

## THE USE OF TISSUE EXPANDERS IN HYPOSPADIAS CRIPPLES AND COMPLEX ANTERIOR URETHRAL STRICTURE: EARLY EXPERIENCE

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**Objective:** This procedure was introduced to evaluate the use of tissue expanders in patients with complex anterior urethral strictures and hypospadias cripples where there is not enough healthy penile skin to bridge the urethral defect or to cover the neourethra.

**Patients and Methods:** Six patients with a mean age of 23.3 years were included in this study. Four patients presented with complex hypospadias after failed multiple repairs. Three of them presented with penoscrotal meatus, residual chordee and scarred ventral penile skin. The fourth patient had multiple proximal fistulas with a scarred narrow distal urethra. The fifth patient was circumcised with a concealed penis and a congenitally short urethra. The sixth patient was referred from another institution after previous unsuccessful urethrotomies and urethroplasties. He had a curved penis, a calcified urethral plate and a proximal penile urethral meatus after first-stage Johanson procedure. The tissue expander was placed under the dorsal penile skin through a subcoronal incision. Penile

skin expansion was performed gradually over 5-8 weeks. Urethroplasty was then performed using the Thiersch-Duplay technique with penile covering using the excess dorsal penile skin.

**Results:** Expansion of the dorsal penile skin was performed successfully in all cases. There were no complications related to the use of tissue expanders except for minimal discomfort at the start of expansion. Complications related to urethroplasty included mild skin infection and temporary penoscrotal urethrocutaneous fistula (which closed spontaneously), a subcoronal fistula that required surgical closure and disruption of the glandular sutures in one case each.

**Conclusions:** The initial good results of this technique are encouraging in patients presenting after multiple failed urethroplasties. It seems to provide an alternative to free grafts, which at present is the only solution for such cases. However, further evaluation on a larger number of patients is required.

**Key Words:** urethra, hypospadias cripples, stricture, tissue expander

### INTRODUCTION

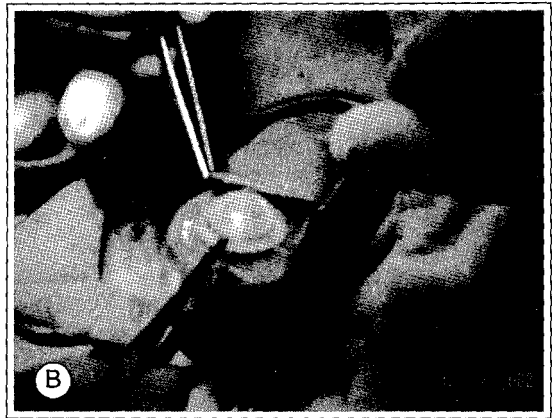
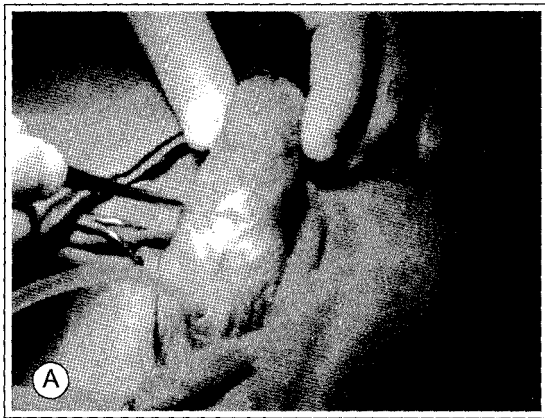
The choice of the substitute material for hypospadias cripples and patients with complex anterior urethral stricture depends on the availability of the preputial and penile skin. In some of these cases, local penile skin is not available due to multiple previous repairs. In such cases, free grafts with their inherent short and long-term complications are the only solution.

Vordermark was the first to demonstrate the use of tissue expanders in the dorsal aspect of

the penis in a patient with failed hypospadias repair as an alternative to the free graft.<sup>1</sup> We herein present our early experience with the use of tissue expanders in the repair of complex penoscrotal hypospadias and calcified pen anterior urethral stricture.

### PATIENTS AND METHODS

Between January 2001 and December 2002, six patients underwent staged urethroplasty. Their age ranged from 13 to 62 years with a mean age of 23.3



**Fig. 1:** View of a penis of a 14-year-old boy with complex hypospadias. **A:** Penis after first stage with penoscrotal meatus. **B:** Placement of tissue expander. **C:** Full expansion of the dorsal penile skin. **D:** Urethroplasty completed and covered with tunica vaginalis. **E:** Postoperative appearance

Four patients presented with complex hypospadias after multiple failed repairs. Three of them presented with penoscrotal meatus, residual chordee and scarred ventral penile skin. The fourth one had multiple proximal fistulas with a scarred narrow distal urethra. A first stage was performed in these four patients with excision of the residual chordee, scarred skin and abnormal urethra leaving a proximal penoscrotal meatus. The dorsal skin was mobilized to cover the ventral surface of the penis.

The fifth patient was circumcised with a concealed penis and a congenitally short urethra. After correction of the curvature by cutting the urethra at the subcorona, the urethra receded backwards to a penoscrotal position.

The last patient was referred from another institution after previous unsuccessful urethrotomies and urethroplasties. He had a curved penis, a calcified urethral plate and a proximal penile urethral meatus after first-stage Johanson procedure. The distal part of the intact urethra was also calcified and narrow. The whole calcified urethral plate and the distal unhealthy part of the urethra down to the mid scrotum were excised to straighten the penis. The ventral surface of the penis was then covered with Byars skin flaps.

In all cases, a cylindrical 80-cc tissue expander was placed between the corpora cavernosa and the dorsal penile skin through a dorsal subcoronal incision. The injection port was placed in the subcutaneous tissue at the penopubic junction. Gradual expansion with 7-10 cc saline was performed weekly starting 10 days after placement of the expander and continuing for 6-8 weeks. Prophylactic broad-spectrum antibiotics were given to all patients before placement of the expander and continued for one week. Definitive urethroplasty was performed after two months using the Thiersch-Duplay tube with covering of the neourethra with a tunica vaginalis flap in all cases (Fig.1). A silicon catheter of an appropriate size was left for 10-14 days. All cases were followed for at least six months post-operatively.

## RESULTS

A good expansion of the dorsal penile skin was achieved in all cases providing healthy non-scarred excess penile skin. After urethroplasty, mobilization of the excess dorsal penile

skin and coverage of the neourethra was performed at ease and without tension in all cases.

There were no complications related to the use of tissue expanders except for minimal discomfort at the start of expansion in four patients. Complications related to urethroplasty included mild skin infection and urethrocutaneous fistulas in two patients, one of them closed spontaneously after treatment of the infection and the other one required surgical closure after six months. Disruption of the glandular sutures occurred in another case leaving a glandular meatus. In the 62-year old patient with pan anterior urethral stricture, expansion had to be stopped at 50 cc due to excessive stretching of the dorsal penile skin. However, the grade of expansion was adequate to achieve penile covering after urethroplasty.

## DISCUSSION

Urethroplasty for hypospadias cripples and complex anterior urethral strictures constitutes a surgical challenge. Penile or preputial skin, if available, is the ideal tissue for urethroplasty in such cases. Occasionally, the penile skin available is not sufficient to be used for urethroplasty or even penile coverage. Extragenital grafts as skin, bladder mucosa and buccal mucosa are the main stay for urethral reconstruction in these complicated circumstances. Although buccal mucosa is a better alternative than non-genital skin grafts and urothelium, it still has a 32-57% complication and a 17-33% reoperation rate.<sup>2-4</sup> Therefore, an alternative technique for urethral reconstruction would be desirable in such complicated cases.

In search of an alternative tissue appropriate for urethral reconstruction Atala and associates investigated the use of bladder submucosal, collagen inert matrix as a free graft substitute for urethral repair in complex hypospadias<sup>5</sup>. The neourethra was created by anastomosing the matrix in an onlay fashion to the urethral plate in four patients. A successful cosmetic and functional outcome could be recorded in all patients. Only one patient developed penile fistula<sup>5</sup>. On the other hand, El-Kassaby et al. demonstrated the potential of an off-the-shelf collagen matrix onlay graft to allow urethral reconstruction in patients with long segment urethral strictures<sup>6,7</sup>. The authors demonstrated an apparent biocompatibility and safety for the use of this off-the-shelf matrix,

but a review of the results suggests that this technique works better in the bulbar urethra than in the penile urethra<sup>7</sup>. Where this collagen matrix is available, it appears to be beneficial in hypospadias cripples and complicated urethral strictures. However, a healthy urethral plate should be available for anastomosis with the collagen matrix in an onlay fashion.

It is well known that one-stage urethroplasty is the gold standard for hypospadias repair. It has been tested over a long time by a large number of surgeons supporting the feasibility of this concept<sup>8</sup>. However, in a subset of patients with severe proximal hypospadias, chordee and small phallus two-stage repair may allow for better cosmetic appearance and a lower complication rate than one-stage repair<sup>9,10</sup>. Moreover, in hypospadias cripples with proximal meatus and scarred ventral skin following previous failed repairs, staged procedures may be a better option than one-stage repair.

Although buccal mucosa onlay grafts are widely used for urethroplasty in complex hypospadias and long segment urethral stricture, buccal mucosa tube grafts clearly are not better than using other materials<sup>11</sup> and it is because of the poor success rate that many authors have abandoned one-stage circumferential reconstruction of the urethra and use two-stage reconstruction instead<sup>12-15</sup>. Andrich and Mundy demonstrated the use of staged buccal mucosa graft in complex hypospadias<sup>13</sup>. In the first stage a wide strip of buccal mucosa was quilted onto the tunica albuginea of the corporal bodies after excision of the scarred urethra. Stage-two closure was performed 3 to 6 months after the first stage. A similar technique was also demonstrated by Snodgrass and Elmore<sup>14</sup> and Mokhless<sup>15</sup>. However, internal revision and regrafting was required in 23-24% of the cases due to scarring and contraction of the graft<sup>13,14</sup>.

Tissue expanders have been used by plastic surgeons to reconstruct cutaneous defects, burn scars and genital malformations. Tissue expansion provides a large supply of local healthy skin similar to the surrounding skin for use in reconstruction. Vordermark was the first to use tissue expanders in the repair of complicated hypospadias<sup>1</sup>. In our cases, the local penile skin was inadequate for either urethroplasty or penile coverage. Also, a circumferential reconstruction of the neourethra was required in all cases due to excision of the un-

healthy urethral plate. In all cases the neourethra was created using the Thiersch-Duplay technique which has the advantage of avoiding circumferential anastomosis and anastomotic stricture due to the continuity of the neourethra with the native urethra. The tunica vaginalis flap served as a barrier tissue to decrease the incidence of fistula in all cases. Dorsal penile skin expansion provided a well-vascularized non-hairy skin, which was used for coverage of the neourethra.

On removal of the tissue expander a thick capsule is found surrounding it. Histologically, this capsule is formed of fibrin-like fibers, fibroblasts and myofibroblasts with surrounding collagen and an outer vascular layer formed of dilated blood vessels and newly formed small vessels<sup>16</sup>. In our cases this capsule was mobilized ventrally with the expanded skin to add an additional covering layer to the neourethra.

The only complication related to the use of the tissue expander was mild discomfort at the start of expansion. On the other hand, expansion was stopped at 50 cc in the 62-year old patient with urethral stricture due to excessive stretching of the dorsal penile skin. This may be explained by the decrease in the extensibility of the skin which changes with age. Therefore, close monitoring of the penile skin during expansion is essential especially in old patients.

We conclude that our initial good results with the use of tissue expanders in complicated urethral reconstruction make this technique an attractive alternative in such cases. However, further evaluation on a larger number of patients with longer periods of follow-up is warranted.

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## RESUME

Due to the fact that this article was accepted on very short notice, the translation of the abstract will be published in Vol. 11, No. 1, 2005. We ask for your understanding.

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