



ORIGINAL RESEARCH PAPER

General Surgery

STUDY OF BUCCAL MUCOSA GRAFT URETHROPLASTY IN URETHRAL STRICTURES: A SINGLE CENTRE EXPERIENCE

KEY WORDS: Urethroplasty, Anterior urethral stricture, Buccal mucosal graft urethroplasty, Urine retention.

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ABSTRACT

Background/purpose: This study was conducted to present our experience in urethral mucosal graft urethroplasty to repair urethral stricture, bulbar, penile and pan anterior urethral stricture. **Methods:** This is a prospective hospital-based study that had been designed to review management outcomes of buccal mucosal graft urethroplasty for anterior urethral stricture from August 2017 to July 2021. **Results:** The total number of involved patients was 50. The success rate was found to be 92% (n=46), while 4 (8%) had a recurrence of stricture. Pain and pain combined bleeding from internal suture lines were the only early complication encountered in 40 (80%) and 2 (4%) patients, respectively. Late complications occurred as follows 14 (28%) patients had UTI, 7 (14%) had wound infections, 7(14%) had changes in ejaculation, and decrease in intensity of orgasm, and 3 (6%) had erectile dysfunction. One of the long-term complications was graft diverticulum in one case and was treated conservatively (in ventral on lay BMG). **Conclusion:** BMG urethroplasty is a versatile technique for all types of anterior urethral stricture with all types of aetiologies with good long term results even in a small scale private hospital.

BACKGROUNDS

Urethral stricture disease is a common condition in urology practice and it affects around 300 per 100,000 males and its surgical treatment can represent a challenge [1]. Various treatment modality available for management of stricture urethra e.g. direct visual internal urethrotomy (DVIU) and anastomotic or augmentation urethroplasty based on the use of flaps and graft [2]. In 1996 Barbagli described the dorsal onlay buccal mucosa graft urethroplasty and this technique has gained worldwide application for the treatment of penile and bulbar urethra strictures [3, 4]. Substitution urethroplasty using a buccal mucosal graft (BMG) has become a well-established modality in the management of bulbar and penile urethral strictures, that are not amenable for excision and anastomosis. Many approaches was developed for BMG urethroplasty configurations like ventral onlay, dorsal onlay, dorsal inlay via a ventral sagittal urethrotomy approach, dorsolateral onlay with one-sided mobilization of the urethra, combined dorsal plus ventral double mucosal grafts, two-stage repairs, and augmented anastomotic urethroplasty [5].

MATERIALS AND METHODS STUDY DESIGN

This is a prospective hospital-based study designed to review the outcomes of buccal mucosal graft urethroplasty while treating anterior urethral stricture. The study was conducted from August 2017 to July 2021. The inclusion criteria in this study were: males patients above 15 years of age diagnosed with anterior urethral stricture (penile and bulbar), who underwent BMG with regular follow-up.

Study

This study was conducted at Vardhman hospital and research centre, Meerut U.P India, a middle size hospital in northern region of India with all urology facility.

Perioperative care

Patients had been diagnosed with anterior urethral stricture after proper history, detailed examination, and urethrogram outpatient clinic visits (Fig. 1). The operation was performed under spinal anaesthesia and graft harvesting under local anaesthesia lidocaine 2% with adrenaline and lidocaine viscous gel. The patient was put in a lithotomy position. Urethroscopy was done by semi-rigid ureteroscope (URS) size 6 FR tip to assess site, complete or partial obstruction, and the length of the stricture if only the guidewire was passed considered a complete obstruction, and if passable by URS considered as partial and then can be augmented. While the guidewire was placed in the urethra longitudinal incision was made along the subscrotal raphe and the bulbar urethral was

explored, but the penile urethra usually invaginated below the scrotum in penile stricture. The bulbospongiosum muscle was cut in the middle (nerve preservation), then the corpus spongiosum was mobilized and separated from the corpus cavernosum. The urethra was opened dorsally (the attached part of corpus cavernosum to corpus spongiosum) from a healthy-to-healthy urethral area under direct vision.

Then the BMG harvested by the following technique: 1. using mouth retractor (Steinhauser retractor). 2. Identification of the parotid duct and marking the edges of the graft by marker pen. 3. Hydro dissection cum local anesthesia by submucosal injection of 2% lidocaine with adrenaline. 4. Then harvesting the BMG followed by defatting of the graft. Then the harvested site most of the time is not sutured. Bleeding was controlled only by external ice pack and coagulation.

The harvested graft was fixed dorsally to the corpus cavernosum by quilting stitch then the edges of the graft were sutured continuously to the urethra, corpus spongiosum, and corpus cavernosum bilaterally using 3/0 vicryl over silicon catheter of adequate size (14 or 16 FR). Lastly, the wound closed in layers. No drain was put in all operations.

Post-operative follow-up For Perineal wound: Removal of covering gauze on the second day and application of mupirocin ointment for 1 week.

For harvested BMG site: On the first day: internal packing removed and asked patient to drink chilled soft drink or ice cream followed by mouth gargle for oral hygiene. in the second day: nonspicy oral fluid, and the third day: soft diet

Patient discharged from 4th to the 7th postoperative day on injectable third-generation cephalosporin and oral metronidazole for 7 days. The removal of the urethral catheter depends on the findings of pericatheter urethrogram if absence of extravasation after 21 days. If patient was on suprapubic catheter preoperatively then we did not remove it and patient was not on SPC then usually we did not prefer to put SPC. SPC was clamped for voiding trial after 21 days if voiding well then SPC was removed within 3 to 5 days.

Long-term follow-up: after 3 months, the clinical assessment was conducted, and uroflowmetry was done. After 1 year, follow up also with clinical assessment and Uroflowmetry was performed and if needed then ascending urethrogram. Ethical approval was obtained from approval acceptance to the hospital authority. Written and verbal consent were

obtained from patients.

Data collection

Data were collected from hospital records and patient's file through structured questionnaires was used to collect data. Success and failure in terms of stricture recurrence, patient demographics, stricture etiology and anatomy, and the adverse outcomes and complications were recorded to determine risk factors for recurrent stricture and complications. Data were analysed by using a computer program SPSS v. 21.0. The analyzed data presented in tables and figures designed by Microsoft Excel 2007. Chi-square used as a significance test for categorical data respectively. The p value considered significant if $p < 0.05$.

RESULTS

A total number of 50 patients were involved in the study. All of them underwent buccal mucosal graft (BMG) urethroplasty for anterior urethral stricture. Their mean age was 40 ± 15.3 years. Regarding the presenting complaints, all the patients ($n=50$; 100%) has weak stream, 40 (80%) patients had straining, 30 (60%) had burning micturition, 22 (44%) had acute urine retention and 11 (22%) patients had dribbling. Hypertension was the most common comorbidity presented in 26 (52%) of the patients and Diabetes Miletus in 16 (32%) patients. Mainly previous procedures were the main etiology of strictures as catheterization ($n=39$; 78%). On the other hand, perineal pelvic injury was encountered in 12 (24%) patients and sexual transmitted disease (STDs) or non-gonococcal urethritis in 7 (14%) patients (Table 1).

In the history of pervious surgery management, 35 (70%) patients underwent visual internal urethrotomy (DVIU) and 12 (24%) patients underwent recurrent urethral dilatation. Forty six (92%) of the patients underwent BMG urethroplasty for first time and 4 (8%) redo the operation (previous surgery was anastomotic or BMG). Regarding the stricture features, in majority of the patients 38 (76%) had stricture in bulbar site and 35 (70%) had stricture with more than 5 cm in length. Concerning to the operation characteristics, most of the cases underwent dorsal onlay operation ($n=44$; 88%), had blood loss volume less than 200 ml ($n=48$; 96%), had operation time from 1 to 2 h ($n=45$; 90%) and used 16 FR catheter size ($n=34$; 68%) (Table 2). Buccal mucosa harvesting site was mainly unilateral in 42 (84%) patients and bilateral in 8 (16%) patients (Table 2). The success rate was found to be 92% ($n=46$), while 4 (8%) had recurrence of stricture. Pain and pain combined bleeding from internal suture lines were the only early complication encountered in 40 (80%) and 2 (4%) patients, respectively (Table 3). Late complications occurrence was found as follow, 14 (28%) patients had UTI, 8 (16%) had wound infections, 7 (14%) had changes in ejaculation, and decrease in intensity of orgasm, and 3 (6%) had erectile dysfunction (Table 3). One of the longterm complications was graft diverticulum in two cases and was treated conservatively (in ventral onlay BMG). According to the perioperative complications in harvesting site, pain presented in all patients ($n=50$; 100%), 28 (56%) as moderate and 22 (44%) as minimal. Also, all the patients ($n=50$; 100%) were normally able to drink, 25 (50%) patients were not able to eat initially, 3 (6%) had tightness and 2 (4%) patients had numbness.

The median duration of pain relieving was 5 days, ranged from 3 to 14 days. Tightness was relieved after 2 days in 2 (33.3%) patients and after 3 days in 4 (66.7%) patients. numbness was relieved after one month in the 4 patients. Pericatheter urethrogram showed no extravasations in 46 (92%) patients and extravasations in 4 (8%) patients, so the catheter was kept for another one weeks. also, post-operative ascending urethrogram (3rd and 12th month) was normal 44 (88%), abnormal (fling defect) in 5 (10%) patients and one patient (2%) had diverticulum. Follow up uroflow on 3 months and first year was with in normal range in 45 (90%). The

volume of blood loss was significantly affected the outcomes (P value=0.000) as the success rate was 91.6% in those lost less than 200 ml of blood compared to no patients of those lost more than 200 ml of blood. The time of operation was significantly affected the outcomes (P value=0.039) as the success rate was high in patients with operation time from 1 to 2 h (97.7%) more than those with operation time more than 2 h (40%). The success or outcomes of BMG urethroplasty was not significantly affected by the sizes of catheter used (P value=0.679).

DISCUSSION

Humby was the first to use buccal mucosa for urethral reconstruction in 1941 for hypospadias repair [9]. Because buccal mucosal grafts have advantages over other grafts, they have been popular since the 1990s. Open urethroplasty is the gold standard treatment for urethral strictures, but it is not a routine operation for a general urologist. Since 1993 El-Kasaby et al. reported the first experience with buccal mucosa urethroplasty for treatment of penile and bulbar urethral strictures [10]. In the present study, most of the patients 42 (84%) had a stricture in the bulbar site. This is in concordance with literature as up to 90% of urethral strictures were in the anterior urethra and approximately two-thirds (75%) of them occur in the bulbar urethra [1, 11, 12]. The common etiologies of urethral strictures in this study was catheterization (78%), while, perineal pelvic injury found in 12 (24%) patients and STDs or non-gonococcal urethritis in 7 (14%) patients. However, in the study of Mohamed et al.; the cause of stricture was idiopathic in 47, inflammatory in 15, lichen-sclerosus in 26, and post failed hypospadias repair in 35 patients [13]. In the study of Kamyar et al., the etiology of the urethral stricture was sexually transmitted disease (STD) in (14.53%), lichen sclerosus in (12.82%), a trauma in (12.82%), catheterization in (11.11%), transurethral resection (TUR) in (5.13%), and unknown in (43.59%) [14]. In this study, the vast majority of the patients underwent dorsal onlay operation ($n=44$; 88%). And this can be explained by the dorsal onlay procedure are a more stable and reliably well vascularized graft bed, and less possibility of sacculation our results were similar to Figler et al. [15]. The current study reported, the overall success rate was 92% ($n=46$ patients). This rate was similar to the studies of Tarun et al. who reported the rate of 91% [6], Mohamed et al. who reported a success rate of 91.1% [11], Kamyar et al. who reported the success rate of 93.3% [14]. And the lowest success rates reported by Marco et al. (81%) [16] and Yalcinkaya et al. (70%) [17] and Guido et al. (80%) [18]. Barbagli described the dorsal onlay graft urethroplasty in 1996 in 12 patients, reporting a successful outcome in all patients [19]. Morey and McAninch reported similar results in 13 patients who underwent ventral onlay BMG urethroplasty for anterior urethral stricture [20]. Barbagli more recently reported the 80.2% long-term success rate for dorsal onlay bulbar urethroplasty using BMG [19]. Variations to this approach have been reported by Kulkarni, with success rates up to 92% [21]. Asopa described the dorsal onlay free graft urethroplasty and with this technique, excellent results up to 87% of success rate have been reported [22]. The variations in the success rates might be attributed to the difference in geographical areas, sampling as well as the types of BMG urethroplasty.

Not surprisingly, the pain was presented in all the patients' post-operation, in addition to urinary tract infection (28%) and superficial wound infection (16%) were the major late complications, the high incidence of infection (UTI and superficial wound infection) can be explained by the absence of urine culture and sensitivity test in this study as a prerequisite before surgery, which might reduce this rate especially most of the patients had an increase in post voiding residual urine volume, which predispose to UTI. In the study of Marco et al., the most frequent complications recorded were urinary fistula (3.1%), graft contracture (3.1%), and graft

failure (3.1%) [16]. While Tarun et al. reported wound infection was the main postoperative complication [6]. The study of Mohamed et al. reported patients complicated by fistula (5.7%), wound infection (1.9%), and meatal stenosis (2.9%) [13].

Regarding the complication in the harvesting site, all the patients (n=50) had pain, and two-thirds (66%) were unable to eat initially, 5 (10%) had tightness and 3 (6%) patients had numbness. This compatible with the findings of Wood et al. study [23]. The results showed the age of the patients was not significantly affected the outcomes of BMG urethroplasty. This finding was in agreement with the study of Yalcinkaya et al. [17] and Biswajit et al. [24]. Interestingly, the success rate of BMG urethroplasty was significantly high among the patients who underwent the procedure for the first time (97%) more than those with redo (25%) (P value=0.020) because of less fibrous tissue in comparison with redo urethroplasty. This was in agreement with a review of Lindsay et al. who reported the failure rate of urethroplasty increases substantially with repeated procedures [25].

Also, showed the success rate was 100% among the patients with stricture in bulbar, 50% in a pan, and penile stricture (P value=0.000). These findings were comparable to the study of Marco et al. [16] and Yalcinkaya [17]. The success rate was 100% among the patients with stricture length less than 5 cm whilst in those with stricture length more than 5 cm the success rate was 87% (P value=0.043) the restricture was found in the proximal and distal end of the graft anastomosis. The current results were consistent with the studies of Marco et al. (14) [16] and Yalcinkaya et al. [17]. The type of operation has significantly affected the outcomes (P value=0.001) as the success rate was high in dorsal onlay (92.9%) more than ventral onlay (50%). A recent review described the outcome of 35 studies of the success rate of the dorsal onlay urethroplasty in a total of 934 patients and reported that with an average follow-up of 42.2 months the average success rate was 88.4% [26]. The volume of blood loss has significantly affected the outcomes (P value=0.000) as the success rate was 96% in those who lost less than 200 ml of blood compared to no patients of those who lost more than 200 ml of blood. The time of operation has significantly affected the outcomes (P value=0.039) as the success rate was high in patients with operation time from 1 to 2 h (87.5%) more than those with operation time of more than 2 h (40%). And remarkably, this study showed the success rate was 100% among the patients with unilateral buccal mucosal sites whilst in those with bilateral buccal mucosal sites the success rate was 40% (P value=0.002)

CONCLUSION

BMG urethroplasty had shown a good response in all types of anterior urethral strictures patients. This study also reflects the same. For long term results further follow up required.

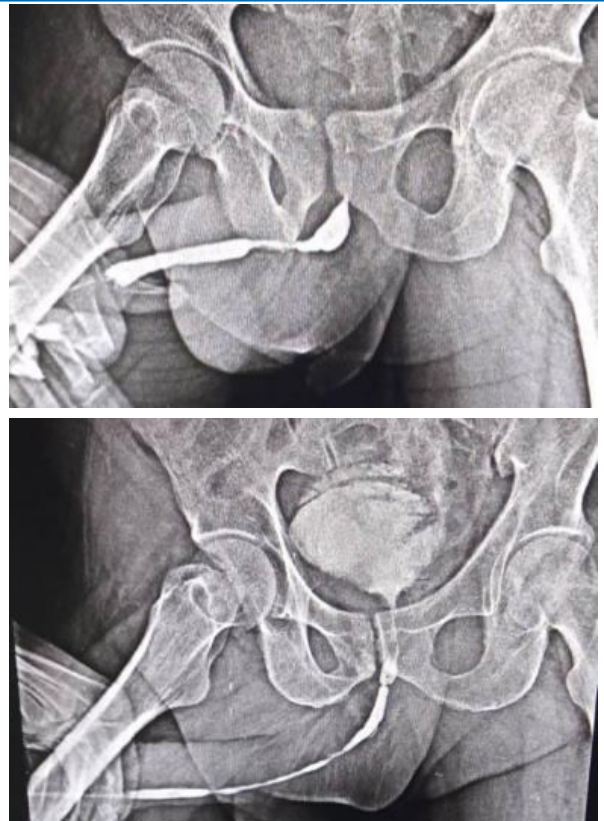


Fig. 1 Retrograde urethrogram showing urethral stricturs.

Table 1 The stricture Etiologies among patient's anterior urethral stricture who underwent buccal mucosal graft (BMG) urethroplasty (N=50)

S.N	Etiology	No.	%
1.	Catheterization	39	78
2.	Cystoscopy & H/O endoscopic surgery	13	26 (TURP)
3.	Pelvic surgery	6	12
4.	Perineal pelvic injury	12	24
5.	STDs or non-gonococcal urethritis	7	14

Table 2 Predictors for the outcome among patients of anterior urethral stricture who underwent buccal mucosal graft (BMG) urethroplasty (N=50)

variable Success 46(92%)
 Age <20 2 (4%) 21-40 18 (36%) 41-60 20(40%) >60 6(12%)
 Stricture recurrence(8%) 02(50%) 2(50%) 0
 P value 0.85

Operation frequency	45(97.8%)	1(2.2%)	0.02
First	1(25%)	3(75%)	
Redo			
Site of stricture			
Bulbar	42	3	
Penile	3	1	
Pan anterior	1		
Type of BMG graft			
Dorsal onlay	42 (95.4%)	2(4.6%)	
Ventral onlay			
Augmented anastomotic	3(75%)	1(25%)	0.001
dorsal onlay	1(50%)	1(50%)	
Expected blood loss			0.00
<200ml	44(91.6%)	4(8.4%)	
>200 ml	0(00%)	4(100%)	
Time of operation 1-2 hrs	44(97.7%)	1(2.3%)	0.039
>2 hrs	2(40%)	3(60%)	
Size of cath. Used 14 Fr.	14(87.5%)	2(12.5%)	0.679
16 Fr.	32(94.4%)	2(5.6%)	

*P value is not statistically significant **P value is statistically significant

Table 3: The postoperative complications among patients of anterior urethral stricture who underwent buccal mucosal graft (BMG) urethroplasty (N = 50)

Early complications n % Pain 40 80 Pain & bleeding from stitch 2 4 line

Late complications UTI 14 28 Wound infection 8 16 Erectile dysfunction 7 14 Retrograde ejaculation & 3 6 changes in orgasm None 12 24

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