

Original Research Article

Dorsal onlay buccal mucosal graft or penile skin graft substitution urethroplasty in bulbar urethral stricture: compare the outcome and review

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Received: 12 January 2020

Revised: 28 January 2020

Accepted: 29 January 2020

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ABSTRACT

Background: Authors describe their experience with dorsal onlay urethroplasty using Buccal mucosal graft or penile skin graft through dorsal sagittal urethrotomy for bulbar urethral stricture.

Methods: From 2014 to 2017, 29 male patients with bulbar urethral stricture have been treated by one stage dorsal onlay substitution urethroplasty using buccal mucosal graft and penile skin graft. Patients with balanitis xerotica obliterans, unhealthy penile skin, oral mucosa pathology or those who had undergone more than one urethral dilation/internal urethrotomy or urethroplasty were excluded from study. Results were analyzed at 6th and 12th month follow up with clinical history and uroflowmetry. Clinical outcome was considered a failure when any postoperative instrumentation was needed, including dilation or optical internal urethrotomy.

Results: A total of 16 men age between 21 to 56 years for buccal mucosa graft (BMG) urethroplasty and 13 men age between 18 to 59 years underwent dorsal onlay substitution urethroplasty using BMG and penile skin graft (PSG). Mean stricture length was 4.2 cm (3.8-6) for BMG urethroplasty and 4.1 cm (3.2-5) for PSG urethroplasty. Mean length and width of graft were 4.2 cm and 2.6 cm respectively in BMG urethroplasty while 4.6 cm and 2.5 cm in PSAG urethroplasty. Average follow up months were 13.4 months with overall success rate 87.5% in BMG urethroplasty while average follow up months were 14.6 months with overall success rate 82.3% in PSG urethroplasty.

Conclusions: On short term follow up substitution urethroplasty using both penile skin and buccal mucosa graft have comparable results.

Keywords: Buccal mucosa, Dorsal onlay, Penile skin, Urethroplasty

INTRODUCTION

Urethral Stricture is a chronic and common urological problem. The principal of stricture management is to "Dilate the stricture and keep it permanently dilated." The first part is easy, but the second part poses a big task to urologists.¹ The treatment of urethral stricture varies according to location, length, depth and density of stricture. Urethral reconstruction remains a challenge in modern urology practice.² Anterior urethral strictures,

which are not amenable to end-to-anastomosis, require substitution urethroplasty.³ Turner Warwick's opinion is still true that urethra is the best substitute for urethra.⁴ The ideal material for substitution urethroplasty remains controversial.⁵ Local skin flaps might also be used to substitute the urethra. Although the results seem to be equal to those of grafts, flaps are associated with higher morbidity and less preferred by the patient.⁶ A piece of skin or mucosa is removed from its vascular bed (donor area) as a graft in substitution urethroplasty and sutured

in the urethra.⁷ Various grafts have been described in substitution urethroplasty: genital and extragenital skin, tunica vaginalis bladder mucosa, colonic mucosa, buccal mucosa, lingual mucosa and tissue -engineered grafts (allo- or autografts).⁸ Penile skin graft (PSG) and buccal mucosa graft (BMG) are the most popular in substitution urethroplasty.^{8,9} In this study we describe experience with dorsal onlay urethroplasty using BMG or PSG through dorsal sagittal urethrotomy technique for bulbar urethral stricture.

METHODS

In this prospective study of adult male patients evaluated and treated for bulbar urethral strictures with inflammatory and idiopathic etiology were randomized to undergo substitution urethroplasty using penile skin and buccal mucosa free graft. Patients with balanitis xerotica obliterans, unhealthy penile skin, oral mucosa pathology or those who had undergone more than one urethral dilation/internal urethrotomy or urethroplasty were excluded from study. This study was conducted from May 2014 to April 2017 in BPS Government medical college, Khanpur Kalan Sonipat, Haryana. Pre-operative evaluation included clinical history, physical examination, urine culture, residual urine measurement, uroflowmetry, retrograde and voiding cystourethrography and urethroscopy. Results were analyzed at 6th and 12th month follow up with clinical history and uroflowmetry. Clinical outcome was considered a failure when any postoperative instrumentation was needed, including dilation or optical internal urethrotomy. Contrast study were done when required depending on the uroflowmetry. The patient is placed in simple lithotomy position. Preoperative urethroscopy is performed using 7 F rigid ureteroscope to evaluate the stricture and to insert the guidewire into the urethra until reaching the bladder. Methylene blue is injected into the urethra to better defined the diseased urethral mucosa. A mid-line perineal incision is made. The bulbar urethra is dissected from corpora cavernosa along the left side. The urethra is rotated 180°, dorsal urethral surface is exposed, and fully opened and urethral stricture is evaluated. The stricture is opened for its entire length by extending the urethrotomy distally and proximally. In case of BMG urethroplasty, buccal mucosa is harvested from the inner side of patient's cheek. Graft bed is sutured. After trimming the graft and removing any remaining fat, buccal mucosa graft is used for urethroplasty. In case of PSG urethroplasty, Preputial skin graft or sub coronal distal penile skin graft (in those patients who were circumcised) was harvested. Graft was dissected free from underlying connective tissue. Graft was devoid of fat/hair follicle. The raw area of the graft was fixed and quilted on the cavernosal bed with the skin epithelium facing the urethra. The fenestrated skin graft or buccal mucosal graft is spread fixed and quilted to the overlying tunica albuginea of corpus bodies. The right mucosal margin of the opened urethra is sutured to the right side of the graft, splicing open the structured tract to the new roof, which

is the spread fixed graft. Urethra rotated back into its original position. The left urethral margin is sutured to the left side of the patch graft and to the corporal bodies. The bulbo-cavernous muscles are approximated over the graft area. An indwelling catheter 16 F silicon Foley's catheter is left in place.

Demographic characteristic, stricture length based on intraoperative measurement, length and width of buccal mucosa graft and penile skin graft, success rate, oral complications and complications related to penile skin were also noted. SPSS statistical software was used to measure various parameters.

RESULTS

A total of 16 men age between 21 to 56 years for BMG urethroplasty and 13 men age between 18 to 59 years underwent dorsal onlay substitution urethroplasty using BMG and PSG. Mean stricture length was 4.2 cm (3.8-6) for BMG urethroplasty and 4.1 cm (3.2-5) for PSG urethroplasty (Table 1). In PSG urethroplasty preputial skin was used in 12 patients and skin from penile shaft was taken in one patient (Table 2).

Table 1: Preoperative parameters.

	BMG urethroplasty	PSG urethroplasty
Number of patients	16	13
Mean patients age (years)	36 (21-56)	38.1 (18-59)
Stricture site	Bulbar	Bulbar
Stricture length (cm)	4.2 (3.8-6)	4.1 (3.2-5)

Table 2: Graft characteristics.

Type of graft	No. of patients
Buccal mucosa	16
Penile skin	
Foreskin	12
Penile shaft	1

Mean length and width of graft were 4.2cm and 2.6 cm respectively in BMG urethroplasty while 4.6 cm and 2.5 cm in PSG urethroplasty (Table 3).

Table 3: Graft characteristics.

Graft dimensions	BMG urethroplasty	PSG urethroplasty
Mean length (cm)	4.2	4.6
Mean width (cm)	2.6	2.5

Mean duration of hospitalization 4.5 days (4 to 6 days). Mean operative time 162 min in BMG urethroplasty and 130 min in PSG urethroplasty. Average follow up months were 13.4 months with overall success rate 87.5% in

BMG urethroplasty while average follow up months were 14.6 months with overall success rate 82.3% in PSG urethroplasty (Table 5).

Table 4: Comparison of complications.

Complications	BMG urethroplasty	PSG urethroplasty
Hematoma	2	1
Wound infection	1	1
Scrotal oedema	1	3
Troublesome postvoid dribbling	3	2
Oral complication		
Perioral numbness	2	-
Increased salivation	1	-

Table 5: Comparison of outcome.

Outcome	BMG urethroplasty	PSG urethroplasty
Mean stricture length (cm)	4.2 (3.8-6)	4.1(3.2-5)
Mean operative time (min)	162 (120-190)	130(110-150)
Mean follow up (months)	13.4	14.6
Stricture recurrence (N)	2	1
Overall success rate (%)	87.5	82.3

During postoperative period, hematoma was present in 2 patients in BMG urethroplasty and 1 patient in PSG urethroplasty. Wound infection occurred in both group in 1 patient. Scrotal edema was developed in 1 patient in BMG urethroplasty and 3 patients in PSG urethroplasty. Troublesome postvoid dribbling occurred present in 3 patients in BMG urethroplasty and 2 patients in PSG urethroplasty. Perioral numbness is felt in 2 patients and increased salivation was presented in 1 patient in BMG urethroplasty (Table 6). Eleven patients showed better flow rate and improvement of symptoms in PSG urethroplasty. Two patients developed stricture at proximal anastomotic site needed optical internal urethrotomy. Fourteen patients were voiding with good stream in BMG urethroplasty. Again, in one year eleven patients were voiding with good flow with PSG urethroplasty. Urethral dilatation was required in two patients.

DISCUSSION

Humby was first to describe the use of buccal mucosa for urethral reconstruction as early as 1941, but it was only in the early 1990s that buccal mucosa was rediscovered for this indication.¹⁰ Various factors have contributed to the acknowledgement of BMG as an ideal substitute for urethra, including easy accessibility and manual handling, resistance

to infection, compatibility to wet environment, thick epithelium and thin lamina propria, allowing early inosculation and good medium term results which are at least comparable with full thickness skin graft.¹¹ Ventrally placing a graft is likely to be associated with a high rate of graft failure because of an inadequate graft bed and poor support, leading to diverticulum formation.¹² In 1953, Presman and Greenfield first reported the reconstruction of the bulbar urethra with satisfactory result using a free full thickness skin graft from the prepuce.¹³ In 1956, Peyton and Headstream, following Presman and Greenfield's suggestions, reported the construction of the bulbar urethra using a spilt thickness skin graft from the prepuce.¹⁴ In 1961, Devine and Horton fully described the use of preputial skin to repair hypospadias using a one -stage technique.¹⁵ In 1963, Devine et al after successfully using preputial skin in one- stage hypospadias repair, popularized the use of the free skin graft in the repair of urethral strictures.¹⁶ Barbagli et al reported medium-term outcomes from first 37 patients treated with dorsal onlay graft using PSG (31) and BMG (6) in 1998.⁸ Patients with PSG urethroplasty, 92% were considered a success at an average of 21.5 month with no requirement for postoperative instrumentation or recurrence of stricture.¹⁷ In 2005, Alsikafi et al compared the outcome of 95 oral graft and 24 penile skin graft urethroplasty to answer whether oral mucosa is superior to the skin. The overall success rate of skin urethroplasty was 84% with a mean follow -up of 201 months, while the success rate of oral urethroplasty was 87% with a mean follow up 48 months. These authors concluded that penile skin and oral mucosa are both excellent material for substitution urethroplasty, with a comparable success rate, though penile skin appear to have a longer follow up.¹⁸ In 2008, Barbagli et al reviewed a large series, 375 patients who underwent one stage bulbar urethroplasty using either penile skin or oral mucosal grafts. The authors concluded that oral mucosa is superior to skin for one stage urethroplasty.¹⁹ Markiewicz et al documented the main biological and clinical characteristics of oral mucosa that justify why oral mucosa has received attention and popularity in the field of urological surgery.^{20,21} Oral mucosa is hairless, is readily available in all patients and is easily harvested from cheek with low postoperative oral morbidity and high patients' satisfaction. In patient requiring a long graft, oral mucosa is easily harvested from the both cheeks.²² Oral mucosa is easy to handle because it has a thick elastin -rich epithelium, promoting its use as a graft employing original inlay or onlay techniques in one or two stage steps. Oral mucosa has a thin and highly vascular lamina propria that facilitates inosculation and imbibition. Oral mucosa avoids cosmetics consequences caused using genital or extragenital skin because it leaves a concealed donor site scar.^{20,21} Oral mucosa is resistant to infection. Because it hosts several micro-organisms, the tissue's inflammatory response to the organisms, the tissue's inflammatory response to the organisms is minimal. There are multiple immunological processes intrinsic to the oral mucosa that makes it impervious to native flora colonization.^{20,21} Histological studies have demonstrated that oral mucosa is highly compatible with the urethral recipient site, at times being

indistinguishable from surrounding tissues. Oral mucosa is elastic and resilient, and when exposed to compression, stretching and shearing forces, it is highly resilient, due to its lamina propria-oral epithelium interface. Oral mucosa east to adapt to any type of urethroplasty and it is rarely affected by lichen sclerosus disease.^{20,21} Disadvantages of BMG urethroplasty are the need of an additional operational field and donor site related complications: transient oral pain in first postoperative day (83-100), perioral numbness (16-26%), alterations in saliva production (11%), oral tightness (9-32%) and risk of retraction of lower lip).^{23,24} PSG harvesting is easy and lies within the operation field. PSG is very elastic and contains no hair. Disadvantages are an altered genital appearance and sometimes the unavailability (e.g. circumcision or after hypospadias).²⁵ Outcomes of BMG urethroplasty and PSG urethroplasty by dorsal onlay technique have been compared in term of follow up and success rate (Table 6 and 7).

Table 6: Outcomes of dorsal onlay buccal mucosa bulbar urethroplasty.

Authors	No. treated	Follow up months	Success rate
Barbagli et al 1998 ¹⁷	37 (6 BM)	21.5 (13.5)	92 (100 for BM)
Andrich et al 2001 ²⁶	42	48-60	95
Raber et al 2005 ²⁷	30 (13 BM)	51	80 (85 for BM)
Pansadoro et al 2003 ²⁸	56	41	98
Dubey et al 2003 ²⁹	16	22	87
Dubey et al 2005 ³	41	36.2	90
Barbagli et al 2005 ³⁰	27	42	85
Barbagli et al 2006 ³¹	6	16	100
Xu et al 2007 ³²	65 (12 BM)	57	77
Present study	16	13.4	87.5

Table 7: Outcomes of dorsal onlay penile skin graft urethroplasty.

Authors	No. treated	Follow up months	Success Rate
Barbagli et al 1998 ¹⁷	37 (31 PS)	21.5	92%
Barbagli et al 2001 ³³	40	43	85%
Barbagli et al 2004 ³⁴	45	71	73%
Present study	13	14.6	82.3%

CONCLUSION

On short term follow up substitution urethroplasty using both penile skin and buccal mucosa graft have comparable results. Dorsal onlay approach to the urethra allowed the use of penile skin or buccal mucosa graft for reconstruction of adequate urethral lumen. Long term follows up needed before considering BMG or PSG as best urethral substitute.

ACKNOWLEDGEMENTS

Author is highly thankful to his patients enrolled in this study, and to all his paramedical staffs which work hard in collecting the data for this study.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

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Cite this article as: Khandelwal AK. Dorsal onlay buccal mucosal graft or penile skin graft substitution urethroplasty in bulbar urethral stricture: compare the outcome and review. *Int Surg J* 2020;7:664-8.