

## DORSAL ONLAY GRAFT URETHROPLASTY USING PENILE SKIN OR BUCCAL MUCOSA IN ADULT BULBOURETHRAL STRICTURES

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### ABSTRACT

**Purpose:** Preputial skin graft is used routinely for urethral reconstruction in patients with stricture disease. Alternative donor sites include extrapenile skin, bladder mucosa and buccal mucosa. Recently buccal mucosa graft has been suggested when local epithelial tissue is not available. We describe our experience with 37 patients undergoing 1-stage correction of bulbar urethral stricture using a penile skin (31) or buccal mucosa (6) graft.

**Materials and Methods:** In 37 patients with bulbar urethral strictures a nontubularized dorsal onlay graft was used for urethral reconstruction. A preputial skin graft was used in 31 patients and a buccal mucosa graft in 6 with a paucity of local skin. Buccal mucosa graft length ranged from 2.5 to 5 cm. (average 4) and preputial skin graft was 2.5 to 12 cm. long (average 4.7). A dorsal approach to the urethral lumen was used in all patients who underwent onlay graft urethroplasty.

**Results:** Mean followup was 21.5 months for all 37 patients, 23 months for 31 treated with preputial skin graft and 13.5 months for 6 treated with buccal mucosa graft. The clinical outcomes were considered a failure anytime postoperative instrumentation was needed, including dilatation. In the series 34 cases (92%) were classified as a success and 3 (8%) as failure.

**Conclusions:** Onlay graft urethroplasty provided excellent results in 92% of adults with bulbourethral stricture. The dorsal approach to the urethra allowed the use of foreskin or buccal mucosa graft for reconstruction of the adequate urethral lumen.

**KEY WORDS:** urethra, urethral stricture, mucous membrane, tissue transplantation

Penile foreskin is an ideal substitute for primary or secondary urethral reconstruction in patients with urethral stricture disease or hypospadias. Occasionally local epithelial tissue is unavailable because of circumcision, or balanitis xerotica obliterans or scar tissue. In these cases extragenital skin (inner arm, posterior auricle, groin, buttocks) or bladder mucosa has been proposed as an alternative donor site.<sup>1-3</sup> However, long-term followup demonstrates that these tissues are far from ideal replacements.<sup>1-3</sup>

Recently buccal mucosa has been suggested for urethral reconstruction in pediatric patients with complex hypospadias<sup>4-6</sup> and men with bulbar urethral strictures.<sup>7-11</sup> Buccal mucosa has provided promising results but long-term followup is mandatory.<sup>10-13</sup> We reviewed our clinical experience with 37 patients undergoing 1-stage correction of bulbar urethral stricture with dorsal onlay graft urethroplasty using penile skin or buccal mucosa. In all patients the graft was applied on the dorsal surface of the urethral lumen, according to our technique previously described.<sup>14,15</sup>

### PATIENTS AND METHODS

From April 1994 to August 1997, 37 men 20 to 61 years old (mean age 44.5) with stricture disease underwent urethral reconstruction using dorsal onlay urethroplasty. Stricture etiology was unknown in 10 patients (27.1%), ischemic in 7 (18.9%), iatrogenic in 5 (13.5%), inflammatory in 5 (13.5%), traumatic in 5 (13.5%) and due to balanitis xerotica obliterans in 5 (13.5%). All strictures were in the bulbar urethra. In 19 patients (51.4%) multiple prior endoscopic procedures or dilations had failed. In 5 patients with balanitis xerotica obliterans surgery for strictures in the navicularis or penile tract had already been performed using a pedicled preputial flap tailored in the ventral foreskin.

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All patients were evaluated preoperatively with uroflowmetry, retrograde and voiding urethrography to define stricture location, and ultrasonography to evaluate stricture length and extent of spongiofibrosis. Stricture length ranged between 2.5 and 12 cm. (mean 4.6). Foreskin provided a graft of sufficient size and length in 31 uncircumcised patients. Skin graft lengths were 2.5 to 12 cm. (mean 4.7). Penile skin was inadequate or unavailable because of circumcision in 2 patients and surgery for balanitis xerotica obliterans in 4, and so buccal mucosa graft was used. Buccal mucosa graft lengths ranged from 2.5 to 5 cm. (mean 4) and width from 2 to 3 cm. (mean 2.5). The inner cheek was the preferred donor site in the area just below Stensen's duct, and the graft was thinned and tailored before urethral anastomosis.

All patients underwent free graft urethroplasty using the dorsal approach to urethral lumen. Our technique for dorsal free graft urethroplasty has been described previously.<sup>14,15</sup> The urethra is completely mobilized from the corpora cavernosa and rotated 180 degrees, and the strictured tract is opened along its dorsal surface. A fenestrated ovoid preputial free skin or buccal mucosa graft is spread and sutured to the tunica albuginea using interrupted stitches. The left mucosal margin of the opened urethra is sutured to the left side of the patch graft. The urethra is rotated back to its original position and the right urethral margin is sutured to the right side of the patch graft. At completion the graft area is entirely covered by the urethral plate and a 16F Foley catheter is placed. For an obliterative stricture the urethra is transected at the stricture site, and the fenestrated ovoid graft is sutured to the tunica albuginea and proximal urethral edge. The mobilized distal urethra is widely opened along its dorsal surface and rotated back over the patch graft, leaving an indwelling 16F Foley catheter. At the end of the procedure the graft area is completely covered by healthy urethra. The

catheter is removed 3 weeks after surgery and voiding cystourethrography is performed.

#### RESULTS

All patients were followed with voiding cystourethrography 3 weeks after surgery and with uroflowmetry, urine culture and urethrography after 4 months. Uroflowmetry and urine culture were repeated every 4 months during year 1 and yearly thereafter. Radiological studies were repeated when uroflowmetry was less than 14 ml. per second. Clinical outcome was considered a failure anytime postoperative instrumentation was needed, including dilation. Followup of the series ranged between 7 and 47 months (mean 21.5), 7 and 47 months (mean 23) for 31 cases of preputial skin graft, and 13 and 14 months (mean 13.5) for 6 cases of buccal mucosa graft (see table).

There were 34 successes (92%) and 3 failures (8%). All 3 failures occurred in 3 of the 31 patients (9.7%) who underwent urethroplasty using penile skin. The cause of failure was chronic urinary infection due to kidney stones, which required multiple endourethral manipulations in 1 patient who underwent 2-stage urethroplasty. The stricture recurred at the proximal anastomosis because of down staging of disease in 1 patient who also underwent 2-stage urethroplasty. Failure occurred in 1 patient because of ischemia due to age (72 years) and graft length (6 cm.). The stricture recurred at the distal anastomosis and the patient underwent a new free graft urethroplasty. No stricture recurred in 6 patients who underwent dorsal onlay graft urethroplasty using buccal mucosa.

#### DISCUSSION

In urethral reconstruction excision of the strictured tract and end-to-end anastomosis provide a success rate of 95% in patients with untreated lesions of the bulbous urethra shorter than 2 cm.<sup>12</sup> We reserve the use of free grafts and penile skin flaps for complex strictures of the penile and bulbous urethra. The outcome of procedures depends on vascularity of the recipient site and revascularization of the donor graft. A well vascularized graft bed allows good neovascularization of the graft. Graft length, graft bed location and patient age may all reflect the quality of the graft bed.<sup>11</sup>

The bulbar urethra proved to be the most reliable portion of the urethra as an ideal graft bed owing to its rich vascularity.<sup>9</sup> According to Wessels and McAninch the failures are not related to donor site of the grafts, history of intervention or cause of strictures but are attributed to placement of grafts onto the penile urethra.<sup>11</sup> On the other hand, strictures at the bulbous urethra healed better with free grafts.<sup>11</sup>

The dorsal onlay graft procedure for bulbar strictures introduces some advantages over traditional ventral onlay graft urethroplasty.<sup>16</sup> The graft is fixed to the undersurface of the corporeal body, which has an excellent blood supply and good mechanical support.<sup>14-16</sup> The spreading of the graft, making use of the tensile strength in the corporeal bodies, reduces the risk of graft shrinkage and chordee, while the dorsal graft bed avoids the problem of ventral sacculation and, by interposing the graft between the urethra and corporeal bodies, fistula formation appears to be limited.<sup>16</sup> Our technique also may be useful for strictures previously operated on as it allows repair on the contralateral side of the

urethra and avoids the previously scarred area.<sup>16</sup> We prefer using free grafts in an onlay manner, preserving the urethral plate, which serves as a graft bed<sup>10,11,17</sup> and as urethral mucosa regeneration according to Weaver and Schulte,<sup>18</sup> and Moore.<sup>19</sup>

For bulbar urethroplasty we use preferentially a preputial graft by circumcision because the donor site is near, and the skin is thin, elastic and hairless. The aesthetic outcome is excellent and harvesting time is brief. When local epithelial tissue is unavailable buccal mucosa is preferred to other various types of extragenital free grafts because of its qualities. We chose the inner cheek over the inner lip as a donor site, according to Baskin and Duckett,<sup>7</sup> because the width of the lip limits the size of the graft. In our experience buccal mucosa harvest increases operative time by 1 hour. Thus, a 2 team approach may be used in which a perineal team exposes and calibrates the stricture, while another simultaneously harvests the graft from the mouth.<sup>8,9</sup> The reduced operative time has remarkable advantages and helps prevent troublesome complications from prolonged high lithotomy position.<sup>8,9</sup>

In our series 3 failures occurred with preputial grafts (90.3% success) and all 6 buccal mucosal grafts were successful (see table). Followup was shorter in patients with buccal mucosal grafts (mean 13.5 months) but early results are encouraging. The success rate of free graft urethroplasty varies from 50 to 95%.<sup>1,11-13</sup> Our overall success rate of 92% is comparable to that of other series of free grafts from various donor sites. However, our mean followup of 21.5 months may not have allowed us to detect all failures, since we have observed recurrent strictures as late as 15 years after urethroplasty.<sup>12</sup> Therefore, a satisfactory long-term evaluation requires a sufficiently large series of patients with prolonged followup (minimum 5 years).<sup>12</sup> The grafts have a tendency to deteriorate with time, especially the tubularized compared to the patch graft,<sup>20,21</sup> which occurs because the urethral tissue substitution determines a progressive decrease of urethral function.<sup>20,21</sup> The innovations of dorsal free graft repair may prove to be the latest advance in ensuring a successful outcome.<sup>16</sup>

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Results of 37 free graft urethroplasties according to donor site

Donor Site	No. Cases	Mean Followup (mos.)	Mean Graft Length (cm.)	No. Success (%)	No. Failure
Preputial skin	31	23	4.74	28 (90.3)	3
Buccal mucosa	6	13.5	4	6 (100)	0
Totals	37	21.5	4.62	34 (92)	3 (8)

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