

# Reconstructive Surgery

## A Comparative Study of Long-Term Results of Buccal Mucosal Graft and Penile Skin Flap Techniques in the Management of Diffuse Anterior Urethral Strictures: First Report in Iran

HOSSEINI J, SOLTANZADEH K

*Department of Urology, Shohada-e-Tajrish Hospital, Shaheed Beheshti University of Medical Sciences, Tehran, Iran*

### ABSTRACT

**Purpose:** To compare Buccal Mucosa Graft with Penile Skin Flap techniques in the management of anterior urethral diffuse strictures longer than 3 cm.

**Materials and Methods:** Thirty seven patients with a mean age of 28.5 (range 5 to 50) years had been treated by these two techniques using the ventral onlay patch from February 1997 to March 2002. Patients' follow-up included physical examination, history taking, retrograde urethrography, cystoscopy and uroflowmetry at the month six, at the end of the first and the second years, and then yearly if required.

**Results:** These techniques were applied for anterior urethral strictures (bulbar and penile) longer than 3 cm. Buccal mucosal graft (BMG) was used in 18 patients and penile skin flap (PSF) in 19. Mean follow-up was 27.5 (range 6 to 50) months. Mean age was 30.8±11.8 years for BMG group and 27.8±15.6 years for PSF group. Urethral stricture etiology, surgery history, and previous endoscopic surgery history were similar in both groups. The stricture site in BMG group was penile in 2 patients (11.1%), bulbar in 8 patients (44.4%), and penobulbar in 8 patients (44.4%). In PSF group the stricture site was penile in 11 patients (57.9%), bulbar in 5 patients (26.3%) and penobulbar in 3 patients (15.8%). Success rate in 6-month follow-up was 93.9% for BMG group and 83% for PSF. By performing dilatation and internal rethrotomy for mild strictures, the success rate with mean follow-up of 27.5 months was 13.8% for BMG group and 78.9% for PSF. Only one patient from BMG developed temporary impotence for about 12 months.

**Conclusion:** BMG and PSF are considered as simple and proper techniques with good long term outcomes in the management of diffuse anterior urethral strictures. These 2 techniques could be applied in patients with history of several surgeries. The results of BMG were better than PSF, still, this difference was not statistically significant.

**KEY WORDS:** urethral strictures, treatment, graft, flap

### Introduction

If a patient with urethral stricture needs urethrocystoplasty, while the excision of stricture and the anastomosis of the ends of urethra are impossible or improper, suggesting substitutions would

be essential. Using grafts and flaps for augmentation or complete urethral substitution in the form of patch or tube may be applied. Different studies reported that the success rate of flap or graft was generally 85% with no consideration to follow-up duration.<sup>(1)</sup> In this study the less frequent BMG

technique was compared to the more familiar technique of PSF.

### Materials and Methods

From February 1997 to March 2002, 37 patients with diffuse anterior urethral (bulbar, penile) stricture longer than 3 cm enrolled in this historical cohort study and underwent BMG or PSF. Those patients with associated posterior urethral strictures were excluded from the study. Stricture length was determined by urethral retrograde urethrography or retrograde urethrography simultaneously with cystogram. Patients were examined by 14 F rigid or 12 F flexible cystoscopes to determine the length of stricture and to observe urethral mucosa. Before urethroplasty, a minimum 6 months elapsed from the last urethral surgery. All procedures were performed by one surgeon and by using reconstructive surgical principals. Patients were secured at lithotomy position after general anaesthesia. Corpus spongiosum was freed at the stricture site in ventrum and was vertically opened by ventral incision in a way that normal mucosa at both sides of stricture became visible to a distance of about 5 mm. Cystoscopy was carried out again during the procedure to assure the normality of proximal urethra. According to the length of urethra, one or two grafts of buccal mucosa from the internal surface of cheek or pedicled island penile skin were used. Davis ecartor was applied to open the mouth and remove mucosa for grafting. This was done by intranasal or oral intubation. The width of graft or flap was about 1.5 cm and its length was based on the length of urethral stricture. During the removal of buccal mucosa, we were careful not to hurt parotid gland duct. Then the graft was fairly thinned and the site of its removal left unsutured. The graft or flap was interruptedly sutured over a 18F silicourethral catheter in the adult or appropriately in children with a distance of 2 mm in the form of ventral onlay with 4.0 vicryl. If stricture site was bulbar, spongioplasty would have been performed as well, but if the site of stricture was penile a vascular flap from dartus or tunica vaginalis was applied as a flap or graft. Cystostomy was carried out in all patients. Patients were at complete bed rest for 5 days and received IV antibiotics for one week and oral antibiotics for another one week after the removal of catheter. Retrograde urethrography along foley catheter was conducted at the end of the third week. If extravasation of contrast media was not seen,

foley catheter would be removed, otherwise, it would be remained for another week. If the patient urinated properly 48 hours after the removal of foley catheter, cystostomy would have been also removed.

Patients were followed up at the end of the week 4, months 3, 6, 12, 18, and 24, and then annually for examination and history taking. Retrograde urethrography, uroflowmetry and cystoscopy were conducted at the months 6, 12, and 24. Any urethral stricture in cystoscopy was considered as a failure.

SPSS software was used for statistical analysis. Descriptive statistical indicators included mean standard deviation and median and analytic statistical indicators consisted of independent t test, Mann-Whitney U test, X<sup>2</sup> test, Fisher's exact test, and Gehan's test. A P value of lower than 0.05 was regarded as significant difference or correlation.

Minimum follow-up of patients was 6 months and patients were followed up for a mean of 27.5 (range 6 to 50) months. Eighteen out of 37 patients underwent BMG and 19 underwent PSF. Their mean age was 28.5 (range 5 to 50) years. Mean age for BMG was 30.8±11.8 years and for PSF was 27.8±15.6. (t=0.64, df = 35, p=0.52)

The length of strictures was between 3 and 12 cm. The site of stricture in the cases of BMG was penile in 2 patients (11.1%), bulbar in 8(44.4%), and penobulbar in 8 (44.4%). While in the cases of PSF, it was penile in 11 patients (57.9%), bulbar in 5(26.3%), and penobulbar in 3 (15.8%) (table 1).

**TABLE 1.** Frequency distribution of sites of urethral strictures

Technique of surgery	Site of stricture			Total
	Penile	Bulbar	Penobulbar	
<b>BMG</b>	2(11.1%)	8(44.4%)	8(44.4%)	18(100%)
<b>PSF</b>	11(57.9%)	5(26.3%)	3(15.8%)	19(100%)
<b>Total</b>	13(35.1%)	13(35.1%)	11(29.7%)	37(100%)

BMG = buccal mucosal graft

PSF = Penile skin flap

The etiology of stricture was catheterization in 6 patients, TURP in 1, trauma in 10, extrophy in 1, hypospadiasis in 8 , urethritis in 4, and unknown in 7 (table 2).

In BMG, 9 patients (50%) had a history of surgical urethroplasty and in PSF 10 patients (52.6%) had the same history. (X<sup>2</sup>=0.02, df =1, p=0.87).

The episodes of endoscopic surgeries (dilatation and internal urethrotomy) in BMG were 1.3±1.9 and in PSF were 0.8±1.1 (MWU=157, p=0.64).

**TABLE 2.** Frequency distribution of preoperative etiology of urethral stricture

Etiology	Technique of surgery		
	BMG	PSF	Total
Catheterization	5(27.8%)	1(5.3%)	6(16.4%)
TURP	0(0%)	1(5.3%)	1(2.7%)
Trauma	5(27.8%)	5(26.3%)	10(27%)
Bladder extrophy	0(0%)	1(5.3%)	1(2.7%)
Hypospadiasis	4(22.2%)	4(21.1%)	8(21.6%)
Urethritis	1(5.6%)	3(15.8%)	4(10.8%)
Unknown	3(16.7%)	4(21.1%)	7(18.9%)
<b>Total</b>	<b>18(100%)</b>	<b>19(100%)</b>	<b>37(100%)</b>

BMG = buccal mucosal graft  
PSF = Penile skin flap

### Results

The mean length of BMG was 2.3±7 cm and of PSF was 6.4±2.7 cm (t=0.62, df =35, p = 0.53). Patients who underwent urethroplasty with buccal mucosa of mouth did not develop any problem during hospitalization. Besides, they were able to urinate after the removal of foley catheter. In 6-month follow-up, urethral stricture was observed through cystoscopy in one out of 18 patients (6-month success rate was 93.6%). In 12-month follow-up of 14 patients, 86% developed no stricture. In 18-month follow-up of 11 patients, the same success rate was seen. In PSF, 2 patients developed wound infection and fistula and one developed dehiscence of suture during hospitalization. Primary surgical success rate was 83.3%. In 6-month follow-up of 19 patients no urethral stricture was reported and the success rate was 83.3%. No stricture was seen in 12-month follow-up of 13 patients (77.3%) (table 3). These results statistically had no significant difference (Overall comparison statistics=0.7, df =1, p=0.37).

In general, 4 patients in BMG developed urethral stricture and consequently underwent inter-

**TABLE 3.** The rate of success in different follow up time

on surgical technique Postoperative time	Success survival of treatment based	
	BMG	PSF
<b>0</b>	100%	83.3%
<b>6-Month</b>	93.9%	83.3%
<b>12-Month</b>	86.7%	77.3%
<b>18-Month</b>	86.7%	77.3%

BMG = buccal mucosal graft  
PSF = Penile skin flap

nal urethrotomy or dilatation, of which one patient had no stricture in follow-up cystoscopy; however, no judgment could have been done for the 3 other patients because of insufficient follow-up duration. Thus, they were considered finally as failed cases.

PSF was failed in 7 patients due to fistula or tissue dehiscence, therefore, repeated surgery was decided. Internal urethrotomy was carried out for the other 4 patients with recurrent stricture reported by cystoscopy, in 3 of whom the stricture improved without any procedure, while surgery was required for the other one.

Regarding the results of internal urethrotomies due to postoperative strictures with a mean follow-up of 27.5 months in BMG, 15 out of 18 patients (83.8%) improved, while in PSF 15 out of 19 (78.9%) improved with no need of repeated surgery. The difference was statistically significant. (table 4) (Fisher's exact test p=0.53).

Potency was studied in 29 patients; temporary impotency occurred for 12 months in just one patient of BMG who had bulbar stricture.

**TABLE 4.** Frequency distribution of final success of treatment excluding follow-up period in BMG and PSF groups

Technique of surgery	Final success		
	Yes	No	Total
BMG	15 83.3%	3 16.7%	18 100%
PSF	15 78.9%	4 21.1%	19 100%
Total	30 81.8%	7 18.9%	37 100%

### Discussion

In this study the success rate of BMG was compared to PSF. Total success rate of flaps and grafts was 85%.<sup>(1)</sup> Six months success rate of the two groups of BMG and PSF was respectively 93.9% and 83.3%, which were comparable to the success rate of other studies.

In 2002, a study was performed by Andrich and Mundy<sup>(2)</sup> in which 14 patients underwent patch urethroplasty with buccal mucosa and 4 patients underwent PSF. Recurrence of disease occurred in one patient (success rate was 93%). Our results were comparable to those of this study. In a study conducted by Meneghini and Cucuola,<sup>(3)</sup> published in 2001, 20 patients with a mean stricture length of 3.6 cm underwent BMG; their mean follow-up was 13 months with a success rate of 80% which was comparable to our BMG study with 12-month

follow-up and success rate of 86.7%, considering that the stricture length was longer in our study. In 2001 a study was published by Andrich and Mundy<sup>(4)</sup> in which 129 patients underwent BMG in the form of onlay or tube graft. Success rate of onlay graft was 89% and the results were similar to our study. The manifestation of clinical symptoms was described as the recurrence of disease in their study. Another survey was carried out by Webster and Islelin<sup>(5)</sup> in 1999, in which, 29 patients were studied. The skin of penile shaft was used in 20 patients, prepuce in 7 and the buccal mucosa in 2. The success rate was 97% in 19-month follow-up. These results were better than ours, however, success rate in the mentioned study was reported according to patients' symptoms and those strictures which were observed in RUG or cystoscopy and the patients had not any symptom, were regarded as the success of treatment.

Barbagli et al<sup>(6)</sup> studies 37 patients; in whom the scrotum was used in 31 patients and the buccal mucosa in 6. Mean follow-up was 21 months and success rate was 92% which was better than our study. However, in this study the mean length of flaps was 4.7 cm and the mean length of graft was 4 cm which indicated shorter strictures and less complicated patients.

In a review article, McAninch and Wessells<sup>1</sup> studied diffuse anterior urethral strictures in which end to end anastomosis could not be done. They found out that the success rate of free graft was 84% and flap was 85%. This was also similar to the results of our study. The same authors<sup>(7)</sup> performed another study in which 40 patients were treated by penile skin, prepuce and the buccal mucosa. Thirty (86%) out of 33 patients with proper follow-up had successful results. These success rates had no relation to the site of used graft, previous intervention and the cause of stricture and generally agree to that of ours.

In this study 37 patients with diffuse anterior urethral stricture were studied, of whom 18 were treated by the buccal mucosa and 19 by the penile skin. Mean patients' follow-up was 27.5 months. All patients were followed up for at least 6 months and both groups were similar in age, etiology of stricture; length of stricture, episodes of previous urethrotomies and history of previous surgery, however, no complete similarity was seen in the site of stricture which was due to the higher number of cases with penile stricture in PSF. The PSF of 3 patients ended in failure during hospitalization, 2 of whom developed urethral fistula to skin

due to wound infection and one with bladder extrophy and multiple pervious urethroplasties, developed dehiscence.

In this study, contrary to some of the above mentioned studies, strictures which were observed in follow-up cystoscopy without patients' symptom were also considered in final results. In 6-month follow-up, success rates of BMG and PSF were respectively 93.9% and 83.8% which were decreased with time, as they became 86.7% and 77.3% in 18-month follow-up, respectively. The results of urethrotomy and dilatation of postoperative strictures were not taken into account.

Regarding the outcome of secondary treatment, 15 out of 14 patients (78.9%) in PSF and 15 out of 18 patients (83.8%) in BMG with a mean follow up of 27.5 months improved.

Although BMG's primary outcome of treatment and its follow-up were better than PSF, this difference was not statistically significant ( $p=0.53$ ).

In comparison with failed treatment group with successful treatment group, no significant difference was seen in the length of stricture and previous urethroplasty (stricture length of  $6.7\pm 2.1$  cm vs  $6.6\pm 3.2$  cm and history of urethroplasty in 36.4% vs 57.7%) ( $p=0.88$ ,  $df=35$ ,  $t=-0.14$  for length of stricture and  $p=0.23$ ,  $df=1$ ,  $X^2=1.4$  for history of surgery).

Subjective potency was studied in 29 out of 37 patients. This analysis was not carried out in 8 patients due to lower age or mental retardation. All of the patients were potent preoperatively. Only a 40-year-old patient in BMG with bulbar stricture developed postoperative temporary impotency which lasted for about one year. In most studies, potency was not considered in the outcome of treatment. In a survey published by Webster and Islelin<sup>5</sup> in 1999, 5 out of 29 patients (14%) developed temporary impotency which lasted for about 3-6 months. Patients' mean age in this study was  $\geq 41$  years. Mean age of impotent patients was 50 years.

## Conclusion

Both BMG and PSF are simple and proper techniques with approximately similar and good long term results in the management of diffuse anterior urethral strictures. Regarding cosmetic aspect and the scar of genital site BMG is better than PSF; however, no difference is seen in the cure rate.

The results of treatment have no clear relationship with surgical history and the length of stric-

ture. The mentioned techniques have no effect on patients' potency.

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