

DISTAL HYPOSPADIAS REPAIR BY THE MODIFIED THIERSCH-DUPLAY TECHNIQUE WITH OR WITHOUT HINGING THE URETHRAL PLATE: A NEAR IDEAL WAY TO CORRECT DISTAL HYPOSPADIAS

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ABSTRACT

Purpose: Various techniques have been described to correct distal hypospadias but many are best suited to patients with subtle specific nuances of meatal and/or glanular configuration. We describe a simplified approach to these defects using the modified Thiersch-Duplay technique with or without hinging the urethral plate (the Snodgrass maneuver).

Materials and Methods: Between 1990 and 1997 we performed the modified Thiersch-Duplay repair as the primary procedure for repairing hypospadias in 197 boys. We initially performed urethral plate hinging (the Snodgrass maneuver) in 1994. By 1997, 82% of our patients were undergoing repair using the hinge technique. Urethroplasty coverage was provided by a second layer of adjacent local tissue or by a pedicle of subcutaneous tissue.

Results: Reoperation was required in 5 boys (2.5%) with fistula and 1 (0.50%) with urinary extravasation. A fistula developed in 4 of the 63 cases (6.4%) in which adjacent local tissue was used to cover the urethroplasty and in 1 of 130 (0.80%) in which a pedicle of subcutaneous tissue was used. Overall 97% of the boys had an excellent result requiring no secondary operative procedure.

Conclusions: The modified Thiersch-Duplay technique with or without urethral plate hinging is reliable for correcting distal hypospadias. The risk of fistula is almost eliminated when a vascularized pedicle of subcutaneous tissue is used to cover the repair. This technique has virtually supplanted all other methods that we used in the past to correct distal hypospadias.

KEY WORDS: hypospadias, urethra, abnormalities

The majority of boys with hypospadias present with a distally positioned meatus. Various surgical techniques have been described to correct this problem. Many procedures are best used in patients with subtle specific nuances of meatal and/or glanular configuration.¹⁻⁴ A technique with more universal applicability in most variants of distal hypospadias would be appealing. A simplified approach to distal hypospadias that is applicable in most boys with this defect has evolved in our practice. The technique is a modified Thiersch-Duplay procedure^{5,6} in which the neourethra is created by tubularizing the urethral plate. Application of the technique may be expanded to include almost all boys with distal hypospadias when it is combined with urethral plate hinging⁷ (the Snodgrass maneuver).⁸

MATERIALS AND METHODS

Between 1990 and 1997 we performed the modified Thiersch-Duplay repair as the primary procedure for hypospadias in 197 boys. During the initial years of this series only a few cases were repaired using the modified Thiersch-Duplay method. However, by 1997 we had performed 71 repairs of this type. We initially performed urethral plate hinging in 1994 and we used this maneuver with increasing frequency during the study period. By the last year of our study 82% of our patients had undergone repair via an incision in the urethral plate (fig. 1). Overall 111 patients (56%) underwent hinged repair. Preoperatively the meatus was located on the glans in 52 boys, at the corona or an immediate subcoronal position in 101 and further down on the shaft in 44. In 1 of the latter cases the urethra was extremely atretic and repair was performed to the penoscrotal junction. Cir-

cumcision had been done in 18 boys before they presented for hypospadias repair.

The decision to deepen or hinge the urethral plate was generally made at the beginning of the procedure. Before hinging the plate the blind ending pit, which is often present distal to the meatus, was incised through the common wall between it and the urethra. This maneuver deepens the cleft immediately distal to the meatus. When it was necessary to deepen the ventral glanular cleft further, it was incised until the urethral plate was divided or the tissues were separated enough to make possible a urethra with an adequate diameter after tubularization. Incising beyond the depth of the plate causes troublesome bleeding, whereas limiting the incision to the plate is relatively bloodless. The initial incisions were then marked to facilitate the ready creation of glans flaps and provide good mobility of the midline tissues adjacent to the ventral glanular cleft (fig. 2).

The initial incisions were opened and the tissue lateral to the U-shaped incision of the Thiersch style repair was de-epithelialized. The penis was degloved and an artificial erection was created. Ventral tethering tissues lateral to the corpus spongiosum and urethral plate were excised as necessary. At the time of this study persistent chordee after ventral dissection was corrected by dorsally located Nesbit plications.⁹ Lateral glans flaps were mobilized after lidocaine with epinephrine solution was injected into the ventral glanular tissue. After the glans flaps were developed some glanular tissue was excised to permit tension-free closure of the glans over the neourethra. The neourethra was tubularized using a running locking 7-zero polyglactin.

In 63 patients the urethroplasty was covered with a second layer of local adjacent glanular tissue that had been mobi-

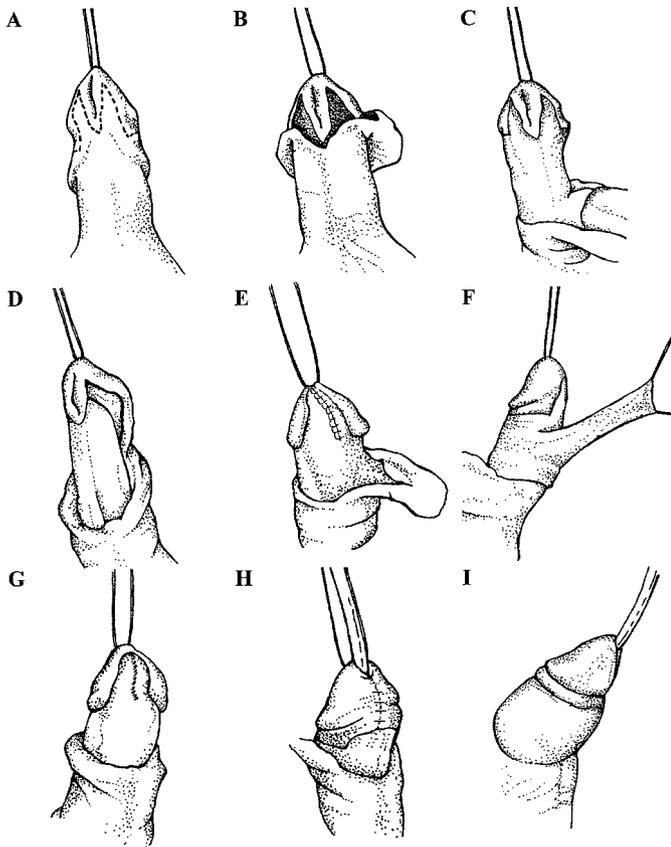


FIG. 1. Evolution of modified Thiersch-Duplay repair and urethral plate hinging.

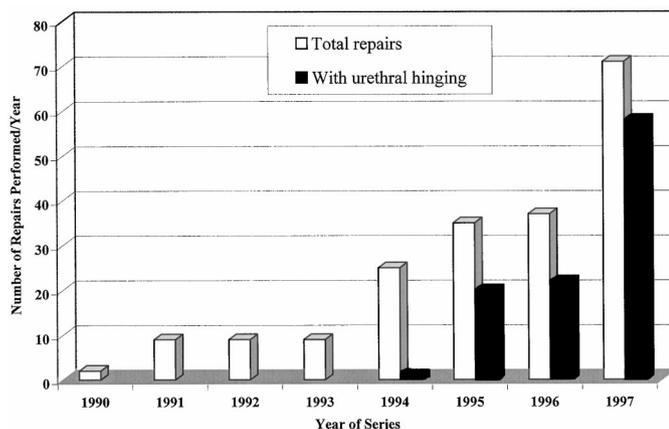


FIG. 2. Modified Thiersch-Duplay repair technique. A, after hinging urethral plate initial incisions are marked. B, incisions are opened and ventral glans is de-epithelialized. C, shaft skin extensively dropped down and chordee is addressed. D, lateral glans flaps are mobilized, exposing distal corpora cavernosa. E, urethroplasty is completed. F, subcutaneous flap is elevated from beneath preputial tissue. G, subcutaneous flap is tacked down to cover repair with underlying urethroplasty suture line barely visible through flap. H, glans and mucosal collars are closed. I, repair is completed and catheter is inserted.

lized with the midline ventral tissues used to create the neourethra. In 130 patients the repair was covered with a discretely mobilized, vascularized subcutaneous pedicle harvested from the preputial tissue. In 4 patients no specific second layer coverage was used. The glans was then closed over the repair using 6-zero polyglactin for deep glans-to-

glans approximation, and 7-zero polyglactin for superficial closure of the glans and mucosal collars. When a catheter was used, a 7F Jackson-Pratt tube was placed through the neourethra into the bladder and allowed to drain. The penile shaft was resurfaced and a foam dressing was applied. The urethral catheter was removed between 5 and 7 days after surgery, and at subsequent visits the urethra was calibrated with an 8F sound.

RESULTS

Followup physical examination was performed in 195 children 2 days to 60 months (mean 5.89 months) postoperatively. There was no episode of postoperative bleeding requiring intervention. Mild meatal retrusion developed in 4 patients, although there was still good glans approximation ventral to the meatus in each and none required reoperation. Minimal ventral scar contracture in 2 cases did not require revision. A minor diverticulum developed in 1 patient. There were no episodes of meatal or urethral stenosis. One patient was treated for urethritis after catheter removal.

Reoperation was required in 6 boys (3.1%). Urinary extravasation in 1 patient (0.5%) was managed by drainage and urethral catheterization. A fistula requiring reoperation developed in 5 patients (2.5%), including 4 of the 63 boys (6.4%) in whom adjacent local tissue was used for second layer coverage of the urethroplasty and 1 of the 130 (0.8%) in whom a flap of subcutaneous tissue was used. The fistula rate in the 2 techniques is statistically significant (Fisher's exact test $p = 0.039$). One boy with a fistula had concurrent meatal retrusion. Overall 97% of the boys had an excellent result requiring no secondary operative procedure.

DISCUSSION

In 1869 Thiersch described a technique using local tissue flaps to repair epispadias.⁵ In 1880 Duplay used a similar type of periurethral skin flaps to form a neourethra in patients with hypospadias.⁶ This technique was popularized for the repair of distal hypospadias by King.¹⁰ In the 1960s cases of glanular or subcoronal hypospadias often remained uncorrected because attempted repair offered little benefit over the original defect. The meatoplasty and glanuloplasty technique of Duckett was designed to improve cosmetic and functional results in distal hypospadias without the risks of formal urethroplasty.³ Meatoplasty and glanuloplasty became the procedure of choice for distal hypospadias in the early 1980s but experience proved that inappropriate application of the technique yielded poor results.^{11,12} Meatoplasty and glanuloplasty should probably be avoided in patients with thin or rigid ventral parametalar skin, or a meatus that is too proximal or wide.¹³ Arap et al proposed a modification of meatoplasty and glanuloplasty specifically intended for patients with a more proximal meatus.¹⁴ We previously described a modification designed to address the factors leading to meatal retrusion and the abnormal glans shape sometimes seen after meatoplasty and glanuloplasty.⁴

We initially performed the modified Thiersch-Duplay repair in cases in which we made incisions to perform the M-inverted-V procedure but then recognized that the parametalar skin lacked adequate mobility to allow appropriate tissue reconfiguring. Although we were concerned about the risk of a fistula, a simple Thiersch style closure seemed a natural next step. Postoperatively cosmesis was so good that we began to use the technique. The glans approximation procedure of Zaontz applies essentially the same technique in patients with a deep ventral glanular cleft,¹ and the pyramid procedure of Duckett and Keating applies it in those with an intact prepuce and megameatus.² In 1995 Van Horn and Kass described a modification of the King technique that essentially involves the modified Thiersch-Duplay repair with glanuloplasty and in situ tubularization of the urethral

plate.¹⁵ Apparently all of these surgeons recognized the usefulness of the original Thiersch-Duplay procedure.

The meatal based flap technique of the Mathieu repair provides another reliable approach for correcting distal hypospadias.¹⁶ When the Mathieu repair was critically reviewed in regard to cosmesis, it was recognized that the meatal configuration was often not ideal. In 1989 Rich et al initially described hinging the urethral plate as an adjunct to meatal based and onlay island flaps in an effort to attain a functionally and cosmetically normal meatus.⁷ Hinging the urethral plate did not receive much attention until 1994, when Snodgrass described his technique of hinging or incising the urethral plate as a complement to the Thiersch-Duplay repair for distal hypospadias.⁸ Hinging the urethral plate in patients with a shallow glanular cleft widens the plate, allowing the surgeon to tubularize a urethra of adequate diameter in a tension-free manner. Snodgrass reported that tubularization of the incised plate provided excellent results in 16 boys with distal hypospadias.⁸ After learning of the Snodgrass technique we began to hinge the urethral plate to expand our ability to use the Thiersch-Duplay method, since our results with it to that point had been gratifying.

The risk of fistula formation was a prime concern when we initially used the Thiersch-Duplay technique. To decrease that risk we covered the repair with a vascularized pedicle of subcutaneous tissue dissected from the dorsal preputial tissue. In some patients the glanular tissue adjacent to the urethroplasty seemed adequate to provide a second layer of coverage, and we used it much as Van Horn and Kass described.¹⁵ Snodgrass reported using a vascularized subcutaneous tissue flap dissected from the dorsal preputial and shaft skin to cover the urethroplasty.⁸ Ross and Kay raised the concern that mobilization of this flap may compromise the blood supply to the skin closure and predispose to torsion.¹⁷ They reported no cases of fistula formation in 15 boys who underwent primary repair by the Thiersch-Duplay technique with the Snodgrass modification using de-epithelialized local skin flaps for second layer coverage. De-epithelialized skin flap coverage in 1-stage hypospadias repair was popularized by Belman¹⁸ and originally described by Smith as an adjunct to hypospadias surgery.¹⁹ In our experience a vascularized pedicle of subcutaneous tissue covering the neourethra results in a statistically significant decrease in the fistula rate over the use of adjacent local tissue. The subcutaneous flap has not adversely affected cosmesis or led to problems with torsion.

Just as experience has proved the limitations of the meato-plasty and glanuloplasty, we believe that overzealous application of the hinging maneuver may illustrate its limitations. Although the surgeon may readily assess the ventral cleft, and recognize that it is shallow and requires hinging, one cannot readily predict how well the incision would allow the midline tissues to separate. The tissue of the plate is unique in that an incision into it is almost bloodless. If the incision in the glanular portion of the plate is deepened beyond the limit of the plate in an attempt to improve tissue mobility, the glanular substance is entered and troublesome bleeding ensues. We suspect that these deeper incisions may not heal in the same fashion as an incision limited to the plate. We are concerned that the likelihood of stenosis may increase if the incision required to provide a urethra of adequate diameter is too deep. When the initial hinging incision limited to the plate does not ensure a urethra of adequate diameter, we think that the hinge should be closed and an onlay procedure should be performed or the hinged area should be covered with a preputial graft before the urethra is closed.^{20, 21}

CONCLUSIONS

The Thiersch-Duplay repair, which we frequently combine with urethral plate hinging (the Snodgrass maneuver), offers a consistently reliable repair in boys with distal hypospadias. Hinging the urethral plate in patients with a shallow glanular cleft allows the plate to be tubularized when its width would not otherwise enable a neourethral lumen of adequate size to be constructed. This procedure creates a vertically oriented, slit-like meatus, resulting in ideal cosmesis in the majority of cases. The fistula rate is less than 1% when the repair is covered with a vascularized pedicle of subcutaneous tissue. This repair has virtually supplanted all other methods that we used in the past to correct distal hypospadias.

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