The outcome of buccal mucosal graft anterior urethroplasty techniques in men with urethral stricture

Radheshyam Gupta (radheshyam130@yahoo.com)
Vayodha Hospital
Honglei Wang
Harbin Medical University Cancer Hospital
Wenxin An
Harbin Medical University Cancer Hospital
Tao Xu
Harbin Medical University Cancer Hospital
Suman Gupta
National Medical College
Wanhai Xu
Harbin Medical University Cancer Hospital
Nand Lal
Harbin Medical University

Research Article

Keywords: Anterior urethral stricture, Buccal mucosal graft (BMG), Urethroplasty, Penile stricture, Balanitis Xerotica Obliterans (BXO)

Posted Date: July 3rd, 2023

DOI: https://doi.org/10.21203/rs.3.rs-3045597/v1

Abstract

Using Direct Visualisation Internal Urethrotomy (DVIU) and surgical evacuation of the stricture using a reconstructive buccal mucosal graft, urethral stricture is a condition that can be treated. This research aims to assess the success rate and risk factors for complications following buccal mucosal graft (BMG) urethroplasty for anterior urethral stricture in patients referred to a high-volume referral centre.

Method: Between 2012 and 2019, 130 patients who underwent various types of BMG urethroplasty under a retrospective research by our team. Patient demographics, stricture aetiology, and anatomy, as well as adverse stricture outcomes like issues, erectile dysfunction (ED) lasting longer than 12 months, and post-micturition dribbling (PMD), were shown in order to identify success rate, risk factors for recurrent stricture, complications, and failure in terms of stricture recurrence.

Results: There were 130 patients in all. The overall number of recurring strictures was 15.3% (20 males), whereas the success rate was reported to be 84.6% (n = 110). An ED occurred in 11% (n = 14) and PMD in 14% (n = 18). All of the Ed was not organic and was given a PDE5 inhibitor orally. Twenty patients (15.3%) experienced postoperative problems. Urinary fistula (n = 4, 3.0%), graft contracture (n = 3, 2.3%), graft failure (n = 5, 3.8%), UTI (n = 4, 3.0%), and wound infection (n = 3, 2.3%) were the most common complications following penile urethroplasty. Age at surgery, aetiology, stricture length, and location were all significant variables for stricture recurrence in the univariate analysis. In the multivariate analysis, the penile location was the only significant independent variable for restricture.

Conclusion: The remarkable results of BMG urethroplasty as a therapy for anterior urethral stricture with a success rate of 84.6% represent improvements in the quality of care in resource-constrained nations like Nepal.

Introduction

A medical disorder called urethral stricture disease, which affects 300 men out of every 100,000, is challenging to surgically cure. There are many techniques that have been recorded, including direct visual internal urethrotomy (DVIU) and anastomotic or augmentation urethroplasty using flaps and grafts [1]. Dorsal onlay-free graft urethroplasty has been successfully used to treat penile and bulbar urethral strictures since Barbagli first described it in 1996 [2, 3]. In the care of bulbar and penile urethral strictures that are not susceptible to excision and anastomosis, the use of buccal mucosal graft (BMG) as a replacement for the urethral mucosa has become a well-established method. BMG urethroplasty has been performed using a variety of configurations, including ventral onlay, dorsal onlay, dorsal inlay via a ventral sagittal urethrotomy approach, dorsolateral onlay with one-sided urethra mobilisation, combined dorsal plus ventral double mucosal grafts, two-stage repairs, and augmented anastomotic urethroplasty [4]. The BMG has been widely used for urethroplasty and offers the advantages of being hairless and simple to harvest. The graft contains the whole thickness of the mucosal graft.

Urologists in Nepal face a serious problem with urethral stricture, a difficult condition that affects the urethra. Only a small number of (3–4) centre hospitals in Nepal have implemented BMG urethroplasty for the treatment of anterior urethral strictures, and this would affect the patients' long-term results. Young surgeons and healthcare practitioners' education and experience will also alter as a result of this. Consequently, based on our information, the first scientific study on BMG urethroplasty in Nepal is reported here. Regardless of the stricture site and duration, it was first treated with regular DVIU and serial dilatation, which had unsatisfactory results.

This study's objectives are to describe the successful management of anterior urethral stricture and to pinpoint the risk factors for complications and stricture recurrence in all patients who have had buccal mucosal graft (BMG) urethroplasty at Vayodha Hospital Kathmandu, Nepal, an ISO-certified facility.

Methods

In order to evaluate the effectiveness of treating anterior urethral stricture with buccal mucosal graft urethroplasty, we conducted a retrospective hospital-based study. The study's data was gathered in the same location from January 2012 to January 2019. The hospital management granted the ethical permission. Male patients over the age of 12 who had been diagnosed with penile and bulbar anterior urethral strictures met the inclusion criteria for this research. 68 individuals overall have bulbar strictures, and 62 have penile urethral strictures. While 99 patients (76.1%) disclosed a history of recurrent stricture after DVIU, urethral dilatation, and urethroplasty in the past. In 2 patients, a single onlay bulbar urethroplasty was completed with a 6-month interval between the first and second phases. According to Barbagli et al. [2], the dorsal onlay approach was used, which involved performing a dorsal stricturotomy into healthy tissue on each side of the stricture and then performing a dorsal onlay free MBG urethroplasty.

Following preoperative outpatient clinic visits, preoperative history, clinical examination flow rate, post-voiding residual, and anterograde/retrograde urethrography, all patients have been diagnosed with anterior urethral stricture (Fig. 1:a,b, and c). General and spinal anaesthesia were used throughout the procedure, along with nasal intubation for the bilateral cheek grafts and local anaesthesia up to the moment of graft harvesting. The same patients had submucosal injection of a 2% xylocaine/200:000 adrenaline/saline mixture for the BMG harvesting procedure. Once the parotid duct has been identified, the borders of the graft are marked using a sterilised permanent marker pen. The bilateral cheek BMG was harvested with a typical 2.5 cm width and large strictures, as illustrated in Fig. 2. The size of the graft was proportionate to the stricture length. A compressive gauze was kept in place and removed in the recovery region following precise hemostasis with bipolar electrocautery (Fig. 2: a, b). All patients were instructed to use benzydamine hydrochloride-based mouthwash three times per day for a week following surgery.

Figure 1a,b,c: All the patients X-ray is a diagnostic test done to look anterior urethral stricture by Anterograde/retrograde urethography preoperatively based on outpatient clinic visits .

Figure 2.a: Long strictures from cheek BMG were extracted, and the size of the graft was proportionate to the stricture length with a typical 2.5 cm width. Bipolar electrocautery was used to preserve hemostasis on the side of the BMG that was harvested. Compressive gauze was left in place and removed at the recovery region on the side of the opposite cheek. (Fig. 2.b)

A lithotomy posture was used for the patient. To assess a location, total or partial obstruction, and the length of the stricture, urethroscopy was performed using a semi-rigid ureteroscope (URS) with a size 6.5/7.5 FR tip. If a guidewire could not pass through the obstruction, it was only considered to be completely blocked. If a URS could pass it, it was considered partial and might then be supplemented. However, in penile stricture, the penile urethra often invaded below the scrotum. As the guidewire was being introduced, a longitudinal incision was created along the sub-scrotal raphe, and the bulbar urethral was examined[1]. The corpus spongiosum was mobilised and detached from the corpus cavernosum when the bulbospongiosus muscle was split along the middle (Fig. 3). (fig: 4) The urethra was opened dorsally (the part of the corpus cavernosum connected to the corpus spongiosum) under direct vision, and the BMG collected the graft visible. (fig: 5)[5]. The harvested graft was then continuously sutured to the corpus spongiosum, corpus cavernosum, and urethra bilaterally using 4/0 vicyl (cutting body with batch number 2443) and an appropriately sized silicon catheter. (14 or 16 FR are depicted in Fig. 6) Finally, hemostasis was maintained without the need for a drain while the wound healed in layers. Figure 7

Fig: 5 Fig: 6

Fig: 7

Figure 7: Using 4/0 vicyl (cutting body with batch number 2443), the borders of the graft were constantly sutured to the urethra, corpus spongiosum, and corpus cavernosum on both sides.

The patient was in the surgical intensive care unit (SICU) on the first postoperative day, and if the patient was stable on the second day, they were moved to a different ward. Fusidic acid ointment was used while the gauze covering the perineal incision was removed for an alternative day dressing till the suture was out. On the first day, internal packing with gauze was completed at the BMG harvest location. Sips of water or non-spicy, cool oral fluid were provided on the second day, and on the third day, a soft diet was administered. From the third to the fifth postoperative day, the patient was released. Third-generation cephalosporin or fluoroquinolones were administered intravenously while the patient was in the hospital, along with oral metronidazole and the same antibiotics intravenously for a further 14 days following discharge. When the routed ascending/descending urethrogram was done on all patients at 4 weeks, 3 months, and 12 months after surgery, as well as post-second stage in cases of penile urethroplasty up to 36 months later, the urethral catheter was removed based on the lack of extravasation. Recently, a suprapubic catheter was placed as per standard, followed by the removal of the urethral catheter and a 3- to 7-day period of tightening. Upon successful urination, the suprapubic catheter was removed. The mean maximum flow rate (Qmax) of the preoperative uroflowmetry investigation was 5.9 ml/s. Twelve months after surgery, the mean Qmax was 25 (range: 12–30) ml/s during the postoperative follow-up period.

Data were gathered with follow-up from patient files and hospital records. Success and failure in terms of stricture recurrence, patient characteristics, the cause and anatomy of strictures, and the unfavourable results. Univariate statistical analysis was performed using t-test and chi-squared; multivariate analysis was done using regression analysis with P0.05 indicating statistical significance using SPSS V.21.0 and table by Microsoft Excel. Risk factors for recurrence and complications were also recorded for analysis.

Result

In the current study, 130 patients who had all had buccal mucosal graft (BMG) urethroplasty for anterior stricture were examined. These patients' average ages ranged from 12 to 71 years, with a mean of 41.4 years. There were 20 males afflicted by the overall recurring stricture incidence, which was found to be 15.3%. Diverse presenting management techniques were used to treat the recurrence in these patients, including clean urethral dilation and direct vision internal urethrotomy (DVIU) (n = 20), intermittent self-catheterization (n = 10), long-term suprapubic catheterization (n = 4), urethral perineal urethrostomy (n = 5), and redo urethroplasty (n = 3). Twenty patients (15.3%) had postoperative complications, the majority of which occurred after penile urethroplasty: urinary fistula (n = 4, 3%), graft contracture (n = 3, 2.3%), graft failure (n = 5, 3.8%), UTI (n = 4, 3%), wound infection (n = 3, 2.3%), and secondary bleeding from the mouth (n = 1, 0.7%)(Table 1). Two cases of spontaneous healing of the urinary fistula were noted, two cases were corrected, and five cases needed revision surgery, three of which were carried out during the second stage of graft. Acute urine retention (AUR) was recorded in 23% of patients (n = 30), post-micturition dribbling (PMD) in 14% of patients (n = 18), and erectile dysfunction (ED) in 11% of patients (n = 14). While all ED patients had penile artery and venous Doppler ultrasonography for more than a year, all cases of PMD were treated conservatively. An oral PDE5 inhibitor was used to treat ED once it was discovered to be non-organic. After undergoing penile urethroplasty, one patient with severe BXO and many prior reconstructions reported an unsatisfactory aesthetic result (3.8%), but the functional outcome was deemed successful. Age at surgery, aetiology, stricture length, and place were found to be significant predictors of stricture recurrence in a univariate analysis.

Table 1
Post-operative complication

Complication	N (%)
1 Urinary fistula	4(3)
2 Graft contracture	3 (2.3)
3 Graft failure	5 (3.8)
4 Urinary tract infection	4(3)
5 Wound infection	3(2.3)
6 Secondary bleeding from mouth	1(0.7)

Table 2
Risk factor for stricture recurrence and side effect after penile and bulbar MBG urethroplasty

Total N (%)	Restricture N (%)	PMD, N (%)	ED > 12 months	Comesis
Age, years [N]				
≤ 30 [28]	2(7.1)	4(14.2)	4 (14.2)	0
31–50 [66]	8(12.1) *	9 (13.6)	7(10.6)	1(4.5)
> 50 [36]	10(27.7) *	5(13.8)	3 (8.3)	0
Aetiology				
Idiopathic [44]	4(9.0)	7(15.9)	3(6.8)	0
BXO [26]	8(30.7) *	1(3.8)	2(7.7)	1(3.8)
Hypospadias[23]	3(13.0)	3(13.0)	2(8.7)	0
Iatrogenic [14]	3(21.4)	2(14.2)	3(21.0)	0
Infection [6]	0	2(33.3)	0	0
Trauma [10]	1 (10.0)	2(20.0)	2(20.0)	0
TURP [7]	1 (14. 2)	1(14.2)	2(28.5)	0
Stricture length [cm]				
≤ 4 [70]	2 (2.6)	3(4.2)	4(5.7)	1(1.4)
4.1–8 [35]	7(20.0) *	7(20.0)	6(17.4)	0
> 8 [25]	11(44.0)*	8(32.0)	4(16.0)	0
Stricture site				
Bulbar [68]	3(4.4)	10(14.7)	7(10.2)	0
Penile/peno-bulbar [62]	17(27.4) *	8(12.9)	7(11.2)	1(1.6)

*, $P < 0.05$ value is statistically significant, BMG: buccal mucosal graft, PMD: post-micturition dribbling, ED: erectile dysfunction.

In contrast to individuals aged 30 years, who only experienced a recurrence in 2 cases (7.1%), statistically significant failure risk was seen in patients aged 31–60 years (12.1%, n = 8) and > 60 years (27.7%, n = 10). In addition, BXO was observed to predict treatment failure in 26 individuals with penile stricture associated with this disease, with stricture recurrence occurring in 30.7% (n = 8) of these patients. Stricture length was divided into three categories: 4 cm (n = 70), 4–8 cm (n = 35), and > 8 cm (n = 25). Only 2.6% (n = 2) of strictures with a length of less than 4 cm returned, whereas failure rates were 20.0% (n = 7) and 44.0% (n = 11), respectively. According to the location of the disease, statistically significant stricture

recurrence was shown: although only 4.4% (n = 3) of 68 patients with bulbar urethral stricture presented with recurrence during follow-up, 27.4% (n = 17) of 62 patients with penile stricture did. The penile location was the sole significant independent variable for re-stricture on multivariate analysis.

Additionally, it was discovered that there was a greater prevalence of problems at the site of the penile stricture, with 15 instances following penile urethroplasty, three cases of wound-side infection, and one case of secondary infection in cases of bulbar urethral stricture. Only stricture length was shown to be linked with a greater incidence in the univariate/multivariate analysis, while PMD and ED were not found to be related to age, aetiology, or stricture location (Table 2).

Discussion

In 1941, Humby published the first description of the use of buccal mucosal graft (BMG) for urethral repair [6]. Due to its simplicity in harvesting, lack of hair, favourable surgical handling properties, compatibility with a moist environment, and early development and graft survival, it has now come to be preferred over other types of grafts. In fact, during the 1990s, it has grown in popularity. The most effective method for treating urethral stricture is still open urethroplasty. In 1993, El-Kasaby et al. published the first case study of buccal mucosal urethroplasty for the treatment of penile and bulbar urethral strictures [7]. The dorsal onlay graft urethroplasty performed on 12 patients by Barbagli in 1996 demonstrated success in all cases after that [2]. Similar outcomes were also reported by Morey and McAninch in 13 patients who had anterior urethral stricture treatment with ventral onlay BMG urethroplasty [8]. In a recent study, Barbagli found that dorsal onlay bulbar urethroplasty using BMG had an 80.2% long-term success rate. Variations of this method, according to Kulkarni, have success rates as high as 92%. In a multicenter retrospective research performed in 2008 by Barbagli and Kulkarni, 359 patients who had bulbar and penile augmentation urethroplasty utilising penile skin or oral mucosal graft, respectively, demonstrated long-term success rates of 73.8% and 74.1% [9, 10]. With a success rate of up to 87%, Asopa reported the same procedure for dorsal inlay free graft urethroplasty [11]. The disparity in success rates, however, may be attributable to variations in geographic location, sample, and BMG urethroplasty types. Comparable results between dorsal onlay and inlay methods have been shown by randomised studies and systematic reviews [12, 13]. In this article, we discuss our experiences treating penile and bulbar urethral strictures with graft augmentation urethroplasty. According to the literature, up to 90% of urethral strictures occur in the anterior urethra and up to two-thirds of up to 75% occur in the bulbar urethra [14–16], the majority of patients, 68 (52%), presented with a stricture at the bulbar site. Our dorsal onlay BMG urethroplasty used the Barbagli procedure to treat bulbar urethral stricture. If a sufficient urethral plate was available, the Asopa procedure was the recommended method for treating penile urethral stricture; otherwise, a total urethral graft replacement with the removal of diseased tissue was carried out. The study reported, penile urethral stricture had a success rate of 72.6% and bulbar urethral stricture of 95.6%. However, the penile location did not respond to either univariate or multivariate analysis. Tarun et al. (91%) [17] and Kamyar et al. (93.3%) [18] reported comparable success rates for the bulbar urethra, whereas Marco et al. (81%) [19] and Guido et al. (80%) [20]reported lower success rates.

In a recent retrospective research, Barbagli showed that penile and bulbar urethroplasty had similar outcomes[9]. For a normal penis, penile urethroplasty is a straightforward treatment, but it carries a greater chance of failure in men who come with severe BXO and failed hypospadias. In our study, penile urethroplasties were done in complicated strictures on 36 (58.0%) patients who had recurrent illness, 26 (41.9%) of whom had previously had hypospadias surgery, and 22 (35.4%) of whom had BXO. Our study also looked at the aetiology, the duration of the stricture, and several prior therapies.

Patel et al. [21] reported on 79 individuals who had penile and bulbar urethral stricture as a result of BXO in a recent retrospective study. They reported success rates that were similar to those seen in our study: 76% for 2-stage BMG urethroplasty and 75% for one stage. An increased likelihood of recurrence is connected with variables such long segment stricture 5 cm, as well as lichen sclerous, infectious, and iatrogenic aetiology, according to Kinnarid's [22] study on a comprehensive retrospective assessment of 604 cases. With a stricture length of less than 5 cm, Taha Awad et al.'s [1] study of 60 patients revealed a success rate of 100%; however, with a stricture length of more than 5 cm, the failure rate was 13%, and the restructuring was discovered at the proximal and distal end of the graft anastomosis. These findings were in line with systemic review studies by Yalcinkaya et al. [5] and Meek [23], which revealed a significant difference in the failure rate of 12.4% for strictures that were less than 5 cm in length, but a failure rate of 16.6% was seen for strictures that were larger than 5 cm. Similar results were found in our research, where only 2% of patients with strictures under 4 cm experienced recurrence during follow-up, compared to failure rates of 20.0% and 44.0% ($P < 0.5$) for strictures between 4 and 8 cm.

The results of the current study show that patients under the age of 30 who had stricture therapy had better outcomes, with a recurrence rate of 7.1% as opposed to individuals between the ages of 31 and 50 (12.1%) and above 50 (27.7%). Similar findings were seen in Taha Awad et al.'s [1] research, where patients under the age of 20 had a recurrence rate of 3.7% compared to those aged 20 to 40, 44 to 60, and 11.1% over the age of 60. For patients who had bulbar urethroplasty, Barbagli reported a success rate of 89.9% for those under 65 and a success rate of 100% for those over 65 [24].

In this study, we found that complications occurred at a rate of 15.3%, primarily in the group receiving penile urethroplasty (9.2% vs. 6.10%). Urinary fistula, graft contraction, graft failure, and urinary tract infections (UTI) accompanying wound infection were the most prevalent side effects. According to Taha Awad et. al [1], urinary tract infections (23.3%) and superficial wound infections (20%) were the most common post-operative sequelae. Additionally, in the research by Marco et al. [19], urinary fistula (3.1%), graft contracture (3.1%), and graft failure (3.1%) were the most often seen problems. The main postoperative consequence, according to Tarun et al., was wound infection [17]. Patients with problems such fistula (5.7%), wound infection (1.9%), and meatal stenosis (2.9%) were identified by Mohamed et al. [25]. The revision rate was 32.3% (n = 42), which included a fresh urethroplasty operation for recurrent stricture. Mori et al. [26] found that in 78 patients who had a multistage repair for challenging anterior urethral strictures, there were 10.3% of revisions and a 19.2% total complication rate.

Conclusion

The excellent outcomes of BMG urethroplasty in treating anterior urethral stricture, with a success rate of 84.6%, are proof of the improvement of care delivery in resource-constrained nations, such as Nepal. Therefore, BMG urethroplasty is a potential surgical procedure for the best urethral stricture treatment. According to the results of the univariate analysis, the patient's age at the time of surgery, the cause of the stricture, its duration, and its location were all highly significant predictors of stricture recurrence. Intriguingly, the multivariate analysis found that the penile location was the only independent variable substantially linked with remodelling. The fact that this study is retrospective and single-center calls for more, larger-scale research on BMG urethroplasty to further support its high success rate.

Abbreviations

AUR Acute urine retention

BXO Balanitis Xerotica Obliterans

BMG Buccal mucosal graft

DVIU Direct Visualization Internal Urethrotomy

ED Erectile dysfunction

PMD Post-micturition dribbling

PDE5 Phosphodiesterase 5

SPC Suprapubic catheterization

SICU Surgical intensive care unit

URS Ureteroscope

Declarations

Acknowledgement

The authors express gratitude to the esteemed patients' record staff of Vayodha (ISA certified) hospital for kidney disease and Urology, Kathmandu, Nepal.

Funding

The authors did not receive any financial support for this endeavor.

Availability of data and materials

The original contribution of the study mentioned in this article is available with the first author GR. The data and information were obtained by the corresponding author.

Authors' contributions

The conceptualization of the study, data acquisition, analysis, interpretation, and writing were undertaken by RG, who also wrote the manuscript. RG, HW, WA accomplished the literature searches and analyses. TX, NL, SG, and WX reviewed the manuscript. All authors are in agreement with the submission and have read and approved the final manuscript.

Competing interests

The authors of this paper have declared that they possess no competing interests.

Ethics approval and consent to participate

All procedures have been carried out in accordance with the applicable guidelines and regulations. A written consent was obtained from all patients and informed consent was obtained to participate from the parents/legal guardians of the patients below the age of 16 years, for the information to be stored in the hospital database and used for research. Ethical approval to conduct the study was obtained from the ethical Instructional review committee of VHPvt. Ltd, Kathmandu, Nepal. (Reference No: VHPL-IRC/389/076/077, Date: 28/03/2019.

Consent for publication

This study was conducted on human models. A written consent was obtained from all patients and their relatives to use their data and information in a research study for publication.

References

1. Awad SMT, Ahmed MAM, Abdalla YMO, Ahmed M, Gismalla MD. Buccal mucosal graft urethroplasty for anterior urethral stricture, experience from a low-income country. BMC Urol. 2021;21(1):171.
2. Barbagli G, Selli C, Tosto A, Palminteri E. Dorsal free graft urethroplasty. J Urol. 1996;155(1):123-6.
3. Chapple C, Andrich D, Atala A, Barbagli G, Cavalcanti A, Kulkarni S, et al. SIU/ICUD Consultation on Urethral Strictures: The management of anterior urethral stricture disease using substitution urethroplasty. Urology. 2014;83(3 Suppl):S31-47.
4. Javali TD, Katti A, Nagaraj HK. Management of recurrent anterior urethral strictures following buccal mucosal graft-urethroplasty: A single center experience. Urol Ann. 2016;8(1):31-5.
5. Yalcinkaya F, Zengin K, Sertcelik N, Yigitbasi O, Bozkurt H, Sarikaya T, et al. Dorsal onlay buccal mucosal graft urethroplasty in the treatment of urethral strictures - does the stricture length affect success? Adv Clin Exp Med. 2015;24(2):297-300.

6. Humby G, Higgins TT. A one-stage operation for hypospadias. British Journal of Surgery. 2005;29(113):84-92.
7. el-Kasaby AW, Fath-Alla M, Noweir AM, el-Halaby MR, Zakaria W, el-Beialy MH. The use of buccal mucosa patch graft in the management of anterior urethral strictures. J Urol. 1993;149(2):276-8.
8. Morey AF, McAninch JW. When and how to use buccal mucosal grafts in adult bulbar urethroplasty. Urology. 1996;48(2):194-8.
9. Barbagli G, Kulkarni SB, Fossati N, Larcher A, Sansalone S, Guazzoni G, et al. Long-term followup and deterioration rate of anterior substitution urethroplasty. J Urol. 2014;192(3):808-13.
10. Kulkarni S, Barbagli G, Sansalone S, Lazzeri M. One-sided anterior urethroplasty: a new dorsal onlay graft technique. BJU Int. 2009;104(8):1150-5.
11. Pisapati VL, Paturi S, Bethu S, Jada S, Chilumu R, Devraj R, et al. Dorsal buccal mucosal graft urethroplasty for anterior urethral stricture by Asopa technique. Eur Urol. 2009;56(1):201-5.
12. Mangera A, Osman N, Chapple C. Evaluation and management of anterior urethral stricture disease. F1000Res. 2016;5.
13. Mangera A, Patterson JM, Chapple CR. A systematic review of graft augmentation urethroplasty techniques for the treatment of anterior urethral strictures. Eur Urol. 2011;59(5):797-814.
14. Stein DM, Thum DJ, Barbagli G, Kulkarni S, Sansalone S, Pardeshi A, et al. A geographic analysis of male urethral stricture aetiology and location. BJU Int. 2013;112(6):830-4.
15. Fenton AS, Morey AF, Aviles R, Garcia CR. Anterior urethral strictures: etiology and characteristics. Urology. 2005;65(6):1055-8.
16. Palminteri E, Berdondini E, Verze P, De Nunzio C, Vitarelli A, Carmignani L. Contemporary urethral stricture characteristics in the developed world. Urology. 2013;81(1):191-6.
17. Shrime MG, Sleemi A, Ravilla TD. Charitable platforms in global surgery: a systematic review of their effectiveness, cost-effectiveness, sustainability, and role training. World J Surg. 2015;39(1):10-20.
18. Tavakkoli Tabassi K, Ghoreifi A. Dorsally Placed Buccal Mucosal Graft Urethroplasty in Treatment of Long Urethral Strictures Using One-Stage Transperineal Approach. Int Sch Res Notices. 2014;2014:792982.
19. Spilotros M, Sihra N, Malde S, Pakzad MH, Hamid R, Ockrim JL, et al. Buccal mucosal graft urethroplasty in men-risk factors for recurrence and complications: a third referral centre experience in anterior urethroplasty using buccal mucosal graft. Transl Androl Urol. 2017;6(3):510-6.
20. Barbagli G, Guazzoni G, Palminteri E, Lazzeri M. Anastomotic fibrous ring as cause of stricture recurrence after bulbar onlay graft urethroplasty. J Urol. 2006;176(2):614-9; discussion 9.
21. Patel CK, Buckley JC, Zinman LN, Vanni AJ. Outcomes for Management of Lichen Sclerosus Urethral Strictures by 3 Different Techniques. Urology. 2016;91:215-21.
22. Kinnaird AS, Levine MA, Ambati D, Zorn JD, Rourke KF. Stricture length and etiology as preoperative independent predictors of recurrence after urethroplasty: A multivariate analysis of 604 urethroplasties. Can Urol Assoc J. 2014;8(5-6):E296-300.

23. Meeks JJ, Erickson BA, Granieri MA, Gonzalez CM. Stricture recurrence after urethroplasty: a systematic review. J Urol. 2009;182(4):1266-70.
24. Barbagli G, De Angelis M, Romano G, Lazzeri M. Long-term followup of bulbar end-to-end anastomosis: a retrospective analysis of 153 patients in a single center experience. J Urol. 2007;178(6):2470-3.
25. Selim M, Salem S, Elsherif E, Badawy A, Elshazely M, Gawish M. Outcome of staged buccal mucosal graft for repair of long segment anterior urethral stricture. BMC Urol. 2019;19(1):38.
26. Mori R, Wood H, Angermeier K. PD3-01 MULTISTAGE BUCCAL MUCOSA GRAFT URETHROPLASTY FOR COMPLEX ANTERIOR URETHRAL STRICTURES. Journal of Urology. 2014;191(4S):e19-e20.

Figures

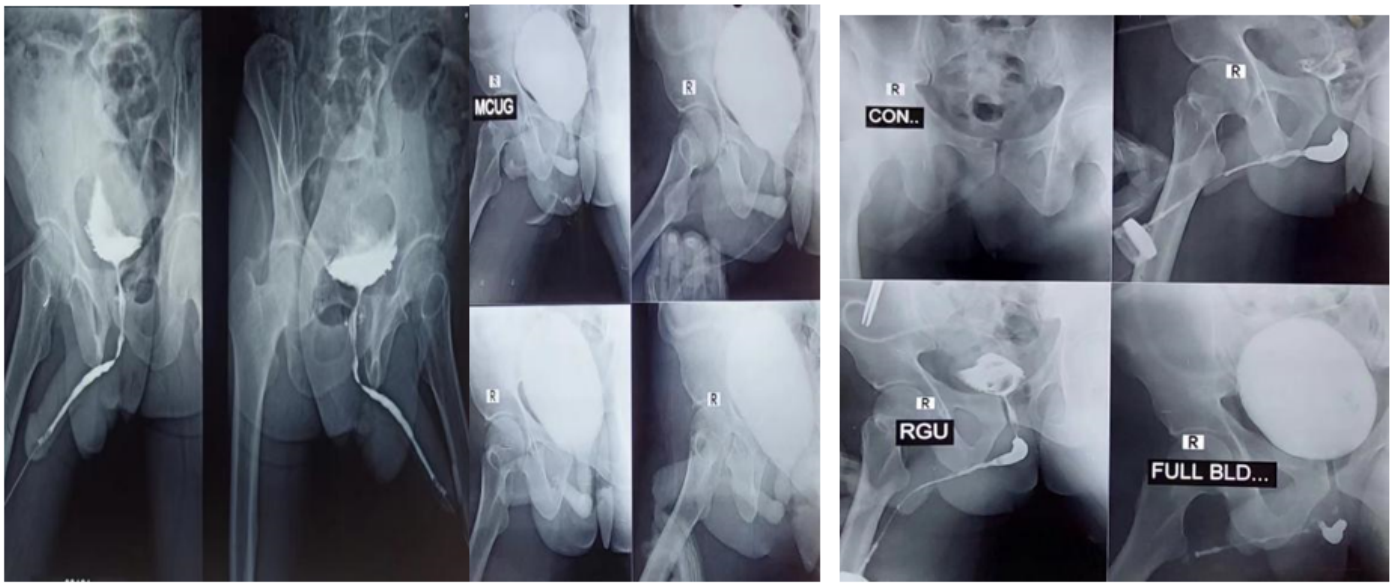

Fig 1.a Fig 1.b Fig 1.c

Figure 1

a,b,c: All the patients X-ray is a diagnostic test done to look anterior urethral stricture by Anterograde/retrograde urethography preoperatively based on outpatient clinic visits.

Fig 2.a Fig 2.b

Figure 2

a: Long strictures from cheek BMG were extracted, and the size of the graft was proportionate to the stricture length with a typical 2.5 cm width. Bipolar electrocautery was used to preserve hemostasis on the side of the BMG that was harvested. Compressive gauze was left in place and removed at the recovery region on the side of the opposite cheek. (Fig 2.b)

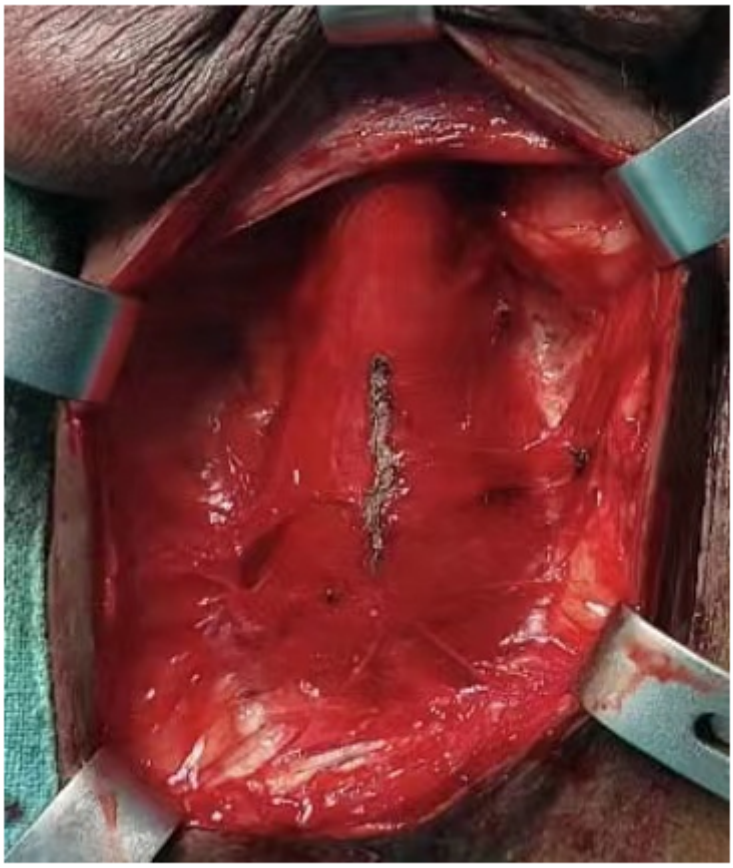

Figure 3

The bulbar urethra was revealed when the skin, colles fascia, and bulbospongiosum muscle were dissected.

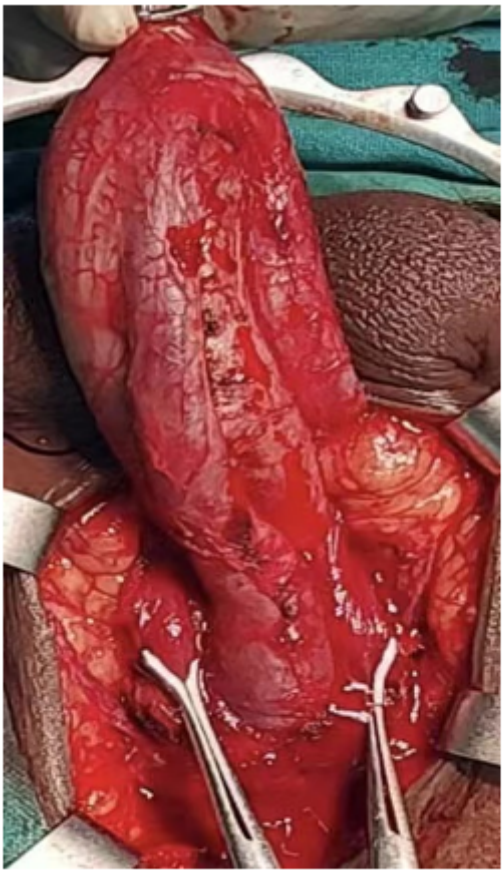

Figure 4

Stricture and corpus cavernosum septum mobilisation of the corpus spongiosum were seen.

Figure 5

Under direct view, the urethra was opened dorsally (the connected portion of the corpus cavernosum to the corpus spongiosum), and the graft was collected by BMG.

Figure 6

A silicon catheter of the proper size (FR 14 or 16) has been inserted.

Figure 7

Using 4/0 vicyl (cutting body with batch number 2443), the borders of the graft were constantly sutured to the urethra, corpus spongiosum, and corpus cavernosum on both sides.