

## Original Article

# Role of the urethral plate characters in the success of tubularized incised plate urethroplasty

Hamdy Aboutaleb<sup>1,2</sup>

Departments of Urology, <sup>1</sup>Minoufiya University Hospitals, Egypt, <sup>2</sup>Mayo Hospital, Hodiedah, Yemen

**Address for correspondence:** Prof. Hamdy Aboutaleb, Department of Urology, Minoufiya University Hospitals, Egypt.  
E-mail: hamdyabotaleb@yahoo.com

### ABSTRACT

**Background:** Today, tubularized incised plate (TIP) urethroplasty is the most commonly performed operation for distal and mid-penile hypospadias. Reports from different centers worldwide confirm its nearly universal applicability and low complications rate. **Aim:** Evaluation of the urethral plate characters and its effect on the outcome of TIP urethroplasty. **Materials and Methods:** Between 2010 and 2013, 100 children with primary distal penile hypospadias underwent TIP urethroplasty. Urethral plates were categorized as flat, cleft, and deeply grooved. Postoperatively, patients were followed-up for evaluation of meatal stenosis, fistula formation, and glandular dehiscence at 1<sup>st</sup>, 3<sup>rd</sup> and 6<sup>th</sup> months. Patients were followed-up for urethral calibration by urethral sound 8 Fr at 3<sup>rd</sup> and 6 months follow-up. Data were statistically analysed using Epi info program to correlate between the width, plate shape, and complications. **Results:** Mean age at surgery was 4.3 years. Patients were followed-up for an average period of 6.4 months. Pre-operative location of the meatus was reported as coronal in 46, subcoronal in 50 and anterior penile in 4 cases. Urethral plate characters were flat in 26 cases, cleft in 52, and deeply grooved in 22. Urethral plate width was >8 mm in 74 cases and <8 mm in 26. Patients with urethral plate <8 mm had a statistically significant higher fistula rate ( $P = 0.004$ ) and failed 8 Fr calibrations in 26.9% ( $P = 0.01$ ) compared with the patients with urethral plate >8 mm. In addition, we also founds higher fistula rate and failed 8 Fr calibrations in flat urethral plate. **Conclusions:** An adequate urethral plate width (>8 mm) is essential for successful TIP repair. Lower success rates with flat plates may need buccal mucosal augmentation to improve the results.

### KEY WORDS

Hypospadias; tubularized incised plate; urethra

### INTRODUCTION

Tubularized incised plate (TIP) repair is recommended as the ideal repair for distal penile hypospadias; it has shown excellent results in the management of primary, redo, distal, and proximal hypospadias.<sup>[1-5]</sup> A number of groups have recently been engaged in studying the plate characters and its impact on the success of TIP. While some authors have shown the importance of the plate characters in the success of TIP repair,<sup>[6,7]</sup> others have shown that the technique could

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10.4103/0970-0358.138956

be used for all cases of hypospadias without concern for the plate configurations.<sup>[6,8,9]</sup> These previous studies have inspired us to undertake the current study to examine the role of the plate character in the success of TIP repair among the study population in Yemen. Here, we present a study evaluating the urethral plate characters, such as shape and the width in the success of TIP urethroplasty for the management of primary anterior penile hypospadias in 100 children.

## MATERIALS AND METHODS

Between January 2010 and December 2013, a total of 100 children with primary anterior penile hypospadias were undergone TIP repair. All cases were undergone in Mayo Hospital, Hodiedah, Yemen. We used Snodgrass technique<sup>[10]</sup> with modifications for our current study. Preoperative routine laboratory examinations were performed for all patients. All children were examined under general anesthesia; the type of the plate is defined and reported by a single surgeon. The plates were measured at the widest area (in mm) at the time of surgery. We divided the study population according to the width of urethral plate  $>8$  mm (Group-A), while patients with urethral plate  $<8$  mm (Group-B). Following the classification made by Nguyen *et al.*,<sup>[11]</sup> the plates were categorized as flat, cleft, and deeply grooved [Figures 1-3]. In addition, examination of the penis was also carried out to evaluate the presence or absence of chordee. Optical loupe magnification was used during surgery for all cases.

### Technique

First a U-shaped incision was made around the plate associated with circumferential incision for complete degloving of the penis. The corpus spongiosum was mobilised. An artificial erection was achieved by saline injection, and the intrinsic ventral curvature was corrected with a dorsal plication if needed. Glandular wings were dissected laterally. One deep midline incision in the urethral plate was made from the tip of the penis to the urethral meatus as described by Snodgrass.<sup>[7]</sup> The plate was tubularized around 6 or 8 French (Fr) Nelaton catheter using polyglycolic acid 6/0 subcuticular running suture. Single subcutaneous vascular dartos flap was used as second layer for all cases. Glanuloplasty was performed in a standard manner with interrupted 6-0 monofilament polyglyconate synthetic absorbable sutures. Wings and penile shaft skin were closed by polyglycolic acid sutures 6/0. Haemostasis



Figure 1: Flat urethral plate



Figure 2: Cleft urethral plate



Figure 3: Deeply grooved plate

was achieved using penile tourniquet. Postoperative urethral feeding tube or silicone foley catheter 8 Fr was used for urinary drainage for average 1 week. Antibiotic Vaseline gauze dressing was applied. Intraoperative single dose antibiotic was used (ampicillin/gentamycin

weight-adjusted dose in all cases). Postoperative management included ampicillin/gentamycin weight-adjusted dose in all cases and oxybutynin for relieving bladder spasms. Nonsteroidal antiinflammatory drugs, oral or suppository, were used in weight-adjusted doses. Success of surgery and postoperative complications were assessed in patients categorized on the basis of the shape of the plate or its width.

**Follow-up**

Postoperatively, patients were followed-up for evaluating meatal stenosis, fistula formation, and partial or complete glandular dehiscence at the 1<sup>st</sup>, 3<sup>rd</sup> and 6<sup>th</sup> months. Patients were followed-up for urethral calibration by urethral sound 8 Fr at the third and 6 months of follow-up. The flow rate was selectively indicated for patients with voiding difficulty and/or a narrow meatal orifice or weak stream. A meatal stenosis was diagnosed when the flow rate was <5 ml/s. Success was defined as the presence of an anatomically positioned vertical slit-like meatus, a normal urinary stream, and a satisfactory cosmetic appearance resembling a circumcised penis.

**Statistical analysis**

Data were statistically analysed using Epi Info program (Centers for Disease Control and Prevention, Atlanta, Georgia, USA). Data were shown as frequency and percent. Fischer exact test for 2 × 2 tables was performed when expected cell count in >25% of cases was <5. *P* < 0.05 was considered to be statistically significant for all analysis.

**RESULTS**

Mean age of the patients underwent surgery was 4.3 years, ranging between 9 months and 12 years. Mean operative time was 115 min (ranging 70-140 min) and the average period of hospital stay was 4.6 days (ranging 1-15 days). Urethral stenting for urine diversion was

used for an average 7.7 days (ranging 3-14 days), and the patients were followed-up for an average period of 6.4 months (ranging 2-24 months).

We found mild insignificant chordee in 15 cases, improved after complete degloving of the penile skin without any additional procedures. Five infants had subcoronal hypospadias along with unilateral undescended testes; these infants underwent orchiopexy at the same time along with hypospadias surgery. Location of the meatus was reported as coronal in 46, subcoronal in 50 and anterior penile in 4 patients.

We divided the study population according to the width of urethral plate as 74 cases (74%) with urethral plate >8 mm (Group-A), whereas 26 cases (26%) with urethral plate <8 mm (Group-B). Next, we monitored them for postoperative complications. Table 1 shows that Group-B patients with urethral plate <8 mm had a statistically significant higher fistula rate compared with the Group-A patients with urethral plate >8 mm (*P* = 0.004). Similarly, Group-B patients also had significantly higher incidences of failed 8 Fr calibration compared with Group-A (*P* = 0.01) [Table 1].

We also divided our study population (100 patients) according to the character of urethral plate as flat (26 patients), cleft (52 patients), and deeply grooved (22 patients) and monitored for postoperative complications. Table 2 shows that higher fistula rate as well as failed 8 Fr calibrations is associated with patients having flat urethral plate compared with the patients with either cleft or deeply grooved urethral plates, although not statistically significant. Irrespective of urethral plate character, overall 8% patients developed fistula, 12% patients had failed 8 Fr calibration, while partial dehiscence occurred in 1 case (1%). In addition, redo surgery was also indicated in 1 patient and fistulectomy in 8 patients.

**Table 1: Complications correlated to urethral plate width**

Complication	Urethral plate >8 mm (74 cases)		Urethral plate <8 mm (26 cases)		Total (%)	P value
	Number	Percentage	Number	Percentage		
Fistula	2	2.4	6	23	8 (8)	0.004
Failed 8 Fr calibration	5	5.95	7	26.9	12 (12)	0.01

A statistically significant higher fistula rate and failed 8 Fr calibrations in association with urethral plate <8 mm is noted

**Table 2: Complications correlated to urethral plate character**

Complication	Flat (26 cases)		Cleft (52 cases)		Deeply grooved (22 cases)		Total (%)	P value
	Number	Percentage	Number	Percentage	Number	Percentage		
Fistula	4	15.4	4	7.7	—	—	8 (8)	0.4
Failed 8 Fr calibration	7	26.9	5	9.6	—	—	12 (12)	0.09

A higher fistula rate and failed 8 Fr calibrations in association with flat urethral plate (*P* value insignificant)

## DISCUSSION

The aim of hypospadias surgery is the creation of a straight penis with slit-like meatus at the tip of a glans with enough skin coverage. TIP urethroplasty is the most common procedure used for hypospadias repair since its introduction in 1994 by Snodgrass.<sup>[10,12]</sup> TIP repair is versatile and can be used for creation for neourethra with satisfactory slit-like meatus.<sup>[2,10,12]</sup>

The urethral plate shape and width are generally evaluated when the TIP repair is opted for the management of hypospadias. In this study, we also categorised our study population based on both urethral plate width and shape. Based on the plate width, patients were divided into Group-A with width >8 mm and Group-B <8 mm. We found significantly higher incidences of fistula in Group-B patients when compared to the Group-A patients ( $P = 0.004$ ). Ideal urethral plate allows the creation of the neourethra >10 Fr in children after a midline incision to widen the urethral plate.<sup>[13-15]</sup> However, a narrow plate <8 mm is inadequate for the creation of neourethra, which might be the cause of the statistically significant higher fistula rate in Group-B patients with urethral plate width <8 mm. Our findings are in accordance with the earlier reports by both Holland and Smith<sup>[16]</sup> and Nguyen *et al.*<sup>[11]</sup> where statistically significant higher fistula was found in patients with urethral plate <8 mm width. However, Nguyen *et al.*<sup>[11]</sup> reported 1 case (3.3%) over 30 cases with narrow urethral plate versus one case (0.7%) over 129 cases with urethral plate >8 mm; therefore, the result was statistically insignificant. The higher fistula rate with narrow urethral plate occurs because of the fact that midline incision of the urethral plate is not enough to create a neourethra with too much width around 8 Fr catheter; as a consequence, the urethral plate makes the anastomoses under tension. Therefore, tubularisation with tension on suture line increases the incidence of fistula formation in cases with narrow urethral plate.

Meatal stenosis could be blamed for distal obstruction predisposing to fistula formation. Failure in 8 Fr calibration in association with fistula formation could be resolved with urethral dilation. In our study, two of the children who had fistula resolved with urethral dilation. Modification to midline incision of the plate by extending it beyond to the tip of glans prevents meatal stenosis as described by Khairallah and Bader-Eldin;<sup>[15]</sup> however, it only decreases fistula rate and meatal stenosis to <1%.

We also divided our study population based on the urethral plate character as flat, cleft, and deeply grooved. A higher fistula rate was noted in patients with flat urethral plate compared to the patients with cleft or deeply grooved; however, the result is not statistically significant ( $P = 0.4$ ). This is also in agreement with the previous reports, where no significant relation was found between urethral plate depth and incidence of fistula.<sup>[11,16]</sup> Although higher failed 8 Fr calibration rate was observed in patients with flat urethral plate compared with the other two groups cleft and deeply grooved, the result is statistically insignificant ( $P = 0.09$ ) [Table 2].

Similar to earlier reports,<sup>[2,4,5,17]</sup> our study also provide evidences of excellent outcome in hypospadias management through TIP repair with overall 8% patients developing fistula, 12% patients with failed 8 Fr calibration, while partial dehiscence occurred in 1 case (1%); redo surgery was indicated in only 1 patient.

In the current study, we found patients with flat and narrow urethral plate developed more complications. In this regard, Tavakkoli Tabassi and Mohammadi Rana<sup>[13]</sup> advocated the use of buccal mucosal graft (BMG) with TIP repair to augment the narrow urethral plate (6-8 mm) and they concluded that the use of mucosal graft decreased fistula rate formation and meatal stenosis. Ye *et al.*<sup>[18]</sup> also combined TIP with BMG in 53 patients and found better outcome. Therefore, urethral plate augmentation is recommended when the urethral plate is narrow and inelastic requiring augmentation with free graft.

## CONCLUSIONS

Based on our findings, we conclude that the TIP urethroplasty has good cosmetic and functional results and offer a modality for hypospadias repair that has the following advantages: Preservation and utilisation of urethral plate without the need for additional flaps, single suture line of the neourethra, creation of glandular and penile urethra, short operative time and low complication rate. This technique can be used for primary anterior penile hypospadias with satisfactory results. Using this technique with plates >8 mm and with cleft and deep grooved plates yields excellent results. Flat plates may need augmentation by BMG as advised by some authors to improve the results in this group of patients.



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**How to cite this article:** Aboutaleb H. Role of the urethral plate characters in the success of tubularized incised plate urethroplasty. *Indian J Plast Surg* 2014;47:227-31.

**Source of Support:** Nil, **Conflict of Interest:** None declared.

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