

Original Article

Comparative Study between Tubularized Incised Plate (Snodgrass) Urethroplasty and Reverse Flap (Mathieu's) Repair in Distal Hypospadias

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Objectives: To compare results of Tubularized incised plate urethroplasty (Snodgrass) and Mathieu's repair in distal hypospadias repair.

Study Design: Experimental Study.

Place and Duration: Department of Urology and Renal Transplantation, Quaid-I-Azam Medical College /Bahawal Victoria Hospital, Bahawalpur, from April 2008 to October 2010.

Materials and Methods: A total of sixty four patients, 1.5 to 25 years of age were included in the study. Patients of Distal Penile Hypospadias with significant chordae and history of previous surgery were excluded. Patients were divided in two groups, 32 patients in each group. Group I had Tubularized Incised Plate Urethroplasty and Group II had Mathieu's repair. Operative time was noted for both the procedures separately. Patients were followed for subsequent outcome. Complications were noted as immediate post-operative (within 24 hours), delayed post-operative (within 72 hours) and on follow up.

Results: The mean duration of surgery was significantly lower for Tubularized incised plate urethroplasty as compared to Mathieu's repair. Only two patients undergoing Tubularized Incised Plate Urethroplasty had complications as compared to seven patients undergoing Mathieu's repair. Cosmetic results were excellent with Tubularized Incised Plate Urethroplasty with a normal slit like meatus and appearance of glans.

Conclusion: The overall complication rate and operative time were significantly lower in Tubularized Incised Plate urethroplasty, which also had a better cosmetic outcome. Therefore we recommend this repair as a primary treatment for distal hypospadias.

Keywords: Distal hypospadias, Tubularized Incised Plate Urethroplasty (Snodgrass), Reverse Flap (Mathieu's) repair, Urethrocuteaneous fistula.

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Introduction

Hypospadias is an abnormal opening of external urethral meatus in male child at birth, and can be anywhere along the ventral side of shaft of the penis or perineum.¹ Hypospadias is a congenital defect due to incomplete Tubularization or fusion of the urethral plate leading to abnormal location of the meatus.² It is one of the common congenital anomalies occurring in approximately 1 in 200- 300 live male births.^{3,4} Hypospadias are classified into Anterior(distal), Middle and Posterior(proximal) according to site of native meatus. The incidence of Anterior (distal) hypospadias is 71%, middle 16%, and posterior (proximal) 13%.⁵

There are many surgical procedures for repair, and none of them is superior to the others.⁶ There have probably been over 200 reported original methods of urethral reconstruction and they continue as modification of modifications. The aim of surgery in hypospadias is to achieve a functional penis with a normal cosmetic appearance. The commonest repairs to correct Anterior (distal) hypospadias are the Thiersh-Duplay,⁷ Mathieu,⁸ Mustarde, Meatal Advancement and Glanuloplasty Incorporation (MAGPI) and Tubularized Incised Plate (TIP) urethroplasty.⁹ Of these procedures Mathieu's and TIP urethroplasty have been widely practiced. The most frequent complications after Mathieu's repair are Urethrocuteaneous fistula and meatal stenosis, which have been reported in up to 21%

of patients.¹⁰ Furthermore, the Mathieu's repair creates a horizontal and rounded meatus which is cosmetically less acceptable than a normal vertical slit-like meatus.¹¹ Therefore, Snodgrass described a technique with a low complication rate for correcting distal hypospadias by tubularizing the incised urethral plate to create a vertical meatus.⁹ In both Mathieu's and Tubularized Incised Plate Urethroplasty, urethral plate is used which makes the post repair appearance regarding glans shape and external meatus near to natural.¹² The present study was designed to compare the outcome of Tubularized Incised Plate urethroplasty and Mathieu's repair.

Materials and Methods

This study was conducted at the Department of Urology and Renal Transplantation, Bahawal Victoria Hospital / Quaid-e-Azam Medical College, Bahawalpur from April 2008 to October 2010. Patients admitted to Department of Urology with distal hypospadias without chordae were included in this study. A total of 64 patients were studied. The patients with age of less than 1.5 years and more than 25 years were excluded from this study along with patients with history of previous hypospadias repair and significant chordae. Patients with associated anomalies like undescended testes were not excluded. Patients were divided into two groups, each group comprised of 32 patients. In Group I patients, Tubularized Incised Plate Urethroplasty was done and Mathieu's repair was done in Group II patients. In both groups, patients with matching age were enrolled, so as to minimize the comparable post-operative variable factors like general health, nutritional status etc.

Investigations like Complete Blood Count, Urine routine examination, Ultrasonography abdomen were done. Detailed history asked about previous repair and its outcome for exclusion from this study. All patients were operated under general anesthesia. A tourniquet was applied at base of penis to maintain a bloodless field for duration of about 40 minutes and released if more time was required to complete repair. Absence of Chordae was confirmed by achieving artificial erection by injecting 0.9% Normal Saline Solution into corpora cavernosa with the help of scalp vein needle.

Procedural Details:

Tubularized Incised Plate (TIP) urethroplasty: For Tubularized Incised Plate Urethroplasty, a U-shaped incision was made, extending along the edges of the urethral plate up to the glans and to healthy skin 2 mm proximal to the meatus. Then an incision was added in midline of urethral plate from native meatus up to glans and the tube was made of local flaps created of urethral plate over a 10 Fr or 12 Fr silastic tube stent using polyglycolic acid sutures. Glans wings were created. Neourethra was then covered with a vascularized subcutaneous (dartos) flap. A dartos layer harvested

from the prepuce, preserving the vascular pedicle provides additional coverage of the new repair. The dartos flap is brought from the dorsum to the ventrum, through a buttonhole in the pedicle. The overlying skin is separated and discarded. Glans traverses through this buttonhole. This dartos tissue is then used to cover the entire neo-urethra and secured with 7-0 polyglactin sutures to Buck's fascia, skin mobilized from penile shaft is replaced up to coronal level. Tubularized Incised Plate urethroplasty (TIP) was described in 1994 by Snodgrass.⁹

Mathieu's Repair: The Mathieu's hypospadias repair starts with measuring the length of the defect from the native urethral meatus to the glans tip. A distance from the meatus was measured on the proximal penile shaft skin. The flap measured over proximal penile shaft was kept 1.5 to 2 times longer than the length measured from native meatus to tip of glans. The urethral plate and perimeatal-based flap were then marked. Typically, a width of 7.5 mm was measured for the proximal flap. This width was tapered to 5.5 mm at the distal extent of flap for placement at glans. Longitudinal lines outlining the urethral plate were then drawn extending along the length of required flap. A line was marked beginning at either lateral margin of the previously marked urethral plate and carried around the dorsal aspect of the penis 5 to 7 mm proximal to the corona of the glans. Glans wings are created by deep dissection under glans away from marked urethral plate, the penile shaft skin is degloved, and the penis is evaluated for curvature.

After ensuring a straight penis by artificial erection, the measured segment of penile skin proximal to the meatus was mobilized off of the urethra in a proximal to distal direction with the aid of skin hooks, fine stay sutures, and tenotomy scissors. This tissue was folded over the native meatus (perimeatal-based flap) up to tip of glans, and bilateral, longitudinal, running subcuticular continuous sutures approximate this flap to the lateral aspects of the urethral plate, thereby creating the neo-urethra. Tubularization was performed over a 10-12Fr Silastic catheter using fine polyglactin suture. The meatus was created at the glans tip with simple, interrupted, fine absorbable suture, and second-layer neo-urethral coverage was provided with dorsal dartos tissue. The glans wings were then approximated without tension in two layers, and skin coverage was completed. The results of this technique were first reported in 1932.⁸ Since then, and due to the successful results, the technique has been popularized by Kim and Hendren.¹³ and Rabinowitz and Hulbert.¹⁴ In the 21st century the single stage flip-flap procedure of Horton and Devine and the meatal based flap technique of Mathieu seem to be the most popular "local-flap techniques" for distal hypospadias without Chordae or with minimal chordae.¹⁵ All patients were maintained on antibiotic prophylaxis. Stent was kept for 7-14 days. Patient discharged from

hospital at 72 hours post-operatively with urethral catheter intact. Follow up was initially fortnightly and then at 3 months intervals. Minimum follow up period was 6 months and maximum 18 months for these particular patients.

Results

A total of 64 patients were studied. Group I (n=32) patients underwent Tubularized Incised Plate Urethroplasty and Group II (n=32) patients underwent Mathieu's Repair. Age ranged between 1.5 years to 25 years with the mean of 6 years. Age of patients at operation is shown in Table I. Majority of the patients (40/64) were between 1.5 to 10 years of age.

Table I: Age at operation

Age (yrs)	Group I		Group II	
	No.	%age	No.	%age
< 5 years	11	34.37	10	31.25
6-10 years	09	28.12	10	31.25
11-15 years	10	31.25	08	25.00
16-25 years	02	6.25	04	12.25
Total	32	100.0	32	100.0

Classification of the patients according to type of hypospadias is shown in Table II. Distal penile hypospadias was present in 44 (68.75%), Sub-Coronal in 18 (28.13%) and Coronal in 02 (3.12%) patients.

Table II: Type of hypospadias

Type of Hypospadias	Group I		Group II	
	No.	%age	No.	%age
Distal penile (DP)	22	68.75	22	68.75
Sub-Coronal (SC)	09	28.13	09	28.13
Coronal (CO)	01	3.12	01	3.12
Total	32	100.0	32	100.0

Operative time ranged from 50 to 80 minutes (mean= 62 minutes) for Tubularized Incised Plate Urethroplasty and from 60 to 115 minutes (mean= 90 minutes) for Mathieu's repair with p value < 0.05.

The post-operative complications among the studied groups are shown in Table III. After Tubularized Incised Plate urethroplasty, there were only 2 (6.25%) patients who developed post-operative complications i.e. Urethrocuteaneous Fistula. And there were 7 (21.87%) patients who developed complications after Mathieu's repair i.e. 3 (9.38%) had post-operative Urethrocuteaneous Fistula, 1 (3.12%) had Meatal Stenosis which was cured with simple dilatation, 1 (3.12%) had Proximal Stricture and 2 (6.25%) had Complete Repair Disruption which required secondary repair.

Table III: Post-operative Complications

Complications	Group I (n=32)	Group II (n=32)
Urethrocuteaneous Fistula	02 (6.25%)	03 (9.38%)
Meatal stenosis	0	01 (3.12%)
Proximal Stricture	0	01 (3.12%)
Complete Disruption	0	02 (6.25%)
Total	02 (6.25%)	7 (21.87%)

Regarding shape of the external urethral meatus, it was rounded in 17 patients, fish mouth in 7 patients and vertically positioned in 5 patients while 2 patients had complete repair disruption and 1 had the meatal stenosis after Mathieu's repair. On the other hand, after Tubularized Incised Plate urethroplasty procedure, 25 patients had vertically positioned external urethral meatus and 7 had rounded meatus. The resultant meatus was also centrally located after Tubularized Incised Plate urethroplasty. Moreover, the cosmetic results were also excellent with Tubularized Incised Plate technique as compared to the Mathieu's repair as regards glans shape and urinary stream.

Discussion

Hypospadias is one of the common congenital anomalies occurring in approximately 1 out of 200- 300 live male births.^{3,4} In 75% of cases abnormal meatus is situated in the glandular, coronal and distal part of the shaft. The surgical goal in patients with hypospadias is to construct a straight penis with meatus as close as possible to normal site and shape to allow a forward directed stream and normal coitus. There have probably been over 200 reported original methods of urethral reconstruction and they continue as modification of modifications.

Earlier most of the distal lesions were repaired with Mathieu's technique. Although this repair produced a glanular meatus, the opening was often rounded, in

contrast to the slit like appearance of a normal meatus. The results of this technique were first reported in 1932.⁸ In the 21st century the single stage flip-flap procedure of Horton and Devine and the meatal based flap technique of Mathieu seem to be the most popular "local-flap techniques" for distal hypospadias without Chordae or with minimal chordae.¹⁵ Careful preservation of the vasculature of the flap and avoiding of overlapping sutures produce a watertight closure with minimal risk of post-operative fistula formation. Mathieu's repair also provides good functional results but cosmesis is more preserved in Snodgrass repair. Even now, Mathieu procedure is considered as the standard by some surgeons, for distal hypospadias.¹⁶ Rich et al¹⁷ incised the urethral plate in the midline to improve cosmesis of a hypospadias repair in 1989. Later, in 1994, Snodgrass added incision in urethral plate from native meatus up to glans and made tube of local flaps created of urethral plate over a silastic tube stent.⁹ The repair gained its name by technique use i.e. Tubularized Incised Plate (TIP) Urethroplasty. It was suggested that healing may occur through re-epithelialization of the relaxing incision without obvious scarring, allowing the incised edges to remain separated. Today, TIP urethroplasty has become a preferred method for repairing distal hypospadias because of its versatility, low complication rate and creation of a normal appearing glanular meatus.^{2,3,18} Severe Chordae and unhealthy urethral plate are the two limiting factors for TIP procedure. Borer et al¹⁹ have found TIP Urethroplasty applicable to essentially all cases of distal hypospadias. Urinary diversion after hypospadias repair is a point of controversy. For urinary drainage, we used indwelling Foley's catheter for 07-14 days. It has produced more satisfactory results and patient compliance than the urethral stents. Urethral stents were found painful for patients and hesitancy while micturating through it, usually got dislodged and resulted in disruption of repair. There was no significant difference between both groups regarding hospital stay and time of catheter removal. Suprapubic urinary diversion with percutaneous cystostomy without stent was used in few pediatric cases and proved to be acceptable as far as patient compliance is concerned. Hakim et al¹⁶ compared the results of the Mathieu's repair with and without a catheter and reported complication rate of 2.7% in stented and 3.6% in unstented repairs. However, Buson et al²⁰ noted a significantly higher complication rate of 18.9% in stentless versus 4.6% in stented cases. Unfortunately, the ideal dressing for hypospadias repair remains elusive, to judge by the varieties of dressings currently in use. In this study, phallus was placed between two gauze pieces and placed over anterior abdominal wall with compression tapes applied over gauze (Sand witch Dressing). Dressing was removed 24

to 48 hours post-operatively. Dressing following the hypospadias surgery has the benefit of gentle compression for hemostasis and immobilization of wound. Potential disadvantages of dressing include ischemia, infection and pain during removal. In a comparative study of dressed and non dressed hypospadias repair, no gross difference was observed in outcome. That particular study concludes that success rate of hypospadias repair, that preserves the urethral plate is independent of dressing used.²¹

The mean duration of the surgery was shorter for the Tubularized Incised Plate urethroplasty than for the Mathieu's repair in our study as observed in many previous studies.^{2,9,18,22,23} Reported incidence of Urethrocuteaneous fistula by Haq A et al² is 3.3% in TIP and 7.7% in Mathieu's repair. Ali H et al²² reported this difference as 9.5% and 14.3% respectively and we have come across this difference as 6.25% in TIP and 9.38% in Mathieu's repair. Incidence of Meatal Stenosis is 0-6% for TIP and 3-9% for Mathieu's repair in many studies^{2,18,23} while in our study meatal stenosis was 0% and 3.12% respectively. Proximal urethral stricture observed in different studies range from 0-5% for TIP and 3-6% for Mathieu's repair^{2,18,22,23} while in our study, it was 0% and 3.12% respectively. In their study, Oswald J et al¹⁸ observed complete repair disruption 3.33% for TIP and 6.66% for Mathieu's repair and Samore M.A et al²³ reported 0% and 10% respectively. While in our study, complete repair disruption occurred 0% and 6.25% respectively. The overall complication rate is 6.25% for TIP repair and 21.87% for Mathieu's repair which is comparable to many previous studies.^{2,9,18,22,23} Secondary surgery was required for 6.25% patients of Group II whereas none of the Group I patients required it. So, our study shows that there is a significantly lower rate of complications with TIP procedure than with Mathieu's repair.

In our study, Functional and cosmetic results were highly satisfactory with the Tubularized Incised Plate Urethroplasty than with Mathieu's repair. TIP technique creates a vertically oriented, slit-like meatus that resembles the normal urethral meatus which are observed in many previous studies.^{2,3,18,22,23}

Conclusion

This study concludes that Tubularized Incised Plate urethroplasty is more effective and reliable method for constructing Neourethra in cases of distal hypospadias because of its less operative time and lower complication rate than Mathieu's repair. Moreover, cosmetic appearance of the external urethral meatus is highly satisfactory with Tubularized Incised Plate urethroplasty. However, when a healthy urethral plate is not available, Mathieu's repair should be done.

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