

LONG-TERM OUTCOME OF VENTRAL BUCCAL MUCOSA ONLAY GRAFT URETHROPLASTY FOR URETHRAL STRICTURE REPAIR

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ABSTRACT

Objectives. To evaluate our patients who were treated with ventral buccal mucosa onlay grafts for open urethral stricture repair with a follow-up exceeding 5 years. Buccal mucosa onlay is widely used for urethral reconstruction; however, the long-term outcome of these patients remains unclear.

Methods. During the past 10 years, 67 patients underwent ventral buccal mucosa onlay graft surgery for urethral stricture repair. Of these, 32 were followed up for longer than 5 years (mean 6.9 years) for the occurrence and timing of any postoperative complications. All patients had undergone prior internal urethrotomy (mean 2.9 procedures), and the average length of the stricture was 4.3 cm (range 3 to 17).

Results. The overall complication rate was 25% (8 of 32). We observed one fistula, one graft infection/necrosis, two lower lip scars with transient impairment of lip motility, and four recurrent strictures (at the proximal anastomosis), all of which were treated successfully with internal urethrotomy. All but one recurrent stricture occurred during the first 12 postoperative months.

Conclusions. Ventral buccal mucosa onlay grafting for urethral stricture repair provides stable long-term results with complications occurring primarily during the first 12 postoperative months. *UROLOGY* 64: 648–650, 2004. © 2004 Elsevier Inc.

Buccal mucosa grafting for urethroplasty of both urethral stricture and hypospadias repair has gained widespread acceptance during the past 10 years. With the initial description by Humby¹ dating back to 1941, the method was reintroduced into the urologic literature in 1992 by Burger *et al.*² and by Dessanti *et al.*³ Numerous reports with very favorable short-term results associated with buccal mucosa grafting for urethral stricture repair have been published; however, the experience with other materials for substitution urethroplasty such as extragenital skin or bladder mucosa has suggested that the long-term outcome ultimately may differ from the promising early experience.⁴

We, therefore, analyzed a group of our patients,

who had undergone a ventral buccal mucosa onlay procedure during the past 10 years, and specifically evaluated those patients with an available follow-up of longer than 5 years.

MATERIAL AND METHODS

Between April 1992 and December 2002, a total of 67 patients underwent a buccal mucosa onlay grafting procedure for urethral stricture repair. All 32 patients of our series with an available follow-up exceeding 5 years (mean 6.9) were evaluated in detail for the occurrence and timing of any complications. All 32 patients had undergone at least one internal urethrotomy procedure (mean 2.9) before urethroplasty. The location of the stricture was in the penile urethra in 17 patients and in the bulbar part in 15. The average stricture length was 4.3 cm (range 3 to 17).

Preoperatively, patients were evaluated with both retrograde and antegrade urethrography to evaluate the location and length of the stricture. The surgical procedure was performed with the patient under general anesthesia using either oral or nasal intubation (graft length exceeding the possibilities of using the lower lip). After urethroscopy, the diseased urethra was exposed through either a midline perineal approach for bulbar strictures or a penile approach for penile strictures. The stenotic urethral segment was incised longitudinally on the ventral part of the urethra, with the urethral opening reaching well into the healthy proximal and distal

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TABLE I. Analysis of complications in 32 patients

Complication	First Postoperative Year	Second Postoperative Year	After Year 2
Fistula	1		0
Graft infection/necrosis	1		0
Recurrent stricture	3	1	0
Impaired lip motility	2		0

urethra. After measuring the length of the urethral defect, the buccal mucosa graft, with a width of 1.5 cm, was outlined on the lower lip with possible extension into the inner cheek when longer grafts were necessary, taking into account a possible shrinkage of 20%. A submucosal injection of saline with 1:200,000 epinephrine (hemostasis) and 1% Xylocaine (postoperative analgesia) was performed to elevate the mucosal graft. Great care was taken for strict submucosal harvesting without damaging the underlying oral musculature. After hemostasis, the oral wound was left open in the lower lip and closed with a running 4-0 Vicryl rapid suture in the aspect of the inner cheek. After thinning the graft with removal of submucosal fat, the graft was sutured to the urethral plate with a 6-0 running suture (catgut and, more recently, Monocryl) over an 8F fenestrated urethral catheter reaching up to the membranous urethra. Care was taken to cover the graft with two to three well-vascularized tissue layers (corpus spongiosum, bulbocavernosus muscle, subcutaneous tissue). A nonadhesive compressive dressing was used and left in place for 3 days. Patients were mobilized on the first postoperative day.

In 2 patients, a two-stage procedure was performed owing to complete destruction of the strictured urethra without a viable urethral plate. In these 2 patients, a mesh graft procedure was performed for the first stage, with the buccal mucosa onlay graft placed 6 months later.

Urinary diversion was performed using a suprapubic catheter for 3 weeks, and the urethral catheter was removed after 10 days. Transurethral micturition started after 3 weeks, when voiding cystography showed a patent urethra without extravasation. In the case of leakage, the suprapubic catheter was left in place for an additional 2 weeks. Follow-up examinations were performed at 6 and 12 months and yearly thereafter using a standardized protocol, including a questionnaire on patient satisfaction, determination of flow rate, and estimation of postvoid residual urine volume by ultrasonography.

RESULTS

For the 32 patients who underwent buccal mucosa grafting for urethral stricture repair with a follow-up exceeding 5 years, the overall complication rate was 25% (8 of 32). The eight complications were one fistula (bulbar), one graft necrosis (penile), two lower lip scars with transient impairment of lip motility (graft length 9 and 14 cm), and four recurrent strictures at the site of the proximal anastomosis. This translates to a stricture recurrence rate of 12.5%.

The fistula at the distal anastomosis in a bulbar stricture was closed successfully with a tunica vaginalis patch 4 months after urethroplasty. The graft necrosis that occurred in a 4-cm penile stricture was repaired with redo-buccal mucosa onlay graft-

ing 7 months after the initial surgery. Four patients had recurrent strictures (bulbar in 2 and penile in 2); in all cases, these occurred at the site of the proximal anastomosis. Of these four strictures, one (penile) occurred in 1 of the 2 patients who had undergone a two-staged approach. Internal urethrotomy was performed successfully in the first postoperative year in 3 patients with recurrent stricture with stable results. For the fourth patient, in whom the stricture occurred 16 months postoperatively, two internal urethrotomies were performed at 17 and 25 months postoperatively. The follow-up thereafter was uneventful for these patients.

No cases of periurethral diverticula were observed radiologically or clinically. In the perioperative period, we observed two leaks at the anastomosis after 3 weeks that resolved spontaneously with 2 additional weeks of suprapubic urinary diversion. These patients had an uneventful course with additional follow-up, without stricture recurrence.

An analysis of the complications according to the timing in the postoperative period showed that all but one complication occurred during the first postoperative year (Table 1). One recurrent stricture at the site of the proximal anastomosis became evident 16 months after urethroplasty.

COMMENT

In recurrent urethral strictures with failed prior internal urethrotomies, the indication is for an open approach. Similarly, urethroplasty may be the first option in long or multiple penile strictures, taking into account the high recurrence rates after internal urethrotomy. Although end-to-end anastomosis remains the method of choice in short uncomplicated strictures, patients with a stricture length exceeding 1 to 2 cm or with complex strictures, particularly in the penile area, require urethroplasty with either genital or extragenital graft material. Historically, genital skin flaps have been widely used for urethroplasty, with the theoretical advantage of a better local blood supply. However, recent studies have suggested that grafts and flaps have equal success rates,⁵ with grafts having the

advantage of easier and quicker harvesting, as well as better availability. Both full-thickness grafts of genital or extragenital skin,⁶ as well as bladder mucosa,⁷ have been associated with specific problems and complications, particularly during long-term follow-up.

These complications have led to the current enthusiasm for buccal mucosa grafting in reconstructive surgery of both hypospadias and stricture repair. Buccal mucosa grafting combines the advantages of wide availability and ease of harvesting. We have previously shown that the buccal mucosa has favorable immunologic properties and tissue characteristics similar to urothelium, which are distinctly different than those of skin grafts.⁸

After the reintroduction into the clinical literature in 1992, numerous series have reported favorable short-term and medium-term results associated with buccal mucosa grafting.^{9–13} Our series specifically addressed the analysis of complications during extended follow-up. Thus, we evaluated our 10-year experience with buccal mucosa grafting and only included patients with the initial surgery dating back more than 5 years in this study. The promising early results held stable with time, with all but one complication occurring during the first 12 months after urethroplasty. This translated to an overall complication rate of 25%, with two oral complications (scarring with transient impairment of lip motility) included. When these two harvesting-related complications were excluded, the complication rate in our series was 19%, and the stricture recurrence rate was 12.5% (4 of 32).

All four recurrent strictures occurred at the site of the proximal anastomosis. Thus, it seems crucial to place the graft well into the healthy urethra. Particularly with bulbar strictures, this may pose a problem owing to the difficult exposure and proximity to the external sphincter.

The incidence of penile strictures (17 of 32) was high in our series, which, in part, may explain the similarly high average stricture length of 4.3 cm. Although penile strictures are usually known to fare worse compared with pure bulbar strictures, the four recurrent strictures were equally split between the penile and bulbar locations. This, in part, may be explained by the small number of patients. Stricture recurrence, however, does not seem to be primarily related to the location but to the availability of well-vascularized tissue locally for covering the graft. Although this point usually favors the bulbar location, meticulous covering is equally feasible in the penile location, with mobilization of subcutaneous fascia, possibly from the dorsal penile circumference.

Much debate has been generated recently as to whether to place the graft ventrally or dorsally.¹⁴ Barbagli *et al.*¹⁵ introduced the dorsal onlay graft

procedure, which has possible advantages compared with ventral graft urethroplasty that include better mechanical support, a better blood supply to the graft, and prevention of urethral diverticula. However, our experience, and that of other investigators, has shown that ventral onlay grafts have similar successful outcomes,^{11,16} with the advantage of easier placement. We believe that meticulous covering of the graft with two to three well-vascularized tissue layers is crucial for both mechanical support and, in particular, for adequate blood supply to the graft.

CONCLUSIONS

Our data indicate that the ventral buccal mucosa onlay graft urethroplasty provides a successful outcome with extended follow-up.

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