

Original Research Article

Role of dorsal onlay buccal mucosal graft urethroplasty for long anterior urethral strictures

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ABSTRACT

Background: Treatment of the urethral strictures is challenging and with appropriate evaluation preoperatively and surgery planning it is possible to achieve good results. The objective of the study was to evaluate the efficacy of dorsal onlay buccal mucosal graft urethroplasty in treating long anterior urethral strictures.

Methods: Between August 2018 to July 2019 a total of 25 patients with anterior urethral stricture were treated with dorsal onlay buccal mucosal graft urethroplasty. Age, etiology of the stricture, stricture length (≤ 7 cm, and > 7 cm), and site of the stricture were assessed as the factors affecting the success rate.

Results: The clinical outcome as Success was defined as the patient not needing any form of urethral instrumentation postoperatively. The mean follow-up period was 18 months. Of 25 patients, 22 (92%) were successful and 3 (8%) were a failure. There was no statistically significant difference between the age groups, etiology of the stricture and success rate ($p=0.21$ and $p=0.444$). The statistical difference was significant for the site and length of the stricture by means of success ($p=0.005$ and $p=0.025$).

Conclusions: Our results show stricture length and localization are the most important variables for good success. Because of less failure rate, single-stage dorsal onlay buccal mucosal graft urethroplasty may be offered as an alternative to staged urethroplasty in case of long urethral strictures.

Keywords: Buccal mucosa, Urethral stricture, Urethroplasty, Buccal mucosa, Graft

INTRODUCTION

Treatment of the urethral strictures are challenging. With appropriate preoperative evaluation and planning of the surgery, it is possible to achieve good results. The long-term results of visual internal urethrotomy are poor, which might require repeated dilatations or concurrent urethrotomies. Routinely staged urethroplasty does not produce consistent results. The use of flaps or grafts is imperative in patients with complex strictures of the urethra.¹ Onlay graft is a recent addition to the armamentarium. Onlay graft can be done either dorsally or ventrally. Various tissues can be used like penile skin,

posterior auricular skin, bladder mucosa and buccal mucosa.²

Since 1996, Barbagli described a new dorsal onlay graft urethroplasty technique. It has been accepted worldwide with a fair amount of enthusiasm. The success rate of this procedure has been upto 95% over a period of 19 to 36 months.³ Memmelar first used the bladder mucosa in substitution urethroplasty, but results were not encouraging due to tissue harvesting problems and also complications like urethral proliferation and formation of diverticulae.⁴ Buccal mucosa has the advantages of being

adaptable to a wet environment, it is hairless, easy to harvest, resistant to infection and has a thick epithelium.

In our study we have performed buccal mucosal graft urethroplasty procedure for long anterior urethral strictures including pan-urethral strictures.

Aim of the study

To evaluate the efficacy of dorsal onlay buccal mucosal graft urethroplasty in treating long anterior urethral strictures.

METHODS

It is a prospective study conducted in the Department of Urology, Narayana Medical College, Nellore over a period of 1 year from August 2018 to July 2019 after institutional ethical board clearance. A total of 25 patients were enrolled in the study. Inclusion criteria are strictures >2.5 cm in length (Long anterior urethral strictures), Patients requiring repeated internal urethrotomy or dilatations. Exclusion criteria are periurethral phlegmon, urethrocutaneous fistula, associated with chronic renal failure, scarred perineum.

The preoperative workup included careful general physical examination, palpation of the anterior urethra for any mass; glans penis inspected for signs of urethral meatal stenosis or balanitis xerotica obliterans. The perineum was inspected and examined for the presence of fistulas or periurethral inflammation. Oral cavity examined regarding the hygiene and to rule out any buccal mucosal pathology.

The preoperative variables included in our study are the age of the patient, duration and aetiology of the stricture disease, preoperative uroflowmetry, history of previous urological intervention. Stricture length as per preoperative retrograde urethrogram and intraoperative assessment.

Surgery was performed under spinal anaesthesia, two teams were operating simultaneously in the oral cavity (under local anaesthesia) and the perineum. Cystoscopy was done and stricture was intubated with a 0.032" guidewire in all patients. The perineum was explored with a midline perineal incision, which was bifurcated posteriorly to improve access. The bulbar urethra was circumferentially mobilized after separating the bulbospongiosus muscle. Strictured urethra and approximately 1 cm of the normal urethra was mobilized proximally and distally. In the case of pan urethral stricture, the penis was invaginated and the urethra was separated from the corpus cavernosum up to the meatus. The urethra is rotated 180° and stricture was incised in the 12'o clock position commencing at the distal end of the stricture and proceeding proximally till you get a healthy urethra admitting 24-26 fr bougie without difficulty. At this point length of stricture and surrounding spongiofibrosis were assessed. If the dense stricture

portion is 1-2 cm with extensive spongiofibrosis proximally or distally, that portion is excised. The urethral ends were spatulated dorsally and the ventral ends were anastomosed with 4-0 vicryl, forming the floor strip, leaving a diamond-shaped defect dorsally. In the case of patients who have undergone visual incision of the stricture, the stricture is already opened and no need to incise the urethra after mobilizing it. The length of the stricture is measured. At the same time, the oral surgical team harvests the buccal mucosal graft. The parotid duct was identified and desired buccal mucosal graft was outlined and margins infiltrated with submucosal injection of 1: 100,000 lignocaine in adrenaline. The graft was harvested minimizing fat in the undersurface while avoiding dissection into the muscle and going close to the gums. Donor site resutured. Depending on the length of stricture buccal mucosal graft was harvested from one or both cheeks. The graft was defatted and fenestrated. The graft was secured to the cavernosa by interrupted Vicryl sutures. Quilting sutures were placed through the graft into the underlying corporal surface along the length of the graft until the entire graft was secured.

The right mucosal margin of the opened urethra is sutured to the right side of the patch graft, splaying open the strictured tract to the new roof, which is the spread fixed graft. The urethra is rotated back to its original position. The left side of the graft is sutured to the left side of the patch graft and the corporal bodies. The grafted area is covered entirely by the urethral plate. The Bulbospongiosus muscle is reapproximated. 16fr suction drain kept. An indwelling 16 fr silicone catheter is left in place.

The decision of which procedure to perform and length of buccal mucosal graft needed was partially based on the length and appearance of the stricture on preoperative retrograde urethrography, but predominantly on the intraoperative findings of stricture length as well as the appearance of the mucosa and spongy tissue.

The patient was started on oral fluids on 1st postoperative day and semisolid diet on day 2 and a normal diet than on. The patients underwent a pericatheter retrograde urethrography study on the 21st postoperative day and the catheter was kept for one more week if it demonstrated a leak. Patients were asked to have a follow-up visit at 3,6,12 months and yearly thereafter. They were evaluated with uroflowmetry. Success was defined as the patient not needing any form of urethral instrumentation. The satisfactory result was defined as a patient who needed urethral manipulation once. Failure was defined as a patient who needs regular urethral dilatation by a urologist or revision of urethroplasty or self-urethral dilatation.

Statistical analysis

Statistical analysis was done to evaluate which factors correlate with success. Age, aetiology of the stricture, stricture length (≤ 7 cm, and > 7 cm), localization of the

stricture were assessed. Pearson χ^2 test and Fisher's exact test were used for statistical analysis. Statistical significance was set at $p < 0.05$. Statistical calculations were carried out with Statistical package for social sciences (SPSS) release 20.0.

RESULTS

A total of 25 patients (mean age 34 years, range 21 to 56 years) underwent BMG urethroplasty by dorsal onlay graft between August 2017 to July 2018 (Table 1).

Table 1: Age group.

Age group (years)	No. of patients
20-30	2
31-40	9
41-50	12
51-60	2

Table 2: Etiology of stricture.

Etiology of stricture	No. of cases
Balanitis xerotica obliterans	16
Post inflammatory	8
Post instrumentation	1

There was no statistically significant difference between age groups and the success rate ($p=0.21$). When patients are grouped according to aetiology of the stricture as Balanitis xerotica obliterans (16 patients), post-inflammatory (8 patients), post instrumentation (post vesicolithotripsy) (1 patient), no statistically significant

correlation was found between success rate and aetiology ($p=0.44$) (Table 2). Based on stricture site, the success rate was 100% in 8 penile strictures, 75 % in 12 pan urethral strictures, 100% in 5 bulbar strictures. Bulbar strictures had the best prognosis, and pan urethral strictures had the worst. This difference for stricture site and success rate was statistically significant ($p=0.005$). Based on stricture length, the success rate was 100% in 16 men with strictures ≤ 7 cm and 66.67% in 9 men with strictures > 7 cm. This difference is statistically significant ($p=0.025$) (Table 3). Patients with longer stricture length as it is in pan urethral strictures have a higher risk of failure. Mean operative time was 120 min (range 105 to 160 min) and mean follow-up was 18 months (range 12 to 26 months). The mean duration of hospitalization was 4.5 days (range 4 to 6 days). Two patients showed extravasation of contrast medium on retrograde urethrogram contrast study after 3 weeks of operation, near the anastomotic site and managed successfully by extended catheterization for another 2 weeks. Repeat contrast study showed no leak, voiding trial was given after catheter removal. Three patients developed stricture at the proximal anastomotic site. Both patients voided normally after a single attempt of VIU. These two patients (8%) were considered to be failures. One patient developed wound infection, managed successfully with change in antibiotics as per wound swab culture sensitivity test. No patient developed diverticulum, fistula, or protrusion of the graft at external meatus. Peak urinary flow rates improved from a mean of 8.5 ml/sec (range 4 to 11 ml/sec) preoperatively to 22.8 ml/sec. (range 16 to 25 ml/sec) after 6 weeks postoperatively ($p < 0.001$). In our series, minimum follow-up was 6 months and maximum follow up was 26 months from the date of operation (Table 3).

Table 3: The success rates according to localization and stricture length.

Localization	No. of patient	Success rate of urethral stricture ≤ 7 cm	Success rate of urethral stricture > 7 cm	Overall success rate (%)
Penile	8	8/8 (100%)	0	8/8 (100)
Bulbar	5	5/5 (100%)	0	5/5 (100)
Panurethral	12	0/6	3/6	9/12 (75)
Overall	25	19	6	$p=0.005$

Table 4: Comparison of panurethral stricture.

Variables	Kumar et al ²⁷	Gupta et al ²⁶	Ducket et al ⁸	Our study
No. of patients	25	12	2	25
Panurethral stricture	21	4	0	12
Failure	3	1	0	3
Follow-up period	3-52 months	10-16 months	6-48 months	12-26 months

DISCUSSION

Anterior long urethral strictures (> 2.5 cm) should be treated with substitution urethroplasty to avoid

postoperative formation of chordee.⁵ In the year 1941 Humby was the first to use buccal mucosa for urethral stricture reconstruction for repair of the hypospadias.⁶ Substitution urethroplasty can be either a patch or a tube

graft.^{3,7-9} Free skin grafts used in substitution urethroplasty commonly has complications like graft shrinkage, formation of diverticulae and recurrent strictures of urethra.¹⁰⁻¹² Buccal mucosal grafts can be placed dorsally, ventrally or laterally but is still controversial. Ventral onlay graft is more prone to formation of the fistula and diverticula which leads to stasis of urine ejaculatory dysfunction.¹³ Where as dorsal onlay graft for the anterior urethral stricture has the advantages of good mechanical support from the corporal bodies with less incidences formation of fistulae.^{14,15} We performed the dorsal onlay buccal graft urethroplasty technique as described by Barbagli.³ In different studies, ventral onlay technique had success rates of about 57% to 100% with a follow-up of 20 to 64 months.¹⁶⁻¹⁸ Where as dorsal onlay technique had a success rate from 87% to 100% with a follow-up of 22 to 41 months.^{5,19} In this study, we evaluated the effect of age, aetiology of stricture, localization of stricture, and length of the strictures for good outcomes. The stricture urethra location and the length are usually the most important factors deciding upon the choice of repair.^{1,20} Strictures less than 2 cm, end-to-end anastomosis is the choice of surgery technique, and for more than 2 cm strictures, substitution urethroplasty is the choice, ideally buccal mucosa should be used.²¹ In our study results demonstrated that the success rate was independent of age ($p=0.21$) and the aetiology of the strictures ($p=0.43$), the success rate is less in long strictures (>7 cm) with statistical significance ($p=0.024$). Likewise, when our results were compared for stricture localization and success rate, the worst was pan-urethral strictures ($p=0.005$). In our study, the success rate for strictures ≤ 7 cm was 100%, which is compatible with the findings found in the literature. When we look at strictures more than 7 cm, the success rate was 66.67%.

Barbagli et al published a retrospective study of 50 cases with bulbar urethral stricture where buccal mucosal graft urethroplasty was done and in their study, grafts were placed ventrally, dorsally and laterally in 17, 27 and 6 patients respectively.²² After a mean follow-up of 42 months, placement of graft into the ventral, dorsal or lateral surface of the bulbar urethra showed a similar success rate. In our series of 25 cases, only three patients developed recurrent stricture at anastomotic sites. These three cases (8%) were considered as failure. Barbagli et al had different results in their series. In one study they did not observe any differences and in another study they found lower success rates for strictures longer than 4 cm.^{21,23} Marchal et al did not find any difference for stricture length.²⁴ El-Kassaby et al stated that stricture length is the most important factor to predict the result.²⁰ In a study by Chen et al the strictures were classified as > 4 cm, ≥ 6 cm, reported success rates of 82%, and 76% with buccal mucosal graft urethroplasty.²⁵ Gupta et al study in treating 12 patients with a long anterior urethral stricture using a single stage urethroplasty with a dorsal onlay buccal mucosal graft through a ventral sagittal urethrotomy with a mean length of the stricture of 5 (3–16) cm and the follow-up of 12 (10–16) months stated that the results were good in 11 of the 12 patients. One patient

developed stricture at the proximal anastomotic site and required an visual internal urethrotomy.²⁶ Anant Kumar et al. had reviewed 39 patients who underwent buccal mucosal urethroplasty for anterior urethral strictures and stated that 25 patients with a salvageable urethral plate were treated with single stage dorsal onlay urethroplasty using a cosmetic incision and 14 patients with a severely scarred urethral plate underwent double stage urethroplasty. At a mean follow-up of 32.5 months (range 3 to 52), 3 patients (12%) in single stage urethroplasty had recurrent stricture, of which 2 and 1 patients were treated with optical urethrotomy and urethral dilation, respectively. Following double stage urethroplasty, 3 patients had recurrent stricture, of whom 2 patients were treated with optical urethrotomy and 1 patient underwent repeat urethroplasty. They have concluded that in BXO related strictures with a viable urethral plate single stage dorsal onlay buccal mucosal urethroplasty provides good results. Double stage procedures provide satisfactory outcomes but they are associated with a higher revision rates.²⁷ Our mean follow-up was mean 18 months, ranging from 12-26 months. Comparative studies with our study is described in Table 4.

Limitations of the study

More long term follow-up is mandatory to calculate long term failures. The placement of buccal graft dorsally, ventrally or laterally is still undetermined. More randomized controlled trials with proper patient selection and long-term assessment of results is required to resolve on this controversial issue.

CONCLUSION

Buccal mucosal graft has good graft properties for graft survival with minimal donor site morbidity. Dorsal onlay graft is the preferred form of graft placement. In a conclusion, our results show stricture length and localization are the most important variables for good success. Because of less failure rate, single-stage dorsal onlay buccal mucosal graft urethroplasty may be offered as an alternative to staged urethroplasty in case of long urethral strictures. Longer follow up is needed (keeping attrition over a while for substitution urethroplasty in mind before coming to a definite conclusion).

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