Reconstructive Surgery

Buccal Mucosal Graft in Repeat Urethroplasty

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ABSTRACT

Introduction: Our aim was to evaluate the efficacy of a tubed buccal mucosal graft in repeat urethroplasty for patients with urethral stricture and failed previous operations.

Materials and Methods: Ten patients (aged 12 to 47 years) with urethral stricture were entered into the study. All had a history of failed previous urethroplasties, and 5 had failed internal urethrotomies, too. Repeat urethroplasties were performed by excising the fibrous tissue around the stricture; buccal mucosa was then harvested from the inner cheek, made into graft tubing, and interposed into the defect. The patients were followed at 1, 6, and 12 months.

Results: The procedure was technically successful in all the patients. The mean operative time was 150 minutes. The stricture sites were in the posterior urethra in 8 and the anterior urethra in 2 patients. The mean urethral defect length was 4.9 cm. The primary etiology was pelvic fracture in 7 patients. Strictures recurred postoperatively in 3 patients, all of whom had a urethral defect longer than 5 cm, and 2 of whom had more than 1 previous failed urethroplasties (compared with 1 out of 7 in the successful cases). Urinary flow rate increased significantly (from 0 to 10.4 ± 7.33 mL/s) postoperatively (P = .018). Longer strictures produced signifcantly poorer graft urethroplasty outcomes (P = .001).

Conclusion: Urethroplasty with buccal mucosal grafts is tough, resilient, easy to harvest, and leaves no scar. It appears to be an optimal substitute for anterior and posterior urethral strictures longer than 3 cm.

KEY WORDS: urethroplasty, graft, urethral stricture, buccal mucosa

Introduction

Reconstruction of long urethral strictures that cannot be excised and reanastomosed remains controversial.[1] Augmenting or replacing the circumference of the urethra using a patch or a tube has been introduced as a means of substitution urethroplasty.[2] Flaps are preferred for substitution urethroplasty because of the theoretical advantage that they carry their own blood supply, and therefore, their viability is more secure. Recently, there has been a trend toward grafts, particularly buccal mucosal free grafts.[2] Humby was the first surgeon to use a buccal mucosal graft for urethroplasty more than

60 years ago.[3] Burger and colleagues are responsible for generating recent interest in the use of buccal mucosa initially for hypospadias repair and subsequently, for urethral strictures.[4]

Buccal mucosa has been used in both primary and salvage urethroplasties, as dorsal onlay, ventral onlay, and as tubed grafts in posterior and anterior urethral strictures. These grafts may be used in 1-stage or 2-stage operations with wide range of outcomes, most likely dependent on patient selection and expertise of the surgeons.

There are several reports of substitution urethroplasty in the literature, the majority of which have short follow-ups. None of them are particular to repeat urethroplasty. We describe our experience using tubed buccal mucosal grafts in 10 patients with failed urethroplasties.

Materials and Methods

Between September 2000 and October 2002, we performed a prospective study on 10 patients (mean age, 28.4 ± 10.4 years; range, 12 to 47 years) with urethral stricture who had a history of failed previous urethroplasty and were unable to void through the urethra. All of the patients had undergone an end-to-end anastomosis in their previous urethroplasties. Five of them had a history of failed internal urethrotomy, as well. Patients were selected for buccal mucosal graft urethroplasty. Patients were informed of the study protocol, and informed consent was obtained. The Institutional Board Review and the Medical Ethics Committee of Tehran University of Medical Sciences in Tehran, Iran, approved the study protocol. Routine laboratory tests, retrograde urethrography, and antegrade cystourethrography via a cystostomy catheter were done, preoperatively.

Patients underwent a urethroplasty that utilized a tubed buccal mucosal graft. Under general anesthesia, using a nasotracheal tube, the mucosa of the inner cheek was infiltrated with epinephrine (concentration 1:200 000), and a free graft of buccal mucosa was harvested, with care taken to avoid injury to Stensen's duct. Edges of the buccal mucosa at the harvest site were approximated with 4-0 suture in a simple running fashion. The graft was defatted and tubed around an 18-F Nelaton catheter using a series of interrupted 4-0 polyglactin sutures. These sutures also were used to anastomose the graft to both ends of the urethra after resection of fibrotic tissue through a midline perineal incision.

A Penrose drain was left in place for 2 postoperative days. A 16-F silicone urethral catheter was left in place for 3 weeks postoperatively. Suprapubic drainage continued until patency of the urethra could be ensured by postoperative antegrade cystourethrography. All patients were followed with urine culture, periodic urine flowmetry, and cystourethrography at 6 and 12 months. Stricture recurrence was defined as developing symptoms that required urethrography or urethroscopy to confirm the diagnosis of stricture, or finding an abnormality on follow-up.

Data were analyzed using the Wilcoxon rank sum test to compare the uroflowmetry results before and after intervention, and the Mann-Whitney *U*, Kruskal-Wallis, and Spearman rank correlation tests to evaluate the effects of preoperative factors on the outcomes. All analyses were done using SPSS software (Statistical Package for the Social Sciences, version 9.0, SPSS Inc, Chicago, Ill, USA).

Results

The mean length of the urethral defect was 4.9 ± 0.99 cm (range, 3 to 6.2 cm). None of the patients were able to void; thus, uroflowmetry could not be performed preoperatively. The most common cause of urethral stricture was pelvic fracture (70%). The majority of the cases were posterior urethral strictures (80%). All patients completed the study, and buccal mucosal graft urethroplasty was technically successful in all of the patients. The mean operative time was 150 minutes (range, 120 to 210 minutes). None of the patients required a blood transfusion. Mean follow-up was 22 months (range, 10 to 30 months). Patient characteristics and procedural outcomes are listed in Table 1.

Early complications consisted of cheek edema in 2 patients with spontaneous resolution, and perineal wound infection in 1 patient, which was treated using empiric antibiotic therapy.

Stricture recurred in 3 patients within 90 days (range, 10 to 90 days). All of these patients had a long urethral defect (≥ 5 cm), and 2 had 2 previous failed urethroplasties.

Urethrography results were satisfactory in the other 7 patients who showed no evidence of a reduced caliber or other abnormality (Figure 1). None required intervention on follow-up. The average urinary flow rate increased significantly (from 0 to 10.4 ± 7.33 mL/s) postoperatively

TABLE 1. *Demographic and clinical characteristics of 10 patients with failed previous urethroplasties who underwent buccal mucosal graft urethroplasty*

	Age (year)	Etiology of urethral stricture	Site of lesion	Number of prior operations	Length of lesion (cm)	Preoperative average urinary flow rate (mL/s)	Postoperative average urinary flow rate at 12 months (mL/s)
	12	Prior surgery	Anterior	1	3	0	18
	25*	Pelvic fracture	Posterior	2	6	0	0
	26	Pelvic fracture	Posterior	2	4	0	16
	29*	Pelvic fracture	Posterior	2	5	0	0
Patients	35	Straddle injury	Posterior	1	5	0	15
	42	Pelvic fracture	Posterior	1	5	0	14
	47*	Pelvic fracture	Posterior	1	6	0	0
	19	Straddle injury	Anterior	1	4	0	15
	24	Pelvic fracture	Posterior	1	6	0	12
	25	Pelvic fracture	Posterior	1	5	0	14

*Failed buccal mucosal grafts

(P = .018). The primary etiology and the stricture site did not affect the postoperative uroflowmetry results (P = .11 and P = .08). Longer strictures were responsible for poorer graft urethroplasty outcomes (lower urinary flow rates) (P = .001). Although 2 of the 3 patients with failed operations had more than 1 previous operation (compared with 1 of 7 patients with successful operations), no statistically significant difference was found (P = .52)

Discussion

Urethroplasty with genital skin flaps and buccal mucosal grafts is the most dependable single-stage procedure for urethral strictures longer than 3 cm.[5]
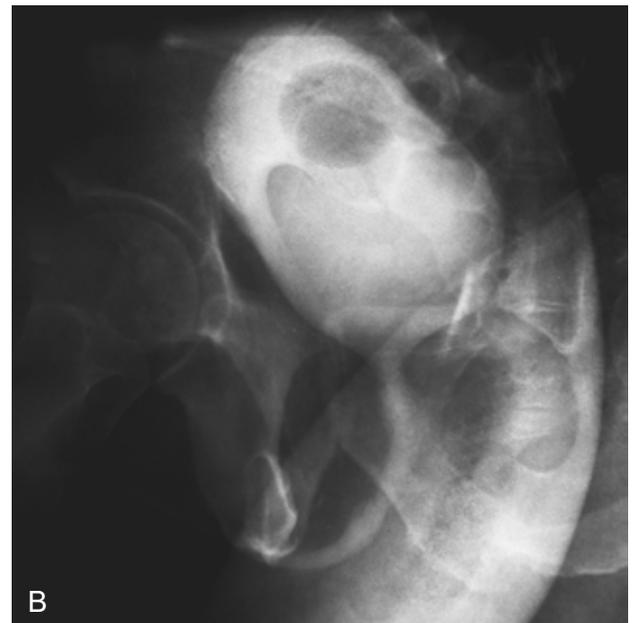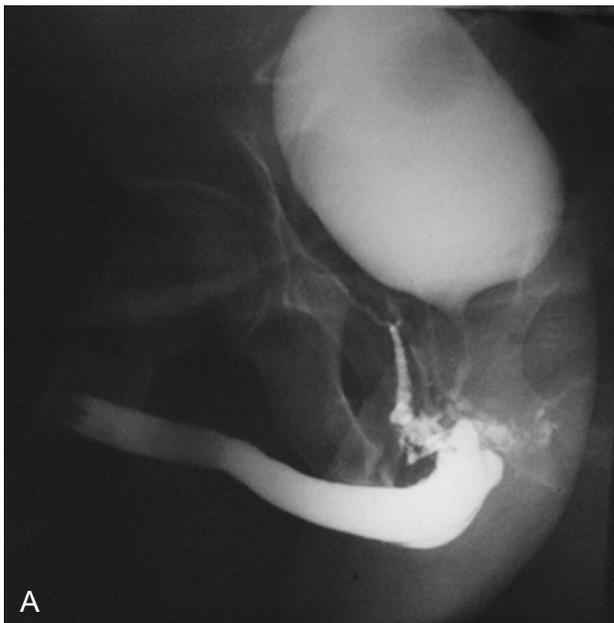
FIG. 1. A. Preoperative cystourethrography of a 40-year-old man with ruptured posterior urethra due to blunt trauma, **B.** Cystourethrography of the same patient, 6 months postoperatively

Buccal mucosa has a thick epithelium rich in elastin that makes it easy to handle and durable. The lamina propria is thin compared with the bladder mucosa and skin, which facilitate inoculation and neovascularization. It has a high capillary density and is easily harvested.[6] Such grafts may offer no advantage in terms of graft survival and stricture cure, but they are easier and quicker to apply than a flap and leave no visible scar.[2] Split skin grafts are not satisfactory for urethroplasty because they contract by as much as 50%.[2]

It is believed that the buccal cheek mucosa and the mucosa of the inner aspect of the lip are preferred for urethral repair on the shaft of the penis and the glandular urethra, respectively.[2] We used the mucosa of the inner cheek for all of our patients. Also, buccal mucosa has a slight tendency to contract by about 10%. Thus, we harvest a slightly larger strip in all cases.

Venn and Mundy have shown that the early results of buccal mucosal graft urethroplasty are encouraging (45% success rate).[7] In 1998, Wessells and McAninch reviewed the literature on free-graft and pedicled skin-flap urethroplasty. They have claimed that free grafts are successful in 84.3% of patients, and flaps are successful in 85.9% of patients. They also have shown that the buccal mucosal graft is the most successful method of reconstructing bulbar urethral strictures.[1]

A literature review shows that the average success rate of grafts and flaps in urethroplasty is about 85%.[2] We had a 70% success rate, which could be related to the inherent nature of these lesions in which ischemia due to repeat surgeries was a problem.

Onlay grafts usually have better results than do tubed grafts.[8] Wessells and McAninch have attributed the superior results of onlay versus tubed grafts to the preservation of spongy tissue that serves as a graft bed.[9] We were obliged to use the tubed grafts because of extensive fibrosis and dissection.

Graft urethroplasty may be associated with meatal prolapse, stricture, and fistula formation.[5] We did not encounter any of these complications during follow-up. In 3 patients, stricture recurred within 3 months. Age, urethral defect length, number of previous operations, extent of dissection, and the primary etiology of the urethral stricture may have some roles. In addition, recipient site vascularity is very important to neovascularization and graft take.[8] Regarding our results, the primary etiology, stricture site, and multiple operations had no significant effect on postoperative uroflowmetry. We found an association only between urethral stricture length and outcome.

A success rate of 55% has been reported for use of tubed grafts in anterior urethral strictures.[7] The 100% success rate in our patients with anterior urethral stricture may be due to the low number of patients examined and the etiologies of their diseases. Also, releasing the anterior urethra is much easier than releasing the posterior part, and subsequently, anastomosis and outcome appear to be more promising.

Conclusion

Our results lend credence to the idea that use of buccal mucosal grafts is acceptable for patients with failed previous urethroplasties. The graft is an excellent source of material for urethral replacement in complex urethroplasties. As substitution urethroplasty has an annual attrition rate, the results of this study (70% success rate at an average of 22 months' follow-up) should be confirmed by long-term studies.

Acknowledgement

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