

Outcome of Snodgrass Tubularized Incised Plate Urethroplasty for Distal Hypospadias in Uyo, South-South Nigeria

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ABSTRACT

Background: Hypospadias is the most common penile congenital abnormality. Snodgrass Tubularized incised plate (TIP) urethroplasty preserves the urethral plate and produces a functional and cosmetically acceptable penis with low complication rates. **Objective:** This is a review of our initial experience with the Snodgrass Tubularized Incised Plate (TIP) Urethroplasty for distal hypospadias repair. **Materials and Methods:** We retrospectively reviewed the medical records of boys who had Tubularized incised plate urethroplasty (TIP) for distal hypospadias in University of Uyo Teaching Hospital over a 5-year period (January 2016-December 2020). The location of the meatus, age at surgery, technique, complications, voiding function and cosmetic results were recorded. The ectopic meatus location was subcoronal in 4 (40%), coronal in 3 (30%), distal penile in 2 (20%) and midshaft in 1 (10%). Dorsal incision of the urethral plate was done with double layer tubularization over a stent, with glanuloplasty and dartos barrier layer over the neourethra before skin cover. **Results:** Ten children with age range from six to thirty months were included in the study. The mean age of repair was 27 months (range 18-36 months). All had healthy urethral plates and were suitable for Tubularized incised plate (TIP) urethroplasty. The postoperative results of repair showed straight urinary stream and satisfactory cosmetic appearance in four patients (40%), while three patients (30%) developed urethrocutaneous fistula, one patient (10%) had meatal stenosis; one patient (10%) had urethral stricture and one patient (10%) had partial glans dehiscence. Two pinhole fistulae closed spontaneously and one was repaired by rotation of local dartos flaps, while the meatal stenosis and urethral stricture were easily dilated. The urine stream and cosmesis improved in nine patients (90%) after treatment of complications and 3-6 months follow up. The patient with partial dehiscence had a repeat urethroplasty. **Conclusion:** Snodgrass Tubularized incised plate urethroplasty produced a functional and cosmetically acceptable reconstruction in our patients.

Key words: Distal hypospadias, Snodgrass procedure, urethral plate, tubularized incised plate urethroplasty

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INTRODUCTION

Hypospadias is the most common congenital anomaly affecting the male external genitalia consisting of arrested penile development with insufficient development of the urethral fold and ventral foreskin, with or without ventral penile curvature. The ectopic meatus is located more proximally on the ventral aspect of the penile shaft anywhere between the tip of the penis to the perineum [1,2]. The reported prevalence rates are 1 in 200 to 1 in 300 live births [1]. The incidence among primary school boys in Eastern Nigeria was estimated to be 1.1% by Okeke et al [4]. Hypospadias is classified based on the location of the meatus into three categories: distal or anterior with meatus on the glans, corona, or subcoronal (50%); midpenile, with meatal opening on distal penile shaft, midshaft, or on proximal penile shaft (30%); and proximal or posterior hypospadias with a penoscrotal, scrotal or perineal meatus location (20%) [1-3]. However, the position of the meatus can only be determined after surgical deglovement of the penis [7].

The objective of hypospadias repair is to create a straight penis with slit-like meatus at the tip of a conical symmetrical glans and a urethra of uniform calibre and length to achieve normal voiding and erection. Urethroplasty techniques can be classified into meatal based advancement techniques; tubularization of the urethral plate; supplementation or substitution of urethral plate with skin flaps; or urethral plate substitution with grafts [1,7]. Procedures for distal hypospadias repair include Meatal advancement glanuloplasty (MAGPI), Mathieu repair and tubularized incised plate urethroplasty (TIP) [1-3,9,12]. Snodgrass popularized the Tubularized Incised Plate Urethroplasty, the procedure of choice for distal hypospadias repair due to its versatility, low complication rate, good cosmetic result and technical simplicity [2,19]. TIP is one stage procedure involving dorsal midline incision of the urethral plate with subsequent tubularization and secondary healing [3]. The midline relaxing incision widens a narrow plate converting a flat plate to a deep plate groove ensuring a normal

calibre neourethra and vertical slit meatus [1]. We present our initial experience and outcome of Tubularized incised plate urethroplasty for distal hypospadias repair.

MATERIALS AND METHODS

This was a retrospective study of ten (10) boys with distal primary hypospadias repaired using Tubularized incised urethral plate urethroplasty over a 5-year period (between January 2016 and December 2020) at the University of Uyo Teaching Hospital. Patients with proximal hypospadias, severe ventral curvature, previous urethroplasty and narrow unhealthy urethral plates were excluded. Data relating to urethral meatus location, age at surgery, operative technique, complications, functional and cosmetic outcome were noted. The surgical technique was as described by Snodgrass.

Surgical Technique: The glans was first retracted with a stay suture of 4-0 nylon and a feeding tube size 8Fr passed from the meatus into the bladder. Artificial erection was induced by placing a tourniquet at the base of the penis and injecting normal saline intracorporeally to allow for accurate assessment of penile curvature. A circumferential subcoronal incision was made about 2mm proximal to the ectopic urethral meatus to deglove the penis down to the penoscrotal junction. Degloving resolved mild ventral curvature if present as we did not need dorsal plication to correct residual curvature. Adrenaline 1:100,000 was infiltrated into the glans along the junction of glans wings and urethral plate. Parallel longitudinal incisions were made along the lateral margins of the urethral plate to the junction of the glans wings and glans wings were mobilized laterally. The crucial step was the dorsal midline deep relaxing incision of the urethral plate from within the meatus down to the distal end of plate at midglans. Tubularization of the incised urethral plate over an 8-10 French feeding tube was done using 5-0 vicryl (polyglactin) to create the neourethra.

Tubularization was taken down to midpoint of dissected glans wings, about 3mm proximal to distal

extent of urethral plate to avoid iatrogenic meatal stenosis. Tubularization was done in two layers, the first subepithelial and a second reinforcing layer. A dorsal dartos pedicle flap was mobilized from inner prepuce, button holed, transposed ventrally, then interposed as a barrier layer between the neourethra and shaft skin closure to prevent fistula formation. A ventral local dartos layer was used in previously circumcised patients. Glanuloplasty was performed using 5-0 sub epithelial polyglactin sutures with the creation of neomeatus, independent of urethral plate (opening of plate not sutured to glans). Subepithelial skin closure was done using 5-0 polyglactin. For midshaft hypospadias, we used a 2-layer sub epithelial closure of the urethral plate, turning all epithelium into lumen; followed by approximation of mobilized corpus spongiosum over the neourethra and a dartos pedicle flap as barrier layer to prevent urethrocutaneous fistula formation. Tunica vaginalis flap was used in three patients instead of dartos. The postoperative stent (8 French feeding tube) anchored to the glans by the initial traction nylon suture was left for 10-14 days and used for urinary diversion into diapers. Sufratulle and compression gauze dressing was applied. Postoperatively, Oxybutynin hydrochloride 0.2mg/kg twice daily was given to reduce bladder spasms. Follow up was at one, three and six months and the meatus was calibrated at 3 and 6 months with 10Fr in smaller boys to 12Fr in older children. The cosmetic and functional outcomes were assessed by parents' satisfaction with the cosmetic appearance of the penis and urine stream, or any difficulty during urination. The surgeon visually assessed the urinary stream as there was no uroflowmetry, and inspected the phallus for complications like fistulae, stenosis or dehiscence.

RESULTS

Out of 10 patients, 3 had coronal hypospadias (30%), 4 subcoronal (40%), 2 distal penile shaft (20%), 1 midshaft (10%) (Table 1).

Table 1: Location of Hypospadias meatus

Location of Meatus	Number	Percentage
Coronal	3	30%
Subcoronal	4	40%
Distal shaft	2	20%
Midshaft	1	10%

The children's age range was between 6 months and 36 months. The mean age for repair was 27 months (range 18 months to 36 months). Cosmetic and functional outcomes were assessed by attending surgeon examination and parents' satisfaction with appearance of the penis and straight urinary stream with no difficulty. Postoperatively, urine stream was good in four patients (40%) and poor in the six patients (60%) with complications. Three patients had urethrocutaneous fistulae (30%), one had meatal stenosis (10%), one urethral stricture (10%) and one dehiscence (10%) (Table 2). Follow up was up to six months. Two of the fistulae were pin hole and closed spontaneously within three months while the remaining fistula was greater than 5mm in diameter and had to be closed with local dartos flap. Two patients with stricture and stenosis had meatal/urethral dilatation with good urinary streams after three months. The patient with dehiscence had reoperation. In nine patients (90%) the penis was straight with a conical shaped glans and a well-positioned, vertical, slit-like meatus. The final outcome at six months was assessed to be satisfactory except for the child with dehiscence who needed reoperation.

Table 2: Complications of Repair

Complication	Number	percentage
Fistula	3	30%
Meatal stenosis	1	10%
Neourethral stricture	1	10%
Dehiscence	1	10%

DISCUSSION

Tubularized incised plate urethroplasty can be used in the majority of distal hypospadias. The mean age of repair was 27 months with range from 18 months to 36 months. Recommended timing of repair is between age of 6 months to 18 months to reduce the emotional and psychological stress of delayed repair

[1,24]. Our experience is similar to findings by Olajide et al where repairs were done between 2 and 4 years when parents were financially and psychologically ready [6].

Tubularization of the incised urethral plate in two layers and glanuloplasty are key steps in Snodgrass urethroplasty. The urethral plate is composed of epithelium overlying well vascularized connective tissue with muscular backing, rich in nerve supply and gland forming capability, its preservation contributing to the success of the urethroplasty [13]. Urethral plate characteristics may determine the use of TIP urethroplasty, whether the plate is flat or deeply grooved, narrow or wide. All ten patients had wide healthy urethral plates suitable for dorsal incision and tubularization. Patients with thin, unhealthy and fibrotic plates were excluded. TIP does not require a deep urethral groove as the dorsal incision widens and deepens a narrow flat plate and TIP repair reliably corrects distal hypospadias regardless of urethral plate configuration (Snodgrass et al 2010 and Nguyen, Snodgrass) [10,19]. Contraindications to TIP hypospadias repair are severe chordee requiring plate transection and unhealthy, thin urethral plate not widened after incision [3,21]. Holland and Smith found increased complications during TIP urethroplasty when the urethral plate was less than 8mm wide or had a shallow groove before midline incision [21].

Urinary diversion with urethral stent of feeding tube or silicone catheter Fr 6-8 was used and allowed to drain into double diapers. Other workers also routinely stented their repairs [8,11,12]. Buson et al [28] found that complication rate of those who did not use urinary diversion was higher than those who used diversion, while Sarac et al [29] found that fistula complications were higher with use of foley silicon catheters than feeding tubes for drainage.

Preoperative hormonal stimulation with testosterone administration or transdermal gel improved vascularity and cosmesis [16]. Perioperative antibiotic prophylaxis reduced the risk of

complicated urinary tract infections, meatal stenosis and urethrocutaneous fistula [17].

The goal of hypospadias repair is normal appearance and functioning penis with straight urine stream, though outcomes usually reported are urethroplasty complications. Urinary stream was good in four of the patients postoperatively and improved in five more patients after fistulae closure and dilatation of meatal stenosis and stricture. The patient with glans dehiscence had redo urethroplasty. The final cosmetic appearance and functional outcome after 6 months of follow up was satisfactory in nine patients (90%) based on visual assessment of a straight phallus with conical meatus and vertical slit-like meatus. Of three patients with urethrocutaneous fistula (30%) two were pinhole and closed spontaneously within 3 months while the remaining large one had local dartos flap repair. Factors that may predispose to fistula formation are incorporation of urethral mucosa in the ventral repair and migration of urethral mucosa and skin into suture tracts, hence the importance of multi-layered repair and extra-mucosal suture technique [22]. Barrier layers using dartos pedicle flaps dissected from inner prepuce or dorsal penile skin in circumcised patients helped to prevent fistula formation. Double-layer vascularized tissue coverage over the neourethra repair can be done in several ways, including preputial dartos flap, adjacent ventral dartos flap in the absence of preputial tissue, tunica vaginalis from the scrotal sac, external spermatic fascia or the use of corpus spongiosum for coverage [5,11,18,22]. The overall complication rate for TIP in children is reported as approximately 33%, with the median fistula rate of 5.0% (mean=5.6%), ranging from 0 to 16% (Braga et al) [5]. Snodgrass reported overall complication rate of 0-4%, mostly fistulas, meatal stenosis and glans dehiscence. Total complication rate in our study was 60% with fistula rate of 30% compared with a complication rate of 30% seen by Barrack et al [8], 33% seen by Tonvichien et al [23], and 36.7% seen by Abdur-Rahman et al [15], even though the later study included both proximal and distal hypospadias repair

using various techniques. The high complication rates in our series were probably due to the small number of patients and related factors including suturing technique, no magnification, tissue handling, inadequate waterproof coverage, and initial surgeon learning curve [24]. In a review of published reports of TIP urethroplasty for distal hypospadias, Braga et al [5] noted that studies with small sample size ($n < 30$) reported more complications ($> 20\%$) in comparison to studies involving large number of patients, suggesting that surgeon experience and high volume of cases may contribute to reduce the number of complications [5]. Snodgrass recommended two-layer neourethra closure, and coverage of the urethroplasty with a tunica vaginalis flap instead of dartos flap to reduce the fistula rate. Urethral strictures and meatal stenosis can be reduced if the tubularization of the incision on the urethral plate is not carried too distally into the glans. Snodgrass reported meatal stenosis rate of less than one percent. Re-epithelialization occurs by secondary intention after incision of the urethral plate and the neourethral lumen should allow introduction of a 10-Fr feeding tube. Glans dehiscence can be prevented by dissecting the glans not only laterally but also distally off the corpora cavernosa to lengthen the wings and reduce tension on approximation. Glanuloplasty independent of urethral plate tubularization and the creation of a vertical slit meatus provided good cosmetic appearance compared with the rounded meatal configuration after Mathieu repair [12,25]. A prospective study by Oswald et al showed that TIP repair was associated with lower complication rates versus the Mathieu technique and the cosmetic results were more satisfactory with TIP operation [25]. The cosmetic appearance and urinary function in our patients were subjectively assessed by parents' satisfaction with appearance of the phallus, and urination without difficulty and by surgeon visual inspection of the phallus, glans, meatus and urinary stream. We did not use standardized photographs, hypospadias objective penile evaluation (HOPE) score and penile perception score (PPS) questionnaire which are objective outcome instruments to evaluate these

patients [26,27]. Uroflowmetry, an objective tool to assess urinary function was not available in our centre [26,27].

CONCLUSION

Snodgrass Tubularized Incised plate urethroplasty offers good cosmetic and functional results. Even though a high percentage of fistulae were seen, they were easily closed. Meatal stenosis and strictures were easily dilated and the glans dehiscence was repaired. The overall outcomes were satisfactory.

Recommendations

Adequate theatre facilities, trained personnel, paediatric microsurgical equipment including optical magnification loupes and proper suture materials would improve outcomes of hypospadias repair. Provision of uroflowmetry and standardized instruments for objective assessment of outcomes are needed.

Limitations: The study was retrospective and limited by small sample size.

Conflict of Interest: None declared.

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