Original Article

# Grafted Tubularised Incised Plate: A Right Option in the Management of Failed Mid-Penile and Distal Hypospadias

**Rajendra B. Nerli[1,2], Shoubhik Chandra[1], Shreyas Rai[1], Neeraj S. Dixit[1]**

[1]Department of Urology, JN Medical College, KLE Academy of Higher Education and Research, JNMC Campus, [2]Department of Urology, Urinary Biomarkers Research Centre, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi - 590 010, Karnataka, India

## Abstract

**Introduction:** Hypospadias is a common congenital anomaly of the urogenital system. The goal of the initial repair is to correct any curvature, ensuring that the penis is straight, allowing for successful intercourse, to create a functional neourethra to direct the urinary stream in a forward direction and to produce a cosmetically normal-appearing penis with a slit-like meatus at the tip of the glans. Failures and complications do occur. Failed hypospadias repair is often associated with penile skin loss or deficient local tissue, which leaves the penis short, scarred and hypovascular. Repair of a failed hypospadias surgery represents one of the most challenging and difficult tasks. We retrospectively evaluated our series of children who underwent reoperative grafted tubularised incised plate (G-TIP) repair for a mid-penile or distal penile hypospadias. **Materials and Methods:** With permission obtained from the university/institutional ethics committee, we retrospectively reviewed the inpatient and outpatient records of all children ≤18 years of age who underwent a reoperative G-TIP hypospadias repair. **Results:** During the study period, a total of 22 children (mean age: 6.8 years) underwent reoperative G-TIP repair. The mean number of previous repairs was 1.36. Nine (40.9%) of the children had persisting chordee. Complications were noted in five (22.7%) children. **Conclusion:** G-TIP is a good option in the management of mid-penile or distal penile failed hypospadias repairs. Although complications are noted, they are easily manageable.

**Keywords:** Failed hypospadias, graft, reoperation, tubularised incised plate urethroplasty

## Introduction

Repair of a failed hypospadias surgery (reoperative urethroplasty) represents one of the most challenging and difficult tasks for the reconstructive urologist/surgeon. The major problem that one encounters with these failed cases is a lack of proper past surgical history, which means that the surgeon has no baseline data about the initial degree of hypospadias or the type of repair(s) carried out. Probably, this information may not be very important to plan a surgical revision; however, it is important to understand the true long-term outcomes of earlier types of surgery. Failed repairs are associated with a wide range of issues that include patient dissatisfaction, urinary dysfunction, sexual dysfunction and/or inadequate cosmetic appearance. Several factors such as the location of the meatus, appearance of the urethral plate, quality and quantity of the remaining genital skin available for urethroplasty and wound closure further influence the process of decision-making.[1]

The techniques of reoperative urethroplasty in the paediatric age group usually reflect the prevailing trends similar to primary repairs. Complication rates following reoperations are far greater than in primary repairs, implying that the quality of residual tissues is abnormal and that one should not underestimate the complexity of these repairs.[1,2] The complication rates following reoperations vary between 14% and 50%.[2,3] Tubularised incised plate (TIP) reoperation has a potential advantage because skin flaps are not needed for the urethroplasty, but the technique can be used only when the urethral plate has been preserved and appears grossly supple despite previous surgery. Even then, the overall complication rate associated with this procedure ranges between 15% and 25%.[4]

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**Address for correspondence:** Dr. Rajendra B. Nerli, Department of Urology, JN Medical College, KLE Academy of Higher Education and Research (Deemed-to-be-University), JNMC Campus, Belagavi - 590 010, Karnataka, India.
E-mail: rbnerli@gmail.com

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The possible strategies that are available when a suitable urethral plate is present include island onlay flap as well as a dorsal inlay graft apart from TIP. Dorsal inlay graft urethroplasty is also called as grafted TIP (G-TIP) or 'Snodgrass' procedure. In this article, we retrospectively evaluated our series of children who underwent reoperative G-TIP repair for a mid-penile or distal penile hypospadias.

## Materials and Methods

With permission obtained from the university/institutional committee, we retrospectively reviewed the inpatient and outpatient records of all children ≤18 years of age who underwent a reoperative hypospadias repair. The age, previous surgery, level of hypospadias [Figure 1a] and presence of chordee were noted [Figure 1b]. Similarly, the choice of operation, source of graft, outcome of surgery and complications were noted and analysed.

### Surgical technique

The operation [Figures 2-4] was performed similarly to that of TIP reoperations.[5] The skin strip substituting for the urethral plate was incised dorsally as for TIP urethroplasty, but then, the defect created was grafted using oral mucosa/penile skin. The desired graft was outlined, injected with 1:100,000 epinephrine and harvested. The graft was defatted. A small graft was made easier to handle by wetting a small area on the paper drapes. Then, it was sewn to the perimeter of the incision using 6-0 polyglactin and quilted in the midline with 6-0 polyglactin on an RB-1 needle, which readily punctures the graft and secures it to the underlying tunica albuginea of the corpora. Urethroplasty, glansplasty and skin closure were then performed as in TIP reoperations.

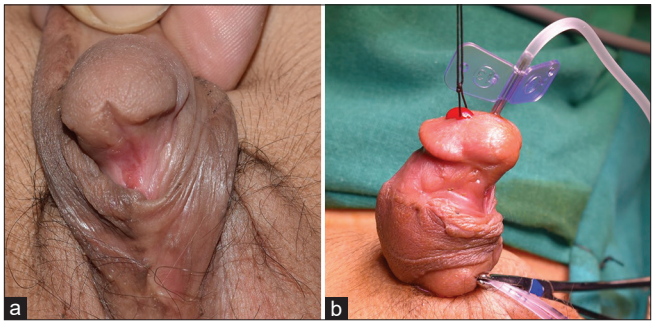


**Figure 1:** (a) Distal penile hypospadias. (b) Crede's manoeuvre shows chordee <30°

## Results

During the study period from January 2010 to December 2019, a total of 22 children (mean age: 6.8 years) underwent reoperative G-TIP repair for mid-penile/distal penile hypospadias. The site of primary external meatus, type of repair, number of repairs and presence of chordee are shown in Table 1. The mean number of previous repairs was 1.36, with eight of the children having been operated twice earlier. TIP procedure was the most common one done at the time of primary repair.

Fourteen (63.6%) of these children were referred from other centres for reoperative procedure and the remaining eight (36.4%) were from our own unit. On evaluation, all these children had a narrow urethral plate which needed to be augmented.

**Table 1: Patient demographics**

| | *n*=22 |
|---|---|
| Primary site of hypospadiac meatus | |
| Coronal/glanular | 3 |
| Distal penile | 15 |
| Mid-penile | 4 |
| Number of previous repairs (mean) | 1.36 |
| Type of primary repair | |
| TIP | 12 |
| Preputial onlay | 4 |
| Preputial inlay | 6 |

TIP: Tubularised incised plate

**Table 2: Operative details**

| | *n*=22 |
|---|---|
| Chordee repair | 9 |
| Degloving penis | 4 |
| Dorsal plication | 5 |
| Complications (%) | 5 (22.7) |

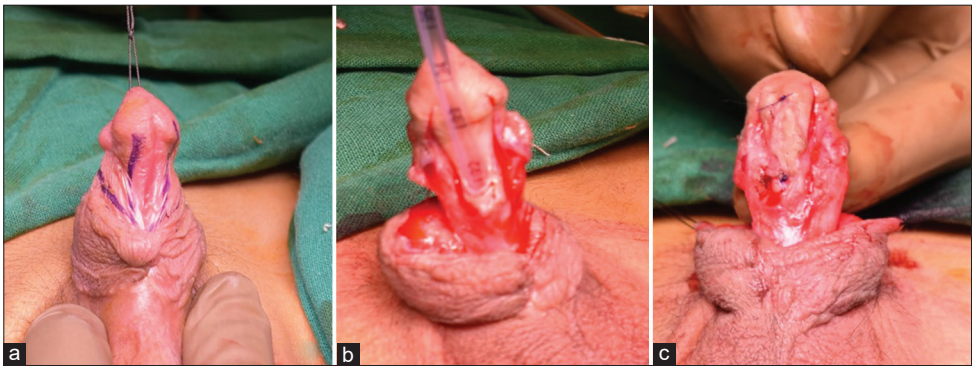


**Figure 2:** (a) Marking of incision. (b) The urethral plate is dissected out. (c) A dorsal incision made in the urethral plate and a free skin graft placed within it

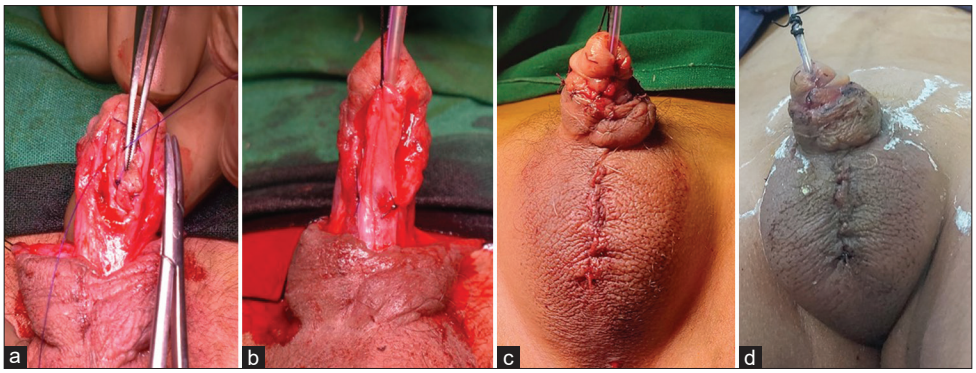


**Figure 3:** (a) The free graft sutured to the urethral plate. (b) A second-layer closure using vascularised tunica vaginalis. (c) The skin closed. (d) The appearance of penis at the end of 1-week

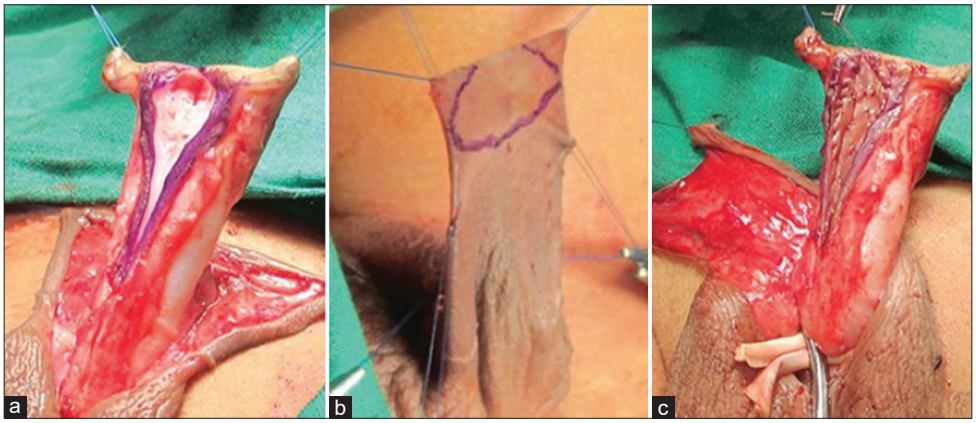


**Figure 4:** (a) A 9-year-old child with a failed repair. Dorsal incision made within the urethral plate. (b) Free skin graft being harvested from dorsal aspects of the penis. (c) Inlay of the graft within the urethral plate

The surrounding tissues were healthy and pliable enough so as to be tubularised. Nine (40.9%) children had persistent chordee which needed to be corrected. All children underwent G-TIP procedure with graft being harvested from the remaining prepuce in 2, buccal mucosa 18 and post-auricular skin in 2. Second-layer closure using vascularised tunica flap was done in all 22 children.

Complications were noted in five (22.7%) children and these included glans dehiscence in one, superficial wound necrosis in two and scrotal wound infection in two [Table 2]. The child with glandular dehiscence needed to undergo a two-staged buccal mucosal graft urethroplasty and the wounds in the remaining four healed by themselves. All children were able to void with good flow and without splaying. The mean follow-up has been 63 months. None of the children had meatal stenosis and chordee. Six of the children who were ≥18 years of age at the last follow-up were assessed using the Hypospadias Objective Penile Evaluation[6] score. All these six children scored >7 points (10 being the maximum). None of these six children had curvature during erection.

## Discussion

Our study has shown that G-TIP repair is feasible and a viable option in the management of reoperative mid-penile/distal penile hypospadias. The incidence of complications was 22.7%, which is comparable with similar studies, and all the children were able to void with good flow and without splaying. Pfistermuller *et al*.[7] undertook a systematic literature search, using MEDLINE and PubMed, to determine the overall complication rates of the TIP repair and also to assess the effects of technical modifications, length of follow-up and geographical location of reported results. A total of 49 studies (4675 patients) were included in the analysis. Fistula and reoperation rates were significantly higher in secondary repairs (15.5% and 23.3%) compared to primary proximal (10.3% and 12.2%) and primary distal (5.7% and 4.5%) ($P = 0.045$ and $P < 0.001$, respectively). Technical modifications reduced fistula rates from 10.3% to 3.3% ($P = 0.003$) and reoperation rates from 13.6% to 2.8% ($P = 0.001$). The rate of meatal stenosis was highest in the secondary repairs, with follow-up >1 year (12.7%). A comparison of geographical location showed that complication rates for all but one variable were significantly lower in North America when compared to Europe and the rest of the world. Mean meatal stenosis rates were 1.8% in North America, 3.4% in Europe and 8.2% in the rest of the world ($P = 0.002$). This remained significant in a multivariable model incorporating repair technique and length of follow-up ($P = 0.046$). Mean rates of urethral stricture,

fistula and reoperation followed a similar pattern ($P = 0.045$, $P = 0.009$ and $P < 0.001$, respectively). Mean follow-up was shortest in the North American group, at 11.9 months, compared to Europe, at 17.8 months, and the rest of the world, at 18.9 months. The authors highlighted the high degree of variability in assessment of outcomes, limiting their ability to compare studies.

Fistulas are the most common complication following hypospadias repair; however, glans dehiscence remains the most common indication for reoperative urethroplasty. Reoperative TIP urethroplasty is an option when the urethral plate is preserved after the previous surgery and lacks gross scarring. Dorsal inlay graft is a technique that is used whenever the urethral plate has been removed, but a strip of grossly healthy skin remains in its place.[8] Snodgrass *et al*.[8] reported 133 reoperations that included only 16 patients (12%) meeting the criteria for inlay grafts. The meatus was distal in 62%, and the mean number of failed repairs was 1.9 (range: 1–9). Indications included glans dehiscence in 15 patients and meatal stenosis with a diverticulum in 1 patient. Urethroplasty complications developed in 2 of 13 patients (15%) with follow-up: one recurrent glans dehiscence and one fistula.

Ye *et al*.[9] similarly reported their experience with single-stage dorsal inlay buccal mucosal grafts using the Snodgrass technique for complex redo cases in 53 patients aged from 3 to 34 years (average: 11.62 ± 7.18 years). The buccal mucosal graft was 3.0–7.5 cm in length and 0.7–2.0 cm in width. All patients required glanuloplasty, with buccal mucosal grafts extended to the tip of the glans. After a follow-up of 14–30 months (mean: 22.6 months), the total complication rate was 15.1%, with five cases of fistula and three cases of stricture. The authors concluded that inlaying dorsal buccal mucosal grafts and applying the Snodgrass technique was a reliable method for creating a substitute urethral plate for tubularisation.

Schwentner *et al*.[10] reported their experience with single-stage dorsal inlay urethroplasty using skin grafts for complex reoperations in 31 patients. Foreskin was used in 15 cases, penile skin in 12 and inguinal skin in 4. The average graft length was 3.92 cm. A total of 20 patients required glanuloplasty with a skin graft extended to the tip of the glans. After a mean follow-up of 30.71 months, five patients underwent redo surgery for a complication rate of 16.1%. Urethral stricture of the proximal anastomosis was the most frequent finding. The likelihood for this complication of proximal anastomotic stricture could be avoided by extending the midline dorsal incision approximately 5 mm into the normal urethra as suggested by Snodgrass and Bush.[5]

Snodgrass and Bush[11] prospectively collected data on consecutive hypospadias repairs (TIP, inlay and two-stage graft) from 2000 to 2015. In contrast to the 135/1085 (12%) complication rate in patients undergoing primary distal and proximal TIP repair, reoperative urethroplasty complications occurred in 61/191 (32%) TIP, 16/46 (35%) inlay and 49/124 (40%) two-stage repairs, $P < 0.0001$. Urethroplasty complications doubled in people undergoing a second hypospadias urethroplasty compared with those undergoing primary repair. This risk increased to 40% with three or more reoperations. Logistic regression demonstrated that each surgery increased the odds for additional complications 1.5-fold.

Devine[12] reasoned that 'once complications have occurred in hypospadias repairs, the surgeon has a tendency to attempt small operations, hoping to convert failure with a minimum of effort. This generally makes matters worse. In these cases, extensive resection of scarring, major shifts of tissues and meticulous reconstruction is necessary to transform a difficult problem into a therapeutic success'. Manzoni[1] in his editorial writes 'Surgical repair of hypospadias should be done by an experienced specialist, whether a pediatric urologist/surgeon, an adult reconstructive urologist, or a plastic surgeon. This is not surgery for the occasional operator, and so a throughput of at least 40–50 cases per year is desirable; this concept is even more relevant for complex redo cases'.[13]

## Conclusion

Management of failed hypospadias repair remains a challenge. There are broadly two options for re-reconstruction, depending on the residual status of the original urethral plate. When a dorsal strip of the urethral plate or skin can be salvaged, it is preferable to create a graft-augmented Snodgrass or 'G-TIP' repair. The alternative is a staged graft repair as popularised by Bracka. G-TIP is a single-stage and effective option in the management of mid-penile or distal penile failed hypospadias repairs.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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