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DOES TUBULARIZED INCISED PLATE URETHROPLASTY FIT PRIMARY AND REPEAT SHAFT HYPOSPADIAS REPAIR?

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Objective To evaluate prospectively our experience using tubularized incised plate (TIP) urethroplasty in primary and repeat penile shaft hypospadias.

Patients and Methods Thirty-two boys with penile shaft hypospadias were selected to undergo TIP procedure. Their age ranged from 22 months to 9 years. Twenty-two cases were primary and 10 cases were repeat hypospadias repairs. To correct penile chordee, complete degloving of the penis and lateral dissection of tethering tissues was done in every case. This was followed by tunica albuginea plication in 7 cases, while ellipse excision was needed in 3 cases. Using the preserved urethral plate, single-layer urethroplasty was done in all cases. A vascularized subcutaneous flap (36 cases) or tunica vaginalis (4 cases) was always used to cover the neourethra. A postoperative stent was used for 8 – 12 days in all cases.

Results The patients were followed up for a mean of 14.2 months. Postoperative clinical evaluation revealed success rates of 95.5% and 90% for primary and repeat cases, respectively. Among the primary cases, only one patient had urethro-cutaneous fistula concomitant with meatal stenosis, while among the repeat cases urethro-cutaneous fistula occurred in one patient. No case of urethral stricture or wound dehiscence was encountered. Our criteria for success were a single unimpeded forward-directed urine stream, a straight penis, good cosmesis and no need for further surgery.

Conclusion We feel that TIP urethroplasty in primary and repeat cases of penile hypospadias is a reasonable option in cases with chordee not severe enough to necessitate excision of the urethral plate and when midline incision of the plate yields an adequate width amenable to tubularization.

Keywords penis, hypospadias, urethroplasty

INTRODUCTION

Modern repair of hypospadias strives to create a penis that is not only functional but also cosmetically normal. In 1989, Rich et al. described midline incision of the distal urethral plate to improve the cosmetic results of Mathieu and onlay island flap procedures[1]. Snodgrass, in 1994, described tubularized incised plate urethroplasty. He extended the incision proximally to the level of the hypospadiac meatus emphasizing that deep incision of the shallow urethral plate was the most important step of the procedure[2]. Since then, many surgeons have reported their experience with this technique in distal hypospadias repair[3-5]. Recently excellent results have also been reported in repeat and more proximal repairs[3,6,7].

In this study we report our experience using TIP urethroplasty as a single procedure in primary and repeat cases of penile shaft hypospadias repair.

PATIENTS AND METHODS

Between December 1997 and November 2000, 32 boys presenting with mid-hypospadias to the Urology Department of Zagazig University Hospitals were selected to undergo TIP procedure. The patients were classified according to the Barcat classification[8] which defines glandular, coronal and subcoronal positions of the meatus as anterior or distal hypospadias; distal, mid and proximal penile shaft positions as mid hypospadias and peno-

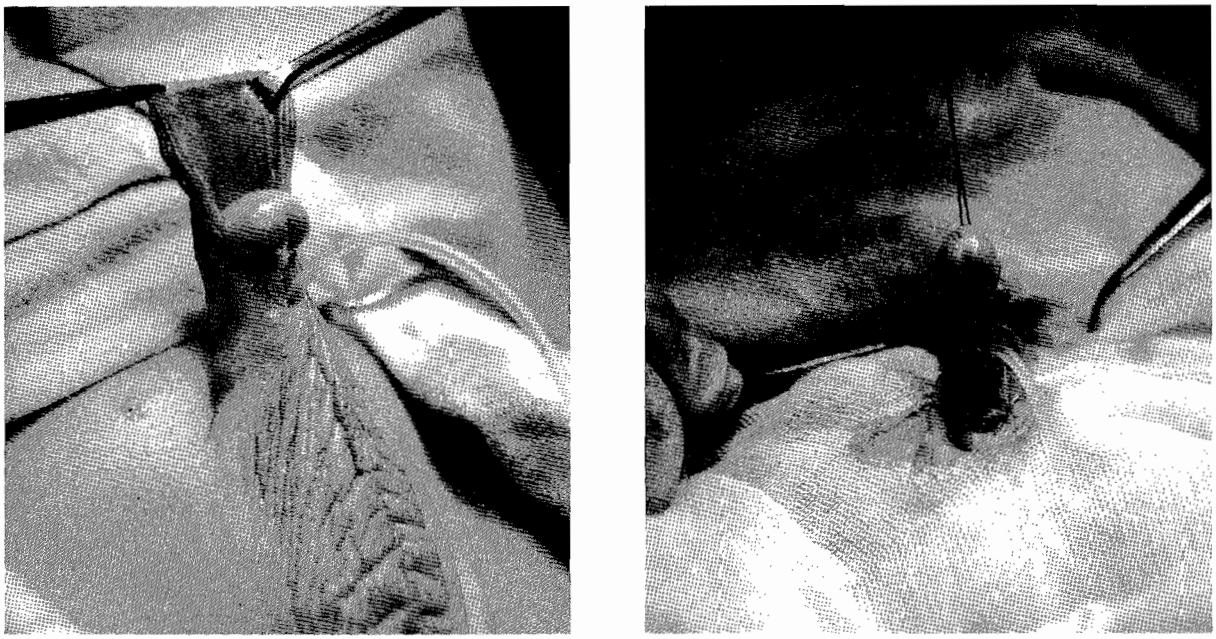

Fig. 1: A: A case of mid penile hypospadias with chordee. **B:** Perfectly straight penis with preservation of the urethral plate after complete degloving and dissection of lateral tethering tissues

scrotal, scrotal and perineal positions as posterior or proximal hypospadias. Patient age ranged from 22 months to 9 years (mean 5.4 years). Twenty-two cases were primary, while 10 cases were repeat cases after failed onlay procedures with preserved urethral plate. Cases with severe chordee necessitating excision of the urethral plate or with a very thin unhealthy urethral plate were excluded. The level of the hypospadiac meatus was documented according to Barcat[8]. In the primary cases it was located at the distal penile shaft in 12, at the mid shaft in 8 and at the proximal shaft in 2 patients. As regards the repeat cases, the hypospadiac meatus was located at the distal shaft in 6 and at the mid shaft in 4 patients.

After placement of a traction suture to the glans, a catheter was inserted. An 8 Fr. catheter was used in boys aged less than 5 years, while a 10-12 Fr. catheter was used in older boys.

A U-shaped incision extending to the glans tip was made around the hypospadiac meatus. In every case the penis was completely degloved down to the penoscrotal junction, then an artificial erection was induced. The ventral tethering tissues lateral to the corpus spongiosum and the urethral plate were excised to straighten the penis (Fig 1). Residual penile curvature was corrected by dorsal tunica albuginea plication (TAP) as described by Baskin and Duckett [9]. In 4 cases we excised an ellipse of tunica albuginea because we judged that simple plication would not be sufficient to correct the residual curvature. 1: 100000 epinephrine was infiltrated into the ventral glans along the junction of the glans wings and the urethral plate. The plate was then separated from the glans by parallel incisions (Fig. 2) and the glans wings were mobilized laterally.

A midline relaxing incision was made from within the meatus to the distal extent of the plate (Fig. 2). The incision was deeply extended down to the corpora cavernosa until no further mobility of the two sides of the plate was observed with further deepening of the incision. For this step a scissors was used as recommended by Snodgrass[2]. When the plate is flat, a deeper incision is done than when the plate is naturally grooved. No electrocautery was used to avoid injuring the tissues of the urethral plate. A 6 Fr. stent was then passed into the bladder for postoperative urinary diversion. Before starting tubularization of the urethral plate we excised the ventral skin present around the hypospadiac meatus. This step is necessary to provide a V-shaped con-

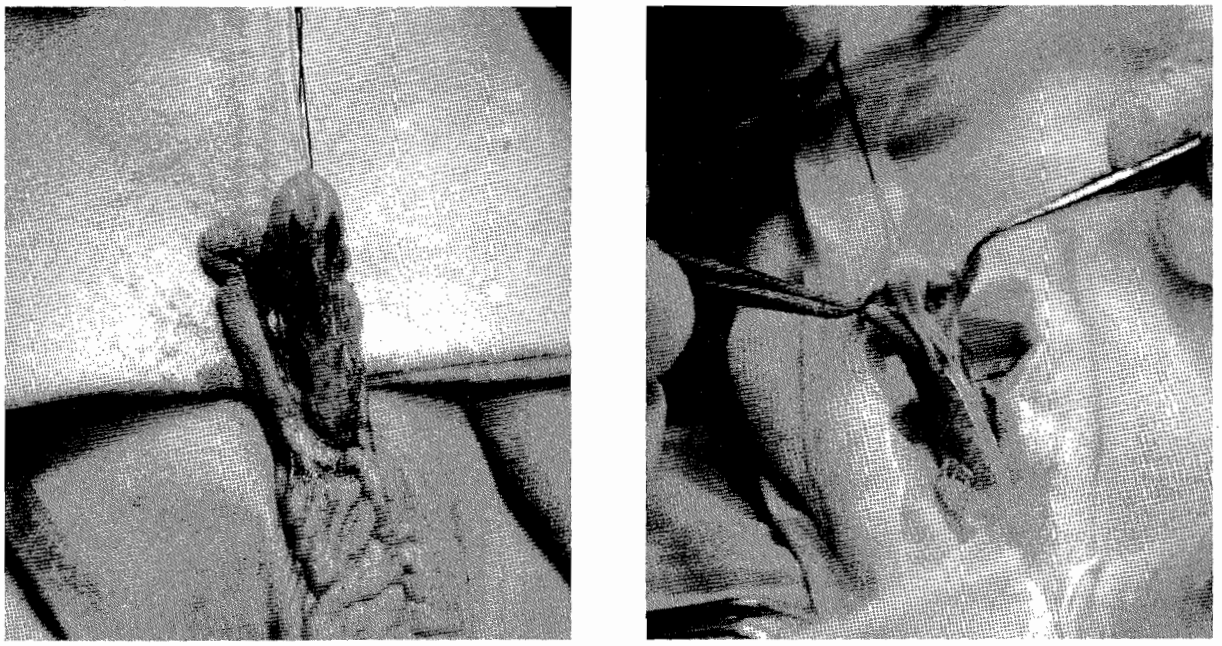

Fig. 2: A: The plate is separated by parallel incisions. **B:** A midline relaxation incision is done from within the meatus to the distal extent of the plate.

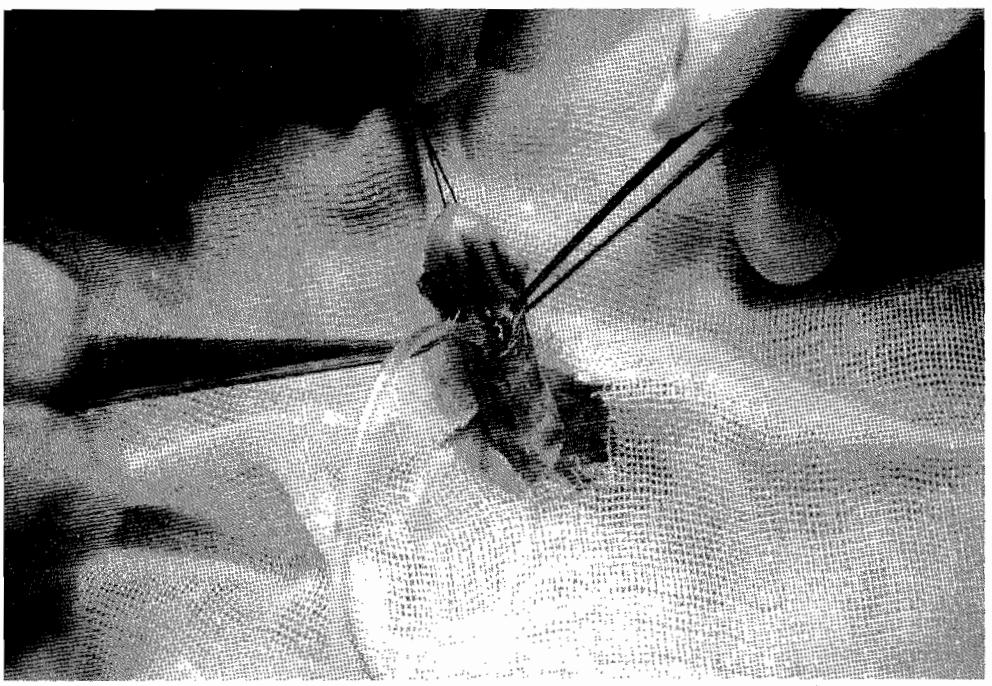

Fig. 2C: The neourethra is closed.

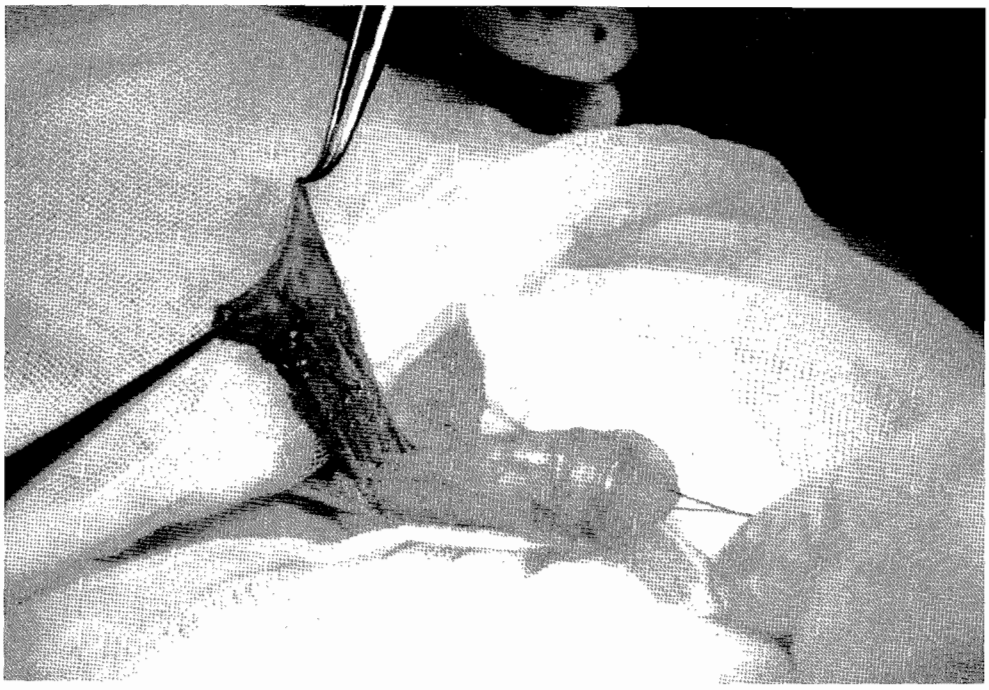

Fig. 3 A: A thin dartos pedicle is mobilized from the dorsal prepuce and shaft skin to cover the entire neourethra.

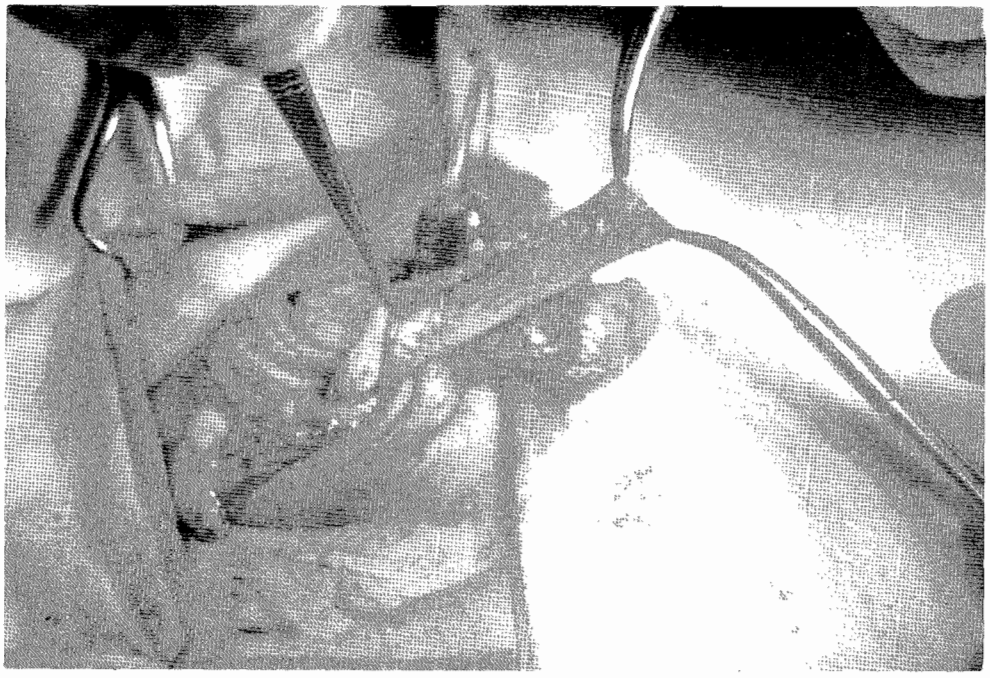

Fig. 3B: A tunica vaginalis pedicled flap is dissected from the coverings of the testis to be used to cover the neourethra.

figuration of the skin around the hypospadiac meatus. Tubularization could be completed up to the distal aspect with running subcuticular 6/0 polyglactin sutures to avoid stitch tract fistula. No more than two stitches were used distally to the level of the mid glans to ensure a generous oval opening of the neomeatus as described by Snodgrass[10] (Fig. 2).

A thin dartos pedicle was mobilized from the dorsal prepuce and shaft skin to cover the entire neourethra (Fig. 3A). In 4 cases where the dorsal skin was not sufficient, we used a tunica vaginalis pedicled flap (Fig. 3B) to cover the neourethra. Glansplasty began at the corona and continued distally with a total of three stitches.

The mucosal collar was approximated in the midline and the shaft skin was refashioned. We used a closed dressing. First generation cephalosporin was used perioperatively. A postoperative stent was kept for 8-12 days. After removal of the stent, routine regular dilatation of the meatus was done by the parents for a period of 2-4 weeks.

Follow up ranged from 6-25 months with a mean of 14.2 months. It included inspection for any evidence of meatal stenosis, fistula, residual chordee, general appearance and observation of the caliber and direction of the urine stream. Turbulence of urine was noted when present.

RESULTS

No intra-operative complications occurred. Tunica albuginea plication was used to correct penile curvature in 7 cases (21.8%), while lateral dissection and excision of the tethering tissues was sufficient in 22 cases. Three cases (9.3%) needed ellipse excision. Meatal stenosis occurred only once in a primary case. It was treated by regular dilatation. Urethrocutaneous fistula occurred in 2 cases. One of them was concomitant with a meatal stenosis. It resolved spontaneously with regular dilatation of the meatus. The other fistula occurred in a repeat proximal penile case and made a second operation necessary. No case of urethral stricture, diverticulum or wound dehiscence was encountered. Success rate with primary cases was 95.5% while for repeat cases it was 90%. The overall complication rate was (6.25%). Our criteria of success were a single unimpeded forward directed stream, a straight penis, no need for further surgery and good cosmesis in the form of a conical glans and a vertically slit glandular meatus.

DISCUSSION

TIP urethroplasty as described by Snodgrass has gained a lot of popularity[2]. This method has replaced almost all other methods used in the past for correcting hypospadias[11]. Dector and Franzoni first performed TIP repair in 1994, and by 1997, 82% of their patients with distal hypospadias were treated with this technique[11].

TIP urethroplasty is used for proximal and repeat hypospadias [6,7,12]. The neourethra is fashioned from local tissues, but in contrast to Duplay's approach a complete tube is made intraoperatively, the dorsal surface of which is expected to re-epithelialize[10].

Concern has been raised about the possible formation of urethral stricture with TIP urethroplasty repair[10]. In this series no cases of stricture of the urethra were encountered as a complication of the procedure. When following up 72 patients who had undergone repair using TIP urethroplasty, Snodgrass[13] concluded that TIP procedure did not result in neourethral stricture. Actually the longitudinal incision does not interrupt the dual blood supply of the two mobilized and tubularized urethral plate strips. Vascularity of the distal urethral spongiosum is more pronounced in hypospadiac penises than in normal penises[14].

Recently, Bluestein et al.[14] conducted the procedure on 5 dogs. He concluded that healing of the incision of the dorsal plate during TIP occurs by re-epithelialization with normal tissue ingrowth. In contrast sutured closure healed with desmoplastic and inflammatory response[15]. Release of epithelial growth factor encouraging tissue repair has been proposed as a cause of re-epithelialization and absence of stricture in cases of TIP urethroplasty [14].

For many years, penile chordee has been attributed to dense fibrous tissue composed of abortive corpus spongiosum[16]. This led to the belief that this structure (now referred to as the urethral plate) should be first excised. However, Smith observed that straightening of the penis often resulted from simply degloving the shaft skin[17]. Bending which was not corrected by release of the shaft skin and lateral

dissection of tethering tissues usually indicated corpora cavernosal disproportion, which needed dorsal plication to straighten the penis thus preserving the urethral plate[18]. Many authors believe that even in the most severe hypospadias the urethral plate may not require division to produce a straight penis[9]. We agree with other authors[9] that there is no fibrotic tissue beneath the urethral plate that must be dissected; we, therefore, do not dissect beneath the urethral plate to avoid jeopardizing its blood supply.

In this series we could straighten the penis with preservation of the urethral plate to be used for TIP urethroplasty in all cases (22 primary mid-hypospadias and 10 repeat cases). All presented with mild to moderate degrees of chordee, however, adequate degloving and dissection of the tethering tissue lateral to the plate were sufficient in 22 cases. In cases still having curvature, dorsal tunica albuginea plication was done in 7 cases and ellipse excision was done in 3 cases. Chen et al. could correct penile chordee and do TIP repair successfully in 90% of patients with mid shaft hypospadias[12]. A dorsal approach is preferred for correcting chordee causing penile curvature of 20°, 30° and 40° [19]. Cases with severe chordee that would necessitate urethral plate excision were excluded from the study, as they are not amenable to this type of surgery in agreement with Snodgrass[10]. In this series, tunica albuginea plication (TAP) was used in 22% of cases to straighten the penis. Chen et al. used TAP in 23% of their proximal hypospadias cases[12], while Baskin and Duckett reported the used of TAP in 90% of cases of preputial island flap/tubes[9].

We started the procedure by a U-shaped incision 2 mm proximal to the meatus as described by Snodgrass[2]. Some surgeons start by the relaxing incision and then proceed to the parallel incision to ensure an adequate width of the plate[20]. In our experience, this is not necessary, because after the relaxing incision very thin plates can be tubularized around a catheter of at least 8 Fr. Yang S. et al.[21] stated that preservation of the thin distal urethra may simplify the operative procedure without compromising the surgical result of TIP urethroplasty. Cases of dysplastic plate that could not be tubularized even after a relaxing incision were excluded from this study. However, they are rare enough - we saw only 1 case in 33 consecutive cases. Snodgrass reported 1 case out of 92 consecutive cases[10].

A V-shaped configuration of the skin around a hypospadiac meatus allowed us to completely invert the epithelial edges without inverting bulky tissue, a point beneficial for non-turbulent flow of urine. We used no more than two stitches distal to the mid glans level at the urethral plate closure as described[10]. This point is the key to avoid meatal stenosis. In our series, only one case of meatal stenosis was encountered in the postoperative period due to distal suturing of the urethral plate.

Some surgeons use a two-layered closure[22,23]. However we feel safe with one layer meticulously closed using subcuticular polyglactin 6/0 sutures. An adequate incision of the plate deep enough to completely mobilize the plate together with mobilization of the glans wings allowed for a tension-free closure of the urethral plate and glans, thus diminishing the risk of dehiscence to nil in this series. Snodgrass, Ross, Retik and Borer using a one-layer closure did not encounter dehiscence in their cases either[4,3,7].

In this series, 2 cases (6.25%) of fistulae were encountered, one was temporary and disappeared after regular dilatation of the meatus as recommended by Elbakry[24]. The other fistula was permanent. A de-epithelialized subcutaneous layer was developed to cover the tube either with a dorsally placed pedicle or, rarely, with a ventrally placed pedicle. It is the most important step in the technique of TIP urethroplasty to prevent urethro-cutaneous fistula. Retik and Borer had one fistula complicating their series of 51 distal and proximal hypospadias repairs using TIP procedure[7]. Snodgrass reviewed data from the literature and concluded that urethro-cutaneous fistulae occurring only in about 2% of cases rarely complicate this operation[10]. Borer et al. highlighted the importance of second layer coverage using dartos or tunica vaginalis in all hypospadias repairs. They stated that in 4 out of the 5 boys with a fistula in their study this second layer coverage had not been done[6].

The overall complication rate in this series was 6.25% which is similar to other multicenter/surgeon reports on tubularized incised plate urethroplasty [6,10].

Using TIP urethroplasty in repeat cases actually was successful in this series with one case of fistula complication out of 10 cases. Success rate was 90%. Shanberg et al. reviewed 13 cases of re-operative hypospadias

repair using TIP urethroplasty, and concluded that excellent cosmetic and functional results could be obtained using this technique for re-operative hypospadias repair[25]. Borer et al. stated that TIP urethroplasy had become the preferred technique of primary and repeat hypospadias repair at their institution[6]. The high success rate in repeat hypospadias repair is attributed to the use of local supple tissue with well established vascularity for urethroplasty and skin coverage as well as cosmetically superior results[6,10]. Using the urethral plate obviates the higher complication rate often seen with skin grafts, bladder mucosal grafts or buccal mucosal grafts[26].

In conclusion, TIP urethroplasy is a versatile mode of repair with excellent cosmesis in the form of a conical glans, a glandular meatus and a vertical slit of the meatus. It is a straightforward technique with few complications. We feel that TIP urethroplasy in proximal and repeat cases of hypospadias is a reasonable option in cases with chordee not severe enough to necessitate excision of the urethral plate and when midline incision of the plate yields an adequate width amenable to tubularization.

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RESUME

La Tubulisation après Incision de la Plaque Urétrale Permet-Elle la Réparation Primaire ou Itérative de l'Hypospadias Pénien ?

Objective : Evaluer de façon prospective notre expérience de l'urétroplastie par tubulisation après incision de la plaque urétrale dans la réparation primaire ou itérative de l'hypospadias pénien. **Patients et Méthodes** : Trente deux garçons présentant un hypospadias pénien ont été sélectionnés pour bénéficier d'une urétroplastie par tubulisation après incision de la plaque urétrale. L'âge des patients variait de 22 mois à 9 ans. Dans 22 cas, il s'agissait d'une première cure et dans 10 cas d'une chirurgie itérative. Le redressement de la verge a été fait dans tous les cas. La correction de la coudure résiduelle a nécessité une plicature de la tunique albuginée dans 7 cas et une excision elliptique de pastilles de l'albuginée dans 3 cas. La tubulisation de la plaque urétrale par un surjet simple a été faite dans tous les cas. Un lambeau sous-cutané vascularisé (36 cas) ou un lambeau libre de tunique vaginale a été utilisé pour recouvrir le néo-urètre. Une sonde urétrale a été laissée en place pour 8 à 10 jours dans tous les cas. **Résultats** : Après un suivi moyen de 14,2 mois, un cas de fistule urétro-cutanée avec sténose du méat a été noté dans les cas de réparation de première intention. Le taux de succès dans ces cas était de 95,5 %. Dans les cas de réparation itérative, un cas de fistule urétro-cutanée a été noté avec un taux de succès de 90 %. Aucun cas de sténose urétrale ou de lâchage de sutures n'a été observé. Nos critères de succès ont été un jet urinaire unique et droit sans dysurie, une verge bien redressée, un bel aspect esthétique et la non nécessité d'une retouche chirurgicale. **Conclusion** : Nous pensons que l'urétroplastie par tubulisation après incision de la plaque urétrale est une option raisonnable dans les cas de coudure peu sévère ne nécessitant pas l'excision de la plaque urétrale et quand l'incision de la plaque urétrale permet d'obtenir une largeur adéquate pour une tubulisation.

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