

## Urethroplasty with Lingual Mucosal Graft for Management of Long and Recurrent Strictures of the Anterior Urethra

Maged M. Ragab, Samir Elgamal, Yasser Farahat, Wael Saber, Mohamed Hawas, Mahmoud Elsharaby

Urology Department, Tanta University, Tanta, Egypt

Submitted on August 18, 2008 - Accepted for Publication on September 18, 2008

### ABSTRACT

**BACKGROUND:** Currently, there is renewed controversy over which tissues and techniques are optimal for urethral replacement. Because surgical treatment of urethral stricture diseases is an evolving process, new technical refinements are continuously being suggested.

**OBJECTIVES:** To evaluate the efficacy and mid-term results of using lingual mucosal grafts (LMG) in management of long and recurrent strictures of the anterior urethra.

**PATIENTS AND METHODS:** The study included 18 patients with long recurrent strictures of the anterior urethra. The recurrence arose in 14 patients after several visual internal urethrotomies, after hypospadias repair in 2, and after buccal mucosal graft (BMG) urethroplasty in 2. The strictures varied in length from 3 to 9 cm. Dorsal onlay of the LMGs was used in 12 patients, while ventral onlay was used in 6 patients. Follow-up lasted from 3 to 24 months. Postoperatively, all patients were followed by urethrography, uroflowmetry, and urethroscopy. Successful reconstruction criteria were a peak flow rate greater than 15 ml/sec and no need for postoperative dilatation.

**RESULTS:** Out of 18 cases, 15 were successful (83.3%). Of the 3 failures, 1 patient had an urethrocutaneous fistula, and 2 patients developed recurrence in the stricture 3 months after urethroplasty.

**CONCLUSION:** The technique of substitution urethroplasty using lingual mucosal grafts has been shown to be easy, safe, and reproducible with good surgical and functional outcomes. The success rate is comparable to other techniques of substitution urethroplasty, especially BMGs, but with fewer donor site complications. Our mid-term results are satisfactory, but larger comparative studies with longer duration of follow-up are needed to confirm the durability of these results.

**KEYWORDS:** LMG, BMG, Urethroplasty

**CORRESPONDENCE:** Maged M Ragab, Urology Department, Tanta University Hospital, Tanta, Egypt, [mmregy@yahoo.com](mailto:mmregy@yahoo.com)

### INTRODUCTION

Since the initial report of the use of free buccal mucosal grafts (BMGs) for the reconstruction of urethral strictures in men [1],

there has been a considerable amount of work published citing its excellent clinical results but also its potential complications [2].

The main immediate postoperative complications following BMG are pain at the site of graft harvest unrelated to the size of the harvested graft and numbness and tightness of the mouth. Meanwhile, the main long-term complications are

persistent perioral numbness, salivatory changes, and difficulty in opening the mouth. Other complications included bleeding, scarring, and lip deviation or retraction [2-6].

The mucosa covering the lateral and under surface of the tongue is thin, smooth, and identical in structure with the lining of the rest of the oral cavity. Therefore, like buccal mucosa, lingual mucosa has constant availability, easy harvesting, and favorable immunological properties (resistance to infection) and tissue characteristics (thick epithelium, high content of elastic fibers, thin lamina propria, rich vascularization) [7].

In February 2006, Simonato *et al.* [7] described the results of a pilot study on the use of the tongue as an alternative donor site for graft urethroplasties with good functional and aesthetic results. Here, we report our early experience with lingual mucosal grafts (LMGs) for urethral reconstruction in men with anterior urethral strictures.

## PATIENTS AND METHODS

We selected 18 patients with long recurrent strictures of the anterior urethra for urethroplasty using LMGs at the Urology Department of Tanta University Hospital. Their mean age was 39.5 years (18-66 years), and the mean stricture length was 4.36 cm (3-9 cm). Of the 18 cases, 6 were penile, 8 bulbar, and 4 bulbopenile. The primary etiology was traumatic in 8 cases, iatrogenic in 6 cases, and inflammatory in 4 cases. Previous stricture treatments included dilations in all 18 patients, optical internal urethrotomy in 14, hypospadias repair in 2, and failed BMG urethroplasty in 2.

Before the study, all patients were completely informed and provided written consent regarding the procedure and possible complications. All patients were preoperatively evaluated with clinical history, physical examination, urine culture, postvoid residual (PVR) urine volume measurement, uroflowmetry, and retrograde urethrography (fig. 1). Antegrade cystourethrography was performed in 5 patients who suffered urinary retention that was temporarily relieved by a suprapubic cystostomy.

### Surgical Technique

All patients underwent one-stage lingual mucosal graft urethroplasty. The urethral procedure was done with the patient in the normal lithotomy position under general anesthesia with nasotracheal intubation to facilitate harvesting of the lingual mucosa.

A perineal midline incision was made with complete mobilization of the stenotic urethra from the corpora cavernosa (fig. 2). A ventral stricturotomy was made in cases of ventral onlay procedures or the urethra was rotated 180 degrees and the strictured tract was opened along its dorsal surface in cases of dorsal onlay procedures. In either case, the incision was extended both proximally and distally until healthy tissue was observed. The length of the urethrotomy was measured to harvest an adequate graft.

The LMG was taken from the lateral and undersurface of the tongue between the papillae situated on the dorsum and the sublingual mucosa (fig. 3). The graft edges were incised with a scalpel, and a full-thickness mucosal graft was harvested using sharp scissors at the anterior landmark of the graft (fig. 4). Graft defatting was performed until all underlying fibrovascular tissue was completely removed (fig. 5). The donor site was easily closed with interrupted 3/0 polyglactin sutures (fig. 6).

Finally, the tailored graft was sutured to the urethral epithelium in a tension-free manner using 4/0 polyglactin sutures over an 18 Fr silicone catheter, and a small suction drain was usually left in place for one day (fig. 7).

Postoperatively, patients were given non-steroidal anti-inflammatory drug injections in the form of Diclofenac (75 mg/ampoule bid) to control pain. Povidone-iodine mouth gargles were also prescribed. No special diet was given, and nutrition was left to the desire of the patient with no restriction on food. A simple pain analogue scale of 0-10 score was used to assess postoperative pain at the donor site.



left: Figure 1. Preoperative retrograde urethrogram  
doi:10.3834/uij.1939-4810.2008.12.02.f1



right: Figure 2. Complete exposure and mobilization of the urethra  
doi:10.3834/uij.1939-4810.2008.12.02.f2

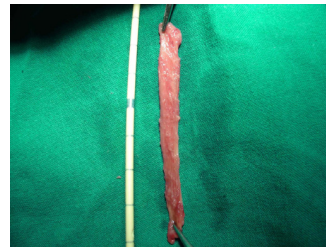
Patients were routinely discharged 3 to 5 days after the surgery, and any complaints cited by the patient were noted. A pericatheter urethrogram was done at 2 weeks, and the Foley catheter was removed if there was no extravasation. However, in case of extravasation, the catheter was left in place for an additional week.

The routine follow-up visits were at 1, 3, 6, and 12 months and annually thereafter. Follow-up included clinical history, symptom reporting using a simple questionnaire regarding their satisfaction, urinalysis and culture, uroflowmetry, ultrasound estimation of the PVR, cystourethrography, and urethroscopy. The clinical outcome was considered a failure if there was a recurrence of obstructive symptoms with a flow rate less than 15 ml/s or if any postoperative procedure was needed, including dilation or internal urethrotomy.

The data was analyzed using the chi-square test or Fisher's exact test for dichotomous variables and the independent samples *t* test for continuous variables with Statistical Package for Social Sciences (SPSS, Chicago, Ill) software. A value of *P* < 0.05 was considered significant.

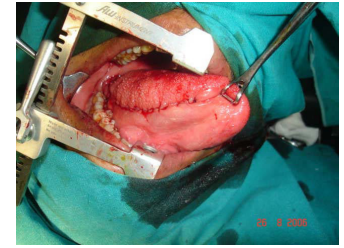
## RESULTS

LMG urethroplasty was technically successful in all of the 18 patients who were included in the study. The graft was placed dorsally in 12 cases and ventrally in 6 cases. The mean operative time was about 177 mins (140-210 mins) using a one-team approach. The length of the LMG used ranged from 4-10 cm and a width of 1.5 cm. The graft was harvested unilaterally in 15 (83%) cases and bilaterally in 3 (17%) cases. There was no need for intraoperative blood transfusions, and there were no



left: Figure 5. Graft excised

doi:10.3834/uij.1939-4810.2008.12.02.f4



right: Figure 6. Closure of the donor site

doi:10.3834/uij.1939-4810.2008.12.02.f6

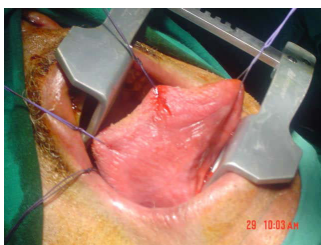
major perioperative complications except for 1 case of perineal wound infection. This was treated by empiric antibiotic therapy and developed into an urethrocutaneous fistula.

There was only slight oral discomfort at the donor site and difficulty in talking in the first 2 days after surgery with a mean PAS of 3 (2-5). All patients were able to resume oral fluids within 24 hours, eat soft solids within 48 hours, and return to normal diet after 5 days. There were no aesthetic or functional complaints reported by any of the patients at the donor site during later follow-up.

Results of urethroplasty were evaluated at 2 weeks by pericatheter urethrogram. Pericatheter leakage was identified in 3 (16.7%) cases, which needed prolongation of the catheter drainage for an additional week. All patients were available for follow-up at 3 months. There were 15 successful cases (83.3%), 2 patients had resticture at the anastomotic site, and 1 patient showed an urethrocutaneous fistula.

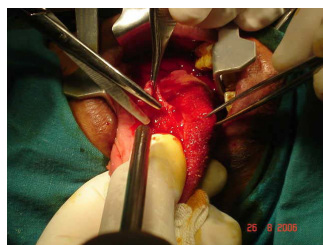
In the 15 successful cases, there were no residual strictures and no urethral diverticulae or sacculations in their urethrograms at 3 months (fig. 8). The peak flow rate improved from a mean of 4.98 ml/s (0.6-8.6 ml/s) to 27.28 ml/s (22.4-39.6 ml/s). Urethroscopy was done in 10 out of the 15 successful cases and revealed that LMGs were almost indistinguishable from the native urethra.

In the 2 cases complicated with resticture, peak flow rate improved from 4.3 ml/s to 9.7 ml/s in 1 patient who underwent weekly 22 Fr urethral dilatation for 3 months. His peak flow improved to 14.3 ml/s, and there was significant improvement in the patient's complaints. The second patient with resticture



left: Figure 3. Site of graft excision from the lateral and undersurface of the tongue

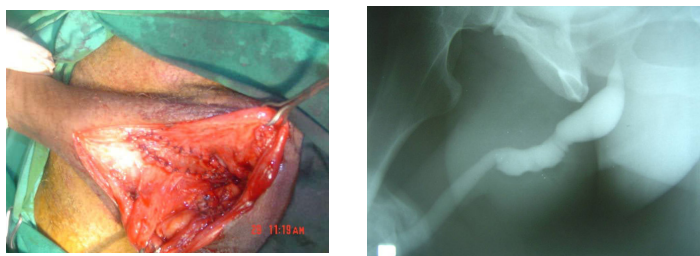
doi:10.3834/uij.1939-4810.2008.12.02.f3



right: Figure 4. Harvesting the graft

doi:10.3834/uij.1939-4810.2008.12.02.f4

was lost during follow-up. The patient with urethrocutaneous



left: Figure 7. Suturing the graft to the urethra (ventral)

doi:10.3834/uij.1939-4810.2008.12.02.f7

right: Figure 8: Postoperative retrograde urethrogram (3 months)

doi:10.3834/uij.1939-4810.2008.12.02.f8

fistula underwent a suprapubic cystostomy and a BMG urethroplasty 3 months later with good functional results.

The mean follow-up was 8 months (3-24 months). To date, all patients have been voiding well with urinary peak flows greater than 14 ml/s. The mean PVR, as determined by ultrasonography, decreased significantly from 450 to 30 mL ( $P < 0.006$ ). The primary etiology, stricture site, and previous operations did not affect the postoperative uroflowmetry results ( $P = 0.08$ ,  $P = 0.56$ , and  $P = 0.87$ , respectively).

During our follow-up period, 4 patients (22.2%) had at least 1 episode of urinary tract infection that was successfully treated with antibiotic therapy. We encountered no cosmetic deformity or incontinence in our patients. Analysis of the results revealed no perioperative mortality and good patient satisfaction in most cases.

## DISCUSSION

Multiple techniques have been practiced to treat anterior urethral strictures using either a penile skin flap [8] or graft materials derived from skin [9,10], bladder epithelium [11], buccal mucosa [12,13], or tunica vaginalis [14,15]. More recent studies have used grafts from a small intestinal submucosa [16-19], tissue engineered buccal mucosa [20,21], and acellular bladder matrix [22,23]. Of these, the buccal mucosa has been widely accepted as the gold standard for graft procedures in the anterior urethra [24].

Various factors have contributed to the acknowledgment of BMGs as an ideal substitute for the urethra, including easy accessibility and manual handling, resistance to infection,

compatibility with a wet environment, a thick epithelium and a thin lamina propria allowing early inosculation, and good mid-term results [24].

However, the harvesting procedure is not without morbidity. It is associated with oral complications, although infrequent, in the form of damage to the parotid duct with postoperative symptoms of salivary obstruction, limitation of oral opening, intraoperative hemorrhage, postoperative infections, pain, swelling, and injury to the long buccal or mental nerves with subsequent paresthesia or anesthesia of the cheek or lower lip [25].

In addition, grafts harvested from the lower lip have negative aesthetic consequences and lead to patient dissatisfaction, making some doctors stop using it for adult patients [26].

A free tongue graft has been used with good functional results to correct lip defects and palatal fistulas in plastic surgery [27] and more recently for urethroplasties [7].

The LMG has two distinct advantages. First, the lateral aspect of the lingual mucosa is identical in structure with the lining of the rest of the oral cavity. Therefore, like buccal mucosa, it has constant availability, easy harvesting, and favorable immunological properties and tissue characteristics. Second, this part of the lingual mucosa has no particular functional features and can be sacrificed as donor tissue without imposing any functional limitations. Thus the risk of intraoral complications, such as numbness, salivatory changes, difficulty with mouth opening, deviation, or retraction, is low or absent [28].

Such characteristics encouraged Simonato *et al.* [7] to use it as a substitute for buccal mucosa with a success rate of 87.5%.

In order to investigate the reproducibility of these results, we used LMG in 18 patients with long recurrent anterior urethral strictures with a mean stricture length of 4.36 cm (3-9 cm).

We selected patients with long strictures (> 3 cm) because the lateral aspect of the tongue offers mucosal tracts that are up to 7 cm long and up to 1.5 cm wide. In 3 cases, we harvested tracts from either side of the tongue due to long strictures (> 7 cm long). Unfortunately, 2 of these long stricture cases developed recurrent strictures and 1 had an urethrocutaneous fistula. The third case was a failed hypospadias case.



In our successful cases, postoperative urethroscopy revealed no significant graft contractures or sacculations. In addition, the LMG was almost indistinguishable from the native urethra. Simonato *et al.* [7] also found that LMGs were nearly indistinguishable from BMGs after the first stage of a two stage urethroplasty, revealing equivalent imbibition, inosculation, and revascularization properties [29].

We achieved a success rate of 83%, similar to those reported by Simonato *et al.* [7] and Barbagli *et al.* [26] who used one-stage LMG urethroplasty and the earlier reports by el-Kasaby *et al.* [30] and Andrich and Mundy [31] who used BMG urethroplasty. However, el-Kasaby [23] reported 100% success rate in a recent article by using BMGs in 15 patients. The difference in the results might be due to the small patient population in all LMG studies and also in el-Kasaby series or might reflect the

experience that was gained with BMG since its rediscovery 15 years ago by Burger *et al.* [1].

With these good results, and until the heterologous graft materials recently reported for urethroplasty [16-23] gain more popularity and attain higher success rates, we believe that LMG urethroplasty is a viable alternative to BMG urethroplasty with fewer complications.

## CONCLUSIONS

The technique of substitution urethroplasty using LMGs has been shown to be easy, safe, and reproducible with good surgical and functional outcomes and with fewer donor site complications than other methods, especially BMGs. These mid-term results are satisfactory, but larger comparative studies with longer duration of follow-up are needed to confirm the durability of these results.

## REFERENCES

- [1] Bürger RA, Müller SC, el-Damanhoury H, Tschakaloff A, Riedmiller H, Hohenfellner R. The buccal mucosal graft for urethral reconstruction: a preliminary report. *J Urol.* 1992 Mar;147(3):662-4.
- [2] Elliott SP, Metro MJ, McAninch JW. Long-term followup of the ventrally placed buccal mucosa onlay graft in bulbar urethral reconstruction. *J Urol.* 2003 May;169(5):1754-7.
- [3] Meneghini A, Cacciola A, Cavarretta L, Abatangelo G, Ferrarrese P, Tasca A. Bulbar urethral stricture repair with buccal mucosa graft urethroplasty. *Eur Urol.* 2001 Mar;39(3):264-7.
- [4] Filipas D, Wahlmann U, Hohenfellner R. History of oral mucosa. *Eur Urol.* 1998 Sep;34(3):165-8.
- [5] Heinke T, Gerharz EW, Bonfig R, Riedmiller H. Ventral onlay urethroplasty using buccal mucosa for complex stricture repair. *Urology.* 2003 May;61(5):1004-7.
- [6] Wood DN, Allen SE, Andrich DE, Greenwell TJ, Mundy AR. The morbidity of buccal mucosal graft harvest for urethroplasty and the effect of nonclosure of the graft harvest site on postoperative pain. *J Urol.* 2004 Aug;172(2):580-3.
- [7] Simonato A, Gregori A, Lissiani A, Galli S, Ottaviani F, Rossi R, Zappone A, Carmignani G. The tongue as an alternative donor site for graft urethroplasty: a pilot study. *J Urol.* 2006 Feb;175(2):589-92.
- [8] Dubey D, Vijjan V, Kapoor R, Srivastava A, Mandhani A, Kumar A, Ansari MS. Dorsal onlay buccal mucosa versus penile skin flap urethroplasty for anterior urethral strictures: results from a randomized prospective trial. *J Urol.* 2007 Dec;178(6):2466-9.
- [9] Raber M, Naspro R, Scapaticci E, Salonia A, Scattoni V, Mazzoccoli B, Guazzoni G, Rigatti P, Montorsi F. Dorsal onlay graft urethroplasty using penile skin or buccal mucosa for repair of bulbar urethral stricture: results of a prospective single center study. *Eur Urol.* 2005 Dec;48(6):1013-7.
- [10] Barbagli G, Morgia G, Lazzeri M. Dorsal onlay skin graft bulbar urethroplasty: long-term follow-up. *Eur Urol.* 2008 Mar;53(3):628-33.
- [11] Ozgok Y, Ozgur Tan M, Kilciler M, Tahmaz L, Erduran D. Use of bladder mucosal graft for urethral reconstruction. *Int J Urol.* 2000 Oct;7(10):355-60.
- [12] Barbagli G, Palminteri E, Guazzoni G, Montorsi F, Turini D, Lazzeri M. Bulbar urethroplasty using buccal mucosa grafts placed on the ventral, dorsal or lateral surface of the urethra: are results affected by the surgical technique? *J Urol.* 2005 Sep;174(3):955-7; discussion 957-8.
- [13] Levine LA, Strom KH, Lux MM. Buccal mucosa graft urethroplasty for anterior urethral stricture repair: evaluation of the impact of stricture location and lichen sclerosus on surgical outcome. *J Urol.* 2007 Nov;178(5):2011-5.

- [14] Foinquinos RC, Calado AA, Janio R, Griz A, Macedo A, Jr, Ortiz V. The tunica vaginalis dorsal graft urethroplasty: initial experience. *Int Braz J Urol.* 2007 Jul-Aug;33(4):523-9; discussion 529-31.
- [15] Calado AA, Macedo A, Jr., Delcelo R, de Figueiredo LF, Ortiz V, Srougi M. The tunica vaginalis dorsal graft urethroplasty: experimental study in rabbits. *J Urol.* 2005 Aug;174(2):765-70.
- [16] Palminteri E, Berdondini E, Colombo F, Austoni E. Small intestinal submucosa (SIS) graft urethroplasty: short-term results. *Eur Urol.* 2007 Jun;51(6):1695-701; discussion 1701.
- [17] Donkov, II, Bashir A, Elenkov CH, Panchev PK. Dorsal onlay augmentation urethroplasty with small intestinal submucosa: modified Barbagli technique for strictures of the bulbar urethra. *Int J Urol.* 2006 Nov;13(11):1415-7.
- [18] le Roux PJ. Endoscopic urethroplasty with unseeded small intestinal submucosa collagen matrix grafts: a pilot study. *J Urol.* 2005 Jan;173(1):140-3.
- [19] Fiala R, Vidlar A, Vrtal R, Belej K, Student V. Porcine small intestinal submucosa graft for repair of anterior urethral strictures. *Eur Urol.* 2007 Jun;51(6):1702-8; discussion 1708.
- [20] Bhargava S, Patterson JM, Inman RD, MacNeil S, Chapple CR. Tissue-engineered buccal mucosa urethroplasty-clinical outcomes. *Eur Urol.* 2008 Jun;53(6):1263-9.
- [21] Morey AF. Tissue-engineered buccal mucosa for substitution urethroplasty. *J Urol.* 2005 Nov;174(5):1858.
- [22] Li C, Xu YM, Song LJ, Fu Q, Cui L, Yin S. Urethral reconstruction using oral keratinocyte seeded bladder acellular matrix grafts. *J Urol.* 2008 Oct;180(4):1538-42.
- [23] el-Kassaby A, AbouShwareb T, Atala A. Randomized comparative study between buccal mucosal and acellular bladder matrix grafts in complex anterior urethral strictures. *J Urol.* 2008 Apr;179(4):1432-6.
- [24] Bhargava S, Chapple CR. Buccal mucosal urethroplasty: is it the new gold standard? *BJU Int.* 2004 Jun;93(9):1191-3.
- [25] Tolstunov L, Pogrel MA, McAninch JW. Intraoral morbidity following free buccal mucosal graft harvesting for urethroplasty. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 1997 Nov;84(5):480-2.
- [26] Barbagli G, De Angelis M, Romano G, Ciabatti PG, Lazzeri M. The Use of Lingual Mucosal Graft in Adult Anterior Urethroplasty: Surgical Steps and Short-Term Outcome. *Eur Urol.* 2008 Sep;54(3):671-6. Epub 2007 Dec 18.
- [27] Cohen SR, Kawamoto HK, Jr. The free tongue graft for correction of secondary deformities of the vermilion in patients with cleft lip. *Plast Reconstr Surg.* 1991 Oct;88(4):613-9.
- [28] Guerrerosantos J, Dicksheet S, Ruiz-Razura A. Free tongue composite graft for correction of a vermilion defect. *Plast Reconstr Surg.* 1985 Sep;76(3):451-4.
- [29] Simonato A, Gregori A, Ambruosi C, Venzano F, Varca V, Romagnoli A, et al. Lingual mucosal graft urethroplasty for anterior urethral reconstruction. *Eur Urol.* 2008 Jul;54(1):79-85.
- [30] el-Kasaby AW, Fath-Alla M, Noweir AM, el-Halaby MR, Zakaria W, el-Beialy MH. The use of buccal mucosa patch graft in the management of anterior urethral strictures. *J Urol.* 1993 Feb;149(2):276-8.
- [31] Andrich DE, Mundy AR. Substitution urethroplasty with buccal mucosal-free grafts. *J Urol.* 2001 Apr;165(4):1131-3; discussion 1133-4.

TO CITE THIS ARTICLE: Ragab MM, Elgamal S, Farhat Y, Saber W, Hawas M, Elsharaby M. Urethroplasty with Lingual Mucosal Graft for Management of Long and Recurrent Strictures of the Anterior Urethra. *UIJ.* 2009 Feb;2(1). doi:10.3834/uij.1939-4810.2008.12.02