

# Tubularized Preputial Free Graft One-Stage Repair for Proximal Hypospadias

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## Abstract

**Background:** One of the most frequent urogenital malformations in newborn boys is hypospadias. After undescended testis, in boys, it is the second most popular congenital abnormality. There are different one-stage surgical procedures used to repair proximal hypospadias, each has its own advantages and outcome. One of them is tubularized preputial free graft, which is first tried by the urologist team of Horton and Devine who used full thickness preputial grafts tubularized in a single-stage operation. **Aim:** The aim of this article is to assess the outcome of a one-stage tubularized preputial free graft. **Materials and Methods:** The present case series study provides a prospective analysis of 88 proximal hypospadiac boys operated on primarily over more than 5.5 years (from March 2014 to September 2019) using preputial skin as a tubularized free graft in one stage. Ethical approval for this review was obtained. **Results:** The present study includes 88 boys with hypospadias with mean age 20.6 months (ranging from 5 months to 7.5 years). The proximal hypospadias represents 33 (37.5%), penoscrotal 51 (58.0%), and scrotal 4 (4.5%) boys. Thirty-three boys out of 88 are under 12 years, 29 are between 12 and 24 years, and 26 above 24 years. The postoperative complications reported are fistula which occurs in 9 (10.3%), glans dehiscence in 3 (3.4%), meatal stenosis in 3 (3.4%), and diverticulum in 2 (2.3%), and numbers of complications with respect to age groups were six complications under 12 years, two complications between 12 and 24 years, and nine complications above 24 years. **Conclusion:** One-stage correction using a tubularized preputial free graft is an appropriate choice for repairing proximal hypospadias with chordee when compared with other widely used procedures for proximal cases.

**Keywords:** One-stage hypospadias repair, proximal hypospadias, tubularized preputial free graft

## INTRODUCTION

One of the most frequent urogenital malformations in newborn boys is hypospadias. After undescended testis, in boys, it is the second most popular congenital abnormality. It is characterized by a combination of the urethral entrance being shifted to the frontal surface of the penis, an aberrant frontal curve of the penis (known as “chordee”), and an atypical foreskin allocation with a “hood” found dorsally and lacking foreskin anteriorly.<sup>[1]</sup> Hypospadias can lead to voiding issues in children, as well as sexual disorders and infertility in adults. It is also linked to a distorted impression of one's own physique. In recent years, rapid detection and primal surgical interference have greatly enhanced functional and aesthetic results.<sup>[2]</sup> At birth, the precise incidence of hypospadias was complex to be calculated due to procedural constraints. The incidence

is approximately 1 in 200–300 male live births on report of the surveillance systems in the United States.<sup>[1]</sup>

The aim of the hypospadias surgical correction is to attain a straight penis in erection and to reconstruct neourethra at the tip of the glans with lifelong normal penile function (allowing voiding in position of standing and tolerating sexual activities) and cosmesis. There is a general consensus among hypospadiologists to repair the distal hypospadias in one stage; however, there is a debate whether single or staged repair is the optimal option for proximal hypospadias.<sup>[3]</sup>

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There are different one-stage surgical procedures used to repair proximal hypospadias, and each has its own advantages and outcome. One of them is tubularized preputial free graft which is first tried by the urologist team of Horton and Devine who used full thickness preputial grafts tubularized in a single-stage operation (Devine and Horton) but with high incidence of graft shrinkage, stricture, and other complications, which made the procedure less popular.<sup>[4,5]</sup>

The preponderance of articles includes retrospective case studies from a single facility or single surgeon, having a short re-examination time and a small sample of patients who were followed up on. In pediatric urology, high-quality randomized trials are exceedingly difficult to conduct; hence, they are seldom done.<sup>[3]</sup>

## MATERIALS AND METHODS

The present case series study provides a prospective analysis of 88 proximal hypospadiac boys operated on primarily over more than 5.5 years (from March 2014 to September 2019) using preputial skin as a tubularized free graft in one stage. This article received ethical approval.

### Inclusion criteria

All patients who had a preputial only flap urethroplasty for hypospadias correction were included.

### Exclusion criteria

Those who had previous circumcision or operation for correction of hypospadias were excluded.

The mean follow-up period was 33.4 months (ranging between 9 and 74 months). All cases had severe chordee with  $>30^\circ$  bending and poorly formed urethral plate. Demographic characteristics, follow-up time, difficulties, and reoperations were all documented.

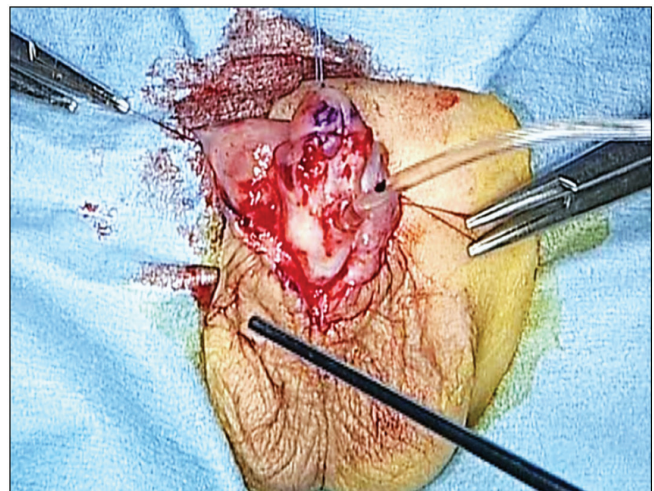
### Surgical technique

The glans is fixed with longitudinal stay suture, and the hypospadiac meatus is catheterized using an 8 Fr. urethral tube, as shown in Figure 1.

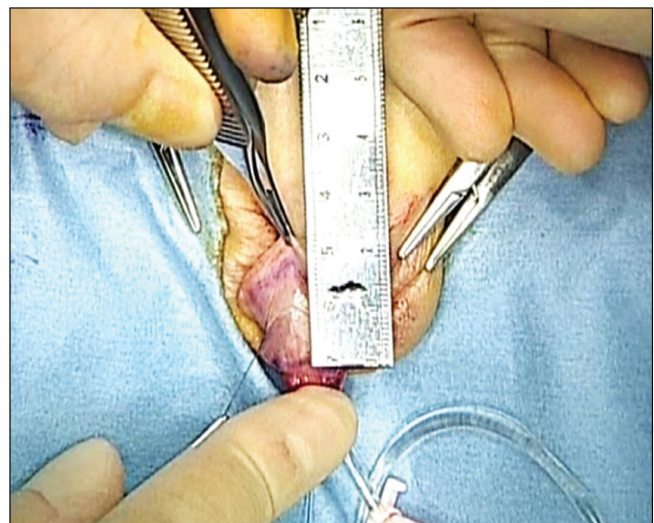
After marking as in Figure 2, four stay sutures are put at the angles of preputial fragment that will be grafted, and skin incision preserves an approximately 4 mm inner preputial collar below the coronal sulcus with at least 18 mm width and extended ventrally along the urethral plate as U-shaped incision incorporating the urethral meatus [Figure 3].

Degloving of the penile shaft to the penoscrotal junction with excision of the fibrous tissue lateral to the urethral plate is illustrated in Figure 4.

Artificial erection test then done with ventral curvature  $>30^\circ$  leads to urethral plate transection, with the distal



**Figure 1:** Stay suture and catheterization



**Figure 2:** U-shaped incision

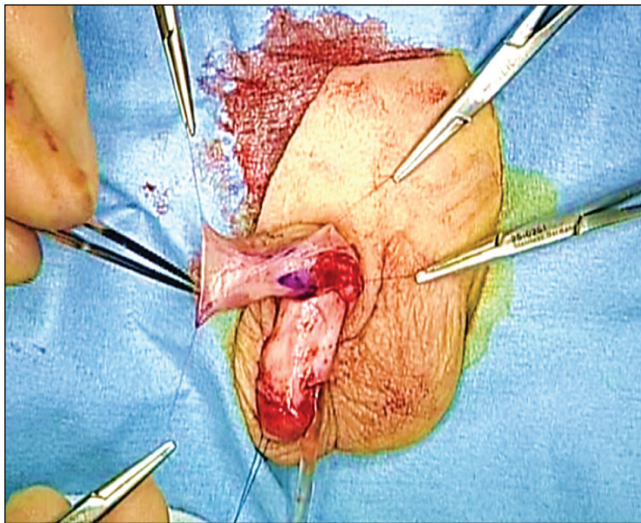
urethra cut back to the level of normal spongiosum. If penile curvature is  $>30^\circ$ , then it is considered unfit for one stage (corporotomies will be the best option with change to two-stage graft urethroplasty). With persistent curvature  $<30^\circ$ , the penis is straightened by dorsal plication.

The preputial graft is harvested as a full-thickness graft and tubularized over 10 Fr. with two-layer suturing: the first is interrupted and the second is continuous in subepithelial manner using 7/0 polyglactine suture [Figure 5].

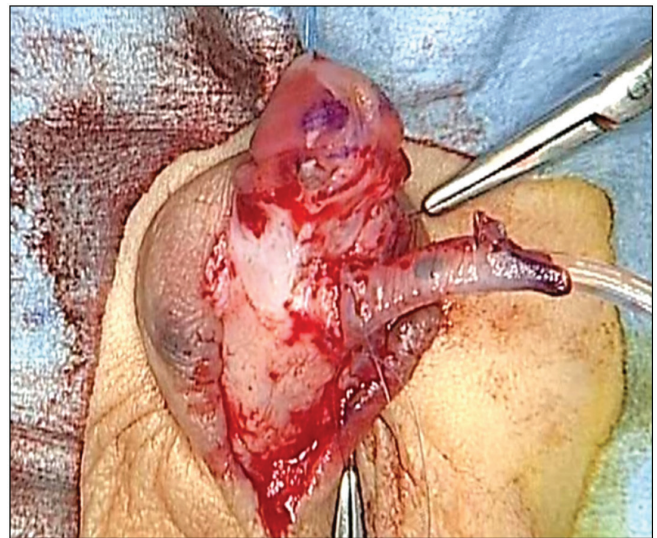
The tubed graft is anastomosed to the native meatus using interrupted subepithelial 7/0 polyglactine sutures as illustrated in Figure 6.

Glans wings are created and dissected laterally with extended mobilization at 3 and 9 o'clock to allow tension-free approximation over the neourethra.

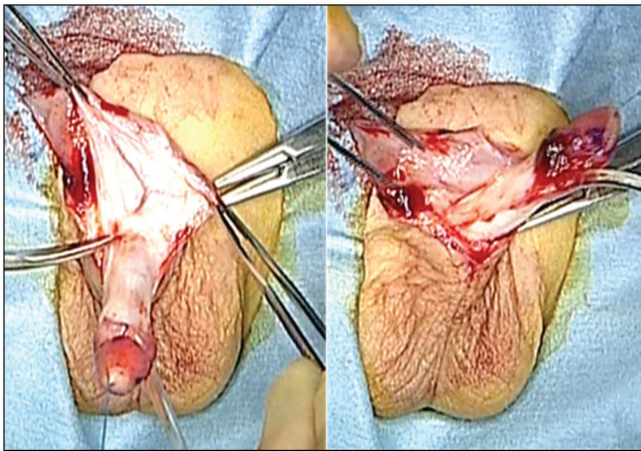
The graft is gently stretched distally putting its suture lines against the corpora.



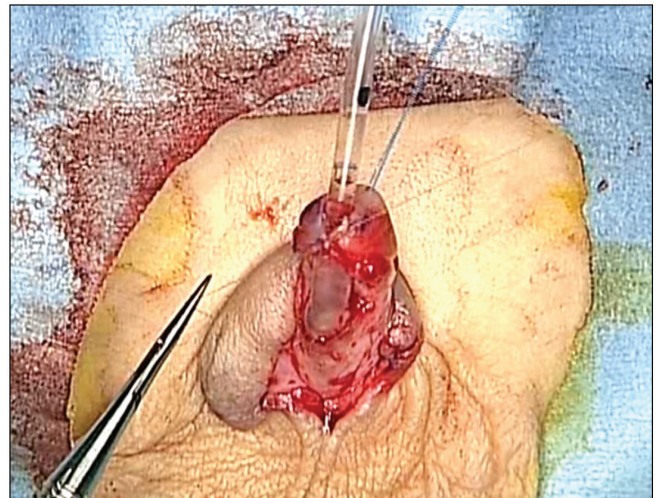
**Figure 3:** Marking step



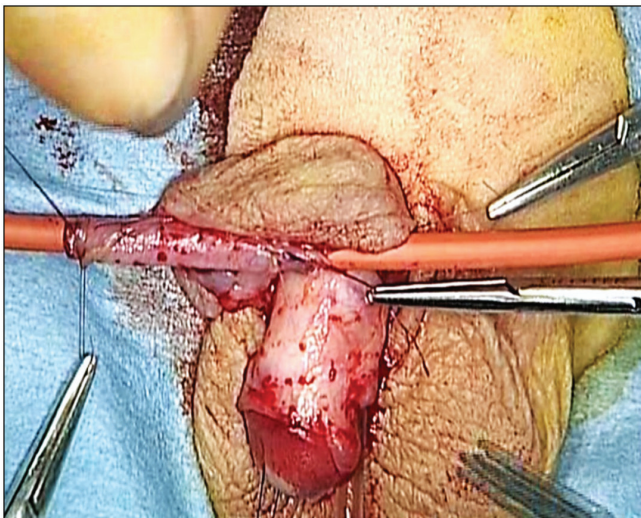
**Figure 6:** Anastomosis of the tubed graft



**Figure 4:** Degloving of penile shaft



**Figure 7:** Creation of glans wings



**Figure 5:** Harvesting of preputial graft and tubularization

Glans wings are sewn to the neomeatus using 7/0 polyglactine and then complete glansoplasty to the corona using 6/0 polyglactine suture, as shown in Figure 7.

The entire neourethra is covered with vascularized layer using dartos or tunica vaginalis [Figure 8].

Midline ventral skin closure is done using subcuticular 7/0 polyglactine suture [Figure 9].

### **Ethical approval**

The study was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki. It was carried out with patients' verbal and analytical approval before sample was taken. The study protocol and the subject information and consent form were reviewed and approved by a local Ethics Committee

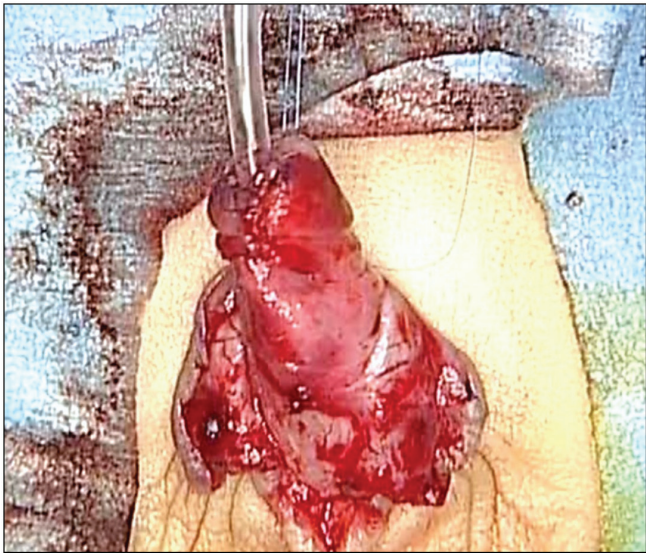


Figure 8: Covering of neourethra



Figure 9: Closure of the skin

according to the document number 39 (dated December 17, 2019) to get this approval.

RESULTS

The present study includes 88 boys with hypospadias with mean age 20.6 months (ranging from 5 months to 7.5 years) with a mean follow-up of 33.46 months.

Figure 10 shows the distribution of study sample according to position and shows that the proximal hypospadias represents 33 (37.5%), penoscrotal 51 (58.0%), and scrotal 4 boys (4.5%).

Figure 11 shows the distribution of study sample according to age groups and illustrates that 33 boys out of 88 are under 12 years, 29 are between 12 and 24 years, and 26 above 24 years.

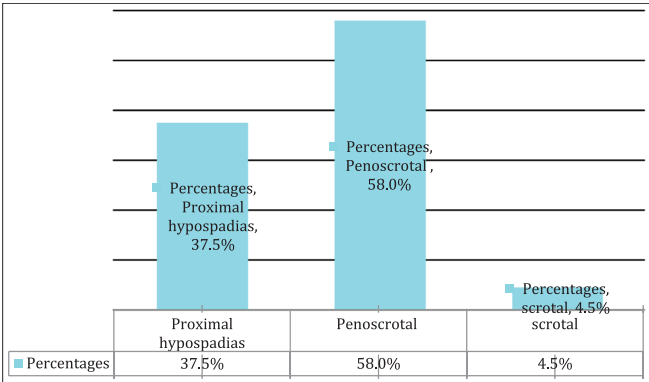


Figure 10: Position of hypospadias defect

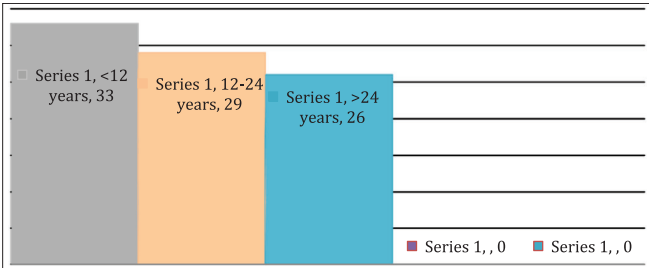


Figure 11: Distribution of study sample according to age groups

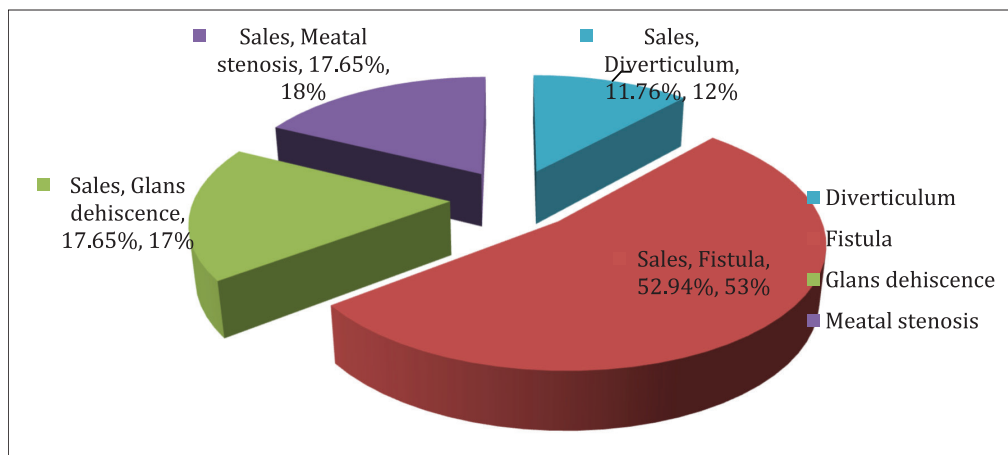
Figure 12 demonstrates the distribution of study sample according to the postoperative complications and shows that fistula occurs in 9 (10.3%), glans dehiscence in 3 (3.4%), meatal stenosis in 3 (3.4%), and diverticulum in 2 (2.3%).

Figure 13 illustrates the distribution of study sample according to the number of complications with respect to age groups and displays that six complications occur under 12 years, two complications occur between 12 and 24 years, and nine complications at the age above 24 years.

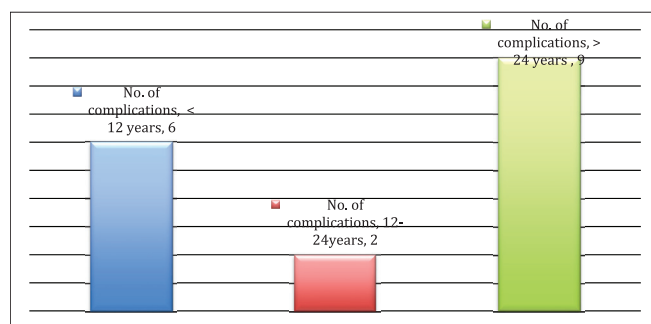
DISCUSSION

The surgical treatment of this congenital anomaly continues to be a problem for surgeons, and there is no consensus on the optimal procedure. In contrast to the aesthetic correction of distal hypospadias lacking the penile curvature, the restoration of mid- and proximal hypospadias has functional implications.<sup>[6]</sup> Trends have shifted from tiered repairs to one-stage repairs throughout the years.<sup>[7]</sup>

Once hypospadias is paired with severe chordee, urethral plate transection is typically suggested during orthoplasty to guarantee that chordee does not reoccur. According to one study, urethral fibrosis is a contributing factor in two-thirds of individuals with recurrent chordee.<sup>[8]</sup> The multi-staged procedure was once preferred for its simplicity and safety above its effectiveness, but many surgeons now utilize a single-stage repair, which has a high accomplishment rate that is both safe and effective.<sup>[5]</sup>



**Figure 12:** Distribution of study sample according to the postoperative complications



**Figure 13:** The distribution of study sample according to number of complications in respective to age group

When the urethral plate is transected, the preputial skin provides one of the most suitable epithelia for creating the neourethra which usually gives a 3 cm length or even more in some cases.<sup>[8]</sup>

Expert opinion was used to develop age criteria for hypospadias correction. The American Academy of Paediatrics Section on Urology in 1996 conducted a review of psychosomatic aspects, anaesthetic concerns, and technical characteristics of the correction before advising surgical repair among the ages of 6 to 12 months, assuming the surgeon, anaesthesiologist, and facility had prior experience with infants. Based on level 4 evidence (case series), the 2012 EAU recommendations suggest that surgery is mainly performed between the ages of 6 and 18 months, with one report of surgery between the ages of 4 and 6.<sup>[9]</sup>

A multivariable statistical analysis was performed on data from 391 patients with a median age of 2 years who had TIP throughout a 10-year period ending in 2007. The age variable was recorded and analyzed as a continuous variable, with results provided for those who had been repaired for less than 4 years vs. those who had been repaired for more than 4 years. Complications had a 3.25 relative risk (95 % CI: 1.44–7.35) in older males.<sup>[10]</sup>

Only a few series have been released. Long-term outcomes of free tube graft urethroplasty have been described in the literature.<sup>[11]</sup>

In our study, 88 cases were treated by tubularized preputial free graft one-stage repair for proximal hypospadias. Complications occurred in 17 (19.3%) of the cases, including 9 fistulas, 3 meatal stenosis, 3 glans dehiscence, and 2 diverticula, compared with De Sy and Oosterlinck, in which one-stage tubularized preputial graft outcomes were reported for 15 primary repairs in one series. Complications include three fistulas and one metal stenosis in four boys (27%).<sup>[12]</sup>

The retrospective analytic study by Powell *et al.*<sup>[13]</sup> included 61 one-stage tubularized preputial skin grafts with median follow-up of 9 months for the total groups of sample, there were 21 (34 %) adverse outcomes after these grafts, involving 11 fistulas, 8 strictures, 1 meatal stenosis, and 1 diverticulum. Nevertheless, glans dehiscence was also reported in three patients who were not included in the list of sequelae.

Another retrospective review<sup>[14]</sup> included 31 patients, mean age 14 years (15 months–26 years), who failed a mean of four prior repairs (1–18) and presented with a variety of complications, including fistulas, strictures, diverticula, and dehiscence (numbers not stated). Grafts were harvested from prepuce ( $n = 15$ ) and penile skin ( $n = 12$ ), with a mean follow-up of 30 months (8–66), complications occurred in five (16%)—four strictures at the proximal junction and one fistula.

Furthermore, a retrospective study of Wang *et al.*<sup>[15]</sup> found that a total of 125 patients (39.1%) developed consequences, 23 of whom (18.4%) had two or more outcomes. There were three main types of adverse consequences: 53 (16.6%) fistulas, 31 (9.7%) urethral strictures, and 41 (12.8%) diverticula.

In the prospective study, 5 (84.2%) of patients were lived without any long term adverse outcomes. In contrast, 16 cases (15.8%) showed persistent adverse events, the most frequent of which was fistula noticed in 5 cases (3%). Other adverse outcomes included recurrent chordee, meatal stenosis, glans, urethral dehiscence, and ventral scarring of the glans. On the first day following surgery, severe acute

post-operative edema was noted in 8 instances (7.9%). This could be due to lymphatic drainage manipulations during dissections. Dysuria and urinary tract infections were found in 23 (22.8%) and 2 (2%), respectively.<sup>[16]</sup>

One-stage preputial tubed grafts were also used in 40 of 80 primary repairs in a cohort of patients of which 17 had proximal hypospadias, whereas the remainder had a mid-shaft or more distal meatus. Complications developed in 50%, including fistulas and strictures.<sup>[17]</sup> Also, Obara *et al.*<sup>[18]</sup> concluded that a free graft in single-stage repair is a proper selection for correcting hypospadias with chordee. It was accomplished without adverse outcomes in 42 patients (75%). Of the remaining 14 patients with postoperative squeals requiring surgical interference, 2 had meatal stenosis, 9 had urethrocutaneous fistula, 1 had urethral diverticulum without meatal stenosis, and 1 had meatal regression. One patient who complained that the urine stream went upwards in an arc underwent cutback meatoplasty to correct the stream.

This graft has the advantages of being thin and flexible, taking dependably, being intended to be moist, having little possibility for hair development, and having an expendable donor site. One-stage repairs necessitate a surgeon's versatility and mastery of a variety of procedures that include urethral plate preservation and transection depending on the circumstances, as well as experience with one or more two-stage repairs for difficult and re-corrective situations.<sup>[19]</sup>

By using the preputial skin as a graft rather than a flap will give better function and cosmesis because the penile torsion can be avoided and asymmetric penile shaft was seen when a vascularized pedicle flap was used. This study suggests that stricture can be avoided by oblique anastomosis between proximal and native urethral opening.

Complication rates are influenced by a variety of factors that are outside the scope of this article. Complication reporting is also influenced by a variety of circumstances. Despite training environment, surgical degree, or period of practice, an up to date study of North American pediatric urologists depicted a substantial difference among complication rates published in the literature and the participants' operative results. The causes behind this intriguing discovery are unknown.<sup>[20]</sup>

## CONCLUSION

One stage correction using tubularized preputial free graft is a suitable option for surgical correction of proximal hypospadias with chordee.

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## Conflicts of interest

There are no conflicts of interest.

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