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BUCCAL MUCOSAL GRAFT URETHROPLASTY FOR ANTERIOR URETHRAL STRICTURE

Urology

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ABSTRACT

Introduction Anterior urethral stricture is a pathological fibrous tissue development involving the corpus spongiousum. A long segment of urethral stricture is the indication for surgical correction. Strictures longer than 2 cm that are not suitable for anastomotic repair, therefore, require substitution urethroplasty, where a graft is used. Common grafts are split and full-thickness skin grafts (genital and extra-genital), bladder mucosa, colonic mucosa, tunica vaginalis, tissue-engineered grafts, and intra-oral mucosa (buccal or lingual). Among the mucosal grafts, the buccal mucosa has proved to be a versatile and successful urethral substitute. Urethral reconstruction using a buccal mucosal graft (BMG) to substitute the urethral mucosa has become a well-established modality in the management of bulbar and penile urethral strictures, not amenable to excision and anastomosis. **Materials and Methods** We retrospectively collected data from patients who underwent buccal mucosal graft (BMG) urethroplasty for anterior urethral stricture in AIMS, Kochi, India from January 2016 to January 2022. **Results** A total of 46 patients who underwent BMG urethroplasty for anterior urethral stricture were analyzed. Causes of urethral strictures in our study were Post catheterization in 11 (24 %), Post transurethral resection (TUR) in 5 (11 %), Inflammatory in 20 (43 %), Sexual transmitted disease (STDs), or non-gonococcal urethritis in 3 (7 %), and Idiopathic in 7 (15%) patients. The length of the stricture ranges from 1 to 13 cm (mean 5.63± 3.113). 26 patients had a stricture in the bulbar urethra, 4 patients had a stricture in the penile urethra and 16 patients had at the penobulbar site. The buccal mucosa harvesting site was mainly unilateral in 26 patients and bilateral in 20 patients. The success rate was found to be in 41 (89.1%) patients. **Conclusion:** Our study suggests that anterior urethral strictures up to 6 cm in length may be effectively managed with BMG urethroplasty. The buccal mucosa is easy to obtain and handle. Furthermore, the rate of complications, from both a urological and oropharyngeal perspective is low.

KEYWORDS

Stricture, Buccal mucosal Graft, Urethroplasty

INTRODUCTION

Urethral stricture disease is a condition that affects 300 per 100,000 males and its surgical treatment can represent a challenge. Anterior urethral stricture is a pathological fibrous tissue development involving the corpus spongiousum. Common causes are trauma, mostly straddle injury, and also RTA, infection, instrumentation, etc. For management factors to be considered include etiology of stricture, site, length and density of the fibrous tissue, and comorbidities [1]. A long segment of urethral stricture is the indication for surgical correction. Strictures longer than 2 cm that are not suitable for anastomotic repair, therefore, require substitution urethroplasty, where a graft is used.

Grafts are harvested from different locations which may be pedicled and free grafts. Common grafts are split and full-thickness skin grafts (genital and extra-genital), bladder mucosa, colonic mucosa, tunica vaginalis, tissue-engineered grafts, and intra-oral mucosa (buccal or lingual) [2,3,4]. Long-term results of scrotal and extra genital skin are disappointing as non-hirsute full-thickness skin grafts are associated with stricture recurrence [5]. Among the mucosal grafts, the buccal mucosa has proved to be a versatile and successful urethral substitute. The use of buccal mucosa graft (BMG) for urethral reconstruction was first reported, in 1894 [6]. Barbagli described the dorsal onlay free graft urethroplasty in 1996 and since then graft urethroplasty has gained worldwide application for the treatment of penile and bulbar urethra strictures. Urethral reconstruction using a buccal mucosal graft (BMG) to substitute the urethral mucosa has become a well-established modality in the management of bulbar and penile urethral strictures, not amenable to excision and anastomosis. The various configurations of BMG urethroplasty have to include 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]. It is relatively easy to obtain and manipulate, is a wet epithelium, and has excellent immunity. It is less prone to stricture recurrence, especially in the presence of lichen sclerosis. Nowadays the buccal mucosa is the preferred donor site for urethral stricture repair [7]. However, its harvesting may be associated with donor site morbidities, such as perioral numbness, difficulty in opening the mouth, and less commonly, dry mouth, and long-term complications such as scarring [8]. The thick buccal mucosa epithelium with dense submucosa and extensive capillary network assures rapid neo-vascularization and early access to nutrients from the wound bed [4, 9, 10].

Here we report our experience with buccal mucosal graft (BMG) for the primary repair of anterior urethral strictures.

MATERIALS AND METHODS

We retrospectively collected data from patients who underwent buccal mucosal graft (BMG) urethroplasty for anterior urethral stricture in AIMS, Kochi, India from January 2016 to January 2022. Patients with complex strictures (strictures associated with abscess, fistula), posterior urethral strictures, history of oral surgery, visible oral mucosal changes, restricted mouth opening, and previously failed urethroplasty were excluded from the study. Patients who did not were also excluded. Patient characteristics and baseline data were recorded. All patients underwent uroflowmetry (UFM), urine culture/sensitivity, ultrasound of KUB with postvoidal residue (PVR), urethrography, and cystourethroscopy. The oral mucosal characteristics were assessed in all patients during the initial workup.

Single-stage dorsal onlay graft urethroplasty was done in all patients.

After nasal intubation under general anesthesia, initially perineal dissection was done. Following the midline perineal incision, the bulbo spongiosus muscle was dissected. The urethra was mobilized. The urethra was opened dorsally. The stricture length was measured. Graft was harvested 2 cm longer than the measured stricture length, as there is an approximate 10% contraction over time, and a width of 15-25 mm was taken to provide a lumen of at least 24 Fr after tubularization. Graft taking was started with the submucosal infiltration of xylocaine and adrenaline (1:100,000) under the marked buccal mucosal patch. Approximately, 0.5-1.0 cm mucosa from Stenson's duct were left to prevent duct injury. After graft harvest, fat removal was done till the graft appeared creamy white. Graft quilted over the corpora cavernosa with mucosa facing towards the lumen, and the edge of the urethra sutured to the buccal mucosa over a 16 F silicone catheter inserted into the bladder. All patients were given intravenous antibiotics for 3 days, followed by oral antibiotics. The patients were allowed a liquid diet 6 hours after the operation and then a gradually soft and regular diet in the following days.

In the postoperative period, patients were asked to visit the outpatient clinic for regular follow-up and to report the complications. The patients were followed at 1 and 3 weeks then at 3, 6, and 12 months 18 months, and 24 months after surgery. Urethral catheter removed after 3 weeks. Voiding symptoms, questionnaires, and uroflowmetry were done in all as primary screening for stricture recurrence. Urethrography and cystourethroscopy were done as a secondary screening only if the patient developed obstructive symptoms or uroflowmetry showed Qmax < 15 ml after ruling out lower urinary tract infection. The success of urethroplasty was considered the primary outcome of the study. We defined success as the absence of any obstructive symptoms and no need for subsequent procedures, such as dilatation, cystourethroscopy, and internal urethrotomy.

Statistical analysis

Data were entered in MS Excel and analyzed in SPSS version 25 software (IBM Corp. IBM SPSS Statistics for Windows). Continuous variables were presented as means ± standard deviation. Proportions (percentages) were calculated for discrete variables.

RESULTS

A total of 46 patients who underwent BMG urethroplasty for anterior urethral stricture were analyzed. The mean age was 53.87 +/- 13.090. Causes of urethral strictures in our study were Post catheterization in 11 (24 %), Post transurethral resection (TUR) in 5 (11 %), Inflammatory in 20 (43 %), Sexual transmitted disease (STDs), or non-gonococcal urethritis in 3 (7 %), and Idiopathic in 7 (15%) patients. (FIG 1)

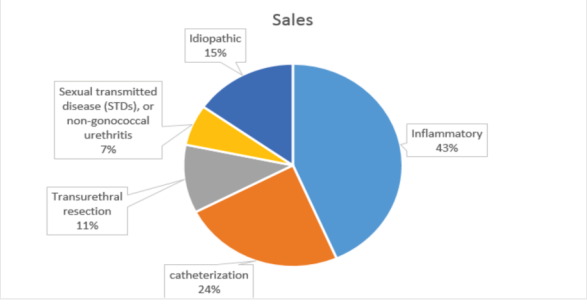

FIG 1: Causes of stricture

The length of the stricture ranges from 1 to 13 cm (mean 5.63± 3.113). 20 patients had no comorbidities, 21 patients had Diabetes and 19 patients had Hypertension. 26 patients had a stricture in the bulbar urethra, 4 patients had a stricture in the penile urethra and 16 patients had at the penobulbar site. All patients underwent dorsal onlay operation, with a Mean blood loss of 142.5 ml, and a mean operation time of 5 hr. The buccal mucosa harvesting site was mainly unilateral in 26 patients and bilateral in 20 patients. The success rate was found to be 41 (89.1%), while 5 had a recurrence of stricture (TABLE 2).

Table 2: Pre op and Intra Op Charactestics of stricture

	Mean +/- SD
Length of Stricture (cm)	5.63 +/- 3.113
Pre Op UFR (Qmax)	3.69 +/- 2.214
Pre Op PVR (ml)	181.67 +/- 81.783 ml
Time of Surgery (Hr)	5.081 +/- 1.14 Hr
Blood Loss (ml)	142.50 +/- 14.366
Hospital stay (Days)	5.57 +/- 1.109
Post Op UFR (Qmax)	19.36 +/- 4.46
Post op PVR (ml)	43.54 +/- 25

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, Since 1993 El-Kasaby et al. reported the first experience with buccal mucosa urethroplasty for the treatment of penile and bulbar urethral strictures [10].

In our study, of 46 patients 26 patients had a stricture in the bulbar urethra, 4 patients had a stricture in the penile urethra and 16 patients had stricture at the penobulbar 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]. Causes of urethral strictures in our study were Post catheterization in 11 (24 %), Post transurethral resection (TUR) in 5 (11 %), Inflammatory in 20 (43 %), Sexual transmitted disease (STDs), or non-gonococcal urethritis in 3 (7 %), and Idiopathic in 7 (15%) patients. However, in the study of Mohamed S et al; the cause of stricture was idiopathic in 47, inflammatory in 15, lichen-sclerosis in 26, and post failed hypospadias repair in 35 patients [13]. In the study of Kamyar T et al, the etiology of the urethral stricture was sexually transmitted disease (STD) in (14.53%), lichen sclerosis 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 our study, all patients underwent dorsal onlay procedure, as it is a more stable and reliably well.vascularized graft bed, and less possibility of sacculation our results were similar to Figler B et al [15]. In our study, the success rate was found to be 41 (89.1%), this rate was similar to the studies of Tarun D et al who reported the rate of 91% (6), Mohamed S et al who reported a success rate of 91.1% [11], Kamyar T et al who reported the tare of 93.3% [14]. And the lowest success rates reported by Marco S et al (81%) [16] and Yalcinkaya F et al (70%) [17] and Guido B 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 inlay free graft urethroplasty and with this technique, excellent results up to 87% of success rate have been reported [23]. The variations in the success rates might be attributed to the difference in geographical areas, sampling as well as the types of BMG urethroplasty.

Post operatively no major clavien –Dindo complications noted in our study, in the study of Marco S et al, the most frequent complications recorded were urinary fistula (3.1%), graft contracture (3.1%), and graft failure (3.1%) [16]. While Tarun D et al reported wound infection was the main postoperative complication [6]. The study of Mohamed S et al reported patients complicated by fistula (5.7%), wound infection (1.9%), and meatal stenosis (2.9%).

CONCLUSION:

Our study suggests that anterior urethral strictures up to 6 cm in length may be effectively managed with BMG urethroplasty. The buccal mucosa is easy to obtain and handle. Furthermore, the rate of complications, from both a urological and oropharyngeal perspective is low.

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