Tubularized Incised Plate Urethroplasty for Midpenile and More Proximal Hypospadias Repair

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Abstract

Background/Purpose: Tubularized incised plate repair is dominant technique for repair of distal hypospadias, but remains controversial for severe types. We report our experience to assess the feasibility, functional, and cosmetic results of hypospadias correction by tubularized incised plate repair of mid penile and penoscrotal hypospadias.

Materials and Methods: Chart review of all patients who underwent mid shaft and proximal hypospadias was performed. Those with tubularized incised plate were divided into 2 groups for mid shaft and more proximal repairs. The technique involved two layer closure of the urethra including V to Y spongioplasty when possible. The second layer covering was from depithalized dartos fascia in the mid penile group A, and dartos muscle flap in more proximal group B.

Results: A total of 15 patients underwent mid shaft repairs, while 13 patients had more proximal defects. Mean patient age at surgery was 16 months (range 9 to 39), with mean follow up of 16 months (range 4 to 28 months). Overall complication rate was 26% (4 out of 15) boys in the mid penile group, and 53% (7 out of 13) in the more proximal group.

Conclusions: Tubularized incised plate repair was possible with reasonable width urethral plate provided that the ventral curvature can be corrected after degloving of the penis without need to divide the urethral plate. The technique is simple with low complication rate and good cosmetic result.

Key Words: Hypospadias; proximal; tubularized incised plate.

INTRODUCTION

Snodgrass described the tubularized incised plate (TIP) for repair of hypospadias in 1994 as a mean to widen and improve mobilization of the urethral plate when performing a Thiersch-Duplay urethroplasty. Since that time many reports have been published describing the success of this modified procedure to repair distal hypospadias lesions.

As a result of the popularity of this procedure, many other currently used techniques such as Mathieu or transverse island onlay, for distal hypospadias will probably decline.

For the penis with a meatus at the penoscrotal junction or more proximally, the choice of surgical techniques also varies and often a combination of techniques is necessary. Approaches for severe hypospadias repair include the Asopa procedure, the Duckett repair, the Hodgson X and XX techniques, double island flap urethroplasty and 2-stage procedures. Results are poorer and complications are greater in extensive procedures such as tube urethroplasty, compared to flaps and TIP.
A modern approach in hypospadias repair is to preserve the urethral plate if possible. Given the relative simplicity of the operative concept, low complication rate and good cosmetic result in distal hypospadias, the tubularized incised plate procedure has been progressively applied to more proximal defects.

The purpose of this study is to report our initial experience with this technique in boys with proximal hypospadias.

**PATIENTS AND METHODS**

At the new Children’s Hospital Cairo University, we identified 28 children (80% of 35 consecutive proximal penile hypospadias cases) who underwent TIP urethroplasty from August 2006 to July 2008 (Fig. 1).

In all cases the goal was to perform TIP urethroplasty unless the urethral plate was thin and unhealthy or severe chordee that required division of the urethral plate.

**Surgical technique:**

All the surgical procedures were performed using magnification loupes. An inverted U-shaped incision is made encircling the meatus to the corona, preserving the urethral plate, and then extended circumferentially around the corona.

**Correction of chordee:**

The correction of any associated chordee was achieved by either:

1. Simple degloving.
2. Mobilization of the bulbar urethra [radical bulbar urethral dissection] Exposure and detethering of the normal proximal urethra with release of lateral attachments and radical proximal dissection.
3. Mobilization of the spayed corpus spongiosum, and the entire urethral plate from the underlying corpora cavernosa.
4. Dorsal tunica plication procedure [Penis was straightened with Nesbit plication sutures]. Orthoplasty for curvature correction was performed by the dorsal plication technique (Nesbit), with 3/0 poly prolene suture after identification and avoidance of the neurovascular bundles.
5. Division of the urethral plate.
6. Ventral grafting.

We were able to preserve the urethral plate in 80% of patients, all of whom underwent TIP urethroplasty. When chordee was more severe, the urethral plate was divided and other techniques were used to straighten the penis in stage 1 of a 2-stage repair.

Urethroplasty was performed only after confirmation of a straight penis by artificial erection. The urethral plate was tubularized with dorsal incision (Fig. 2), Polyglactin 6/0 material was used to close the urethra with continuous sutures performed in 2 layers.

**Spongioplasty:**

When possible corpus spongiosum alongside the urethral plate was mobilized from the surface of the corpora cavernosa and approximated over the neourethra in Y-to-I fashion (Fig. 3, and was done to complete the urethroplasty, with a 6 Fr to 10 Fr urethral catheter, depending on patient's age, left in situ.

**Barrier layer:**

A de-epithelialized dartos flap harvested from the dorsal prepuce and shaft was used as a barrier layer in midpenile cases (Fig. 4). In more proximal repairs a dartos muscle layer flap was additionally used to cover the entire neourethra before glanuloplasty and skin closure (Fig. 5).

**Glanuloplasty:**

Glanuloplasty was performed by incising the glans wings to the level of the tunica albuginea and closing them around the urethra with a catheter in situ, with 5/0 for the deep layer and 6/0 superficially.

Skin sutures were applied without drainage and Pressure dressing was applied in all cases with cotton gauze and double elastic adhesive tape. Antibiotics (amoxicillin-clavulanic acid) were given perioperatively to all patients.

The urethral catheter was removed on postoperative day 7 to 14. Patients were followed up weekly in the first month then bimonthly 6 months and then annually (Fig. 6).

At follow up, patients or parents were interviewed for site and shape of meatus and the presence of any complication such as chordee, fistula or narrow stream.
Fig 1. Preoperative penoscrotal hypospadias.

Fig 2. Degloving and incision of the urethral plate.

Fig 3. Spongioplasty.

Fig 4. Inner preputial fascia.

Fig 5. Dartos muscle

Fig 6. Postoperative appearance.
RESULTS

Thirty five patients with proximal penile hypospadias treated at one of the pediatric surgical units at the new Children’s Hospital Cairo University over the study period were evaluated. Mean patient’s age at surgery was 16 months (range 9 to 39). The patients were grouped to mid shaft hypospadias group (n=15) and proximal shaft to perineal hypospadias (n=20). All 15 patients with mid shaft hypospadias underwent TIP repair. While 13 boys with proximal shaft to perineal hypospadias underwent TIP repair, and 7 (20%) were excluded from the study underwent staged urethroplasty for an unhealthy appearing urethral plate or for ventral curvature that required plate transection to correct chordee. We were able to perform TIP urethroplasty in 28 patients (80%) of all proximal penile hypospadias presented.

At the start of operation artificial erection test was done. The overall incidence of chordee was in 20 boys (71%). Nine of 15 boys (60%) of the midpenile group had ventral chordee compared to 11 of 13 (84.6%) who had more proximal hypospadias. simple degloving and exposure and detethering of the normal proximal urethra with release of lateral attachments were done in 14 out of 20 (70%) boys with chordee and 7 boys (30%) required either mobilization of the entire urethral plate from corpora cavernosa or Nesbit plication sutures Table 1.

Inner preputial fascia was used as a barrier layer in 12 of 15 boys (80%) in mid penile group compared to 6 of 13 (46%) in the more proximal group, while the dartos muscle was used in 3 (20%) and 7(54%) in mid and more proximal groups respectively.

Mean catheter duration was similar for both groups, at 8.3 days (range 7 to 10) for the midpenile group and 9.8 days (7 to 14) for the more proximal group (p not significant). Mean follow up was 16 months (range 4 to 28 months).

The overall complication was in 11 out of 28 (39%) patient. Fistula occurred in 4 boys (14%) and disruption in 3 (10%).

The rate of fistula and wound disruption was lesser after TIP repair in the midpenile group, occurring in 2 of 15 boys (fistula 1, disruption 1; 13%), compared to 5 of 13 (fistula 3, disruption 2; 38%) who more severe hypospadias.

Meatal stenosis occurred in 1 patient in the midpenile group, also one case of meatal stenosis was observed in the more proximal group. Residual curvature occurred in 1 patient in each group. Overall complication was in 4 of 15 (26%) boys in the midpenile group and in 7 out of 13 (53%) in the more proximal group. All complications of both groups are summarized in Table 2.

DISSCUSION

The goals of primary hypospadias repair include straightening the curvature of the penis, extending the meatus to the glans tip, and revising the abnormal prepuce by either circumcision or foreskin...
reconstruction to allow satisfactory cosmetic and functional results regarding urination and sexual function.¹

At our institution, we identified 28 children who underwent TIP. The goal was to perform TIP unless the urethral plate was thin and unhealthy or chordee that required division of urethral plate.

In the present era, with the good results of TIP, it is logical to use urethral preservation procedures. Many centers use TIP as the main technique of urethroplasty because it is simple procedure with one suture line in the urethra, less operative time, imparts good cosmesis and results in a uniform vertical meatus.¹⁴

Restricted chordee correction is the main limitation of TIP. In our cases to increase the scope of TIP repair we performed exposure and detethering of the normal proximal urethra with release of lateral attachments and, mobilized the urethral plate with corpus spongiosum of the corpus cavernosum as described by Mollard and Costagnola and it was possible to correct the chordee along with dorsal plication, with preservation of the urethral plate. The blood supply of the urethral plate and urethra is from the bulbar artery, which is maintained as the urethral plate is lifted with corpus spongiosum, and the proximal and distal ends are kept attached maintaining the continuity of the corpus spongiosum.¹¹

We were able to correct chordee and straighten the penis then performing TIP urethroplasty in 80% of 35 consecutive proximal penile hypospadias cases with Nesbit plication done in 30% of cases. Our results with TIP in severe hypospadias are comparable to other series. We had over all complication in 11 out of 28 (39%) patient. Our fistula rate was 4 (14%) boys and disruption in 3 (10%) boys. Snodgrass and Lorenzo managed mid shaft to scrotal hypospadias with TIP, where plication was done in 55% of the cases, with an overall complication rate of 33% and fistulas observed in 22% of the cases.¹⁵

Snodgrass mentioned that the most common problem following TIP was fistulas. In his first series of proximal TIP repairs he also used single layer tubularization and a dartos barrier flap but observed a 33% incidence of fistulas, which diminished to 10% using 2-layer subepithelial closure and using tunica vaginalis.¹⁶

Chen et al managed 40 cases of proximal hypospadias with TIP, with an overall complication rate of 17.5%. ¹⁷ Warren Snodgrass and Selçuk Yucel were able to perform TIP urethroplasty for 65% of all proximal penile hypospadias with an overall complications for proximal repairs averaged 37%. Fistula occurred in 7 out of 35 patients (20%).¹⁶

Spongioplasty was done whenever possible in all cases. Spongioplasty adds length to the urethra and penis, which, again, helps in the correction of chordee.¹⁸ In addition, spongioplasty gives almost a normal shape to the urethra, and the repair is more anatomical. Finally, spongioplasty adds an extra layer of healthy vascular tissue, which helps to prevent fistula.

In a comparative Analysis by Luis H.P. Braga and Joao L. Pippi Salle et al of tubularized incised plate versus onlay island flap urethroplasty for penoscrotal hypospadias the overall complication rate was similar for tubularized incised plate and onlay urethroplasty.⁸

CONCLUSION

Based on our experience we conclude that the TIP provide an excellent result in repairing midpenile and more proximal hypospadias. It is a simple procedure taking less operative time with one suture line and satisfactory functional and cosmetic result. Technical modifications, including use of polyglactin sutures in 2-layers urethroplasty, turning epithelium into the lumen and spongioplasty, and dartos muscle barrier layer have reduced overall complications

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