

A Hospital Based Assessment of Ventral-Inlay Buccal Mucosal Graft Urethroplasty (VI-BMGU) in Female Urethral Stricture Disease (USD)Arshad Jamal¹, Rana Pratap Singh²¹Additional Professor, Department of Urology, Rajendra Institute of Medical Sciences (RIMS), Ranchi, Jharkhand, India²Associate Professor, Department of Urology, Rajendra Institute of Medical Sciences (RIMS), Ranchi, Jharkhand, India

Received: 11-09-2023 / Revised: 25-10-2023 / Accepted: 29-11-2023

Corresponding Author: Dr. Rana Pratap Singh

Conflict of interest: Nil

Abstract**Aim:** The aim of the study was to assess ventral-inlay buccal mucosal graft urethroplasty (VI-BMGU) in female urethral stricture disease (USD).**Methods:** The present study was conducted at department of Urology, Rajendra Institute of medical sciences (RIMS), Ranchi, Jharkhand, India for one year and retrospective review was performed on 10 females with urethral stricture who underwent VI-BMGU. Full informed consent was taken from all patients**Results:** The mean age at the time of surgery was 52 (range, 28–75) years. Mean stricture length was 2.1 (range, 0.1–5) cm and mean stricture caliber was 11 (range, 0–18) Fr. The mean size of catheter that was left in place after surgery was 18 (range, 14–30) Fr, with mean catheter duration of 17 (range, 2–30) days. Mean postoperative follow-up was 33 (range, 7–106) months. Presenting symptoms included obstructive voiding symptoms (80%), urinary frequency (60%), dysuria (60%), urgency (50%), urinary tract infection (40%), incontinence (30%), urinary retention (26%), bladder pain (8%), dyspareunia/pelvic pain (8%), and hematuria (5%). 10% reported pre-operative. All the women could urinate successfully after foley removal. There was an improvement in AUA symptom score and Qmax and a reduction in PVR at 3, 6, and 12 months. Cystopanendoscopy (CPE) showed no stricture in the second patient, and urethra could be calibrated with an 18 Fr Foley's catheter.**Conclusion:** Female buccal BMG urethroplasty is a safe and effective management option for female urethral stricture. Women should be referred to centers where female urethroplasty is performed for surgical consideration, rather than undergo repeated urethral dilations that have poor long-term success.**Keywords:** female urethral stricture disease, buccal mucosal graftThis is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Bladder outlet obstruction (BOO) is an uncommon entity in women. The incidence is only 2.7–8% of women referred for voiding symptoms. [1] Female urethral stricture (FUS) is a more rare subgroup of female BOO and accounts for only 4–13% cases of female BOO. [2,3] Compared to male strictures, this lower incidence is attributed to the shorter length, straighter course, greater anatomical mobility, and the protection provided by the bony symphysis over its entire length. [4]

Female urethral stricture is an under-recognized condition and estimates as to its true burden vary. Older studies have put estimates of prevalence at 3–8% of all women, or 4–18% of women with bladder outlet obstruction. [4,5] One more recent study analyzing a nationally-represented dataset showed the annual rate of physician office visits for female urethral stricture to be 186 per 100,000 (0.19%),

with increasing prevalence among women over 65 years of age. [6] The etiology is typically due to iatrogenic, traumatic, or idiopathic causes.³ Diagnosis can be difficult due to wide and varying presenting symptoms, including dysuria, urgency, frequency, straining, incomplete emptying or urinary retention. [7,8] Treatment for female urethral strictures has traditionally been with dilation and/or self-catheterization; however, there has been an increasing use of urethroplasty due to improved success rates. [9-11]

Comparatively, success rates for urethroplasty range from 73–100% for vaginal or labial or flap urethroplasty (mean estimates 80% and 91%, respectively) and 50–100% for oral mucosal graft urethroplasty (mean estimate 94%). [3] Surgical techniques for female urethroplasty vary, with grafts or flaps being utilized and reconstruction performed

at the ventral or dorsal urethra. As a result, female urethroplasty outcomes data is often limited by small sample sizes, single institution studies, disparate techniques of reconstruction, and varied methods to assess surgical success. Reconstruction with oral mucosal graft has shown excellent success in the repair of female urethral strictures to-date with the largest series evaluating 15 patients with 12 month follow-up data. [12] Free grafts have commonly been used dorsally using an onlay technique. [12-14] Studies on ventral onlay [15,16] are also available where a plane is created between the urethra and vagina at 6 o'clock.

The aim of the study was to assess ventral-inlay buccal mucosal graft urethroplasty (VI-BMGU) in female urethral stricture disease (USD).

Materials and Methods

The present study was conducted at department of Urology, Rajendra Institute of medical sciences (RIMS), Ranchi, Jharkhand, India for one year and retrospective review was performed on 10 females with urethral stricture who underwent VI-BMGU. Full informed consent was taken from all patients. The diagnostic criteria for defining stricture were AUA symptom score more than 7 and/or a maximum urinary flow rate of less than 12 ml/s and/or an inability to calibrate the urethra with a 12 Fr Foley's catheter and/or ultrasonography showing a thick-walled/trabeculated urinary bladder with a significant postvoid residual urine (PVRU >100 ml).

Patients with abnormal focal neurological examination or neurogenic bladder were excluded. Strict diagnostic criteria have not been defined for female USD because of its low incidence. Cystoscopy was done with a 6 Fr 30° pediatric

cystoscope (Olympus A3765A) to confirm the diagnosis of urethral stricture. Postoperatively, the women were followed up at 3, 6, and 12 months after surgery with AUA symptom score, uroflowmetry, and PVR estimation. Recurrence in symptoms, increase in AUA symptom score, maximum flow rate (Qmax) <12 ml/s, failure to calibrate the urethra with an 18 Fr catheter, and demonstration of narrowing of the urethra on CPE with a standard 19 Fr sheath were used to define recurrence of the stricture.

Surgical Technique

Cystoscopy was done with a 6 Fr 30° pediatric cystoscope (Olympus A3765A) to confirm the diagnosis of urethral stricture. The urethra was progressively dilated by inserting a guidewire and passing a nontoothed forceps across the urethral length. Strictured urethral mucosa and spongiosum were incised at 6 o'clock position until the urethra was wide enough to allow a nasal speculum to be inserted. Homeostasis was achieved with sparse use of bipolar cautery. Now, the urethral bed was deemed ready for the placement of buccal mucosa. The normal 5-0 PDS needle was straightened to a J-shape. This helped in taking stitches at the proximal edge of the incised urethra, to fix the buccal mucosa. The buccal mucosa was fixed to the urethra at four points: two at proximal edge of the incised urethra and two at the external meatus. Additional stitches were taken laterally, if necessary. A 16 Fr silicon Foley's catheter was placed to drain the bladder and provide extrinsic compression for the buccal mucosa on to the urethral bed. Catheter removal was done after 1 month.

Results

Table 1: Characteristics of female dorsal inlay buccal mucosa graft (FD-BMG) urethroplasty

Characteristics	N	P Value
Age, years	52 [28–75]	0.40
Stricture length, cm	2.1 [0.1–5]	0.20
Stricture caliber, Fr	11 [0–18]	0.12
Catheter size, Fr	18 [14–30]	0.10
Catheter time, days	17 [2–30]	0.60
Follow-up, months	33 [7–106]	

The mean age at the time of surgery was 52 (range, 28–75) years. Mean stricture length was 2.1 (range, 0.1–5) cm and mean stricture caliber was 11 (range, 0–18) Fr. The mean size of catheter that was left in place after surgery was 18 (range, 14–30) Fr, with mean catheter duration of 17 (range, 2–30) days. Mean postoperative follow-up was 33 (range, 7–106) months.

Table 2: Presenting symptoms

Presenting symptoms	%
Obstructive voiding	80%
Urinary Frequency	60%
Dysuria	60%
Urgency	50%
Urinary tract infection	40%

Incontinence	30%
Urinary retention	20%
Bladder pain	10%
Dyspareunia/pelvic pain	10%
Hematuria	10%
Pre-operative incontinence	10%

Presenting symptoms included obstructive voiding symptoms (80%), urinary frequency (60%), dysuria (60%), urgency (50%), urinary tract infection (40%), incontinence (30%), urinary retention (26%), bladder pain (8%), dyspareunia/pelvic pain (8%), and hematuria (5%). 10% reported pre-operative.

Table 3: Patient characteristics

Age	Etiology	Previous dilation	Native urethral lumen size	Preoperative			Site of stricture	Outcome	Postoperative			Follow-up in months
				AUA	Q _{max}	PVR			AUA	Q _{max}	PVR	
40	Idiopathic	Yes	8	30	NA	150	Dis	Success	10	24	24	26
34	Idiopathic	No	12	24	9	235	Dis	Failure	24	8	350	24
52	Idiopathic	Yes	10	25	7	85	Mid	Success	6	25	10	22
38	Postcaruncle excision	Yes	10	28	8	125	Mid	Success	9	23	25	24
25	Post-TURBT	Yes	8	22	NA	80	Pro + mid	Success	24	16	120	20
22	Idiopathic	Yes	12	27	10	170	Mid	Success	8	18	60	16
30	Idiopathic	No	12	25	8	128	Dis	Success	7	22	40	16
42	Idiopathic	Yes	10	32	4	249	Dis	Success	11	28	30	12
44	Idiopathic	Yes	10	29	8	59	Dis	Success	8	22	15	14
40	Idiopathic	Yes	12	26	9	75	Mid + dis	Success	10	26	16	15

All the women could urinate successfully after foley removal. There was an improvement in AUA symptom score and Qmax and a reduction in PVR at 3, 6, and 12 months. Cystopanendoscopy (CPE) showed no stricture in the second patient, and urethra could be calibrated with an 18 Fr Foley's catheter.

Discussion

Female urethral stricture disease is relatively rare, and thus outcomes data for female urethral reconstruction are limited. Furthermore, techniques for female urethroplasty are diverse and include vaginal and labial flaps or oral grafts which can be placed via a ventral, dorsal, or circumferential approach. Unfortunately most of the published data are from small series and often includes various techniques for reconstruction. [17] This leads to heterogeneity of outcomes data, with difficulty assessing outcomes of any single approach. There is considerable uncertainty in diagnosing FUS due to lack of agreed-upon criteria for FUS diagnosis. Urologists often use various factors such as symptoms, urethral meatal appearance, history of difficult instrumentation, urethroscopy, radiography and supportive urodynamic standards to diagnose FUS. [18] Although Urethral dilatation (UD) has long been used as the only method to treat this condition, this practice is often considered overused and unnecessary, posing a considerable expenditure on the healthcare system. [19,20]

The terms ventral "inlay" and ventral "onlay" are often intermingled in the literature. Creating a plane of dissection between the urethra at 6 o'clock position and the vagina, incising the entire thickness

of urethra, and applying the graft or flap should be called ventral "onlay." However, when the graft is applied endoluminally through the urethra, cutting only the urethral mucosa and fibrotic tissue below and not opening the entire urethra and not creating a plane between the urethra and vagina should be called ventral "inlay." Upon evaluation of other series that report failures, Sharma et al. report that in the one failure in their series, the time to failure was 3 months and this patient required repeated dilations for several months but was ultimately stricture-free at 12 months. [12] In the Goel et al. series, 3 of 8 patients had recurrence, and all were treated with dilation and subsequently required self-catheterization to maintain patency. [13] Pain may be reduced by avoiding the dorsal mobilization of the urethra. In the ventral approach, dissection is not done in the clitoral bed which preserves its vascular and neural supply which leads to decreased intra-operative blood loss and lesser sexual dysfunction in the post-operative period. The external urinary sphincter in female has been shown in previous studies to be thinner in the ventral part and thicker in the dorsal part. Since the striated muscle fibers are relatively deficient in the ventral part, the ventral approach may have a theoretically benefit. [21,22]

However, the advantages of dorsal approach are that there is a lesser chance of sacculation due to strong mechanical support and vascular bed provided by clitoral/cavernosal tissue and a more physiological urethral meatus directed upward. [13] Although the incidence of urethral stricture in female is considered low, we were able to enroll 10 patients in 18 months because our center is a tertiary care

referral center and with a lack of surgical expertise in this rare disease at other nearby centers. This is also because female urethral stricture is usually an under-diagnosed condition [14] and it was treated in the past with repeated urethral dilatations and internal urethrotomies.

Conclusion

Female buccal BMG urethroplasty is a safe and effective management option for female urethral stricture. Women should be referred to centers where female urethroplasty is performed for surgical consideration, rather than undergo repeated urethral dilations that have poor long-term success.

References

- Carr LK, Webster GD (1996) Bladder outlet obstruction in women. *Urol Clin N Am* 23 (3): 385–391.
- Groutz A, Blaivas JG, Chaikin DC (2000) Bladder outlet obstruction in women: definition and characteristics. *Neurourol Urodyn Off J Int Cont Soc* 19(3):213–220
- Osman NI, Mangera A, Chapple CR (2013) A systematic review of surgical techniques used in the treatment of female urethral stricture. *Eur Urol* 64(6):965–973
- NITTI et al (1999) Diagnosing bladder outlet obstruction in women. *J Urol* 161(5):1535–1540.
- Blaivas JG, Groutz A. Bladder outlet obstruction nomogram for women with lower urinary tract symptomatology. *Neurourology and Urodynamics: Official Journal of the International Continence Society.* 2000;19(5): 553-64.
- Santucci RA, Payne CK, Saigal CS, Urologic Diseases in America Project. Office dilation of the female urethra: a quality of care problem in the field of urology. *The Journal of urology.* 2008 Nov;180(5):2068-75.
- Keegan KA, Nanigian DK, Stone AR. Female urethral stricture disease. *Current urology reports.* 2008 Sep;9(5):419-23.
- Hoag N, Chee J. Surgical management of female urethral strictures. *Translational andrology and urology.* 2017 Jul;6(Suppl 2):S76.
- Faiena I, Koprowski C, Tunuguntla H. Female Urethral Reconstruction. *J Urol* 2016;195:557-67.
- Önol FF, Antar B, Köse O, Erdem MR, Önol ŞY. Techniques and results of urethroplasty for female urethral strictures: our experience with 17 patients. *Urology.* 2011 Jun 1;77(6):1318-24.
- Petrou SP, Rogers AE, Parker AS, Green KM, McRoberts JW. Dorsal vaginal graft urethroplasty for female urethral stricture disease. *BJU international.* 2012 Dec;110 (11 c):E1090-5.
- Sharma GK, Pandey A, Bansal H, et al. Dorsal onlay lingual mucosal graft urethroplasty for urethral strictures in women. *BJU Int* 2010;105:1309-12.
- Goel A, Paul S, Dalela D, Sankhwar P, Sankhwar SN, Singh V. Dorsal onlay buccal mucosal graft urethroplasty in female urethral stricture disease: a single-center experience. *International urogynecology journal.* 2014 Apr ;25:525-30.
- Singh M, Kapoor R, Kapoor D, Kapoor R, Srivastav A, Chipde S. Dorsal onlay vaginal graft urethroplasty for female urethral stricture. *Indian Journal of Urology: IJU: Journal of the Urological Society of India.* 2013 Apr;29(2): 124.
- Önol FF, Önol ŞY, Tahra A, Boylu U. Ventral inlay labia minora graft urethroplasty for the management of female urethral strictures. *Urology.* 2014 Feb 1;83(2):460-4.
- Gozzi C, Roosen A, Bastian PJ, Karl A, Stief C, Tritschler S. Volar onlay urethroplasty for reconstruction of female urethra in recurrent stricture disease. *BJU international.* 2011 Jun; 107(12):1964-6.
- Osman NI, Chapple CR. Contemporary surgical management of female urethral stricture disease. *Current Opinion in Urology.* 2015 Jul 1;25(4):341-5.
- Keegan KA, Nanigian DK, Stone AR (2008) Female urethral stricture disease. *Curr Urol Rep* 9(5):419–423.
- Santucci RA, Payne CK, Saigal CS (2008) Urologic diseases in America project office dilation of the female urethra: a quality of care problem in the field of urology. *J Urol* 180(5): 2068–2075.
- Wu JN, Stone AR. Female urethral stricture disease: diagnosis and management. *AUA Update Series* 2011: Volume 30. Lesson 7: 16 - 19. AUA Office of Education. 2011.
- Hoag N, Gani J, Chee J. Vaginal-sparing ventral buccal mucosal graft urethroplasty for female urethral stricture: a novel modification of surgical technique. *Investigative and Clinical Urology.* 2016 Jul 1;57(4):298-302.
- Ackerman AL, Blaivas J, Anger JT. Female urethral reconstruction. *Current bladder dysfunction reports.* 2010 Dec;5:225-32.