Buccal Mucosa Graft Urethroplasty for Anterior Urethral Stricture Repair: Evaluation of the Impact of Stricture Location and Lichen Sclerosus on Surgical Outcome

Laurence A. Levine,* Kurt H. Strom and Matthew M. Lux

From the Department of Urology, Rush University Medical Center, Chicago, Illinois

Purpose: We report our experience with buccal mucosa grafts for anterior urethral strictures. We compared outcomes in the pendulous and bulbar urethra as well as the impact of lichen sclerosus on success.

Materials and Methods: A total of 53 men underwent buccal mucosa graft urethroplasty from 1997 to 2004 for strictures of all etiologies, including lichen sclerosis in 13. Of the patients 46 underwent 1-stage repair and 7 with full-thickness circumferential disease underwent multistage repair. For 1-stage repair strictures were limited to the bulb in 33 cases and they involved the pendulous urethra in 13. A dorsal onlay was used in 24 cases and a ventral onlay was used in 22. For multistage urethroplasty 2 strictures were in the bulbar urethra and 5 were in the pendulous urethra. Success was defined as no postoperative procedures or complications.

Results: The success rate of all urethroplasties was 81% (43 of 53 cases) at a mean followup of 52 months. For bulbar vs pendulous urethroplasty the success rate was 86% (30 of 35 cases) vs 72% (13 of 18, $p = 0.23$). For 1-stage urethroplasty by graft location success was achieved in 20 of 24 cases (83%) for dorsal onlay vs 17 of 22 (77%) for ventral onlay ($p = 0.61$), in 18 of 21 (86%) for bulbar-dorsal onlay, in 10 of 12 (83%) for bulbar-ventral onlay, in 2 of 3 (66%) for pendulous-dorsal onlay and in 7 of 10 (70%) for pendulous-ventral onlay. For multistage urethroplasty success was achieved in 2 of 2 cases (100%) for bulbar repair vs 4 of 5 (80%) for pendulous repair. In the 13 patients with lichen sclerosus success was achieved in 4 of 8 (50%) with 1-stage repair vs 4 of 5 (80%) with multistage repair ($p = 0.28$). Complications developed in 10 of 53 cases (19%), including fistula in 1, urinary tract infection in 1 and stricture in 8 that required treatment, including dilation in 3, internal urethrotomy in 4 and perineal urethrostomy in 1. Five of these 8 recurrent strictures (63%) developed in patients with lichen sclerosus, including 4 in urethras in which 1-stage repair was done for lichen sclerosus. There were no donor site complications, postoperative erectile dysfunction or chordee.

Conclusions: A buccal mucosa graft placed dorsally or ventrally remains an excellent graft material in the bulbar and pendulous urethra. When lichen sclerosus is present, careful consideration should be given to complete excision of the diseased urethra with multistage repair vs accepting a higher rate of stricture recurrence with 1-stage repair.

Key Words: urethra, urethral stricture, lichen sclerosus et atrophicus, mouth mucosa, transplants

Urethral stricture disease continues to be a challenging problem for urologists. Depending on location and length, strictures greater than 2 cm may not be amenable to repair by excision and reanastomosis.[1–3] Autologous BMG has been extensively used to repair the bulbar urethra, although its use is less commonly reported in the pendulous urethra.[4,5] Its widespread application is in part due to its favorable characteristics, including a thick epithelium, highly vascularized lamina propria, availability and strength. BMG is also advantageous because it is associated with little donor site morbidity and it appears to resist infection well. Numerous series have shown excellent long-term results when using ventral and dorsal BMG to repair bulbar urethral strictures.[6–8]

It is well known that the anatomy of the pendulous urethra with its limited elasticity and thinner corpus spongiosum compared to those of the bulbar urethra results in a decreased ability to repair long strictures with primary excision and anastomosis. Similarly patients with full-thickness, circumferential pendulous strictures may be at higher risk for recurrence with onlay grafting due to a compromised vascular bed for the graft. LS, which more commonly involves the distal urethra, further compromises successful stricture repair due to the recalcitrant nature of this disease.[9] In fact, some surgeons insist on complete excision with multistage repair for all LS strictures.[10]

We report our ongoing experience with dorsal and ventral BMG for the repair of all anterior urethral strictures regardless of etiology with attention to strictures involving the pendulous urethra. We also compared our experience with the published experience with BMG repair for pendulous strictures and we examined the impact of LS throughout the urethra. Although we present single and multistage stricture repairs with BMG, this case series review is not intended to compare outcomes between these approaches since the indications for each were different and depended on several factors, including tissue quality, and stricture severity, length and location.

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* Correspondence: Rush University Medical Center, 1725 West Harrison, Suite 352, Chicago, Illinois 60612 (telephone: 312-563-5000; FAX: 312-563-5007; e-mail: drlevine@hotmail.com).

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PATIENTS AND METHODS

Between April 1997 and August 2004, 53 men with an average age of 45 years (range 21 to 75) underwent BMG urethroplasty for recurrent USD. Of the patients 46 underwent a 1-stage procedure, while 7 underwent multistage repair with stricture excision and BMG resurfacing with subsequent tubularization. Patients with more isolated disease were selected for 1-stage repair and those with full-thickness, circumferential spongiofibrosis were chosen to undergo partial urethrectomy with multistage repair. Patients were evaluated with a medical history, physical examination, retrograde urethrogram, urethroscopy, uroflowmetry, urinalysis and ultrasound assessment of post-void residual urine volume. The paired t test was performed on preoperative and postoperative Qmax, and the Fisher exact test was used to assess success between treatment groups.

LS was present in 13 patients. The diagnosis was made according to the clinical appearance and confirmed by histology. No premalignant or malignant histological features were identified. Of 1-stage cases USD involved the bulbar urethra in 33 and the pendulous urethra in 13. Dorsal onlay was used in 24 cases and ventral onlay was used in 22. An additional 7 patients underwent multistage urethroplasty with strictures involving the pendulous urethra in 5 and limited to the bulbar urethra in 2.

The etiology of stricture disease in the 46 patients with 1-stage repair was infection in 1, hypospadias repair in 5, trauma in 6 and LS in 8, while the cause was unknown in 26. In the 7 multistage cases the etiology was traumatic in 1, infectious in 1 and LS in 5. Successful reconstruction was determined as defined by Barbagli et al as that in which no "postoperative procedure was needed, including dilation"[8] as well as no postoperative infection, urinary retention, fistula, chordee or erectile dysfunction.

Surgical Technique for 1-stage BMG

For pendulous and bulbar strictures urethroscopy was used to approximate the stricture site. An incision was made overlying the approximate area of the penis or perineum. The dorsal attachments of the urethra were not disturbed when ventral repairs were performed. When a dorsal onlay was performed, the urethra was isolated in the area of the stricture circumferentially and rotated 180 degrees. A midline urethrotomy incision was made along the length of the stricture and approximately 1 cm into healthy urethra proximal and distal. Urethrotomy length was measured.

Attention was then turned to the mouth. All BMG harvests were completed using a single team approach by the surgeon (LAL) performing urethroplasty, as described by Morey and McAninch.[11] Typically nasal intubation was used to enhance exposure and a Dingman retractor was used for the mouth. The donor site was marked and its margins were infiltrated with saline. The donor site was closed with a running 3-zero chromic suture. An ovoid graft was designed to fit the urethral defect in a tension-free manner with a 24Fr to 36Fr caliber lumen depending on location. The graft was prepared by removing any muscular, glandular or excess fibro-areolar tissue. The BMG onlay was then secured into the urethral defect using a 4-zero polydioxanone running suture on each side of the defect.

Dilute methylene blue was irrigated into the urethra via the meatus to ensure a watertight seal. A suprapubic tube was placed for urinary diversion and a 16Fr silicone catheter was inserted into the bladder via the urethra and plugged. Pericatheter retrograde urethrogram was performed 14 days postoperatively to ensure no extravasation before the urethral catheter was removed.

Surgical Technique for Multistage BMG

The technical aspects of this procedure were previously described in detail.[12] We present a brief description of our approach.

Stage 1. After it is determined that the patient has a circumferential stricture with full-thickness spongiofibrosis the involved urethra is excised with a minimum 1.0 cm margin of healthy urethra. If available, dartos fascia or tunica vaginalis is mobilized and secured to the ventral tunical albuginea. The buccal graft(s) are harvested, prepared and quilted in place with interrupted 4-zero chromic. The transverse diameter of the neourethra should be at least 3.0 cm. The graft is incised in piecrust fashion to allow drainage. A bolster dressing is secured over the repair to enhance graft take. We apply an Owens dressing (Kendall Healthcare Products, San Diego, California) directly to the graft, followed by a large piece of sterile cotton, which is lightly saturated with mineral oil. The dressing is secured to the penis with 2-zero silk sutured to the skin edges. The dressing is removed in 7 days.

Stage 2. The BMG typically softens in 4 to 6 months and it is then ready to tubularize to form the neourethra. If there are areas of significant contraction, an interim procedure to incise and inlay a small buccal mucosal graft may be necessary. Occasionally a simple midline releasing incision according to Snodgrass can be made during stage 2 into which a BMG can be placed or it can simply be left open to heal without grafting.

The neourethra is closed ventrally in 2 layers. Tubularization of the urethra is accomplished by elevating the lateral aspects of the graft to create a 24Fr to 30Fr tube. The dartos and skin are also closed in an effort to avoid overlapping suture lines. A suprapubic tube is placed. We typically leave the urethral Foley catheter in place for 2 to 3 weeks and perform pericatheter retrograde urethrogram to confirm healing without fistula or extravasation.

RESULTS

A total of 53 men underwent BMG urethroplasty, including 46 with 1-stage and 7 with multistage urethroplasty. Overall mean followup was 53 months (range 15 to 120). The success rate of all single and multistage urethroplasties was 81% (43 of 53). Complications occurred in 19% of the patients (10 of 53), including fistula in 1, urinary tract infection in 1 and recurrent strictures in 8, of which 3 required dilation, 4 required internal urethrotomy and 1 underwent perineal urethrostomy. Five of these 8 recurrent strictures (63%) developed in patients with LS. There were no donor site complications, postoperative erectile dysfunction or chordee. Table 1 lists the results.

One-Stage Onlay Repair

A total of 33 strictures were limited to the bulbar urethra and 13 involved the pendulous urethra. Mean followup was 55 months.