

Evaluation of preputial graft urethroplasty in primary repair of narrow plate hypospadias

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Background

There is yet no perfect Procedure for repairing hypospadias. In certain cases, a graft is required to reinforce the poor urethral plate (UP). The study aims to assess the efficacy of dorsal inlay preputial graft urethroplasty (DIGU) as a primary repair for narrow urethral plate distal and mid-penile hypospadias.

Patients and methods

A 40- child who underwent dorsal inlay preputial graft urethroplasty Repair for primary distal or mid-penile hypospadias at least 6 months old, as well as a UP less than 8 mm in a noncircumcised penis, were included in the research.

Results

The success rate was 75% (30 patients) and the Complications rate was 25% (10 patients). Six (60%) of the ten complicated patients had UP widths of 2.5–4 mm (total of 8 patients), implying that 75% of these patients had complications. There were four patients with fistula, two patients with meatal stenosis, two patients with meatal retraction, and two patients with failure.

Conclusion

One of the main factors influencing the surgical result of the hypospadias correction is the width and configuration of the UP.

Keywords:

hypospadias, preputial graft urethroplasty, primary repair, narrow plate hypospadias

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Abbreviations: DIGU Dorsal inlay preputial graft urethroplasty, TIP Tubularized incised plate, HOSE Hypospadias objective scoring evaluation, UP Urethral plate.

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Patients and methods

In order to conduct a prospective cross-sectional study, it was decided to do so between May 2018 and October 2019. Patients with hypospadias who were admitted to a hospital's hypospadias clinic were included in the research.

The guardians of the patients provided signed informed permission. The study was carried out with the faculty of medicine's ethical committee's consent.

The inclusion criteria were a noncircumcised penis, a UP smaller than 8 mm, and a kid who complained of distal or mid-penile hypospadias at age 6 months or older. Excluded from the study were children with proximal hypospadias, nonpreservable plates, severe Chordee (30% or more), redo hypospadias, and patients who had undergone circumcision.

The direction of the urine stream, signs of a urinary tract infection, past medical history and previous repairs, a family history of hypospadias among first-degree relatives, a history of hormonal intake (local or systemic), a history of acute or chronic diseases during gestation, exposure to medications or environmental endocrinological disruptors—all of these factors have been gathered from the patient's parents.

Physical examination to determine body weight, any related congenital abnormalities, and any other health issues. The length and size of the penis (normal or small phallus) are examined locally together with the external genitalia. The location, quality, and presence or absence of surrounding glossy skin were assessed for the meatus. We looked at the prepuce's width and shape (complete or partial). The glans' width and shape (cleft, incomplete cleft, and flat) were assessed. The width, length, and presence of concomitant urethral dysplasia were assessed in the UP. A well-developed or undeveloped scrotal wall can be determined by

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examining the presence and degree of penile rotation, transposition, and curvature. Examining the contents of the scrotum: feeling the testis, determining its location, size, bilateral symmetry, and presence or absence (undescended), as well as any related issues such as hydrocele or congenital hernia.

Before surgery, the hypospadias objective score assessment (HOSE) was completed. It includes assessing the shape and location of the meatus, the urine stream, the parents' assessment of the erection's straightness, and the existence of any comorbid urethral fistula. A total score of 5 would be the lowest and 16 the maximum.

Routine tests such as complete blood count (CBC), prothrombin time (PT), Partial Thromboplastin Time (PTT), urine analysis, and, if required, urine culture. Ultrasonography of the abdomen and pelvis to rule out related congenital abnormalities. IV third-generation cephalosporins (50 mg/kg) were given preoperatively to every patient before the administration of general anesthesia. To lessen the pain following surgery, a caudal block was then performed. To reveal the external genitalia, patients are positioned in a supine posture and sterilized and towed.

Preoperative measurements, including penile girth, UP length (Fig. 1A), UP width (Fig. 1B), vertical glans length (Fig. 2A), and maximum glans width (Fig. 2B), were obtained before the commencement of the procedure after anesthesia was induced.

Surgical technique

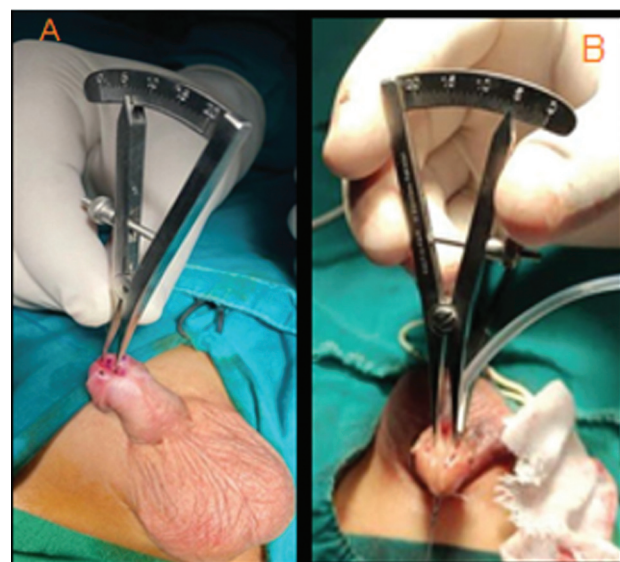
The surgical technique started with a midline traction suture using a 5/0 Vicryl suture that was placed in the glans just beyond the anticipated dorsal lip of the

neomeatus to secure the urethral stent (Fig. 3A). Nelaton or Silicone 6–8 Fr was used to catheterize the hypospadias urethral meatus (Fig. 3B).

A circumferential subcoronal skin incision was made with a 'U' shape on the limits of the UP, 1–2 mm proximal to the meatus. Care must be taken to preserve enough inner prepuce to approximate the formation of what is called a 'mucosal collar' in the ventral midline after glansplasty (Fig. 4).

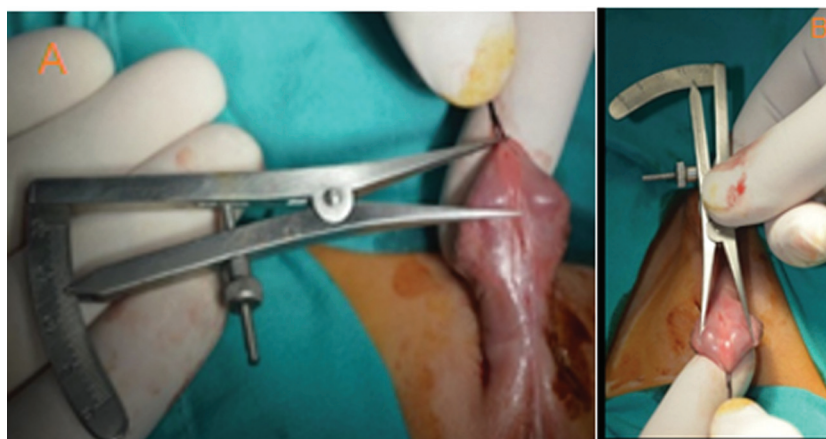
The UP was separated from the distal penile skin and glans wings by two parallel incisions that ran from the para-meatal skin to the tip of the glans. Tenotomy scissors are used to mobilize the glandular wings, being

Figure 1

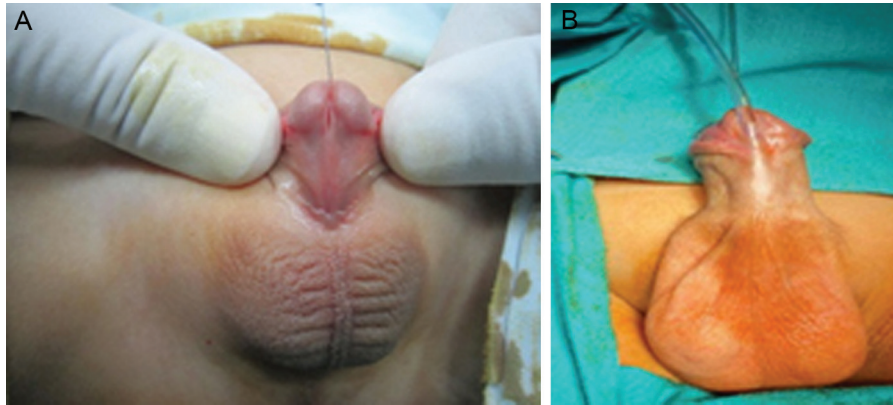


A-Urethral plate length (measured from the tip of the glans to the hypospadias meatus). B- Urethral plate width (measured at the point of maximum width) measure 2mm.

Figure 2



A-Measurement of glandular vertical length. B-Measurement of glandular width.

Figure 3

A: A midline traction suture was placed in the glans just beyond the anticipated dorsal lip of the neomeatus. B: Insertion of 6–8 Fr. Nealon catheter in the hypospadias urethral meatus.

Figure 4

U shaped incision on the limits of the urethral plate.

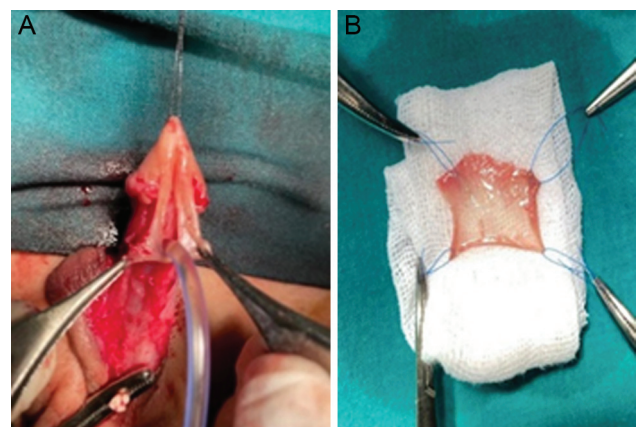
careful to preserve the vascularity of the UP and to leave sufficient thickness to allow the wings to be firmly approached without experiencing any opposing tension. Make a midline incision from the meatus to the end of the plate with a scalpel.

To prevent meatal stenosis, the distal glans' edge should not be cut. This relaxing incision continues to the corpora cavernosa in all instances, albeit its exact depth varies according to the breadth and depth of the plate. Penile skin degloving to the penoscrotal junction and if a minimum chordee found, it has to be corrected (Fig. 5A).

A free graft was measured, harvested, defatted, and stitched to the UP from the inner prepuce (Fig. 5B). The graft was stitched to the borders of the incised plate using interrupted 6/0 polyglactin sutures that extended from the old meatus to the tip of the glans. The graft width and length differed in each case, depending on the position of the meatus, the features of the UP, and the depth of the midline incision. (Fig. 6).

Two layers of the neourethra are closed using a (6–0 Vicryl sutures). A second interrupted layer served as reinforcement for the first layer, which was formerly a continuous subcuticular layer (Fig. 7). To prevent the development of fistulas, the whole neourethra was covered with a localized flap of the Dartos fascia that was vascularized.

The glans wings were closed, with a good cosmetic appearance of the glans and the neomeatus. The first suture begins at the desired point for the ventral lip of

Figure 5

A: Degloving of the penile skin to the penoscrotal junction. B: A free graft was measured, harvested and defatted from the inner prepuce.

the meatus through the epithelium without securing the glans to the underlying neourethra using a 6-0 Vicryl suture. Then a subepithelial second suture is applied to reinforce the neomeatus and prevent partial glandular dehiscence. The remaining part of the glans proximal to the corona was closed by interrupted sutures using 6-0 Vicryl. The subcoronal collar and ventral shaft skin are then closed in the midline (Fig. 8). The subcoronal collar of the inner prepuce was sutured, the extra skin was removed, and the remaining edges were stitched.

A gauze dressing with Vaseline paper and gentle pressure. To prevent the dressing from slipping, we

used a simple wrap dressing around the shaft of the penis and secured it to the patient at the suprapubic region. The tip of the glans must be exposed for close observation and follow-up of the vascularity of the glans.

Postoperative care and follow-up

The repair was done as day-care surgery, and all the patients were discharged. They received an oral broad-spectrum antibiotic for the duration of the urethral catheter insertion and an analgesic. The catheter is looked after, and its patency is checked on a regular basis by flushing it with 10 mL of saline every 6 h to prevent obstruction.

The schedule for follow-up through the outpatient clinic is on the third day, 'dressing removal.' On the seventh day, 'stent removal,' after 1 month, 3 and 6 months later (Fig. 9).

All patients were evaluated for functional and cosmetic outcomes based on the position of the meatus at the glans tip, Meatal shape, micturition quality (stream), home-filmed videos of micturition, and calibration of the neourethra and plate using urethral dilators. The straightness of erection was evaluated by the parents. The complications of surgery include fistula, meatal stenosis, glandular dehiscence, stricture, and urethral diverticula. At 1-month postoperative the cosmetic outcome was evaluated according to the hypospadias objective scoring evaluation HOSE [6].

Statistical analysis

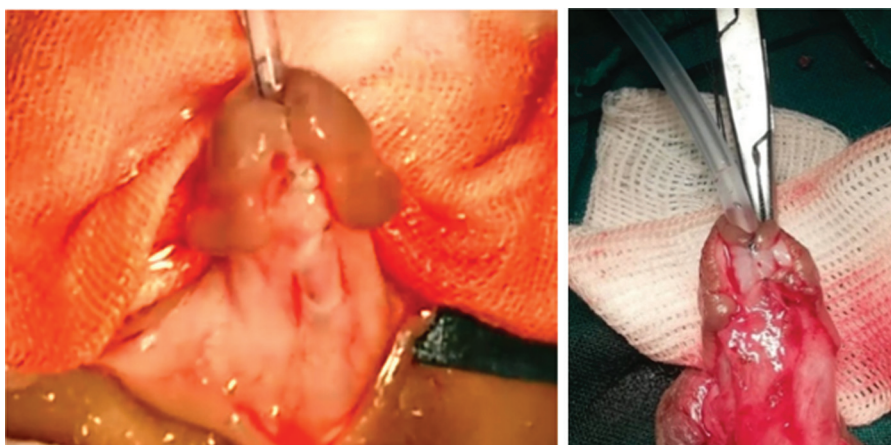
Version 26 of SPSS (Statistical Package for Social Sciences) was used to analyze the data. Numbers and percentages were used to characterize qualitative data. The mean SD was used to characterize

Figure 6



The graft was fixed to the medial edges of the incised plate.

Figure 7



The neourethra is closed using a fine suture.

Figure 8



The glans wings were closed with a good cosmetic appearance by a subepithelial second suture.

quantitative parametric data. Min-max and median were terms used to characterize quantitative nonparametric data.

Results

In this study, a total of 40 children with distal to mid-penile hypospadias and narrow UP, which is defined by a plate width of less than 8 mm, were repaired using DIGU.

The age of patients ranged from 6 to 62 months (Table 1). The most frequently reported patient condition was distal penile hypospadias. Six (15%) patients had a positive family history of hypospadias. Two (5%) patients had a congenital inguinal hernia that was corrected before hypospadias repair (Table 1). As regards the location of the hypospadias meatus, the coronal meatus was found in five (12.5%) patients, the subcoronal in eight (20%) patients, the distal penile in 23 (57.5%) patients, and the midpenile in four (10%) patients. Patients’ UP widths ranged from 2.5 to 7.5 mm, with a mean value±(SD) of 5.74±1.50 mm and a median value of 6 mm.

A mean operative time value±(SD) of 95.20 ±11.35 min. Patients’ UP widths after incision ranged from 6 to 14 mm, with a mean±(SD) of 8.79 ±1.71 mm and a median value of 8.5 mm. (Table 1).

Figure 9



Early postoperative follow-up.

Table 1 Demography of hypospadias patients in the study (NO. of patients=40).

Age (months)	
Mean±SD	18.88±12.62
Type of hypospadias of the studied patients	
Coronal	5 (12.5%)
Subcoronal	8 (20.0%)
Distal penile	23 (57.5%)
Mid penile	4 (10.0%)
Family history of hypospadias	
Yes	6 (15%)
No	34 (85%)
Associated Congenital Anomalies	
Congenital inguinal hernia	2 (5%)
No	38 (95%)
Glans length (mm) of the studied patients	
Mean±SD	8.41±2.87
Glans width (mm) of the studied patients	
Mean±SD	9.34±1.78
Urethral plate length (mm) of the studied patients	
Mean±SD	9.50±3.03
Urethral plate width (mm) of the studied patients	
Mean±SD	5.74±1.50
Urethral plate width after incision (mm)	
Mean±SD	8.79±1.71

The success rate was 75% (30 patients), and the complication rate was 25% (10 patients). There were four patients with fistula, two patients with meatal stenosis, two patients with meatal retraction, and two patients with failure. Six (60%) of the 10 complicated patients had UP widths of 2.5–4 mm (total of eight patients), implying that 75% of these patients had complications.

The urethrocutaneous fistula was detected in 4 (10%) cases (2 coronal and 2 sub-coronal) (Table 2; Fig. 10A). The fistulae were small and without meatal stenosis. Fistulae were repaired six months later by simple closure. Two (5%) patients had meatal stenosis; both

Table 2 Postoperative complications according to urethral plate width (mm)

Fistula according to urethral plate width (mm)	Patients (n=40)
2.5	1
3.5	1
5	1
6.5	1
Metal stenosis according to urethral plate width (mm)	
4	1
5.5	1
Metal retraction according to urethral plate width (mm)	
3.5	1
6	1
Failure according to urethral plate width (mm)	
2.5	1
3	1

responded to regular dilatation. (Table 2; Fig. 10B). Failure had occurred in two (5%) patients with dehiscence and ‘disrupted urethroplasty,’ both of whom operated after 6 months. The preoperative HOSE score of patients was 9.1 ± 1.3 . The postoperative HOSE score was ranged from 12 to 16 with a mean value (\pm SD) of 13.68 ± 1.46 .

Table 3 Postoperative complications according to age (months)

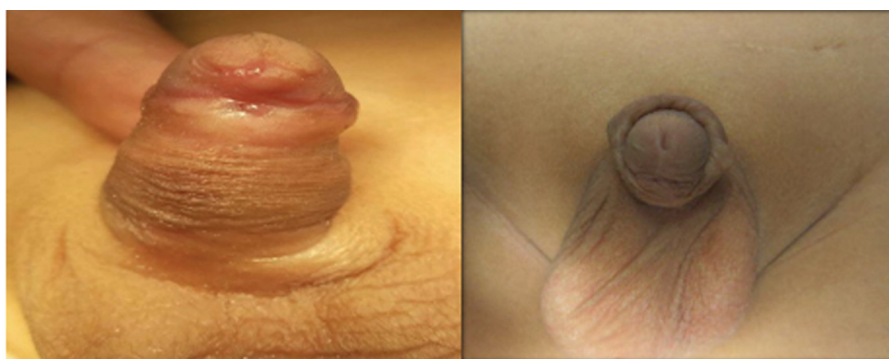
Complications	Age (months)
Fistula	8
Fistula	13
Fistula	17
Fistula	19
Meatal stenosis	11
Meatal stenosis	26
Metal retraction	20
Metal retraction	23
Failure	10
Failure	30

Discussion

Pediatric surgeons believe that patients with a UP less than 8 mm ‘narrow UP’ should not undergo TIP, also known as the Snodgrass procedure, due to the possibility of complications such as neourethral and/or meatal stenosis [7,8]. In situations when there is inadequate local tissue or unfavorable UP (inelastic, diseased, or narrow), a graft may be required to essentially reinforce the UP [9]. Kolon and Gonzales introduced the idea of a DIGU when they created a neourethra by using an inner prepuce as an inlay graft. This allowed them to expand the UP, increase the surface area of healthy epithelium, create a bigger neourethral meatus, and prevent the neourethra from having a huge, denuded surface area that is liable to re-epithelialization and possible scar formation, which results in stenosis [4].

In our study, we present our experience with the DIGU in 40 cases of primary distal to midpenile hypospadias. All cases in our study were narrow UPs (<8 mm), with a range of 2.5–7.5 mm. Patients with UP width less than or equal to 4 mm were eight (20%), and patients with UP width 4.5–7.5 mm were 32 (80%). The success rate in our study was 75% (30 patients), and the failure rate was 25% (10 patients). Six (60%) patients of 10 complicated ‘failed’ patients had a UP width of 2.5–4 mm Table 3. However, grafting of an incised plate with a pre-incisional width less than or equal to 4 mm may be associated with a higher fistula rate and failure. The UP configuration and width still is a major determinant on the surgical outcome of the hypospadias repair. There are several scoring systems for hypospadias evolution, but we used Holland *et al.*, 2001 score because it is the simplest one [6,10–12].

Figure 10



A-Postoperative Coronal Fistula. B-Postoperative Meatal Stenosis.

The lack of a comparison group for the standardized TIP urethroplasty was one of the study's apparent limitations. To confirm the long-term effects of grafting the incised poor plates, a study with more participants and long-term follow-up, including functional evaluation with uroflowmetry, is required. Also, we recommend another study with proximal penile hypospadias.

Conclusion

The authors' experience indicates that a width of 4 mm is the lowest limit of clinical significance that denotes inadequate UP. Cases with a native plate width less than 4 mm showed considerably worse results even after grafting, indicating that native plate width is still an important determinant of outcome. Grafting that plate did not improve its poor natural properties during the primary repair, but it did provide a good neourethral wall for a possible secondary repair without causing graft related issues.

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To Prof. Dr. Hesham Mohamed Elsaket, the peace to his soul.

Declaration

Ethical approval and consent to participant: Approved

Consent for publication: Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Ethical approval: This study was approved by the ethical committee of the Cairo faculty of medicine.

Availability of data and material: Available when editor requests.

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Nil.

Conflicts of interest

Competing Interests: None.

References

- 1 Thakur D. Outcome of Snodgrass Repair in Distal Hypospadias-An Institutional Experience. *J Soc Surg Nepal* 2018; 21:28–31.
- 2 Kaplan GW. Repair of proximal hypospadias using a preputial free graft for neourethral construction and a preputial pedicle flap for ventral skin coverage. *J Urol* 1988; 140:1270–1272.
- 3 Kolon TF, Gonzales ET. The dorsal inlay graft for hypospadias repair. *J urol* 2000; 163:1941–1943.
- 4 Zhou Y, Lu J, Takahashi G. Snodgrass procedure for primary hypospadias repair. *Int j urol* 2002; 9:215–218.
- 5 Seleim H, ElSheemy M, Abdalazeem Y, Abdullateef K, Arafa M, Shouman A, *et al.* Comprehensive evaluation of grafting the preservable narrow plates with consideration of native plate width at primary hypospadias surgery. *J pediatr urol* 2019; 15:345.e1–e7.
- 6 Holland A, Smith G, Ross F, Cass D. HOSE: an objective scoring system for evaluating the results of hypospadias surgery. *BJU int* 2001; 88: 255–258.
- 7 Pramod S, Anukethan J. Short term outcomes of snodgrass urethroplasty in distal and mid penile hypospadias. *Int Surg J* 2018; 5:1878–1881.
- 8 Keays MA, Dave S. Current hypospadias management: Diagnosis, surgical management, and long-term patient-centred outcomes. *Can Urol Assoc J* 2017; 11(1-2Suppl1):S48.
- 9 Hayashi Y, Kojima Y. Current concepts in hypospadias surgery. *Int j urol* 2008; 15:651–664.
- 10 Hadidi AT. Classification of hypospadias. *Hypospadias surgery: an illustrated guide* 2004; 5:79–82.
- 11 Van der Toorn F, de Jong TP, de Gier RP, Callewaert PR, van der Horst EH, Steffens MG, *et al.* Introducing the HOPE (Hypospadias Objective Penile Evaluation)-score: a validation study of an objective scoring system for evaluating cosmetic appearance in hypospadias patients. *J pediatr urol*. 2013 9:1006–1016.
- 12 Esposito C, Savanelli A, Escolino M, Giurin I, Iaquinto M, Alicchio F, *et al.* Preputioplasty associated with urethroplasty for correction of distal hypospadias: a prospective study and proposition of a new objective scoring system for evaluation of esthetic and functional outcome. *J pediatr urol* 2014; 10:294–299.