Original Article

Tubularized incised plate hypospadias repair : a multicenter experience

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Abstract

Objectives: *To report the outcomes in a series using modified tubularized incised plate (TIP) urethroplasty (Snodgrass) technique. The use of the TIP urethroplasty (Snodgrass) technique has gained wide acceptance among pediatric urologists for the correction of hypospadias repair because of its good cosmesis, low complication rate, and reliability in creating a vertically oriented meatus.* ***Methods:*** *A total of 54 boys aged 2 -13 years admitted in paediatric surgery ward Glanular(5.5%),Coronal(18.5%),Subcoronal(35.18%), Distal RMCH and IBH,Rajshahi with penile(11.1%),midpenile(9.6%) hypospadias underwent one-stage repair using a modified TIP repair during January,2010 to December,2010 were included in the study. Outcome was reviewed for each patient to determine the complications, reoperations, cosmesis, and functional results after surgery.* ***Results:*** *With at least 6 months of follow-up, all patients had achieved excellent functional and cosmetic results, with the meatus at the tip of the penis on follow-up. Three repairs for meatal stenosis and two for fistula were needed.* ***Conclusions:*** *The modified TIP procedure is a safe and reliable technique. It provides excellent cosmesis with a low reoperation rate.*

Introduction

Hypospadias is an abnormality of anterior urethral and penile development due to incomplete tubularisation of the urethral plate leading to abnormal location of the meatus any where along the ventral aspect of penile shaft and down on to the perineum. In the majority (over 80%) of cases the meatus is located distal to the midshaft.The penis is more likely to have associated ventral shortening and curvature, called chordee, with more proximal urethral defects. It is one of the commonest congenital abnormalities of the male genitalia occurring in approximately 0.8-8.2 per 1000 live male births and 1 in 300 male child[1].

The majority of cases are distal hypospadias, and many different techniques have been described for their repair, but currently the Snodgrass repair is the most frequently employed. In 1994 Warren T Snodgrass described his technique of tubularized incised plate urethroplasty (TIP) which is a relatively straightforward one-stage procedure offering excellent cosmetic and functional results[2]. Proximal hypospadias constitute about 20% of all hypospadias and proximal penile hypospadias constitute about 15% of proximal variety[2]. Anatomic classification of hypospadias recognizes the level of the meatus without taking into account curvature. This classification indicates the site of urethral meatus (before and after chordee correction),

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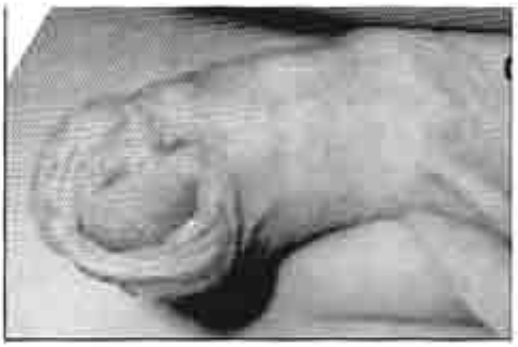

Figure 1: Coronal hypospadias.

Figure 2: Hypospadias is often associated with undescended testis.

the prepuce (incomplete or complete), the glans (cleft, incomplete cleft or flat), the width of urethral plate, the degree of penile rotation if present and the presence of scrotal transposition[26].

The clinical presentation varies with severity of the disorder. Children with hypospadias and a narrow meatus may have a weak urinary stream that is deflected downwards and splayed.

Uncorrected, erections might be painful in those children with chordee, and sexual intercourse might not be possible in severe cases. Fertility might be otherwise affected as the abnormal deflection of the ejaculate might preclude effective insemination.[3]

If untreated these patients as well as their parents suffer physical, psychological and social problems. In our society, family, who have such a child still suffer various kinds of social problems, such as divorce, refusal to keep relation with the family, even homicide of the patient. After correction of these defects the patient and the family can lead a normal physical, psychological and social life.

The ideal age for surgical repair in a healthy child is approximately 6 to 12 months of age[3]. Delayed repair may cause recurrent urinary tract infection, vesicoureteric reflux and even stone formation, where there is meatal stenosis. The aim of surgery in hypospadias is to achieve a functional penis with a normal cosmetic appearance. The commonest repairs to correct distal hypospadias are the Thiersch-Duplay, Mathieu, Mustarde, meatal advancement and glanuloplasty (MAGPI) and tubularized incised plate (TIP) urethroplasty.[3,4] Of these procedures Mathieu and TIP urethroplasty (Snodgrass repair) have been widely practiced. Snodgrass being now the preferred method

Smith 1938	Schaefer 1950	Avellan 1975		Browne 1938	Duckett 1996		Hadidi 2004
1st degree	Glanular	Glanular		Glanular	Glanular	Anterior	Glanular
				Sub-coronal	Sub-coronal		
					Distal penile		Distal
2nd degree	Penile	Penile		Mid Shaft	Mid shaft	Middle	
					Proximal penile		
		Penoperineal		Penoscrotal	Penoscrotal		
3rd degree	Perineal	Perineal		Medscrotal	scrotal	Posterior	Proximal
		Penneal w/o Bulb		Perineal	Perineal		

Figure 3: Classification of hypospadias[27]

since it creates a vertical slit-like normal appearing meatus, unlike a horizontally oriented and rounded meatus ('Fish mouth') produced by the meatal based (Mathieu) flap repair. This procedure allows construction of neourethra from the existing urethral plate without additional skin flaps. The technique is versatile and suitable for almost all distal lesions.[5] Both Mathieu and Snodgrass make use of the urethral plate which makes the appearance to near natural[6]

Figure 3: Penile amputation was the treatment of hypospadias in ancient Egypt[27].

The challenge of hypospadias repair has stimulated surgeons for centuries. As a result more than 300 types of urethroplasty for repair have been explored in depth and in great detail[7,21]. Surgeons have proceeded through Browne repairs and scrotal flaps, to Duplay tubes, to free skin grafts, to island flaps and onlays, to bladder and buccal mucosal repairs, to a host of single-stage innovations, to different concepts of chordee correction and with all manner of bladder drainage systems.[23] What has become apparent from all of this is that the problem has many facts and many solutions but the absolute right technique or approach is not yet in hand.

The standard two staged approach involve initial correction of penile curvature along the preparation of a ventral bed of tissue. This neourethral plate can then be tubularized at a second setting. However this approach inherently required every child to undergo two procedures with many requiring a third or more for complications that may develop[22,24].

By 1988, it was being suggested that all primary hypospadias should be repaired with a single stage approach. One -stage procedures are undoubtedly attractive, desirable and popular. They are associated with a shorter hospital stay and are more convenient for both patient and surgeon alike[24].

Tubularized Incised Plate urethroplasty (TIP).The Tubularized Incised Plate repair is based on the assumption that midline incision into the urethral plate may widen it sufficiently for urethroplasty without stricture. Many centres report excellent results with this technique[23,24] The technique has gained popularity because it is easily performed, with few complications and results in a slit like meatus[25].

Material and methods

In the present cross-sectional study a total of 54 patients were studied. All patients were operated under general anesthesia with adjunctive caudal block and without optical magnification. A tourniquet was applied to maintain a bloodless field. A straight penis was confirmed by performing an artificial erection.

For Snodgrass repair, a U-shaped incision was made extending along the edges of the urethral plate to healthy skin 2 mm proximal to the meatus. Flaps mobilized for a tension free repair. The urethral plate was then incised in midline from the hypospadiac meatus distally. Incised plate was then tubularised over a stent using interrupted polyglycolic acid sutures. Neourethra was then covered with a vascularized dartos flap harvested from subcutaneous tissue of dorsal prepucial skin. Polyglycolic acid (vicryl) 6/0 was used for tubularisation, 5/0 used for the subsequent layers. Repair was performed over a stent (feeding tube Fr. 6 or 8). Circumcision was performed in all those patients who were uncircumcised and the fascia of the dorsal hood used to cover the neourethra.

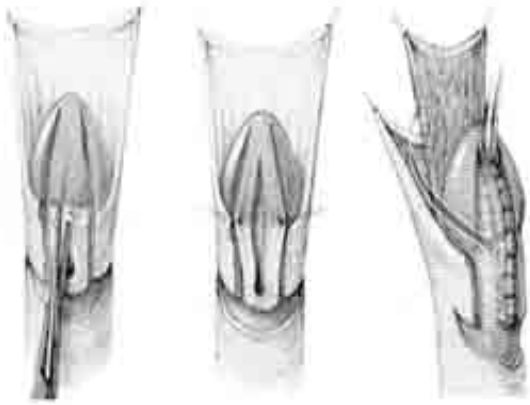

Figure 4: Basic method of tubularised incised plate urethroplasty[27]

All patients were maintained on antibiotic prophylaxis. Stent was removed after 7 days. Patients were followed for 6 months to one year. Operative time was calculated for each repair. Patients were followed for complications.

Results

A total of 54 cases were studied. All patients underwent Snodgrass repair. Age ranged between 2 years to 13 years with the mean of 7.5 years. Types of hypopadias were Glanular 3(5.5%),Coronal 10 (18.5%), Subcoronal 19 (35.18%), Distal penile 6 (11.1%), midpenile 16 (9.6%). 24 (44.4%) patients were already circumcised. Urethral plate was healthy in all patients. Presurgical hormonal treatment was not given to any of our patients. Operative time ranged from 75 to 110 minutes (mean=92.5 minutes). Hospital stay was 6 days to 15 days (mean=10.5days) for Snodgrass repair. Results are displayed in the following tables:

Table 1: Type of chordee

Type of chordee	Percentage (n=54)
Skin Chordee	53.7
Superficial Chordee	40.7
Deep Chordee	0
No Chordee	5.5

Table 2: Functional out come

Status of urinary flow	Percentage (n=54)
Straight flow	83.3%
Good caliber	88.8%

Table 3: Complications

Complications	Snodgrass repair (n=54)
Persistent Chordee	0
Meatal Stenosis	(6) 11.1%
U-C fistula	(5) 9.2%
Wound inf	(3) 5.5%
Uretral sricture	(2) 3.7%
Flap necrosis	0
Granular Ddhiscence	0

Figure 5: Post urethroplasty distal penile hypospadias with stent in situ.

Discussion

Hypospadias is a common clinical problem[8]. In the majority of cases abnormal meatus is situated in the glanular, coronal or in the distal part of the shaft. The goal of repair is a functionally and cosmetically normal penis. More than 200 methods of repair have been introduced throughout the 125 years history of hypospadias repair. Earlier most of the distal lesions were repaired with meatal-based flip flap procedure (Mathieu repair). Although this repair produced a glanular meatus, the opening was often rounded, in contrast to the slit like appearance of a normal meatus.

This technique was first described by Mathieu in 1932 for distal hypospadias using a meatal based flap.[9] Then in 1981 Wacksman reported his initial experience with this technique[12]. Subsequently in 1987, Rabinowitz described catheterless repair using the Mathieu repair[10]. Although 1 and 2-layer neourethral anastomoses have demonstrated satisfactory results, the two layer technique has produced lower complication rates[11].

Careful preservation of the vasculature of the flap and avoidance of overlapping suture lines produce a watertight closure with minimal risk of postoperative fistula formation.

Mathieu repair also provides good functional results but cosmesis is more preserved in Snodgrass repair. Minimal complication rate has been reported even with stentless repair[11]. Rich et al incised the urethral plate in the midline to improve cosmesis of a hypospadias repair in 1989[13]. Later, in 1994, Snodgrass advanced this concept by extending the incision of the urethral plate from the meatus to the tip of the glans[4]. This maneuver allowed construction of a new urethra from the existing urethral plate. It was suggested that healing may occur through re-epithelialization of the relaxing incision without obvious scarring, allowing the incised edges to remain separated[14]. It reliably creates a normal appearing penis with a vertical slit-like meatus unlike the Mathieu or Thiersch-Duplay which create a horizontal, rounded meatus. The TIP urethroplasty is a versatile procedure which can be used for both distal and proximal hypospadias repair in all age groups. It is a single stage procedure, typically performed as a day case and thus avoids the need for repeated general anaesthetic.

We encountered a fistula rate of 9.2% and this is comparable with most series from leading institutions. Precise identification of minute tissue relations and preservation of the periurethral vascular supply and gentle tissue handling helped to keep fistula rate minimum.. Care needs to be taken when covering the neourethra with a thin layer of Dartos fascia. This vascularised flap is used to prevent fistula formation but may also create some thickness over the neourethra making the glans closure too tight, promoting obstructive voiding and possibly fistula formation.

Meatal stenosis generally occurs in 11.1% of patients after hypospadias repair. Our meatal stenosis rate although initially disappointing represents a learning curve associated with the introduction of a new surgical technique. It is also evident that there was a dramatic improvement in meatal stenosis rates after surgical technique and management were modified. Recently Cheng et al have suggested a two layer closure of the neourethra to minimize the fistula rate.[16] Meatal stenosis is mostly the result of technical error; not confining the dorsal midline incision to the urethral plate. Other complications such as urethral stricture, diverticulum, and wound breakdown are infrequent

In one comparative study[20] the mean duration of surgery was found significantly lower for Snodgrass procedure than for Mathieu repair (75 vs. 115 minutes. $P<0.05$) with urocutaneous fistula more frequently in Mathieu repair and meatus being slit like in Snodgrass repair and rounded and horizontal in Mathieu repair.In the present study operative time was comparable with these studies.

From this study it was concluded that TIP urethroplasty is a more favored technique for anterior hypospadias because of its less operative and its low rate of complications. Moreover the cosmetic appearance of the meatus is also near normal with this procedure.[15]. Severe chordee and unhealthy urethral plate are the two limiting factors for this procedure. Fistula can be avoided by interposition of a vascularized dartos flap between the neourethra and overlying skin.

Figure 5: Healthy outcome results in better patient compliance.

Conclusion

Today TIP urethroplasty has become a preferred method for repairing distal hypospadias because of its versality, to correct different meatal variants, the simplicity of the operative technique, low complication rate and reliable creation of a normal appearing glanular meatus. This study represents an experience with the tubularised incised plate urethroplasty in the management of distal hypospadias. With its simplicity, versality, excellent cosmetic and functional results and a low complication rate, TIP urethroplasty is the procedure of choice for most of the distal defects.

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