Section: Urology

Original Research Article

OUTCOMES OF ANTERIOR ONLAY BUCCAL MUCOSAL GRAFT URETHROPLASTY IN WOMEN WITH URETHRAL STRICTURE: A SINGLE-CENTER PROSPECTIVE STUDY

Narendar Tiramdas[1], Yanala Vinay Kumar Reddy[2], S. Shubhneet Singh Dua[3], Raghava Tiramdas[4]

[1]*Associate Professor, Department of Urology, Kamineni Institute of Medical Sciences Narketpally, Nalgonda, Telangana, India.*
[2]*Assistant Professor, Department of Urology, Kamineni Institute of Medical Sciences Narketpally, Nalgonda, Telangana, India.*
[3]*Resident, Department of Urology, Kamineni Institute of Medical Sciences Narketpally, Nalgonda, Telangana, India.*
[4]*MBBS Student, GMC, Secunderabad, Hyderabad, Telangana, India.*

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Corresponding Author:
Dr. Yanala Vinay Kumar Reddy,
Assistant Professor, Department of Urology, Kamineni Institute of Medical Sciences Narketpally, Nalgonda, Telangana, India.
Email: vinaydruro@gmail.com

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ABSTRACT

Background: Female urethral stricture, though uncommon, is a recognized cause of bladder outlet obstruction in women and often leads to bothersome lower urinary tract symptoms. While dilatation offers only temporary relief and is associated with frequent recurrence, substitution urethroplasty using buccal mucosa has shown more reliable outcomes. The anterior onlay approach provides a stable graft bed with limited vaginal dissection and favorable anatomical support. The objective is to present early experience and short-term outcomes of anterior onlay buccal mucosal graft urethroplasty in women with urethral stricture at a single tertiary care institution.

Materials and Methods: Between October 2022 and March 2025, twelve women with symptomatic strictures unresponsive to prior dilatation underwent anterior onlay buccal mucosal graft urethroplasty. Preoperative assessment included history, examination, urine analysis, serum creatinine, ultrasonography with post-void residual measurement, and uroflowmetry. Follow-up was scheduled at 1, 3, and 6 months, then annually, with uroflowmetry and ultrasound reassessment. Surgical success was defined as a maximum flow rate (Qmax) above 15 mL/s without further intervention.

Results: The mean patient age was 60.7 years (range 45–72), and the average stricture length measured 1.7 cm. Most strictures were located in the mid to distal urethra. Coexisting conditions included lichen sclerosus (n=2), evaluation for renal transplantation (n=1), and long-standing voiding dysfunction since childhood (n=1). No intra- or perioperative complications occurred. At a mean follow-up of 16 months (range 1–30), surgical success was achieved in 10 of 12 patients (83.3%). Two patients developed early recurrence and were successfully managed with calibration and topical tacrolimus.

Conclusion: Anterior onlay buccal mucosal graft urethroplasty appears to be a safe and effective technique for women with urethral stricture, providing encouraging short-term outcomes. Larger, multicenter studies with longer follow-up are needed to confirm long-term durability and patient-reported benefits.

Keywords: Female urethral stricture; buccal mucosal graft; anterior onlay urethroplasty; outcomes.

INTRODUCTION

Female urethral stricture (FUS) is an infrequent but clinically significant cause of bladder outlet obstruction in women. Its reported prevalence is low, partly due to under-recognition and varying diagnostic criteria. Patients often present with non-specific lower urinary tract symptoms such as frequency, urgency, recurrent urinary tract infections, poor urinary stream, or difficulty during

catheterization.[1] Because these symptoms overlap with more common conditions, diagnosis is frequently delayed.[2]

Conservative options like repeated dilatation or direct vision internal urethrotomy have traditionally been used but generally provide only short-lived improvement, with recurrence and worsening fibrosis in many patients.[3,4] For this reason, reconstructive procedures have increasingly become the preferred management strategy in women with definitive strictures.

Among the available reconstructive approaches, substitution urethroplasty using buccal mucosa has gained popularity. The graft provides several advantages, including a thick epithelium, good elasticity, robust vascularity, and resistance to infection.[5] Placement of the graft on the dorsal (anterior) surface is favored by many surgeons, as the corporal bodies provide a well-vascularized and stable graft bed, while avoiding dissection of the vaginal wall and reducing the risk of postoperative fistula or incontinence.[2,6]

Although published outcomes of buccal mucosal graft urethroplasty in women have generally been encouraging, most series are limited to small cohorts with relatively short follow-up.

The present study was conducted with the aim of assessing the feasibility, perioperative safety, and early functional results of anterior onlay buccal mucosal graft urethroplasty for female urethral stricture in a tertiary care setting.

MATERIALS AND METHODS

Study Design and Setting: his was a prospective observational study carried out in the Department of Urology, Kamineni Institute of Medical Sciences, Narketpally, Telangana, from October 2022 to March 2025. Approval was obtained from the institutional ethics committee, and informed consent was taken from all participants before enrollment.

Patient Selection: Women presenting with lower urinary tract symptoms (LUTS) suspicious for bladder outlet obstruction were evaluated. Initial work-up included a detailed history and physical examination. Patients with urethral involvement due to malignancy, previous pelvic radiotherapy, or active urinary infection at the time of assessment were excluded.

Those with suspected narrowing of the urethra underwent a trial of monthly dilatation along with topical estrogen application for two to three months. Women who continued to have symptoms and demonstrated a maximum flow rate (Qmax) <15 mL/s on uroflowmetry with an obstructed pattern underwent further imaging with micturating or voiding cystourethrogram (MCUG/VCUG) and diagnostic urethroscopy. Patients with a definite stricture on urethroscopy and no alternative pathology were selected for urethroplasty.

Preoperative Evaluation: Routine investigations included urine analysis, urine culture, serum creatinine, and ultrasonography of the kidney, ureter, and bladder (KUB) with post-void residual (PVR) volume estimation. Uroflowmetry was performed in all cases before surgery.

Surgical Technique: All operations were performed under either regional or general anesthesia by the same surgical team. A suprameatal inverted U-shaped incision was used to expose the urethra, and traction sutures were placed at 3 and 9 o'clock positions for exposure. A dorsal urethrotomy was made at the 12 o'clock position, extending from the external meatus proximally into healthy urethral mucosa.

Buccal mucosa was harvested from the inner cheek, defatted, and trimmed to the required length. The graft was sutured to the urethral mucosa with interrupted 3-0 Vicryl over an 18 Fr Foley catheter. Quilting sutures anchored the graft to the clitoral body, ensuring a well-vascularized bed. The catheter was maintained for three weeks.

Follow-up: Patients were followed up at 1, 3, and 6 months, at 1 year, and annually thereafter. At each visit, evaluation included symptom review, urine analysis, uroflowmetry, and ultrasonography with PVR estimation.

Outcome Measures: The primary endpoint was surgical success, defined as a Qmax >15 mL/s on uroflowmetry without the need for repeat dilatation or any secondary intervention. Secondary endpoints included postoperative complications, recurrence, and donor site morbidity.

Statistical Analysis: Continuous variables were expressed as mean ± standard deviation (SD) and ranges, while categorical variables were presented as frequencies and percentages. Pre- and postoperative uroflowmetry values (Qmax, average flow, and PVR) were compared using a paired t-test. A p value of <0.05 was considered statistically significant. Statistical analyses were performed using IBM SPSS Statistics.

RESULTS

Demographic and Clinical Profile: Twelve women underwent anterior onlay buccal mucosal graft urethroplasty. The mean age was 60.7 ± 8.2 years (range: 45–72). The average stricture length was 1.7 ± 0.6 cm (range: 1–3 cm). The majority of strictures were located in the mid to distal urethra. Preoperative challenges included lichen sclerosus (n=2, 16.7%), surgery for pre-transplant evaluation (n=1, 8.3%), and a history of poor urinary stream since childhood (n=1, 8.3%).

Functional Outcomes: There was a statistically significant improvement in urinary flow parameters following surgery. Mean Qmax increased by more than twofold, average flow rate nearly tripled, and post-void residual urine volume was reduced by approximately 80% (Table 2). These improvements

were consistent at all follow-up visits, and no patient required re-catheterization postoperatively.

Follow-up and Success Rate: The mean follow-up duration was 16 ± 7.4 months (range: 1–30). Surgical success, defined as Qmax >15 mL/s without additional intervention, was achieved in 10 patients (83.3%). Two patients (16.7%) developed recurrence of symptoms within one month. Both were managed with urethral calibration and topical tacrolimus ointment, with subsequent symptomatic improvement.

Complications: No intraoperative complications occurred. Postoperative morbidity was minimal: one patient (8.3%) developed mild oral donor site discomfort and another (8.3%) had a urinary tract infection, both resolving with conservative measures. No cases of urinary incontinence, graft contracture, or significant donor site morbidity were reported during follow-up.

Table 1: Baseline Characteristics of Study Population

Parameter	Value
Total patients	12
Mean age (years)	60.7 ± 8.2 (range: 45–72)
Mean stricture length	1.7 ± 0.6 cm (range: 1–3)
Stricture location	Mid to distal urethra
Preoperative challenges	Lichen sclerosus (n=2); Pre-transplant (n=1); Poor stream since childhood (n=1)

Table 2: Uroflowmetry Parameters Pre- and Post-Urethroplasty

Parameter	Preoperative (Mean ± SD)	Postoperative (Mean ± SD)	p value
Maximum flow rate (Qmax, mL/s)	8.2 ± 2.4	18.6 ± 3.1	<0.001
Average flow rate (mL/s)	4.1 ± 1.2	11.2 ± 2.2	<0.001
Post-void residual (mL)	112 ± 45	22 ± 10	<0.001

Table 3: Postoperative Outcomes and Complications

Outcome	Number of Patients (%)
Surgical success (Qmax >15 mL/s)	10 (83.3%)
Recurrence	2 (16.7%)
Intraoperative complications	0
Postoperative complications	Oral donor site discomfort (n=1, 8.3%); UTI (n=1, 8.3%)
Incontinence	0

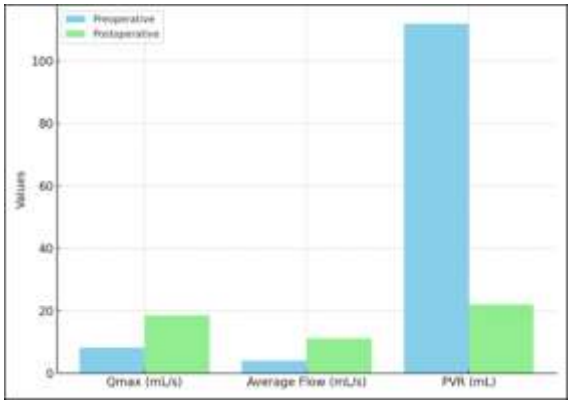

Figure 1: Uroflowmetry Parameters Before and After Urethroplasty

DISCUSSION

In this series, anterior onlay buccal mucosal graft (BMG) urethroplasty resulted in a success rate of 83.3% at an average follow-up of 16 months. No patients developed de novo incontinence, and morbidity was minimal. Two women (16.7%) experienced recurrence during the early postoperative period, but both could be managed successfully with calibration and topical tacrolimus rather than requiring a second urethroplasty.

The outcomes in the present study are in line with those reported previously. Osman et al,[1] in their systematic review, described success rates for female BMG urethroplasty ranging between 62.5% and 100%, with follow-up durations extending from 7 to 33 months. Similarly, Barbagli et al,[5] achieved an 82% success rate in 17 patients after a mean follow-up of 28 months. Palminteri et al,[7] later reported 87% success at 24 months in 21 women. These published outcomes compare well with the 83.3% success obtained in our study.

The average stricture length in our cohort was 1.7 cm, which corresponds closely with the 1.6 cm mean length described by Khattar et al.[2] The majority of strictures were found in the mid-to-distal urethra, a distribution pattern consistent with the findings of Smith et al,[3] who reported distal strictures in 70% of cases.

Our recurrence rate of 16.7% lies between that observed in different series: slightly higher than the 10% reported by Barbagli et al,[5] but below the 20% recurrence documented by Gómez and Limaye,[6] in their series of 10 women. Importantly, none of our patients required a redo open procedure.

The complication profile was favorable, with only one urinary tract infection (8.3%) and one case of short-lived oral donor site discomfort (8.3%). Comparable donor site morbidity (9.5%) was reported by Palminteri et al.[7] The absence of new-onset incontinence in our patients also reflects the

low risk highlighted by Osman et al,[1] who estimated this complication at below 5%.

More recent literature further supports these outcomes. A multinational study covering the years 2016–2023 and involving 42 women reported an overall success rate of 88%, with dorsal onlay showing 100% success compared to 71% with ventral inlay after a mean of 27 months follow-up.[8] Herforth et al. reported a recurrence rate of 20% in 25 patients with a median follow-up of 12 months.[9] In a long-term series, Prabhuswamy et al. achieved 89% success at 30.2 months of follow-up.[10] From India, Iyyan et al. described an 87% success rate in 8 patients, with Qmax improving from 4.2 to 15.4 mL/s and PVR decreasing from 110 to 39.1 mL.[11] A meta-analysis pooling results from dorsal and ventral graft techniques demonstrated success rates of 92.1% and 95.5%, respectively, without a statistically significant difference.[12] Yeow et al. more recently reported favorable functional outcomes with low sexual dysfunction and minimal incontinence after dorsal BMG urethroplasty.[13]

Overall, these findings suggest that the outcomes of our study are in agreement with international data, where success rates for BMG urethroplasty in women consistently fall within the 80–90% range. The lack of de novo incontinence and low graft-site morbidity in our series further validate the safety of the dorsal onlay technique.

CONCLUSION

Anterior onlay buccal mucosal graft urethroplasty is a reliable surgical solution for female urethral stricture, producing favorable functional improvement and low complication rates. In this study, an 83.3% success rate was recorded with notable enhancement in urinary flow and reduction in residual urine. Recurrence was uncommon and was controlled with conservative measures. While these short-term outcomes are in line with global reports, the limited cohort size and relatively short follow-up emphasize the need for larger, multicenter studies with longer observation periods and inclusion of patient-reported outcomes.

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