Versatility of tubularized incised plate urethroplasty in the management of different types of hypospadias: 5-year experience

Gamal Al-Saied[1], Ahmed Gamal[2]

ABSTRACT

Background: The outcomes of urethroplasty in the management of different types of hypospadias have continued to improve since the introduction of the tubularized incised plate (TIP) urethroplasty (Snodgrass method). The aim of this study was to evaluate the feasibility and applicability of TIP urethroplasty in the management of different types of hypospadias. **Materials and Methods:** This work was carried out at Al-Azhar University Hospital, Cairo, Egypt in the period from January 2002 to December 2002 and King Abdul Aziz Specialist Hospital, Taif, Saudi Arabia; in the period from January 2003 to January 2007 by the same authors. The medical records of 175 boys with different types of hypospadias, who underwent TIP urethroplasty, were critically reviewed. Their age ranged from 9 to 36 months (mean age; 22.72 ± 7.75 months).The period of follow-up was ranged from 7 to 60 months (mean 34.42 ± 15.41). **Results:** All families were happy with penile aesthetic appearance. The total number of boys with different types of hypospadias was 175 (145 1ry and 30 2ry). Out of 175 cases, the overall urethrocutaneous fistula rate was 11 (6.29%), and the overall rates for glanular dehiscence, urethral stricture, meatal stenosis and meatal regression were 4 (2.29%), 5 (2.86%), 17 (9.71%), and 10 (5.71%), respectively. All cases of urethral stricture and most cases of meatal stenosis 12 (6.86%) responded well to regular urethral dilatation. Meatoplasty was performed in only 5 (2.85%) cases (1 of 1ry and 4 of 2ry cases). Secondary surgery for fistula repair and glans closure was successful in all patients. All children void with a single straight urinary stream in a forward direction, and have a rounded glans with vertical slit-like terminal glanular meatus. The mean hospital stay was 4.6 days. **Conclusion:** TIP urethroplasty with neourethral coverage using a vascularized pedicle of dartos flap is versatile and simple operation in management of different types of hypospadias. It has a good functional and cosmetic outcome.

Keywords: Hypospadias, snodgrass repair, tubularized incised plate urethroplasty

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Departments of Pediatric Surgery and Urology, [1]Al-Azhar University, Cairo, Egypt, [1,2]King Abdul Aziz Specialist Hospital, Taif, Saudi Arabia

Address for correspondence:
Dr. Gamal Al-Saied,
King Abdul Aziz Specialist Hospital, Taif, POB 10127, Saudi Arabia.
E-mail: gamal4a@hotmail.com

INTRODUCTION

Hypospadias is one of the most common congenital anomalies occurring in approximately 1 of 200 to 1 of 300 live births.[1] Many operations have been described for hypospadias repair. The introduction of tubularized incised plate (TIP) urethroplasty by Snodgrass in 1994, resulted in a revolution in management of different types of hypospadias (distal and proximal, either new or reoperative cases) as documented by many reports.[2-7] The purpose of this retrospective review is to present our experience with the tubularized incised plate TIP urethroplasty for management of different types of hypospadias over the past five years and to emphasize that TIP urethroplasty with neourethral coverage using a vascularized pedicled flap of dartos fascia is versatile and simple operation with good functional and cosmetic outcome.

MATERIALS AND METHODS

A total of 175 boys with different types of hypospadias either primary (new) or secondary (previously failed repair) with distal, mid shaft, or proximal meatal position had been operated at two tertiary institutes during two consecutive periods by the same authors who were already familiarized with the technique of TIP urethroplasty. A total of 15 patients were operated at Al-Azhar University Hospitals, Cairo, Egypt, between January 2002 and December 2002; and 160 patients at King Abdul Aziz Specialist Hospital, Taif, Saudi Arabia, in the period from January 2003 to January 2007. The period of follow-up was ranged from 7 to 60 months (mean 34.42 ± 15.41 months). Their age ranged from 9 to 36 months (mean age; 22.72 ± 7.75 months). The study was reviewed and approved by the review board and written consent of patient's parents in accordance with the human rights committee guidelines of the hospital was taken. The length of hypoplastic urethra ranged from 0.5-1.5 cm. The preoperative clinical data of patients were summarised in Table 1.

Table 1: Different types of hypospadias at time of surgery

Position of meatus at time of surgery (%)	No. (%)	No. (%) 1ry (new cases)	No. (%) of 2ry (previously failed repair)
Coronal	101 (57.71)	84 (48.00) 71 (84.52) HU [13(15.48%)]	17 (09.71)
Penile			
Distal shaft	37 (21.14)	31 (17.71) 25 (80.65) HU [6(19.35%)]	6 (03.43)
Mid-shaft	23 (13.14)	19 (10.86) 15 (78.95) HU [4(21.05%)]	4 (02.29)
Proximal shaft	14 (08.00)	11 (06.29) 9 (81.82) HU [2(18.18%)]	3 (01.71)
Total no. %	175 (100)	145 (82.86) 120 (82.76) HU [25(17.24%)]	30 (17.14)

HU: Hypoplastic urethra

Surgical technique

Under complete a septic technique, a traction suture of 5-0 silk is placed in the glans to stabilize the penis during the procedure and help in demonstration of the abnormal curvature and redundant dorsal preputial skin. A circumscribing incision is made 2 mm proximal to the hypospadiac meatus, and the penis is degloved to the penoscrotal junction in cases with proximal meatus. In cases of hypoplastic urethra (the urethra devoid of corpus spongiosum), the meatus was preserved in all patients by a de-epithelialisation of hypoplastic urethra. Artificial erection is conducted to verify the penile shaft without bending. If the penis is straight, TIP repair is continued; parallel longitudinal incisions are then made approximately 6 to 8 mm apart to separate the glans from the lateral margins of the plate and the glanular wings are mobilized to facilitate subsequent glans closure without tension. Then, the edges of the urethral plates are gently retracted laterally with fine forceps to delineate the midline which is deeply incised with tenotomy scissors from the hypospadiac meatus to the end of the plate, just below the tip of glans penis [Figure 1]. The incised urethral plate is tubularized without tension over a catheter of an appropriate size (6Fr or 8Fr), using continuous subepithelial (non-interrupted) 6/0 polyglactin sutures [Figure 2]. The epithelium of the urethral plate is inverted toward the lumen to avoid fistula formation. Thereafter, the corpus spongiosum alongside the plate is sutured together over the neourethra with the "Y to I" technique. In all cases, a vascularized dartos fascia flap harvested either from the prepuce or the penile shaft is used to cover the urethroplasty as a second layer. It is placed in such a manner as to cover the original suture line and sutured with periurethral tissue. Care must be taken to avoid rotation of the penis [Figure 3]. Then, the lateral glans wings are re-approximated over the neourethra using vertical mattress 6/0 polyglactin sutures [Figure 4].

If the curvature is less than 30 degree, dorsal plication of the corporal tissue in the midline is performed to preserve the urethral plate [Figures 5 and 6]. In case of severe chordee, more than 30 degree, excision of the chordee is followed by covering the ventral raw area with preputeal skin as a first stage. Then, TIP urothroplasty is performed as a second stage after 6 months.

Then, preputeal skin is divided in midline and rotated on both sides of the shaft of the penis to cover the second layer of dartos fascia and sutured to the subglanular skin edge to cover the ventrum of the penis. In circumcised patients, penile ventral skin is approximated and sutured to cover the ventrum of the penis. Then, a straight catheter within the urethra is secured distally to the glans with the traction suture. Urinary diversion was carried out via a percutaneous suprapubic vesicostomy in cases with proximal hydospadiac meatus either primary or secondary. A compression dressing is applied and left in place for 4-7 days. Prophylactic IV antibiotics was started 30 minutes before the induction of anesthesia and continued for 36 hours postoperatively. The first exchange of dressing is applied 48 hours after surgery to assess the viability of the repair and to detect the acute postoperative complications (bleeding, haematoma and edema), and continued daily till catheter removal. The duration of the catheter indwelling ranged from 7 to 10 days according to the length of the neourethral. All patients were kept on regular follow-up in outpatient clinic at the end of first, third, and sixth month. Calibration was done only for selected patients that appeared to have meatal stenosis and urethral stricture.

RESULTS

All families were happy with penile aesthetic appearance. The total number of boys with different types of hypospadias was 175 (145 1ry and 30 2ry). Out of 175 cases, the overall urethrocutaneous fistula rate was 6 (4.14%) in 1ry cases and 5 (16.67%) in 2ry cases. The overall rates for glanular dehiscence, urethral stricture, meatal stenosis, and meatal regression were 4 (2.29%), 5 (2.86%), 17 (9.71%), and 10 (5.71%), respectively.

All cases of urethral stricture and most of the cases of meatal stenosis 12 (6.86%), responded well to regular urethral dilatation. Meatoplasty was performed in only 5(2.85%) cases (1of 1ry and 4 of 2ry cases). Secondary surgery for fistula repair and glans closure was successful in all patients [Table 2]. All children void with a single straight urinary stream in a forward



Figure 1: A U-shaped skin incision was made surrounding the meatus and paramedian incisions were made bilaterally along the urethral plate. The urethral plate was incised deeply in its midline from just below the tip of the glans to the regressed meatus



Figure 2: The incised urethral plate was tubularized without tension over a catheter of an appropriate size. Then the corpus spongiosum alongside the plate was sutured together over the neourethra with the "Y to I" technique



Figure 3: A vascularized dartos fascia flap harvested either from the prepuce to cover the neourethra as a second layer



Figure 4: The lateral glans wings were reapproximated over the neourethra and the ventral aspect of the penis was covered with preputeal skin and sutured to the subglanular skin collar



Figure 5: Penoscrotal hypospadias with chordee less than 30 degree



Figure 6: Dorsal plication of the corporal tissue was done in the midline to preserve the urethral plate then, TIP urethrolplasty is performed as mentioned earlier in the same session

direction and have a rounded glans with vertical slit-like terminal glanular meatus. The mean hospital stay was 4.6 days [Tables 1-3], summarize different types of hypospadias at time of surgery, early and late complications after TIP repair, respectively.

DISCUSSION

A technique to repair hypospadias with universal applicability in most variants would be appealing. The Snodgrass technique is a simple technical innovation that has revolutionised hypospadias surgery. Rich *et al*., first described an incision in the urethral plate to obtain a cosmetically acceptable vertical slit-like meatus for the Mathieu repair.[8] This was subsequently adopted for the entire length of the urethral plate as a complement to the Thiersch-Duplay urethroplasty for distal hypospadias reported by Snodgrass.[2-5]

The dorsal relaxing incision over the urethral plate results in a neourethra of more than 10F[2-5] and does not seem to compromise the blood supply of urethral plate.[9,10] It also results in reepithelialisation rather than fibrosis of the subcutaneous tissue which may later give rise to stricture of the neourethra.[4,6,11]

In 2001, Borer *et al*., found that the risk of fistula was reduced by using second layer to cover the suture line, and recommended this maneuver after TIP urethroplasty.[6] In 2003, Samuel and Wilcox used a second layer of vascularized pedicle subcutaneous tissue harvested from the dorsal hooded prepuce provided cover for the urethroplasty to minimise the incidence of urethrocutaneous fistula.[7]

In 2003, Sozubir and Snodgrass mentioned that dartos pedicle flap obtained from the dorsal prepuce and shaft skin is used to cover the neourethra. In some patients with proximal hypospadias, the corpus spongiosum alongside the plate was sutured together over the neourethra with the "Y to I" technique before the dartos flap was applied.[12,13]

In this series, the incised urethral plate was tubularized without tension over a catheter of an appropriate size (6Fr or 8Fr), using continuous subepithelial (non-interrupted) 6/0 polyglactin sutures. Then, the corpus spongiosum alongside the plate was sutured together over the neourethra with the "Y to I" technique. A second layer of vascularised dartos pedicle flap was harvested from the dorsal prepuce or penile shaft skin in circumcised patients to cover the suture line after TIP urethroplasty. We think this combined technique have resulted in good functional and cosmetic outcome.

In 2002, Elbakry concluded that postoperative regular urethral calibration should be considered as an integral

Table 2: Early complications after tubularized incised plate repair

Position of meatus at time of surgery	Early complications		
	Bleeding (%)	Haematoma (%)	Oedema (%)
1ry (new)			
Coronal	0	0	1(01.19)
Distal shaft	1(03.23)	0	0
Mid-shaft	2(10.53)	2(10.53)	3(15.79)
Proximal shaft	1(09.09)	2(18.18)	2(18.18)
No.	4(02.76)	4(02.76)	6(04.14)
2ry (previously failed repair)			
Coronal	0	1(5.88)	1(5.88)
Distal shaft	1(16.67)	1(16.67)	2(33.33)
Mid-shaft	1(25.00)	1(25.00)	0
Proximal shaft	2(66.67)	2(66.67)	1(33.33)
No.	4(13.33)	5(16.67)	4(13.33)
Total no. & overall	8 (04.57)	9 (05.14)	10(05.71)

Table 3: Late complications after tubularized incised plate repair

Position of meatus at time of surgery	Complications				
	Meatal stenosis (%)	Meatal regression (%)	Urethral stricture (%)	Fistula (%)	Glanular dehiscence (%)
1ry (new)					
Coronal	1 (01.20)	0	0	0	0
Distal shaft	2 (06.45)	1 (03.23)	0	2 (06.45)	0
Mid-shaft	3 (15.79)	2 (10.53)	1 (5.26)	2 (10.53)	1 (05.26)
Proximal shaft	3 (27.27)	2 (18.18)	1 (09.09)	2 (18.18)	2 (18.18)
No.	9 (06.21)	5 (03.45)	2 (01.38)	6 (04.14)	3 (02.07)
2ry (previously failed repair)					
Coronal	2 (11.76)	2 (11.76)	0	1 (05.88)	0
Distal shaft	3 (50.00)	1 (16.67)	1 (16.67)	2 (33.33)	0
Mid-shaft	2 (50.00)	2 (50.00)	1 (25.00)	1 (25.00)	1 (25.00)
Proximal shaft	1 (33.33)	0	1 (33.33)	1 (33.33)	0
No.	8 (26.67)	5 (16.67)	3 (10)	5 (16.67)	1 (03.33)
Total no. & overall	17 (09.71)	10 (05.71)	5 (02.86)	11 (06.29)	4 (02.29)

part of the TIP urethroplasty to prevent the neourethral and/or meatal stenosis with subsequent urethral fistula.[14]

In 2002, Lorenzo and Snodgrass concluded that dilatation of the neourethra is unnecessary after TIP urethroplasty, and the calibration and uroflowmetry after 6 months of surgery may be useful to detect subclinical obstruction. They attributed the meatal stenosis detected in other series (El bakry 2002) to the technical error including failure to deeply incise the plate and/or tubularisation of urethral plate too far distally.[15]

In this series, meatal stenosis was observed in 9(6.21%) of 1ry cases and in 8(26.67%) cases of 2ry cases. Short neourethral stricture was seen in 2(01.38%) of 1ry cases and 3(10%) of 2ry cases, inspite of the deep incision and tubularisation of urethral plate adequately and they were kept under regular calibration in outpatient clinic.

In 2002, Snodgrass and Lorenzo concluded that TIP urethroplasty can be used for hypospadias reoperation, even when the urethral plate has been incised previously, but should be avoided when the urethral plate is obviously scarred or has been resected.[16]

In this series, TIP urethroplasty was used for hypospadias reoperation with successful results. Thin distal urethra devoid of spongiosum sometimes called 'hypoplastic urethra', has been noticed in approximately one-fourth of patients undergoing urethroplasty.[17] In this study, the hypoplastic urethra has been noticed in 25 (17.24%) among the primary cases.

Traditionally, the hypoplastic urethra is spatulated till the 'healthy' urethra with spongiosum cover is obtained and the urethroplasty is commenced. This step creates a more proximal hypospadias, thus increasing the chances of postoperative fistula.[18] In this series, the urethral hypoplasia is preserved by its deepithelialisation followed by fashioning of the neourethra then reinforced by suturing the corpus spongiosum alongside the plate together over the neourethra with the "Y to I" technique before the dartos flap is applied with good functional and cosmetic outcome.

In conclusion, this retrospective review of our surgical experience over the last five years have emphasized that TIP urethroplasty with neourethral coverage using a vascularized dartos pedicle flap of subcutaneous tissue is versatile, single-stage, and simple operation in management of different types of hypospadias. It has good functional and cosmetic results. The accumulated surgical experience and refinements in TIP urethroplasty covered by second layer of vascularized pedicle dartos flap, the choice of fine suture material of good quality, and use of magnification tools have contributed to improved the outcomes.

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