

Our Tubularized Incised Plate Urethroplasty Repair Results for Hypospadias Surgery

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Abstract

Background: The Tubularized Incised Urethral Plate (TIP) urethroplasty is a widely accepted technique among urologists and heavily used in their centers. This technique was developed by Snodgrass in 1994 for repairing varied degrees of hypospadias.

Aim: This paper aims at analyzing and evaluating our early experience and the outcomes of using TIP urethroplasty technique. Therefore, the results have to be assessed in a large series.

Methods: In this prospective study, 95 patients with varying hypospadiac meatus levels who experienced the procedure of TIP. During the entire sampling period, patients had varying degrees of hypospadias ranging from glanular to penoscrotal (glanular 2, coronal/subcoronal 37, distal shaft 30, mid-shaft 10, proximal shaft 5 and penoscrotal 11).

Results: The overall success rate of TIP procedure repair of hypospadias was 87.4%; whereas the overall reoperation rate was 12.6%. The highest percentage was for those with failed previous repair (secondary). The average duration of the procedure was 58.6±18.4 minutes. Nearly a third of the patients developed one or more postoperative major complication. The total rate of fistula was 12.6%, with “10.6% in primary distal, 15.9% in primary proximal and 20% in secondary repair”. Sixteen cases had a mild degree of “meatal stenosis” (16.8%), but all were managed by simple dilatation at the office or at home using 8 F feedingtube.

Conclusion: The outcomes demonstrated that the TIP procedure is a quick, safe and reliable technique. Additionally, it can provide excellent cosmeses and function with few complications and acceptable reoperation rate.

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Introduction

In certain cases, the penis may suffer a congenital anomaly. Such a case is known as hypospadias. This occurs when the urine stream opens nearer its normal position at the glans tip [1]. This is reported in nearly 1 out of 250 newborns, or approximately 1 out of 125 births of live male [2]. Hence, a distal extends from the hypospadiac meatus is formed as an epithelium strip covering the connective tissues. In the past decade, the unformed part of the urine stream has been commonly called the urethral plate. Additionally, the penis with hypospadias typically has a partly formed prepuce (dorsally hooded foreskin) and may exhibit ventral curvature (chordee) [1,3].

Historically, hypospadias has been classified into three degrees. The first-degree hypospadias refers to a glanular meatus. Openings on the penile shaft are termed second-degree hypospadias, and penoscrotal to perineal anomalies are third-degree hypospadias. As depicted in figure, Different forms of hypospadias including a coronal, glanular, subcoronal, midshaft, distal shaft, a proximal shaft, perineal, scrotal and penoscrotal have been identified in the urologic literature (Figure 1) [1].

From the earliest recorded description of hypospadias to the

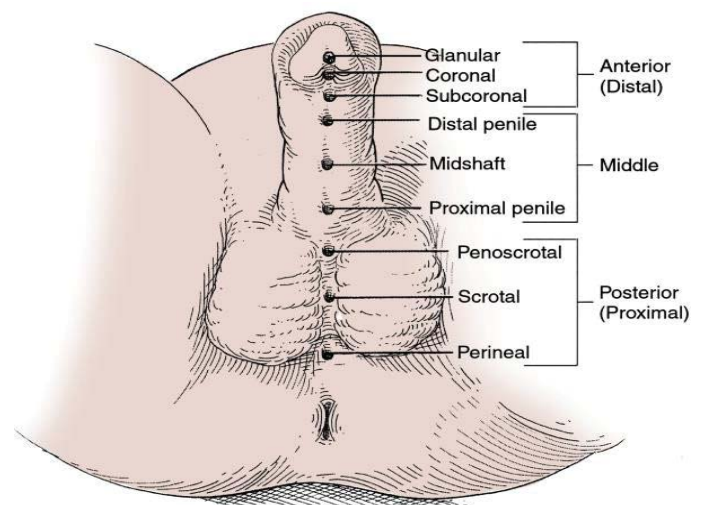


Figure 1: Classification of hypospadias [9].



present, several hundred surgical approaches and/or variations on a theme have been described [4]. In 1994, WT Snodgrass described TIP urethroplasty for “distal penile hypospadias”. TIP is a simple, innovative technique considered as a turning point in the surgical management of hypospadias [5]. Snodgrass et al. (1996) found that this technique can be further used for repairing mid-penile and penoscrotal hypospadias. They also demonstrated satisfactory cosmetic and functional results [6]. The “TIP urethroplasty” becomes a widely accepted technique at the present time. This technique also showed durability and long-term success even in some of the more proximal variants [6-8].

Technique of TIP

TIP urethroplasty technique has been for repairing “distal penile hypospadias. Figure 2 presents the Tubularized incised plate urethroplasty (Snodgrass technique). In Figure 2A, the horizontal line indicates circumscribing incision to deglove penis. Additionally, ventral lines demark junction of the urethral plate to glans wings. Let’s come to Figure 2B; the urethral plate is separated from glans wings but is too narrow for tubularization. The midline relaxing incision of the urethral plate in Figure 2C is made from within the meatus to its distal extent to widen and deepen the plate. Figure 2D shows urethral plate is tubularized over the 6F stent. Furthermore, in Figure 2E exhibits how dartos pedicle covers the neourethra. Lastly, Figure 2E shows that Glans wings, mucosal collar, and ventral shaft are closed [10,11]. The technique presents a combination of modifications made to techniques that have been previously developed including [5]:

- “Urethral plate incision” by Rich et al. (1989).
- Tubularization by Thiersch (1869) and Duplay (1880).

In 1994, Perovic and Vukadinovic described the concept of a “urethral plate relaxing incision” as an adjunct to “hypospadias repair” to allow tension-free “neourethral tubularization” [10]. The use of this technique has been extended by Snodgrass et al. (1996) to include the repair of midpenile and penoscrotal hypospadias. The study Snodgrass et al. (1996) demonstrated satisfactory cosmetic and functional and results when applied to a large population consisting of 148 patients [6].

As mentioned earlier that the “TIP urethroplasty” becomes a widely accepted technique among urologists and heavily used in their centers. It can be used to correct hypospadias of varying degrees (primary or recurrent). Therefore, the results have to be assessed by applying this technique to a large population.

Patients and Methods

TIP urethroplasty was applied to 95 out of 140 patients with hypospadias in a single stage operation at Mosul urologic center in Al-Jumhoori teaching hospital and Kirkuk general hospital during the period from November 2008 to October 2014. The patients’ ages ranged between 6 months and 26 years (mean 7 ± 5.4 years). Table 1 summarizes the patients’ aging information in general. The majority of them (56 patients represented by 59%) were below 7 years of age. As outlined in Table 2, Patients have varying degrees of hypospadias ranging from glanular to penoscrotal (glanular 2, coronal/subcoronal 37, distal shaft 30, mid-shaft 10, proximal shaft 5, penoscrotal 11). Eighty-five cases were operated on for a first time with 10 for the second or third time (secondary repair) (Table 3). They were studied in a prospectivemanner.

Surgery was performed under general anesthesia with a tourniquet application for a maximum of 30 min. The operative procedure essentially involved degloving of the penis with preservation of urethral plate. This can be corrected most of the chordee (if occurred). Then, adequate mobilization of glans wings, midline incision of the urethral plate followed by tubularization. The subsequent covering of repair with vascularized dartos flap mobilized from the dorsum of the penile shaft, or inner prepuce or both. Urethral tubularization was performed with different types of absorbable suture materials (polyglactin (vicryl), polyglycolic acid (dexon), polyglyconate (Maxon) or chromic catgut), of varying sizes (4/0, 5/0, 6/0, or 7/0), in continuous subepithelial, or continuous through and through (no case closed by interrupted fashion). Splinting and diversion by catheters either Foley catheter or infant feeding tube (suprapubic diversion not needed in any case) of variable sizes were used. The average duration of the procedure was (58.6 ± 18.4)min.

All patients were called for follow up at time of dressing removal,

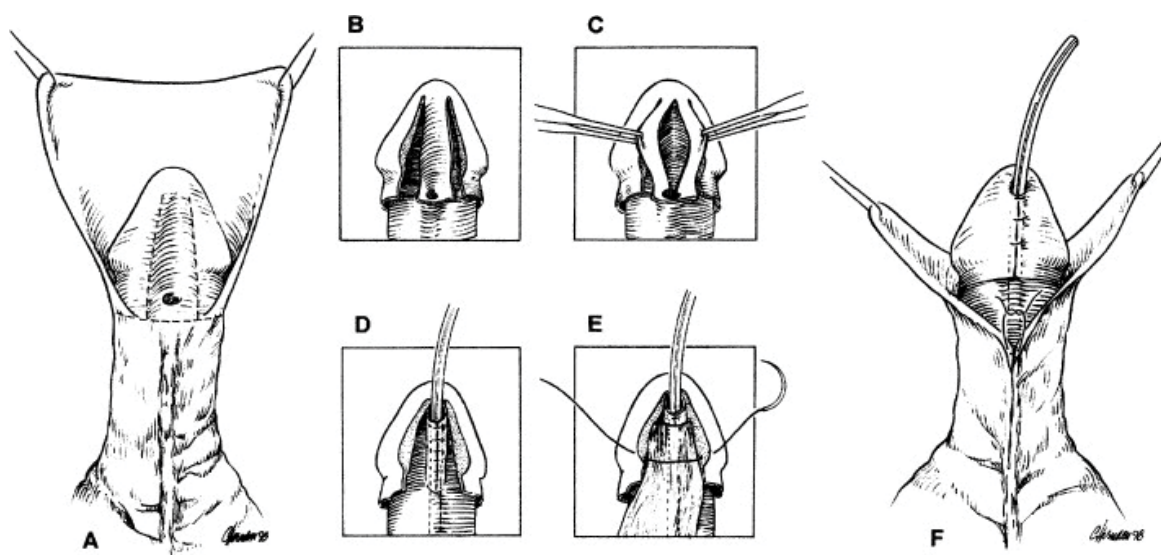


Figure 2: Tubularized incised plate urethroplasty (Snodgrass technique).



catheter removal, within 2 weeks, one month, 6 months and occasionally at one year later if indicated. At follow up visits, patients are examined and evaluated for cosmetic and functional results (urine stream, glans shape, meatal shape and position, and patients or parents satisfaction) in order to detect any minor (wound infection, hematoma, catheter obstruction or slipping) or major complications (meatal stenosis, urethrocutaneous fistula, urethral stricture, skin or flap necrosis and wound breakdown and any residual penile curvature or shaft torsion) and for urethral calibration and meatal dilatation using appropriate size feeding tube or a thermometer if needed. Rarely urethroscopy is done if the urethral stricture is suspected (2 cases). For statistical evaluation of data, descriptive results were represented as frequency, mean and \pm standard deviation (SD).

Results

Operating Time: The average duration of procedures was 58.6 ± 18.4 (ranging between 30-120) min.

Follow Up: The mean duration of follow up was 5.1 months (ranging between 1-12 months). All patients were followed up regularly within 2 weeks and 1 month (100%). Ninety cases were observed after 6 months (94.7%); while only 10 cases were evaluated after other 6 months often for a specific cause, such as those with fistulas or wound breakdown (10.5%).

Postoperative Complications: Infections were mild and responded well to a prolonged course of antimicrobials. Hematoma collections were simple and needed no drainage in most of the cases with a favorable response to conservative measures. The overall fistula rate was 12.6% (12/95, but 2 fistulas closed spontaneously during follow up,

only 10 required closure later on), with 10.6% in “primary distal, 15.9% in primary proximal and 20% in secondary repair”. Sixteen cases had a mild degree of meatal stenosis (16.8%), but all were managed by simple dilatation and calibration at the office or at home using an 8F feeding tube or the mercury end of the thermometer, and no one required meatotomy or refashioning meatoplasty under anaesthesia. Complete or partial wound dehiscence due to skin and/or flap necrosis occurred in 4 cases (4.2%), the majority of them were glanular dehiscence only, and two of them required reoperations (Table 3). Residual penile curvature was reported in 4 patients (4.2%), all with moderately severe chordee before the operation. Residual curvature was mild with acceptable angulation which needed no further correction. There were two cases of urethral stricture (2.1%) proved on urethroscopy and managed successfully by dilatation. As reported in Table 4, all of the major complications occurred much higher in those with proximal hypospadias compared with distal, and in previously failed (secondary) hypospadias compared with the primary.

Success and Failure Rate: Overall success rate of TIP procedure repair of hypospadias was 87.4%. Nearly a third of the patients (31.6%) had one or more postoperative complications (Table 5). This rate even reduced down to 21% after correction of mild meatal stenosis by dilatation during the first three postoperative months. Fortunately, two cases with urethrocutaneous fistulas were closed spontaneously within several weeks of follow up, and two cases of superficial skin necrosis were managed conservatively without squally on the final outcome. So, the overall reoperation rate was 12.6%, and the highest percentage was for those with failed previous repair (secondary) (Table 3).

Functional and Cosmetic Results: Functional and cosmetic results are summarized in Table 5.

Table 1: Ages at repair operation.

Age groups	Age (years)	Total number	Group percentage (%)
Preschool age	0.5-6	56	59
School age	7-12	26	27.4
Adolescents	13-17	7	7.3
Adults	≥ 18	6	6.3

Table 2: Types of hypospadias.

Groups	Types	Numbers	Total number	Percent score (%)
Primary distal	Glanular	2	66	69.5
	Coronal/subcoronal	37		
	Distal shaft	27		
Primary proximal	Mid-shaft	6	19	20
	Proximal shaft	5		
	Penoscrotal	8		
Secondary distal	Glanular	0	3	3.1
	Coronal/subcoronal	0		
	Distal shaft	3		
Secondary proximal	Mid-shaft	4	7	7.4
	Proximal shaft	0		
	Penoscrotal	3		

Table 3: Reoperation rate.

Type	Fistula	Meatal stenosis	Wound breakdown	Urethral stricture	Total number	Percent score (%)
Primary distal (number=66)	6	0	0	0	6	9
Primary proximal (number=19)	2	0	1	0	3	15.8
Secondary (number=10)	2	0	1	0	3	30
Total reoperation	10*	0	2 [#]	0	12	12.6



Table 4: Postoperative complications with regard to the type of hypospadias.

Complications	Total Number (no.=95)	Total Percentage (%)	Primary distal (no.=66)		Primary proximal (no.=19)		Secondary (no.=10)		
			No.	%	No.	%	No.	%	
Mild infection	15	15.7	6	9	5	26.3	4	40	
Hematoma	13	13.7	8	12.1	3	15.9	2	20	
Meatal stenosis	Before dilatation	16	16.8	10	15.1	5	26.3	1	10
	After dilatation	0	0	0	0	0	0	0	0
Urethrocutaneous fistula	12	12.6	7	10.6	3	15.9	2	20	
Wound breakdown	4	4.2	2	3	1	5.3	1	10	
Residual penile curvature	4	4.2	0	0	2	10.5	2	20	
Urethral stricture	2	2.1	0	0	1	5.3	1	10	

Table 5: Functional and cosmetic results.

Parameters		Number(n=95)	Percentage (%)
Urine stream	Normal vertical	84	88.4
	Splayed	6	6.3
	Downward deflection	5	5.3
Glans shape	Conical	83	87.4
	Flat	12	12.6
Meatal position	At tip	70	73.7
	Mid-glans	21	22.1
	Coronal	4	4.2
Meatal shape	Vertical slit	70	73.7
	Oval	25	26.3
Cosmetic result	Good	67	70.5
	Fair	24	25.3
	Bad	4	4.2
Patient/parent satisfaction	Highly satisfied	73	76.8
	Satisfied	15	15.8
	Unsatisfied	7	7.4

(ranging between 154-240 min) [15].

Complications: the primary complications rate in this study were also favorable as compared with other studies [5,6,16 and 17]. Nearly a third of patients in this study (31.6%) had one or more postoperative complications (Table 4). This rate even reduced down to 21% after correction of mild meatal stenosis by dilatation during follow up. Abdulrahman et al. (2008) revealed that the overall complication rate in TIP was 60% [18]. The overall complication rate of TIP urethroplasty in a meta- analysis of large series worldwide was 33%. The high complication rates occurred in Thailand was (33%) as reported in the study of Tonvichien and Niramis (2003). Besides, in Nairobi was (30%) based on the study of Barrack and Hamdun (2001). This can be explained by the lack of familiarity with the surgical technique [19]. In another Thailand study by Sujijantararat and Chaiyaprasithi conducted in 2009, the overall complication rates were dropped down to 23.5% and urethrocutaneous fistula rates were 14.7% in TIP. There were no complications in “distal hypospadias”. However, the rate of complication was 37.5% in “proximal hypospadias” [20]. This indicates an improvement in technique and experience. In an Indian study, 13.4% of patients had major complications [3]. In a Canadian study by Luis HP Braga et al. (2007), the overall complication rates were 60% for the tubularized incised plate for distal type [21]. Mazen and Rien (2010) reported that the overall complication rate was 12% including fistulae, meatal stenosis and glandular dehiscence. No patient had residual chordee, neourethral stricture or a urethral diverticulum [15]. In a Turkish series of 350 cases with primary distal and mid-penile hypospadias, fistula, wound dehiscence, urethral stricture, and meatal

stenosis and total complications rate were noted to be 11%, 4%, 1%, 10%, and 23%, respectively [22].

Success and Reoperation Rates: in this study, the overall success rate of TIP procedure repair of hypospadias was 87.4%, primary distal 91%, primary proximal 84.2%, and secondary hypospadias 70%. Re-operations were required in 12 patients (12.6%); 10 of them required closure of single urethrocutaneous fistula (represented by 10.5%); and other two cases required redoing TIP for complete or partial disruption of the repair (represented by 2.1%) (No meatotomy or meatoplasty required for meatal stenosis or urethroplasty for urethral stricture, nor orthoplasty for residual curvature). These figures are acceptable in comparison to those found in other studies, such as Singh et al. and Mustafa (2005) [3,23].

In a study of 500 hypospadiac children in pediatric urology department, urology and nephrology center, Mansoura University, in Egypt, by Osama M Sarhan et al. (2009), the overall success rate was 81.4%. Re-operation was required in 18.6%, urethrocutaneous fistula in 9.4%, complete disruption of the repair in 6.4% and meatal stenosis in 2.8% [24]. In a Pakistanian study, the procedure was successful in 78% of patients; while 22% of patients had complications. In this study, only 10% of patients required another operation for fistula repair, the rest healed spontaneously and with dilatation [25]. In an Indian study, 10.1% of cases needed a second operation [3]. In a Turkish series conducted by Mehmet Elicevik et al. (2004), the overall success rate was 77% and reoperations rate was 23%, 8% of them required closure of a single fistula, 4% redo TIP urethroplasty for dehiscence, 1% neourethral stricture and 3% multiple fistulas with meatal stenosis and 7% meatoplasty for meatal stenosis [22]. The complication rate after redo TIP urethroplasty was found to be 30%, which is just similar to our reoperation rate for previously failed different techniques of hypospadias repair for one or more times (Table 3) [22]. Cakan et al. (2005) reported a success rate of 78.4% in re-operative TIP urethroplasty for distal or mid-penile hypospadias [26]. In the series of Elicevik et al. (2007), the ultimate success rate of tubularized incised plate urethroplasty reoperation was 74% whereas [27].

Functional and Cosmetic Outcome: Functionally, 88.4% of patients showed normal urine stream immediately after removal of the catheter. Most of the reminders resumed normal stream during follows up. Cosmetically, all patients, except 4, who underwent the TIP procedure resulted in good (70.5%) and acceptable (25.3%) cosmetic appearance (total 95.8%), and penis appeared normal in the majority of patients by (85%) with a “slit-like vertical glandular meatus” and a “conically shaped glans with a circumcised penis”. Good patients and parent satisfaction were reported in 88 (92.6%) cases. In Al-Kahansa’a



center studies, the excellent cosmetic result was obtained with near-normal nice, conical glans configuration and vertical slit-like meatus. This is confirmed by the surgeon's opinion on good cosmetic results by 87.5%; while acceptable cosmetic results were represented by 12.5%. On the other hand, the family opinion indicated a good result by 70%, and satisfactory results by 30% [18,28]. Abdel-Wahab El-Kassaby et al. (2008) suggested that an excellent functional and cosmetic result were achieved in 96.6% of the cases after repair of anterior penile hypospadias by using TIP urethroplasty with modification using dorsal preputial flap [29]. Inayat-ur-Rehman et al. (2010) reported that in 6% of the cases the appearance of the glans was not conical although they had no functional problem in the form of meatal stenosis or urethrocuteaneous fistula; this appearance was acceptable to the parents because there was no functional problem [25]. A study in Croatia, by Zdrinko Brekalo et al. (2007) confirmed that all patients with distal and middle hypospadias had the meatus placed vertically except one who had an oval meatus and similarly, the urinary stream in all of them was straight and with the abundant flow [30]. All patients were satisfied with the penile appearance. This supports other studies which confirmed that no other procedure reliably creates a vertically oriented meatus and near normal configuration of the glans, except TIP technique[31].

Conclusion

The TIP procedure is a safe, reliable, and relatively quick, which has simplified decision making and technique of hypospadias repair. Also, it has been proved that this procedure is satisfactory for reoperation in various cases after first or second failed the previous repair. It provides good cosmeses and function, with high patients and parent's satisfaction. It is a relatively straightforward technique that continues to expand in applicability and popularity due to its proved success, durability and versatility with few complications and acceptable failure rate.

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