Comparison of the of tubularised incised plate uretheroplasty versus grafted tubularised incised plate uretheroplasty in distal hypospadias repair with narrow uretheral plate

Original Article

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ABSTRACT

Background: Tubularised incised plate uretheroplasty (TIPU) repair has become the most popular technique for repairing distal hypospadias. Several complications, including meatal stenosis, have been reported. Dorsal inlay graft urethroplasty ('Snodgraft') has been described as an effective method for hypospadias repair with the main advantage of reducing the risk of meatal stenosis.

Aim: To compare the outcomes of TIPU and grafted TIPU in cases with narrow urethral plates.

Patients and Methods: This retrospective cohort study between January 2021 and December 2022. Patients with distal hypospadias with a narrow urethral plate narrower than 8 mm were included in this study. 25 patients in TIPU group and 25 patients in the grafted TIPU group. Data collected included age at repair, type of distal hypospadias, stretched penile length, and penile girth, urethral plate width, and glans width. The operative time and the presence of postoperative complications such as urethral fistula, meatal stenosis, urethral stricture, diverticulum, or failure of the repair.

Results: The mean width of the urethral plate in TIPU was 5.5 mm (range 3–8 mm) and in grafted TIPU was 5.8 mm (range 5–8 mm). The mean glans width in TIPU was 13.5 mm (range 9–20 mm) and in grafted TIPU was 12.1 mm (range 8–17 mm). The mean operative time in TIPU was 92.4 min (range 86–105 min) and in grafted TIPU was 115.2 min (range 80–130 min) and the difference was statistically significant ($P<0.01$).

Urethral fistula was detected in 2 (8%) cases of TIPU group and similarly in 2 (8%) cases of grafted TIPUU group. The failure of repair occurred in 1 (4%) case of TIPU while occurred in 2 (8%) cases of grafted TIPU. No cases of urethral strictures were detected.

Conclusion: Grafting the urethral plate had no added benefit to the original TIP urethroplasty regarding the incidence of meatal stenosis and urethral stricture complications.

Key Words: Distal hypospadias, grafted tubularized incised plate uretheroplasty, snodgrass, urethral plate.

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INTRODUCTION

Hypospadias is the most frequent congenital penile defect affecting the external male genitalia, with an incidence of around 1 in 250 male newborns, although this seems to be increasing[1]. Surgery in hypospadias repair aims for both satisfactory cosmetical and functional outcomes. The goal of the reconstructive techniques is to create a penis with a good caliber urethra with slit-like meatus at the tip of the glans (urethroplasty procedure), a straight erectile position with normal sexual function, and a minimal scarred penile skin[2]. In general, the choice of the applied technique results from an intraoperative decision-making process based on the anatomy and the presentation of the hypospadias combined with the experience of the surgeon[3]. It could be stated that there are as many techniques and modifications as surgeons who perform hypospadias correction. No technique for reconstruction has ever emerged as a gold-standard and many techniques are recognized as effective[4]. The commonest repairs to correct anterior (distal) hypospadias are the Tubularized Incised Plate (TIP) urethroplasty[5], Duplay [1874], Mathieu [1932], and Meatal Advancement and Glanuloplasty Incorporation (MAGPI) Duckett[6]. Of these procedures, TIP urethroplasty and Mathieu's have been widely practiced[7]. Tubularized incised plate urethroplasty repair[5] has become the most popular technique for repairing distal hypospadias at many institutions during the last two decades. Although this technique is easily applicable with good cosmetic results, several complications, including meatal and/or neourethral stenosis, have been reported. Dorsal inlay graft urethroplasty ('Snodgraft') using an

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inner preputial free graft has been described as an effective method for hypospadias repair with the main advantage of reducing the risk of meatal/neourethral stenosis. Since this modification was first reported[8], only a few studies of the modification have been conducted to date. The major indications for grafting were the presence of a narrow or shallow glans, or insufficient urethral plate width[9]. In a trial to address the issue of either to graft or not to graft the urethral plate; the study will compare the two techniques and report the results.

PATIENTS AND METHODS:

After obtaining approval from institutional review board (code number: R.24.01.2468), a retrospective cohort study was conducted, including patients who underwent TIPU and Grafted TIPU procedures in pediatric surgery department in Mansoura University Children Hospital (MUCH) between January 2021 and December 2022. Informed consent was taken from the parents. Patients with distal hypospadias with a narrow urethral plate narrower than 8 mm[10] were included in this study. Patients with follow-up period less than 1 year or incomplete data and redo cases were excluded. Patients were divided into two groups according to the technique performed 25 patients in TIPU group and 25 patients in grafted TIPU group. Data collected from patients records including age at repair, type of distal hypospadias, stretched penile length and penile girth, urethral plate width, glans width. The operative time and blood loss were reported and postoperatively.

Operative techniques

The TIP group was repaired using Snodgrass urethroplasty technique as described by Warren Snodgrass (1994)[5]. A U-shaped incision around the urethral plate was created with a midline incision of the urethral plate down to the corpus (Fig. 1a–d).

The incised plate was then tubularized around a 6–8 F nelaton catheter using subepithelial Polyglactin 6/0 sutures (Fig. 1f).

The intermediate layer was harvested from the Dartos layer (Fig. 1g).

The grafted TIPU technique was employed as described by the Kolon and Gonzales[8]. The graft was harvested from the inner layer of the prepuce with meticulous de-fattening to ensure adequate take of the graft (Fig. 2a).

The graft was utilized to cover the diamond-shaped raw area of the incised urethral plate using polyglactin 6/0 in an interrupted fashion with a few stitches anchoring the body of the graft to the underlying corpus to occlude the dead space beneath the graft (Fig. 2b).

Follow-up

Patients were examined at the time of catheter removal, then assessed at the outpatient's clinic on a weekly interval for 1 month and then monthly for the first 6 months for the intactness of repair, size, and shape of the neo-meatus, the presence of postoperative complications with comparison of both groups; as urethral fistula, meatal stenosis, urethral stricture, urethral diverticulum or failure of the repair; by examination of the external genitalia, evaluation of voiding symptoms, calibration of the neourethra after one month, three months and six months and cosmetic outcome was evaluated by using Hypospadias Objective Score Evaluation (HOSE) (Fig. 3). The data were collected, tabulated and subjected to statistical analysis using statistical package for social sciences (SPSS) version 22 (SPSS Inc., Chicago, Illinois, USA).

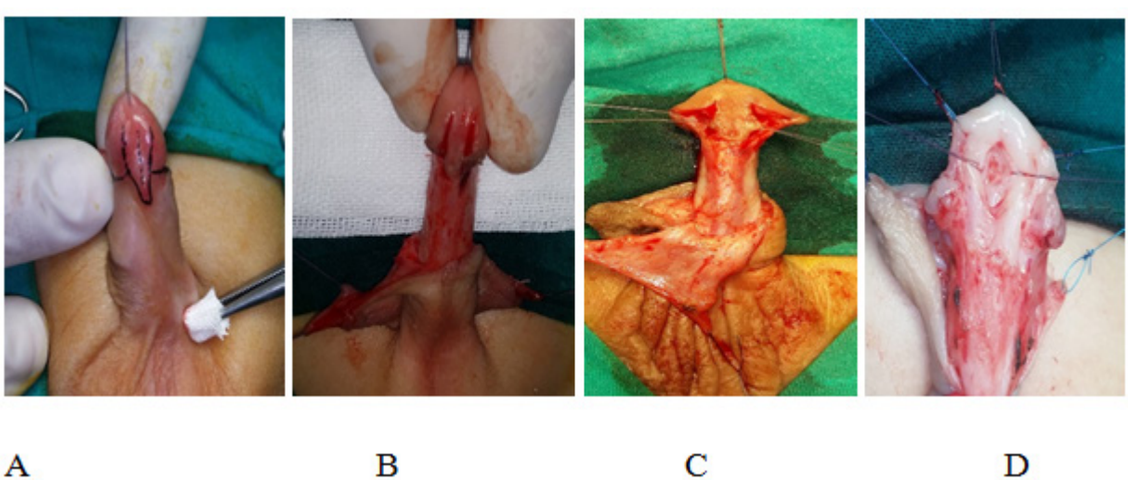


Fig. 1: A–D: Snodgrass technique.

Fig. 1 F: Snodgrass tubularization.

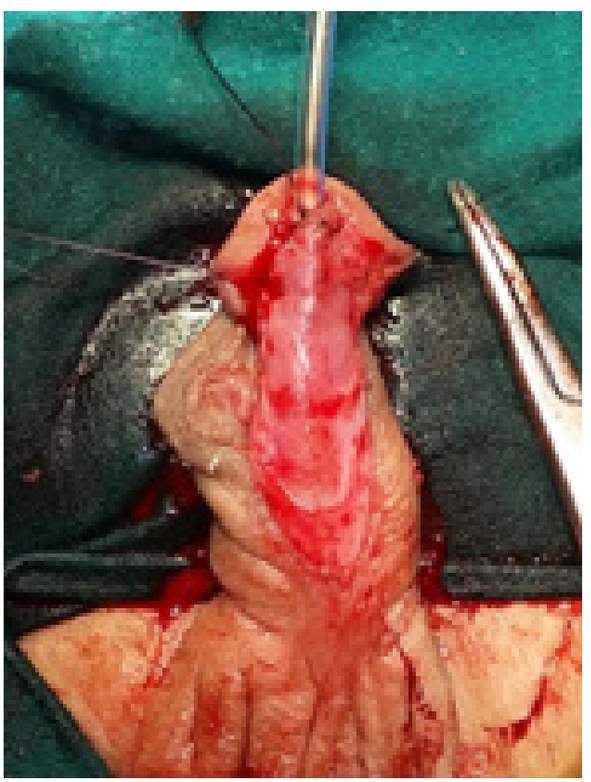


Fig. 1 G: Dartos layer interposition.

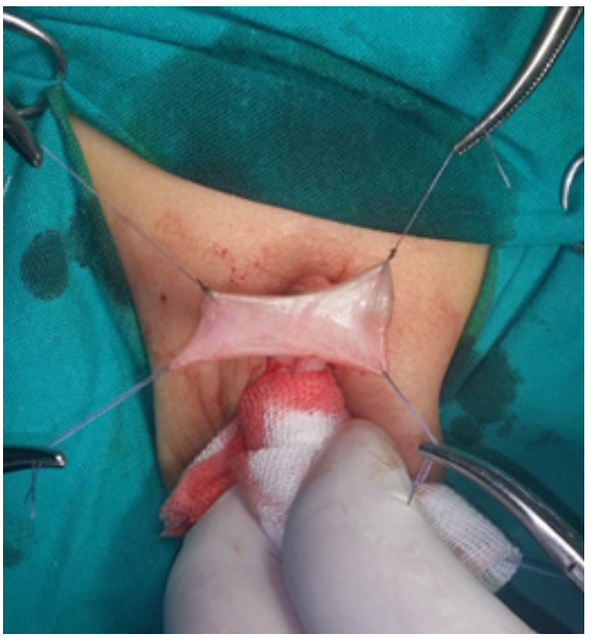


Fig. 2 A: Harvesting the graft.

Fig. 2B: Fixation of the graft.

HOSE – Hypospadias Objective Scoring Evaluation

Assessor: Patient:

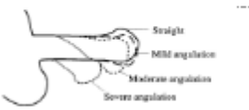
Variable	Score		Diagram
1. Meatal location			
Distal glanular	.....	4.....	
Proximal glanular	.....	3	
Coronal	.....	2	
Penile shaft	.....	1	
2. Meatal shape			
Vertical slit		2	
Circular		1	
3. Urinary stream			
Single stream		2	
Spray		1	
4. Erection			
Straight		4	
Mild angulation (<10°)		3	
Moderate angulation (> 10° but <45°)		2	
Severe angulation (> 45°)		1	
5. Fistula			
None		4	
Single – subcoronal or more distal		3	
Single – proximal		2	
Multiple or complex		1	
Total			

Fig. 3: Hypospadias Objective Score Evaluation (HOSE) score[11]

RESULTS:

The median age at surgery in TIP group was 20 months compared with 13 months in Grafted TIP group (*P 0.08*) (Table 1). The type of distal hypospadias in TIP group was coronal in 5 (20%) cases, subcoronal in 14 (56%) cases, and distal penile in 6 (24%) cases; while in grafted TIP group it was: coronal in 4 (16%) cases, subcoronal in 17 (68%) cases (68%) and distal penile in 4 cases (16%) (*P 0.67*) (Table 2). The mean stretched penile length in TIP group was 37.6±5.54 mm (range 25–50 mm) and in grafted TIP group was 35.7±5.33 mm (range 28–45 mm) (Table 3). The mean penile girth in TIPU group was 37.08±3.8 mm (range 32–45 mm) and in grafted TIPU group was 36.64±3.75 mm (range 30–45 mm) (Table 3). The mean width of the urethral plate in TIPU group was 5.48±1.7 mm (range 3–8 mm) and in grafted TIPU group was 5.84±1.34 mm (range 5–8 mm) (Table 3). After the incision of the urethral plate, the mean width of the plate in TIPU group was 11.88±1.79 mm and in grafted TIPU group was 12.40±1.63 mm (Table 3). The mean glans width in TIPU group was 13.4±2.9 mm (range 9–20 mm) and in the

grafted TIPU group was 12.04±2.52 mm (range 8–17 mm) (Table 3). The mean operative time in TIPU group was 91.04 min (range 86–105 min) and in grafted TIPU group was 115.0 min (range 80–130 min) and the difference was statistically significant (*P<0.001*) (Table 4). The length of hospital stay in TIPU group was 5.44±1.08 days (range 5–9 days) and in the grafted TIPU group was 5.56±1.08 days (range 4–9 days) (Table 4). The urethral fistula was detected in 3 (12%) cases of TIPU group and in 2 (8%) cases of grafted TIPU group (P 0.36) (Table 5). The failure of repair did not occur (0%) in TIPU group, while occurred in 2 (8%) cases of grafted TIPU group (0.15) (Table 5). The mean size of the neo-meatus in the TIPU group was 2.8±0.65 mm (range 2–4 mm) and in the grafted TIPU group was 3.35±0.71 mm (range 2–4 mm) (P 0.008) which revealed improvement in meatal size in grafted group (Table 4). No cases of urethral strictures were detected among cases of both groups during the period of follow-up (mean 9 months, range 5–17). The HOSE scoring was 15.84±0.37 in TIPU group compared with 15.52±1.12 in grafted TIPU group (Table 4).

Table 1: Comparison between the two studied groups according to age

	Repair			
	Grafted TIP (*N*=25)	TIP (*N*=25)	Z	*P*
Age (month)	13 (6–43)	20 (6–90)	1.740	0.082

Z, *p*: Z and *P values* for Z- test for comparing between the two groups.

Table 2: Comparison between the two studied groups according to type of hypospadias

	Repair			
Type of hypospadias	Grafted TIP No (%)	TIP No (%)	χ^2	*P*
Subcoronal	17 (68.0)	14 (56.0)	0.801	0.670
Coronal	4 (16.0)	5 (20.0)		
DPH	4 (16.0)	6 (24.0)		

χ^2, *p*: χ^2 and *P values* for Chi square test for comparing between the two groups.

Table 3: Comparison between the two studied groups according to measurements

	Repair			
Measurement	G-TIP (*N*=25)	TIP (*N*=25)	t	*P*
Stretched penile length	35.72±5.33	37.60±5.54	1.222	0.228
Urethral plate length	9.24±2.35	9.32±2.64	0.113	0.910
Urethral plate width	5.84±1.34	5.48±1.71	0.827	0.412
Penile girth	36.64±3.75	37.08±3.83	0-.410	0.683
Length of the glans	8.36±2.46	9.28±1.74	1.523	0.134
Width of the glans	12.04±2.52	13.40±2.90	1.768	0.083
Urethral plate width after incision	12.40±1.63	11.88±1.79	1.074	0.288

t, *p*: t and *P values* for Student t-test for comparing between the two groups.

Table 4: Comparison between operative time, length of hospital stay, width of the meatus and HOSE score between G-TIP and TIP

	Repair			
	G-TIP (*N*=25)	TIP (*N*=25)	t	*P*
Operative time	115.00±10.19	91.04±6.89	9.740	<0.001*
Length of hospital stay	5.56±1.08	5.44±1.08	0.392	0.697
Meatus mm	3.35±.71	2.80±.65	2.792	0.008*
HOSE score	15.52±1.12	15.84±.37	1.352	0.187

t, *p*: t and *P values* for Student t-test for comparing between the two groups.

Table 5: Comparison between the two studied groups according to surgical outcome (summary of the complications)

	Repair			
	G-TIP No (%)	TIP No (%)	χ^2	*P*
Fistula				
No	23 (92.0)	22 (88.0)		
Subcoronal	1 (4.0)	0	2.022	0.364
Coronal	1 (4.0)	3 (12.0)		
Failure rate				
No	23 (92.0)	25 (100.0)	2.083	0.149
Complete	2 (8.0)	0		
Stricture				
No	23 (100.0)	25 (100.0)	–	–
Yes	0	0		
Meatal recession				
Meatal recession	2 (8)	0	2.083	0.149
Normal	23 (92)	25 (100)		

χ^2, p: χ^2 and *P values* for Chi square test for comparing between the two groups

Table 6: Statistical correlation

Fistula	G-TIP (*N*=2)	TIP (*N*=3)	t	*P*
Age	11.00±2.83	42.33±1.53	16.704	<0.001*
Urethral plate width	4.50±0.71	5.33±1.15	0.889	0.440
Width of the glans	12.00±0.00	14.67±2.52	1.422	0.250
Type				
Subcoronal	2 (100)	2 (66.7)	0.833	0.361
DPH	0	1 (33.3)		
Meatal stenosis	G-TIP (*N*=3)	TIP (*N*=8)	t	*P*
Age	16.67±12.90	32.88±27.46	0.959	0.363
Urethral plate width	5.33±.58	5.13±1.13	0.299	0.772
Width of the glans	13.00±4.36	13.25±2.60	0.120	0.907
Type				
Subcoronal	1 (33.3)	4 (50)	0.665	0.717
Coronal	1 (33.3)	1 (12.5)		
DPH	1 (33.3)	3 (37.5)		

t, *p*: t and *P values* for Student t-test for comparing between the two groups.

DISCUSSION

The surgical repair of hypospadias has historical turning points that changed the pattern of practice worldwide. One of these was Tubularized incised plate urethroplasty described by Snodgrass (1994)[5], that became one of the most popular techniques in the last two decades in many institutions[7]. In spite of being an easily applicable technique with good cosmetic results, several complications, including meatal and/or neourethral stenosis, had been reported[8]. These drawbacks were attributed to the incision of the urethral plate that was supposed to heal by epithelialization and consequently the neo-urethra will be of adequate caliber. However, some authors reported that healing of the incised urethral plate resulted in a fibroses strictured neo-urethra[12]. The concept of grafting the incised plate emerged to treat these drawbacks as the grafted plate leaves no raw area that may be the cause of neo-urethral stricture if healing occurred by fibrosis, not epithelialization[8].

The incidence of urethral stricture following TIP urethroplasty in distal hypospadias had been reported to be 1.3% (range 0.8–2.2%)[13]. Kolon and Gonzales[8] described a dorsal inlay graft using inner preputial

skin aiming to minimize the incidence of neo-meatal and urethral strictures. After an average follow-up of 21 months; they reported 32 cases repaired by their new technique with no meatal stenosis or urethral stricture. Following that, other studies[14,15] reported similar results. Several comparative studies had been conducted to rule out the value of grafting the incised plate. Shimotakahara et al.[16] reported a comparative study between both Snodgrass and Snodgraft techniques and concluded that grafting the plate had an added value of minimizing the incidence of meatal stenosis and urethral stricture but the study was retrospective in nature.

Mouravas et al.[17] conducted a comparative study between both techniques and concluded effectiveness of the grafted plate to reduce the incidence of complications, notably the meatal stenosis and urethral stricture. On the other hand, Shuzhu et al.[18] reported a 3% rate of meatal stenosis after TIP urethroplasty compared with 4.4% after grafted TIP.

In the current study, no cases of urethral stricture had been reported in both techniques. Regarding neo-meatal size, both techniques resulted in a slit like meatus of adequate caliber, but the grafted TIP technique resulted in a statistically significantly better meatal size (3.35 vs. 2.80 mm). On the other hand, the failure rate was higher in grafted TIP group than TIP group (8% vs. 0%), but the difference is not statistically significant. Unfortunately, the significantly longer operative time in grafted TIP group (115 vs. 91 min, $P < 0.001$) is not met with a significantly reduced rate of posturethroplasty complications especially urethral stricture and meatal stenosis.

CONCLUSION

Snodgrass urethroplasty proves its efficacy as a simple technique in distal hypospadias with an acceptable rate of complications. Grafting the urethral plate did not add a remarkable value in terms of reducing the complications assumed to result from incision of the urethral plate. the limitation of the study is the use of a retrospective study due to lack of randomization. Further studies with large patient series are needed to substantiate our findings.

CONFLICT OF INTEREST

There are no conflicts of interest.

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