

# The effect of pre-incision urethral plate width and glanular width on the outcome of Tubularized Incised Urethral plate repair surgery in distal penile Hypospadias, A prospective study

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## Research Article

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# Abstract

## Objective:

To determine the cosmetic and functional outcomes of hypospadias repair in relation to the width of the urethral plate in addition to granular width and configuration.

## Materials and methods

The study was a prospective evaluation of patients operated for hypospadias after approval of ethical committee a formal consent were taken from parents. The urethral plate width (UPW) and glans width (GW) of the patients were measured preoperatively using standard calipers. The width of the urethral plate was correlated to the cosmetic outcome (using hypospadias objective penile evaluation [HOPE]) and functional outcome (using the urinary stream) of hypospadias repair.

All patients were managed via the same technique using Snodgrass tubularized incised plate repair (TIP). All operations were performed by a single surgeon. All intraoperative data were recorded. All patients were followed up for 1 year. Success was defined as slit shaped meatus at the tip of the glans with no stenosis, fistula or diverticulum.

## Results:

All 38 patients were evaluated at 6 months and 1 year follow up. The mean age at surgery was  $4.5 \pm 2.1$  years. Overall, the mean  $\pm$  SD of UPW was  $10.92 \pm 1.24$  mm. a 24 patients (61.5 %) (Group A) had a urethral plate width of less than 8 mm while 14 patients (35.9 %) (group B) had a urethral plate width greater or equal to 8 mm. the mean  $\pm$  SD of GW was  $9.52 \pm 1.56$  mm. Success was documented in 36/38 patients (94.3%).

The only complication was Fistula in two patient (6.7 %), glans dehiscence in three patients (10%). Success rate was not statistically different in correlation of UPW and GW ( $p=0.5$ ).

The only statistically significant difference between all patients was a longer operative time in the patients with deficient urethral plate compared to others with adequate urethral plate ( $p= 0.005$ ). The urinary stream was straight in 32 boys and sprayed in 6. Overall, mean  $\pm$  SD HOPE score was  $39.1 \pm 8.83$ . A significant correlation found between the cosmetic outcome of the two groups and HOPE score ( $p = 0.06$ ).

## Conclusions:

The pre-incision urethral plate width and glanular width was not correlated with the TIP outcome. A better HOPE score is associated with wide urethral plate.

# Introduction

Dating the final 2 decades, tabularized incised plate procedure (TIP) for repair of distal penile hypospadias is the foremost common method at numerous institutions. In any case, a few downsides counting meatal and/or neourethral stenosis and the require for standard urethral dilatation have been recorded **(1)**. The preservation of the urethral plate and the increase in the surface area with healthy epithelium give better outcome **(2)**

TIP is a procedure that is more dependent on urethral plate quality in comparison with other surgical procedures. The plate quality is generally regarded as one of the intrinsic risk factors influencing the outcomes of hypospadias repairs. However, there is currently no clear agreement on the evaluation of the urethral plate **(5)**.

The urethral plate width was classified based on an arbitrary 8-mm cut-off value, while groove depth was graded as deep, moderate and shallow. However, is the arbitrary value of 8 mm suitable for all penis sizes? **(3)**.

Generally, urethral plate width increases with penis size, as the patient grows. It might be more appropriate to evaluate urethral plate quality with a parameter scaled with penis size. In recent years, Glans–Urethral Meatus–Shaft score was proposed to classify the severity of hypospadias, providing a concise method for evaluating urethral plate quality **(4, 5)**.

There is a debate regarding the effect of UPW and GW on the postoperative complications post TIP surgery. Some reports have found that urethral plate (UP) widths <8 mm before TIP incision increased urethroplasty complications **(6)**. While, The UP width before incision did not increase urethroplasty complications **(7-9)**.

Glans size does not correlate with age in patients with hypospadias between 3 and 24 months old, supporting the decision to operate as early as 3 months in some centers **(10)**. Small glans size, defined as width <14 mm, is an independent risk factor for urethrocutaneous fistula **(8)**.

To address this void, we aimed to answer a question, Is the UPW and GW are a controlling factors for hypospadias outcome as regard the functional and cosmetic outcome?

## Materials And Methods

After approval from Institutional Review Board, we conducted a prospective study that was carried out in Urology department in kafr el Sheikh University, between November 2018 and November 2019. A total of 60 children diagnosed with distal penile hypospadias were included.

Inclusion criteria were, distal penile hypospadias, primary, uncircumcised, and no or mild chordee (less than 30°), aged < 10 years, No associated syndromes and boys able and willing to comply with follow up schedule.

We excluded boys who were recurrent, circumcised, with severe chordee. Written consent with detailed description of the operation and expected complications was explained and signed from the parents.

All operations were performed by **single pediatric urologist**. Preoperative IV antibiotic prophylaxis was given. A circumferential subcoronal incision is made proximal to the hypospadiac urethral meatus. The penis is degloved. A bilateral longitudinal incision was made along the urethral plate to prepare the glanular wings. The flap was obtained from the inner dartos muscle and sutured overlying the incision line with 6/0 vicryl.

The flap width and length were differing in every case according to the location of the meatus, urethral plate characteristics and depth of the midline incision. Urethroplasty was performed using 6/0 Vicryl continuous subcuticular then interrupted sutures and 2nd layer cover using dartos fascia flap. Glanular approximation was done with 6/0 Vicryl. 8F stent was kept for 7-10 days.

All patients were routinely followed up for cosmetic and functional results at 3 months intervals. By routine examination of the external genitalia, evaluation of the voiding symptoms, uroflowmetry study was performed if possible and it was repeated when the voided volume was insufficient or when the result was inconsistent with the physical examination and history.

Overall acceptable cosmetic appearance of the penis was decided according to the slit like appearance of the neo-meatus, the straight position of the penis and this cosmetic aspect was judged by an independent blinded observer. Hypospadias Objective Penile Evaluation (HOPE) is considered a valuable tool for assessing the outcome **(11)**

All methods were carried out in accordance with relevant guidelines and regulations.

Informed consent was obtained from all subjects or, if subjects are under 18, from a parent and/or legal guardian.

## **Statistical analysis**

Statistical analysis was performed with IBM Statistical Package for Social Sciences. IBM SPSS Statistics for Windows (version 22.0. Armonk, NY) was used to evaluate multiple steps. Significance level was set to  $p < 0.05$ . Internal consistency reliability was tested using Cronbach's  $\alpha$ , and test-retest reliability was assessed with the Wilcoxon signed rank test. For concurrent external validity, Spearman rank correlation was used. For values  $> 0.70$ , it was assumed that there was sufficient consistency and reliability.

## **Results**

All 30 patients were evaluated at 1 year of follow up. Mean age at surgery was  $4.5 \pm 2.1$  years.

Of the 30 patients who had their distal hypospadias repaired using TIP, seven patients (23.3 %) had glanular hypospadias, nine patients (30 %) had coronal hypospadias and 14 patients (46.7 %) had distal

penile hypospadias (Table 1).

Overall, the mean  $\pm$  SD of UPW was  $10.92 \pm 1.24$  mm. a 24 patients (61.5 %) (Group A) had a urethral plate width of less than 8 mm while 14 patients (35.9 %) (Group B) had a urethral plate width greater or equal to 8 mm. the mean  $\pm$  SD of GW was  $9.52 \pm 1.56$  mm.

### Functional outcome

The average urine flow rates (Qmax) of 38 patients was 7 ml/sec (5.3-10.3).

A 20 (83.3 %) patients in group A have good urinary stream while 12 patients (85.7%) in group B have good urinary stream.

There was a significant correlation between good urinary stream with the mean UPW of the 2 groups ( $p < 0.05$ ).

### Post-operative complications

Two patients (6.3%) developed urethrocutaneous fistula, three patients (10 %) developed glanular dehiscence.

Five patients (14.3%) in group A developed complications while one patients (16.7%) in group B developed complications.

However, no statistical significance found in relation of the complications to the mean UPW or GW of the two groups of patients ( $p = 0.5$ ).

### Cosmetic outcome

The cosmetic outcome was assessed using Hypospadias Objective Penile Evaluation (HOPE), **as shown in Table 2.**

Overall, mean  $\pm$  SD hypospadias objective penile evaluation (HOPE) score was  $39.1 \pm 8.83$ . Group a patients had a mean HOPE score of  $37.2 \pm 6.4$  SD while Group B patients had a mean HOPE score of  $42.4 \pm 6.1$  SD.

A significant correlation found between the cosmetic outcome of the two groups and HOPE score ( $p = 0.06$ ).

## Discussion

Hypospadias is an extremely common anomaly. There are different procedures that have been described for the adjustment of hypospadias since of the presence of various hypospadias presentations. Be that as it may, no single technique had 100% satisfactory result (**12**). The goals of hypospadias surgery

include development of a urethra of sufficient caliber and length, orthotopic meatus at the tip of the glans permitting the patient to void in a straight stream without maddening spreading.

Moreover, obtaining a conical glans and rearrangement of the dorsal skin provides a uniform ventral skin cover and correction of penile curvature just to achieve proper sexual intercourse and effectively inseminate **(13)**.

Hypospadias surgery is continuously evolving, since its description by Galen in the first and second centuries AD, to improve a suboptimal functional and cosmetic results. The aim of hypospadias surgery is the creation of a straight penis with a slit-like meatus at the tip of the glans **7**.

In spite of the recognition of the urethral plate as the tissue distinct from the glans and penile skin that would have formed the urethra and as having a well vascularized connective tissue and its incorporation in hypospadias repair, an objective way of assessing the impact of urethral plate on outcome is yet to be established.

Snodgrass in 1994 reported his own technique of tubularized incised plate urethroplasty (TIP) repair for distal hypospadias that gained a widespread use for its perceived simplicity and good cosmetic outcomes in the majority of cases [11]. However, unfortunately, when the urethral plate is narrow the rate of urethrocutaneous fistula, meatal/neo-urethral stenosis is increased [12].

In the current study, we evaluated the effect of width of the urethral plate and glanular width on outcome of hypospadias repair.

Most of our patients had coronal and midpenile hypospadias (38.5 %), the same findings by Prat et al **(14)**. The reason for this is not clear but might be explained by the geographical location.

Hypospadias Objective Penile Evaluation (HOPE) which assessed the cosmetic outcome, there was a statistical significance correlation ( $p = 0.06$ ). This finding agrees with the result from some previous studies **(15)**. However, Aboutaleb et al **(6)** in their study

We used 8 mm in the present study because urethral plate width 8mm or greater is essential for creation of adequate neourethra and successful hypospadias repair **(16)**, while, Da Silva et al **(15)** in their study had 41.9% of their patients in the narrow urethral plate group and 58.1% in the wide urethral plate group.

Comparing both studies, the slight difference in percentages may be explained by the fact that Da Silva used 10 mm as the dividing line between narrow and wide urethral plates while we used 8 mm in the current study. Nguyen et al **(9)** and Aboutaleb et al **(6)** in their studies also used 8 mm as the dividing line. Urethral plate of more than 8 mm is associated with good cosmetic outcome **(16, 17)**

On the assessment of the functional outcome, 20 (83.3 %) patients in group A had good urinary stream while twenty patients 12 (85.7%) in group B had good urinary stream. Statistical analysis showed that there is a statistically significant difference between the 2 groups ( $p$  value of 0.05). This agrees with

findings of some other studies that concluded that narrow urethral plate is associated with poor functional outcome such as poor urinary stream and complications such as meatal stenosis and urethrocutaneous fistula (17-19).

However, Nguyen et al<sup>8</sup> and Da Silva et al (15) in their study concluded that width of urethral plate do not affect the functional outcome of hypospadias repair. This is related to the fact that there were confounding variables in their study such as penile size, glans shape and vascularity of the prepuce which were not separately analyzed. We did not assess penile size, glans shape and vascularity of the prepuce in the current study.

There are a diversity in the complications following hypospadias repair. It ranges from 6-30% (20, 21). The most common complication we recorded was urethrocutaneous fistula. These differences in complication rates may be explained by the differences in surgical expertise due to low volume of hypospadias repairs done per year in our setting. The rate of urethrocutaneous fistula in our study is not correlated with narrow urethral plate, a similar to (20).

While, Aboutaleb reported higher incidence in fistula in patients with narrow urethral plates when compared to those with wide urethral plate (6, 21).

Though this study was a prospective study, it was limited by a small sample size that hindered the significant statistical difference detection in complications. Moreover, single surgeon series cannot be generalized as the outcome of repair, including complications, may be related to the skill of the surgeon.

## Conclusion

The pre-incision urethral plate width and glanular width was not correlated with the TIP outcome. A better HOPE score is associated with wide urethral plate. However, the width of the urethral plate and glanular width may predict the functional outcome (urinary stream).

## Declarations

### Competing interest:

No Conflict of interest

### Funding:

none

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## **Mohamed Galal**

### **Authers contributions:-**

**Dr Mohamed Galal and Dr Khaled zein elabeden** collect data of the article.

**Dr Diaa-Eldin Taha** wrote the article.

**Dr Tarek Abdelbaky and Dr Hossam Nabeeh** revised the article

### **Ethical committee:-**

The article has been accepted by Kafr elsheikh faculty of medicine ethical committee.

### **Consent to participate:-**

All patients' parents were informed about the study and agree to participate.

### **Availability of data:-**

Data were collected patient by patient with utmost accuracy

### **Consent to publication:-**

All authors reviewed the article and accepted the publication

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## Tables

Table 1. Patients' demographics

		<b>Distal hypospadias ( N= 38)</b>	<b>P</b>
<b>Age in years (mean ± SD)</b>		4.5 ± 2.1	0.59
<b>Weight (mean ± SD)</b>		26.16 ± 13.16	
<b>Operative time (mean ± SD)</b>		76.60 ± 9.8	
<b>Meatal location</b>	<b>Glanular</b>	8 (21.1 %)	0.9
	<b>Coronal</b>	15 (38.5 %)	
	<b>Midpenile</b>	15 (38.5.5 %)	
<b>Mean urethral plate width (UPW)</b>		4.92 ± 1.24	0.5
<b>Urethral configuration</b>	<b>Adequate</b>	24 (80 %)	0.7
	<b>Hypoplastic</b>	6 (20 %)	
<b>Circumcised (NO)</b>		11 (36.7 %)	
<b>Mean glanular width (GW)</b>		9.52 ± 1.56	0.4
<b>Ventral curvature</b>	<b>10-30</b>	2 (5.2 %)	0.21
	<b>≤ 10</b>	5 (18.1 %)	

Table 2. Outcome in correlation to UPW

		UPW ≤ 8 mm ( N= 24)	UPW ≥ 8 mm ( N= 14)	P
<b>No of UC</b>		0 (0%)	3 (12.3 %)	0.2
<b>Glanular dehiscence</b>		1 (4.2 %)	2 (14.3 %)	0.6
<b>Meatal stenosis</b>		2 (8.3 %)	2 (14.3 %)	0.4
<b>Slit like urethra</b>		20 (83.3 %)	12 (85.7%)	0.6
<b>Straight penis</b>		20 (83.3 %)	12 (85.7%)	0.3
<b>Apparently Normal looking skin</b>		20 (83.3 %)	12 (85.7%)	0.6
<b>Meatal shape</b>	<b>Vertical slit</b>	20 (83.3 %)	12 (85.7%)	0.3
	<b>Cicular</b>	4 (16.7 %)	1 (7.1%)	
<b>Urinary stream</b>	<b>Single stream</b>	20 (83.3 %)	12 (85.7%)	0.6
	<b>Spray</b>	4 (16.7 %)	2 (14.3 %)	
<b>Q max (mean ± SD)</b>		<b>8.4 ± 2.4</b>	<b>10.4 ± 3.1</b>	0.05
<b>HOPE</b>		<b>37.2 ± 6.4</b>	<b>42.4 ± 6.1</b>	0.06