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Urethral mobilization and meatal advancement: a surgical principle in hypospadias repair

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Abstract A technique of urethral mobilization and advancement in hypospadias repair using the urethral elasticity to partially or completely bridge the defect in urethral length was employed in 56 children. In 46 with distal hypospadias it was the only procedure used. In 10 with proximal hypospadias, it was combined with other techniques. In distal hypospadias, no postoperative fistula occurred. Complications of the operation were 3 meatal stenoses that responded to dilatation, 1 urethral injury immediately repaired with no consequent fistula, and 1 chordee that was subsequently corrected. Of the 10 children with proximal hypospadias, 3 developed minor fistulae and 1 meatal stenosis. Urethral mobilization was found to be a safe and effective procedure in the management of hypospadias. It could be the only procedure required in distal hypospadias, or in combination with other procedures in proximal hypospadias.

Key words Hypospadias · Urethral mobilization

Introduction

The general principles of hypospadias surgery combine correction of the penile curvature with reconstruction of the missing urethra to provide a functional as well as cosmetically acceptable terminal urethral meatus. Many one- and two-stage procedures have been described to achieve this objective [6], which reflects the wide spectrum of this common congenital anomaly and the failure of any single technique to win uniform acceptance.

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Most of the described surgical procedures for reconstruction of the neourethra utilize non-urethral tissue such as penile or preputial skin, free skin grafts, and buccal or bladder mucosa. An alternative to creating a neourethra is mobilization and elongation of the existing urethra and advancement of its meatus to a distal position. This principle could be used in hypospadias repair to bridge part of all of the urethral defect.

Urethral advancement was first described by Beck [2] and later popularized by Waterhouse and Glassberg [12], Koff [8], and Baran [1]. Proponents of urethral mobilization (UM) recommend its use mainly in the management of distal penile hypospadias [3]. Recent reports incorporated the technique with preservation and tubularization of the urethral plate in the management of more proximal hypospadias [11]. The technique is not widely used, probably due to the early unsuccessful attempts of limited UM and the subsequent development of chordee secondary to a taut urethra, in addition to the fear of ischemia from extensive dissection of the urethra and the potential for its injury.

Over the last 4 years, we have used UM and advancement as the main technique in the management of coronal, subcoronal, and distal penile hypospadias with no or mild degrees of chordee. We have also used it in combination with other techniques of urethroplasty in order to shorten the gap to be bridged by the neourethra, or when the urethral plate is used to reconstruct the neourethra. The aim of this study is to report our results in using UM and advancement in the management of different types of hypospadias.

Patients and methods

From September 1994 to August 1997, UM and advancement was used in the management of hypospadias in 56 children whose ages ranged from 1 to 5 years (average 3.8 years). In 46 children the meatus was coronal (27), subcoronal (12), and distal penile (7); in this group UM was the only procedure. In 10 cases of proximal hypospadias, UM was combined with another technique; Duckett's transverse preputial flap [5] in 4, Thiersch-Duplay-Monfort

urethroplasty in 4, and Onlay island flap [10] in 2. The reported patients have been followed for 6 months to 3 years (average 1.8 years).

With the patient under general anesthesia, a traction suture was placed through the glans. A size 8 Foley catheter was passed into the bladder. Epinephrine 1:200,000 was injected along the incision lines. An artificial erection was induced to demonstrate the degree of chordee in all questionable cases.

In distal hypospadias, the technique used was a combination of Koff's [8] and De Sy's [3] UM (Fig. 1A–F). A circular skin incision was made 4–5 mm from the balano-preputial groove, ventrally circumsizing the urethral meatus and leaving 3–4 mm surrounding skin attached. If the corpus spongiosum surrounding the meatus was very thin, it was excised. The penile skin was dissected free along Buck's fascia and slid toward the base of the penis. The urethra was dissected along the plane of cleavage between the spongy tissue of the urethra and corpora cavernosa. Any fibrous bands distal to the meatus that might contribute to a degree of chordee were excised. Care was taken not to enter or injure the urethra. The separated urethra was measured against the straight penis to determine if it would reach the tip of the glans without tension.

Initially, we used a wide glanular tunnel to transmit the mobilized urethra. The skin rim around the meatus was anastomosed to the glans using 7/0 PDS sutures. If the end of the urethra was trimmed due to insufficient spongy tissue, we preferred not to tunnel it but to create triangular glans flaps. The mobilized urethral meatus was spatulated and anastomosed to the central triangular flap; the lateral glanular wings were wrapped around it. This technique creates a wide meatus and gives good coverage of the mobilized urethra. At present, the triangular glans flaps have replaced the tunneling procedure in all cases. The degloved penil skin was pulled back and sutured to the circumferential rim of inner preputial skin along the coronal sulcus. Ventrally, we rotated two mucosal cuffs as described by Firlit [7]. The penis was dressed using a sponge compression dressing and the urethral catheter was sutured to the glans penis. In distal hypospadias the child was discharged the next morning, and the catheter and dressing were usually removed on the 3rd post-operative day.

In proximal hypospadias, UM was combined with other procedures. When combined with Duckett's transverse preputial flap, the gap to be bridged became shorter. In the other procedures [10, 11], the urethral plate was mobilized with the urethra. The extensive proximal mobilization of the urethra facilitated inturning of the urethral-plate edges and the formation of a urethral tube.

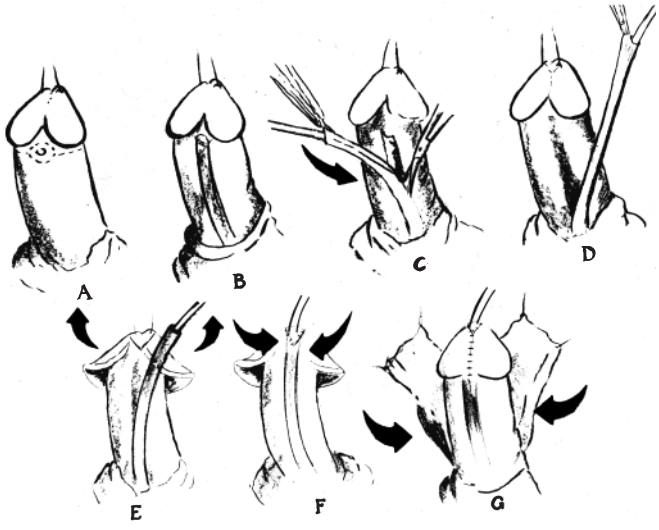

Fig. 1 Technique of urethral mobilization and advancement

Results

Meatal stenosis occurred in 4 children, all of whom had the mobilized urethra tunnelled through the glans. Two responded well to dilatation and 1 needed a meatoplasty. One child with distal penile hypospadias developed a noticeable penile curvature on erection, requiring reoperation. The urethra, which initially was not sufficiently mobilized, was separated and mobilized more proximally, obtaining more length and resulting in correction of the curvature. In 1 child the urethra was injured during dissection. It was immediately sutured using 7/0 PDS. No fistula occurred in the 46 operated children with coronal, subcoronal, and distal penile hypospadias, including the one with a urethral injury. In the 10 children with proximal penile hypospadias who had UM combined with other procedures, fistulae occurred in 3, 2 of 4 UM operations combined with a Duckett transverse preputial flap and 1 of the 2 with an Onlay island flap. The final outcome of all operated was functionally and cosmetically excellent; they all voided easily with a straight stream and no chordee.

Discussion

Extensive mobilization of the hypospadiac urethra is an important surgical principle that should be considered in the management of this common anomaly. The elasticity of the normal urethra and the rich blood supply, i.e., the corpus spongiosum, allow its safe mobilization and elongation [4]. Urethral injury during mobilization was uncommon in our series: it occurred only once in 56 operations, and when immediately discovered was sutured with no subsequent fistula formation.

Early in our series, meatal stenosis occurred in 4 children who had the urethra passed through the tunnelled glans. Since then, we have modified the technique by triangularization of the glans and wrapping the lateral glanular wings around the mobilized and advanced urethral meatus. The problem of a taut urethra and penile curvature that complicated 1 of the early cases was due to insufficient UM. The mobilized urethra should be checked against the artificially erected penis to ensure that sufficient length has been obtained. A ratio of 1:3 is recommended: i.e., to bridge a 1-cm gap, 3 cm urethral mobilization is needed.

In proximal hypospadias, UM and meatal advancement is useful as it can shorten the gap to be bridged or to be combined with procedures that preserve and utilize the urethral plate in the formation of the neourethra [9].

In conclusion, we believe that UM and meatal advancement is an important technique that can be used with few complications for total correction of distal hypospadias and in combination with other techniques in more proximal types.

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