57% of cases. Chordee correction was required in 92.86%. The mean neourethral length was 3.78 ± 1.1 cm. Postoperative complications occurred in 21.43%: UCF in 16.6%, meatal stenosis in 14.29%, and stricture in 4.76%. No diverticula, residual chordee, or penile torsion were noted. All UCFs were successfully repaired. The mean follow-up was 9 months. Conclusion: Single-stage modified TPIFU is effective for proximal hypospadias with severe chordee. The described modifications potentially reduce complications and eliminate the need for a staged repair. Longer-term studies with larger cohorts are warranted to validate these findings.
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Introduction

Hypospadias is a common congenital genital abnormality in boys where the urethra open in ventral surface. Amongst all, proximal hypospadias accounts for 20% of all. Proximal hypospadias with severe ventral curvature accounts for the most difficult cases to repair with maximum reported complications. Though commonly used procedures for single stage urethroplasty are Duckett's, Onlay and Koyanagi urethroplasty still the final decision of repair whether staged or single stage depends on the operating surgeon based on the intraoperative findings.¹ Although some surgeons prefer doing staged urethroplasty to minimise complications several studies have shown that complications rate of staged procedures are no less than single stage procedures for severe hypospadias.¹ Advantage of single stage urethroplasty are cost effectiveness, less hospital stays, less exposure to anaesthesia. Amongst all, Transverse Preputial Island Flap urethroplasty (TPIFU) is the commonly performed procedure. Due to its complication rate, surgeon over years have tried modifying the procedure.^{1,2,3} In this study, we have slightly modified the procedure by making a wide slit distal meatus, performing an oval anastomosis in the proximal end, prolonging the indwelling catheter to 10 days to prevent stricture and fixing the urethral tube to the underlying corpora. This study intends to find the effectiveness of TPIFU in the short-term follow-up with our modifications.

Material and methods

This is a retrospective study conducted in an emerging tertiary centre of eastern India. Retrospective data were collected over a period of 20 months from May 2023 to December 2025. All children with mid or proximal hypospadias who underwent single stage TPIFU urethroplasty were included in this study. Basic demographic details were noted. Children were classified into mid-penile, proximal penile, penoscrotal and perineal hypospadias according to Duckett's classification. Preoperative assessment like glans width, position of meatus, urethral plate chordee were noted. Post operative the child was given IV antibiotics for 3 days, oral antibiotics and oxybutynin till catheter in situ. Catheter was removed on post-operative day 10 for all patients. Child was followed up on OPD at 1,3 and 6 months. Complications like meatal stenosis, urethrocutaneous fistula (UCF), urethral stricture, diverticula surgical site infections were noted. If any meatal stenosis or UCF developed on follow up parents were taught for self-calibration at home. Persistent UCF after 6 months required additional fistula closure.

Procedure:⁴

A circumcoronal incision was given without transecting the urethral plate was made. Penis degloved completely. Gittes' test was performed to assess chordee. If there is residual severe chordee then urethral plate was transected. Plate was completely taken

off the corporal bodies and all dysplastic fibrous spongiosa tissues also excised. If still chordee persists > 30 degree, then a dorsal plication was done.

Length from proposed neomeatus to native meatus was measured which represents the urethral defect. All our tubularisation was done over 8 Fr infant feeding tube. According to the measurement the appropriate preputial skin is cut and harvested carefully along with the mesentery. Careful dissection is required at this point to preserve the main blood supply to the skin. After tubularisation the tube was transposed on ventral surface from the right side, taking care of the vascular pedicle not be in tension. Pedicle was harvested till root of penis to prevent penile torsion. We took 3-4 interrupted suture on both the ends of the tube with intervening sutures being continuous. We modified our procedure by making an oblique proximal anastomosis between the native and neourethra, V shaped cut on distal meatus for meatoplasty, three fixing stitches of the tube to corporal bodies. Glansplasty was done and skin coverage given. The detail of the procedure is depicted in Figure 1 and Figure 2 and the post operative appearance in Figure 3.

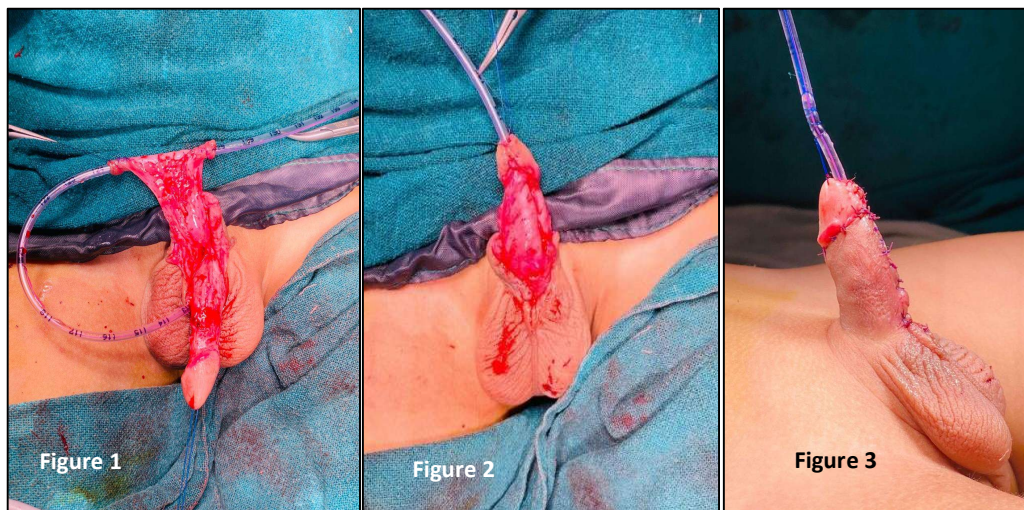


Figure 1 - The Duckett's tube on pedicle, Figure 2 - Duckett's tube anastomosed, Figure 3 - Post-op appearance.

Observations

A total of 42 boys were included who underwent DTU for mid and proximal hypospadias. The mean age was 3.67 ± 1.7 years. Types of hypospadias included were midshaft in 12 (28.57%) cases, proximal penile in 30 (71.43%) cases. Chordee was released after complete urethral plate transection and fibrous remnant excision in 39 (92.86%) cases, except in three (7.14%) cases where Baskin's plication was done. The mean stretched penile length was 3.64 ± 1.13 centimeters (cm). The mean distance of the proposed neourethra (from the native meatus to the proposed neo-meatus) was 3.18 ± 1.2 cm. The

mean neo-urethral length or the length of the Duckett's tube was 3.78 ± 1.1 cm. The mean duration of the procedure was 116 ± 13 minutes.

Post-operative complications were seen in nine boys (21.43%). Meatal stenosis was seen in six (14.29%). Urethrocutaneous fistula (UCF) was encountered in seven cases (16.6%), of which four (9.52%) were proximal and three (7.14%) were distal. All of these seven cases had single fistula, which did not close with daily self calibration at home. A proximal urethral stricture in two cases (4.76%). We did not encounter any cases of urethral diverticula. Of the two cases of urethral stricture, one underwent cystoscopy dilation with the required Visual Internal Urethrotomy (VIU).

All the UC fistula were operated after six to nine months of initial surgery and are doing well with single urinary stream and no recurrence. None had any persistent chordee or severe penile torsion within our short term follow up. The mean follow-up period was nine months (range 5 -14 months).

Discussion

There has always been a debate about surgery for severe form of hypospadias between single Vs stages and flap Vs Graft procedures. Some authors still conclude for doing a staged Bracka's, Byar's or a Duckett's urethroplasty for severe hypospadias with other penile abnormality with a proven low complications rate than single stage repair.¹ Proximal hypospadias is always a complex genitalia malformation that include ventral chordee, long urethral defect, dysplastic spongiosa and glans and penoscrotal transposition. All the above-mentioned factors are to be considered during surgery before deciding on the type of urethroplasty. In 1980, Professor Duckett made a historic innovation by describing transverse prepuce island flap urethroplasty (TPIFU). This procedure takes care of the chordee and repair can be completed in a single stage even for a proximal meatus. On the other hand, this procedure is also accompanied by short term complications and of course a steep learning curve.⁴ Although experienced surgeons are constantly improvising and modifying their techniques over years, the overall complications rate reported remains high as 37.9%.^{1,5} In this study, the overall complications were seen in 21.43% (nine boys). From this result we can see that the rest 71.57% cases were treated by single stage urethroplasty. This helped in reducing parental concern for major anaesthesia risk, cost of hospital stays and less burden on the

hospital beds. Since described in 1980, there have been many modifications of this procedure.

The mean age of operating in this study was 3.67 ± 1.7 years which is higher than what is recommended in literature. This delay could be due to late referral by physicians, parental anxiety towards early surgery and due to no major functional limitation, they choose to come late to us. Dale et al⁶ in their study on 108 boys stated that hypospadias repair is well done before 2 years of age and suggested that urethroplasty must be done at 18-24 months of age due to perceived benefits in terms of psychological impact, development, toilet-training versus potential for anaesthesia induced neurodegeneration.⁶ Complications are higher in older children due to many factors like non compliant to medications, genital/stent awareness, difficulty in handling them by parents, dermal papillary necrosis and cytokine modulation in pubertal boys that leads to poor wound healing.

In this study, we have routinely taken continuous sutures for tubularisation except 3 interrupted sutures at both the ends. Several studies prior compared interrupted versus continuous sutures and stated that interrupted sutures have less complications than taking continuous but we did not compare these both.^{7,8} We had a favourable outcome with continuous sutures as well.

Meatal stenosis in our study was reported to be 14.29%. All the 6 boys with stenosis were associated with UCF requiring dilation and fistula closure later.

UCF was seen in 16.6%. The cause of fistula in the present study could be because of poor wound healing, distal meatal stenosis, failure to invert the edges, tissue ischemia and local infections.⁹ Lyu et al¹⁰ had fistula rate of 34% in their cohort, Huag et al¹¹ in 2017 conducted a study on TPIFU for severe hypospadias and found to have a fistula rate of 15% . Similar low fistula rate of 17% was also shown by Jiayi Li et al ¹² in their study in 2023.

Urethral stricture in our study was seen in 4.76% which was managed cystoscopy and dilation in one case VIU in other case. Stricture formation usually occurs at the proximal anastomosis between the tube and native urethra due to tension, lack of vascularity and circumferential anastomosis between the two tubes. We reported a less incidence of stricture as the catheter was strictly kept for 10 days and parents were taught how to be compliant with it. We also modified our technique by ensuring an oblique proximal anastomosis between the neo and native urethra similar to the technique was also used by Jiayi Li et al.¹² Similar results were also seen by studies done by Imran et al¹³ and Haan et al¹⁴ who also had stricture rate <5% in their cohort of 115 and 161 boys respectively. Castagnetti et al³ in their systematic review over 20 years follow-up reported the stricture rate to 12%. We routinely stent the neourethra for 10 days in single stage repair for proximal hypospadias. Stenting the urethra acts as a mould for the neourethra to heal, prevent extravasation of urine and prevents inflammation. Recently published by Guanglun et al. suggested to keep the catheter for 6 weeks in proximal hypospadias with severe chordee undergoing single stage flap repair.¹⁵

One of the unique complications to DU is urethral diverticula formation mostly in the distal urethra. Causes can be distal meatal stenosis, tortuous and irregular flap and urodynamic changes due to this wide flap urethra. Also lack of support to the tubularised flap also results in diverticula. However, we didn't encounter any cases of diverticula so far the cause for which could be uniformity in formation of the neourethra and the 3 interrupted fixing stitches from the neourethra to underlying corpora. Reported incidence of urethral diverticula in other studies vary between 4-12%. In consistent with the present study Huang et al. in 2017 reported no diverticula in their cohort of 65 boys.¹¹

We did not encounter any residual chordee or penile torsion in our 6 month follow-up. Similar results were shown by Chong Wang et al. and Xu Cui et al. where there were no cases of recurrent chordee in their long term follow up for 10 years.^{7,16} But on the contrary, previous studies by Vandersteen et al. showed chordee appearing at 16 years follow up thereby concluding more long-term follow-up is required even after puberty.

They also stated that if follow-up is lesser than 6 years there might some complications which may go under-reported.¹⁷

The fundamental principles of surgical procedures for hypospadias have remained consistent throughout the years. When it comes to urethroplasty, surgeons have the option to perform single-or two-stage procedures, each with its own set of advantages and disadvantages. However, it is important to note that the quality and number of studies consulted to determine the superiority of one over the other may vary. Currently, available studies present conflicting results, highlighting the absence of a universally superior technique. Ultimately, the decision to perform single-or two-stage urethroplasty depends on the individual patient's condition and the surgeon's preference, taking into consideration the breadth and depth of research findings.

Limitations of this study are small cohort, retrospective nature, initial learning curve and short-term follow-up. Large sample size with a longer follow-up is required to comment on the feasibility and success of the procedure.

Conclusion

Single stage TPIFU remains a good procedure for hypospadias with severe chordee requiring urethral plate transection. It can prevent a staged procedure though it comes with its own set of complications. Short term follow-up shows good cosmesis and outcomes.

Take home message

- ❖ Single-stage modified TPIFU is a feasible option for selected children with proximal hypospadias and severe chordee.
- ❖ A 78.6% complication-free outcome was achieved in this series at short-term follow-up.
- ❖ Technical modifications—oblique proximal anastomosis, wide slit-like meatoplasty, 10-day stenting, and neourethral fixation—may help reduce postoperative complications.
- ❖ No urethral diverticula, residual chordee, or severe penile torsion were observed during the follow-up period.
- ❖ The technique can avoid a second-stage procedure, potentially reducing anesthesia exposure, hospital stay, and treatment burden.

- Long-term follow-up and larger prospective cohorts are needed to establish the durability of these results

References

1. Lyu Y, Chen F, Xie H, Huang Y, Wu M, Li X, et al. One-stage repair of proximal hypospadias by in situ tubularization of the transverse preputial island flap. *World J Urol.* 2023 Mar;41(3):813–9. doi:10.1007/s00345-023-04296-0. PMID: 36745192; PMCID: PMC10082699.
2. Stanasel I, Le HK, Bilgutay A, Roth DR, Gonzales ET, Baker LA, et al. Complications following staged hypospadias repair using transposed preputial skin flaps. *J Urol.* 2015 Jun;194(2):512–6. doi:10.1016/j.juro.2015.02.044.
3. Castagnetti M, El-Ghoneimi A. Surgical management of primary severe hypospadias in children: systematic 20-year review. *J Urol.* 2010 Oct;184(4):1469–74. doi:10.1016/j.juro.2010.06.044.
4. Duckett JW. Transverse preputial island flap technique for repair of severe hypospadias. *Urol Clin North Am.* 1980;7:423–30. doi:10.1016/S0094-0143(21)01243-X.
5. Andersson M, Sjostrom S, Doroszkiewicz M, Arnbjörnsson E. Urological results and patient satisfaction in adolescents after surgery for proximal hypospadias in childhood. *J Pediatr Urol.* 2020 Oct;16(5):660.e1–8. doi:10.1016/j.jpuro.2020.07.005.
6. Dale J, Woodward B, Elagami H. Age-dependent early complications of hypospadias repair: a single institutional experience. *Pediatr Surg Int.* 2023 Feb 11;39(1):115. doi:10.1007/s00383-023-05388-z. PMID: 36773206; PMCID: PMC9918807.
7. Wang C, Zhang ZC, Zhang DY, Hua Y, Liu F, He DW, et al. A new modified Duckett urethroplasty for repair of proximal hypospadias with severe chordee: outcomes of 133 patients. *BMC Urol.* 2022 Mar 28;22(1):47. doi:10.1186/s12894-022-00993-x. PMID: 35346153; PMCID: PMC8962008.
8. Samir M, Mahmoud MA, Azazy S, Tawfick A. Does the suturing technique (continuous versus interrupted) have an impact on the outcome of tubularized incised plate in hypospadias repair with adequate urethral plate? A prospective randomized study. *J Pediatr Urol.* 2021 Aug;17(4):519.e1–7. doi:10.1016/j.jpuro.2021.05.017.
9. Moursy EE. Outcome of proximal hypospadias repair using three different techniques. *J Pediatr Urol.* 2010 Feb;6(1):45–53. doi:10.1016/j.jpuro.2009.05.013.
10. Lyu Y, Yu L, Xie H, Huang Y, Li X, Sun L, et al. Comparison of short-term complications between onlay and Duckett urethroplasty and the analysis of risk factors. *Int Urol Nephrol.* 2019 Apr;51(4):783–8. doi:10.1007/s11255-019-02125-1.
11. Huang LQ, Guo YF, Ge Z, Lu RG, Deng YJ, Ma G, et al. A new modification of the Duckett technique for one-stage repairing urethral plate transected hypospadias:

- another option for severe hypospadias? Int Urol Nephrol. 2017 Nov;49(11):2091–7. doi:10.1007/s11255-017-1690-z.
12. Li J, Liu P, Yang Z, Wang X, Fan S, Li Z, et al. Reoperation frequency after transverse preputial Island flap urethroplasty “Duckett’s technique” in treatment of severe hypospadias: A single center study. Front Pediatr. 2023;10:1030649. doi:10.3389/fped.2022.1030649.
 13. Qadir I, Ali S, Jamil S, Muhammad H. Clinical efficacy of transverse preputial island flap urethroplasty for single-stage hypospadias repair in Children Hospital Faisalabad: A retrospective study. Prof Med J. 2024;31(01):7–11. doi:10.29309/TPMJ/2024.31.01.7709.
 14. Han W, Zhang W, Sun N, Yang Y. Comparison of continuous eversion and inverting subepithelial suture in transverse preputial island flap urethroplasty in proximal hypospadias repair: a retrospective study. Int Braz J Urol. 2020 Sep–Oct;46(5):772–7. doi:10.1590/S1677-5538.IBJU.2019.0484.
 15. Zhou G, Jiang M, Liu X, Yin J, Yang Z, Li S, et al. Effect of prolonging the duration of stenting on urethral stricture in proximal hypospadias with severe curvature repair: a prospective cohort study. Eur J Pediatr Surg. 2024 Aug;34(4):363–7. doi:10.1055/s-0043-1769797. Epub 2023 Jun 19. PMID: 37336243; PMCID: PMC11226329.
 16. Cui X, He Y, Huang W, Chen L, Wang Y, Zhou C. Clinical efficacy of transverse preputial island flap urethroplasty for single-stage correction of proximal hypospadias: a single-centre experience in Chinese patients. BMC Urol. 2020 Aug 5;20(1):118. doi:10.1186/s12894-020-00686-3. PMID: 32758190; PMCID: PMC7404920.
 17. Vandersteen DR, Husmann DA. Late onset recurrent penile chordee after successful correction at hypospadias repair. J Urol. 1998 Sep;160(3 Pt 2):1131–7. doi:10.1016/S0022-5347(01)62504-6.

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Received on 23 rd May 2025	Published on 1 st Oct 2026
Acknowledgment none	Conflicts of interest none
Source of funds none	Ethical clearance obtained
Citation	https://doi.org/10.70947/PST2026.39
Orcid	0000-0003-0117-0725



