Urethroplasty for High Risk, Long Segment Urethral Strictures with Ventral Buccal Mucosa Graft and Gracilis Muscle Flap

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Abbreviations and Acronyms

AUS = artificial urinary sphincter

BMG = buccal mucosa graft

GMF = gracilis muscle flap

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Purpose: Long segment urethral strictures with a compromised graft bed and poor vascular supply are unfit for standard repair and at high risk for recurrence. We assessed the success of urethral reconstruction in these patients with a ventral buccal mucosa graft and gracilis muscle flap.

Materials and Methods: We retrospectively reviewed the records of 1,039 patients who underwent urethroplasty at Lahey Hospital and Medical Center between 1999 and 2014. We identified 20 patients who underwent urethroplasty with a ventral buccal mucosa graft and a gracilis muscle flap graft bed. Stricture recurrence was defined as the inability to pass a 16Fr cystoscope.

Results: Mean stricture length was 8.2 cm (range 3.5 to 15). Strictures were located in the posterior urethra with or without involvement of the bulbar urethra in 50% of cases, and in the bulbomembranous urethra in 35%, the bulbar urethra in 10% and the proximal pendulous urethra in 5%. Stricture etiology was radiation therapy in 45% of cases, followed by an idiopathic cause in 20%, trauma in 15%, prostatectomy in 10%, and hypospadias failure and transurethral surgery in 5% each. Nine patients (45%) were previously treated with urethroplasty and 3 (15%) previously underwent UroLume® stent placement. Urethral reconstruction was successful in 16 cases (80%) at a mean followup of 40 months. One of the patients in whom treatment failed had an ileal loop, 2 had a suprapubic tube and urethral dilatation had been done in 1. Mean time to recurrence was 10 months (range 2 to 17). Postoperatively 5 patients (25%) had incontinence requiring an artificial urinary sphincter.

Conclusions: Urethroplasty for high risk, long segment urethral strictures can be successfully performed with a ventral buccal mucosa graft and a gracilis muscle flap, avoiding urinary diversion in most patients.

Key Words: urethral stricture, recurrence, surgical flaps, transplants, radiotherapy

Urethral strictures can be debilitating and cause significant morbidity. Substitution urethroplasty using a BMG has become the primary surgical treatment for long segment urethral strictures that are not suitable for anastomotic urethroplasty.[1] The success rate of urethroplasty with BMG is between 81% and 96% with a recent systematic review demonstrating an overall 15.6% failure rate for substitution urethroplasty.[2,3] Followup duration and the definition of success vary in

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the literature, which may under represent true failure rates, especially for complex urethral reconstruction.

Long segment urethral strictures without a traditional, well vascularized graft bed present a particularly difficult challenge. These strictures are not amendable to traditional reconstructive maneuvers such as anastomotic or substitution urethroplasty with a traditional dorsal or ventral onlay approach and they carry a high risk of stricture recurrence.[4] These strictures are often the result of radiation, failure of previous urethral reconstruction or hypospadias repair, severe trauma or stenting of the posterior urethra.[4,5] Many of these patients ultimately require an indwelling catheter or urinary diversion.

We previously proposed using a GMF as a graft bed in these patients at high risk who are candidates for traditional reconstructive techniques.[4] These muscle flaps promote neovascularity and provide a well vascularized graft bed for buccal graft substitution urethroplasty. In this study we assessed the long-term success of urethral reconstruction for high risk, long segment urethral strictures with a ventral BMG and GMF in patients who were not candidates for standard repair because of a poor graft bed.

MATERIALS AND METHODS

Institutional review board approval was obtained for this retrospective review. Data were collected on 1,039 patients who underwent urethroplasty at a single tertiary care hospital between 1999 and 2014. Study inclusion criteria were patients with urethral strictures who underwent urethroplasty with a ventral BMG and a GMF buttress as a graft bed. Using CPT codes for urethral reconstruction and muscle flap we identified 20 patients who fit the inclusion criteria. No patient who met these criteria was excluded from analysis. Patient demographics, stricture etiology, length and location, prior surgical procedures and surgical approach were identified from the electronic medical record.

Three fellowship trained reconstructive urological surgeons (JCB, LNZ and AJV) performed the procedures. All patients underwent cystoscopy preoperatively along with retrograde or antegrade urethrography. Patients were counseled preoperatively on the possibility of a buccal graft and a gracilis flap based on stricture length and the potential for a poor graft bed based on history.

The patient was placed in the dorsal lithotomy position. An inverted U-shaped incision was made over the perineum to adequately expose the bulbomembranous and distal prostatic urethra. After exposing the ventral aspect of the urethra a ventral urethrotomy was made through the stricture and ventral buccal graft onlay was performed. The gracilis muscle was harvested, rotated into the perineum and securely buttressed to the buccal graft with at least 4 absorbable sutures located proximal, lateral and distal to the graft to ensure proper placement of the muscle to the graft.

A 16Fr urethral catheter or a suprapubic tube was left in place at the end of the procedure depending on surgeon preference. A closed suction drain was left under the muscle flap in the perineum until drainage was less than 30 ml per day. Voiding cystourethrogram was performed 3 to 4 weeks postoperatively.

Patients were followed 3 to 6 months and 1 year postoperatively by subjective voiding symptoms, uroflowmetry, post-void residual urine measurement and cystoscopy. Thereafter patients were followed yearly with subjective voiding symptoms, uroflowmetry, post-void residual urine measurement and cystoscopy if there was any change in voiding symptoms or uroflowmetry. Stricture recurrence was defined as the inability to pass a 16Fr cystoscope on followup. A secondary outcome (analysis of urinary incontinence requiring an AUS) was included in our review.

RESULTS

A total of 20 patients were included in this retrospective review. Mean age at surgery was 60 years (range 23 to 81) and the mean body mass index was 33 kg/m^2 (range 19.3 to 55.0). All patients included in analysis had at least a 4-month postoperative followup (mean 40, range 4 to 92).

Mean stricture length was 8.2 cm (range 3.5 to 15). Stricture etiology was radiation therapy in 45% of patients (9 of 20), an idiopathic cause in 20% (4), trauma in 15% (3), prostatectomy in 10% (2), hypospadias failure in 5% (1) and transurethral surgery in 5% (1). Nine patients (45%) previously underwent urethroplasty and in 3 (15%) UroLume stents had previously been placed. Six of the 9 patients (67%) previously treated with urethroplasty had undergone more than 1 urethroplasty procedure. In 18 patients (90%) prior radiation therapy or previous urethral reconstruction had been performed. One patient underwent prior prostatectomy with a perineal abscess and the remaining patient had stricture due to prior transurethral surgery. Before surgery 18 patients (90%) had undergone dilatation and/or endoscopic incision. Strictures were located in the posterior urethra with or without bulbar urethral involvement in 50% of cases (10), and in the bulbomembranous urethra in 35% (7), the bulbar urethra in 10% (2) and the proximal pendulous urethra in 5% (1).

Urethral reconstruction was successful in 16 of 20 patients (80%). Of the 4 patients in whom reconstruction failed 1 underwent ileal conduit urinary diversion, 2 received a suprapubic tube and 1 was treated with urethral dilatation. In the 4 failed cases stricture etiology was external beam radiotherapy in 2, prior transurethral surgery in