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Original Article

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Outcome of Dorsal Onlay Buccal Mucosa Graft Urethroplasty in Female Urethral Stricture

Muhammad Mahmud Alam[1], Mohammad Al Amin[2], Md Mahmud Hasan[3], Md Akter Alam[4], Khondaker Arafuzzaman[5], KM Arifur Rahman[6]

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ABSTRACT

Background: *Female urethral stricture (FUS) is a rare, underdiagnosed condition often misidentified as other lower urinary tract disorders due to nonspecific symptoms. Although traditionally considered uncommon in women, recent studies indicate higher prevalence, often linked to trauma, infections, or iatrogenic causes. Conservative treatments like dilation offer temporary relief with high recurrence. Buccal mucosa graft (BMG) urethroplasty, especially the dorsal onlay technique, has shown superior, durable outcomes due to its favorable tissue properties and anatomical advantages.*

Aim of the study: *This study aims to evaluate the clinical outcome of dorsal onlay BMG urethroplasty in female patients with urethral stricture treated at a tertiary-level hospital in Bangladesh.*

Methods: *This prospective observational study was conducted in the Urology Department of a tertiary hospital in Bangladesh over a defined period 2 years, from 1st January 2022 to 31st December 2023, to assess dorsal onlay buccal mucosa graft (BMG) urethroplasty outcomes in 30 female patients with urethral stricture. Patients included were aged 18–65 years, refractory to dilatation, and diagnosed using uroflowmetry, urethroscopy, or VCUG. Exclusions were active infection, malignancy, neurogenic bladder, or poor surgical fitness. All underwent standardized preoperative evaluation and BMG urethroplasty under general anesthesia. Postoperative follow-up at 1, 3, 6, and 12 months assessed symptom relief and uroflowmetry. Data were analyzed using SPSS version 26.0.*

Results: *The study included 30 female patients with a mean age of 42.6±9.2 years and a BMI of 25.3±3.1 kg/m². Most were married (83.3%) and from urban areas (63.3%). Poor urinary stream (90%) was the most common symptom, followed by urgency/frequency (66.7%) and UTIs (56.7%). The average symptom duration was 14.2±6.7 months, with 3.1±1.6 prior dilatations. Strictures averaged 1.4±0.6 cm in length, most commonly in the mid-urethra. Postoperatively, Qmax improved from 5.2 to 18.4 ml/sec, and PVR decreased from 86.5 to 18.6 ml. Complete symptom relief occurred in 80% of cases, with minimal complications, confirming the procedure's effectiveness and safety.*

Conclusion: *Dorsal onlay buccal mucosa graft urethroplasty is a safe, effective option for treating female urethral stricture. It offers high success rates, sustained symptom relief, and low complication rates. The study advocates the broader use of reconstructive surgery over repeated dilatation, especially in resource-limited settings, to improve patient outcomes and quality of life.*

Keywords: Female urethral stricture, Buccal mucosa graft urethroplasty, Dorsal onlay technique, Urethral reconstruction and Surgical outcomes

1. Assistant Professor, Department of Urology, Mugda Medical College Hospital, Mugda, Dhaka, Bangladesh
2. Junior Consultant, Department of Urology, Mugda Medical College Hospital, Mugda, Dhaka, Bangladesh
3. Assistant Professor, Department of Urology, Mugda Medical College Hospital, Mugda, Dhaka, Bangladesh
4. Assistant Professor, Department of Urology, Mugda Medical College Hospital, Mugda, Dhaka, Bangladesh
5. Assistant Professor, Department of Urology, Mugda Medical College Hospital, Mugda, Dhaka, Bangladesh
6. Assistant Registrar, Department of Urology, Mugda Medical College Hospital, Mugda, Dhaka, Bangladesh

Correspondence : Dr. Muhammad Mahmud Alam, Assistant Professor, Department of Urology, Mugda Medical College Hospital, Mugda, Dhaka, Bangladesh Email: tariquro@gmail.com

Introduction

Female urethral stricture (FUS) is a rare but underdiagnosed condition that presents with lower urinary tract symptoms (LUTS) such as hesitancy, poor urinary stream, frequency, urgency, and incomplete emptying. The condition is often misdiagnosed as overactive bladder, urinary tract infection, or functional voiding dysfunction due to its nonspecific symptoms and the low index of suspicion among clinicians, resulting in delayed or inadequate treatment.[1,2] Anatomically, the female urethra is short, approximately 3-4 cm long, and surrounded by periurethral tissues, which traditionally made strictures a less frequent diagnosis than males.[3] However, recent studies suggest that FUS is more prevalent than previously reported and is often secondary to repeated catheterizations, previous surgeries, childbirth trauma, infections, or idiopathic causes.[4,5] Various treatment modalities have been employed to manage female urethral strictures, ranging from urethral dilation and clean intermittent catheterization (CIC) to urethrotomy. Nonetheless, these conservative measures often yield only temporary relief and are associated with high recurrence rates.[6] In contrast, urethroplasty using grafts or flaps has emerged as the most definitive and durable solution, offering superior outcomes regarding symptom resolution and recurrence prevention.[7] Buccal mucosa graft (BMG) urethroplasty has gained popularity in female urethral reconstruction due to the favorable histological characteristics of buccal mucosa, including its thick epithelium, high vascularity, resistance to infection, and ease of harvest.[8] The dorsal onlay technique of BMG urethroplasty has shown promising outcomes by preserving the ventral urethral support and reducing risks of fistula formation and graft sacculation.[9] The dorsal approach, first described in detail by Richard et al., involves mobilizing the urethra dorsally and placing the graft over the urethral plate, thus providing a well-vascularized bed and long-term patency.[10] A systematic review by Goel et al. reported success rates exceeding 80% in dorsal onlay BMG urethroplasty for FUS, with minimal morbidity and high patient satisfaction.[11] Despite the increasing interest in BMG urethroplasty in female patients, data remain limited, particularly in developing countries like Bangladesh, where diagnostic delays and limited access to reconstructive expertise pose significant challenges. Most literature originates from high-volume centers in Western countries, leaving a gap in knowledge regarding the outcomes of BMG urethroplasty in resource-limited settings.[12] Assessing the effectiveness of dorsal onlay BMG urethroplasty in such contexts is vital to developing localized treatment protocols and improving patient care. This study aims to evaluate the clinical outcome of dorsal onlay BMG urethroplasty in female patients with urethral stricture treated at a tertiary-level hospital in Bangladesh.

Methodology & Materials

This was a prospective observational study conducted in the Department of Urology at a tertiary-level hospital in Bangladesh over (numbers) months, from (start) to (end). The study aimed to evaluate the clinical outcomes of dorsal onlay buccal mucosa graft (BMG) urethroplasty in female patients with urethral stricture. A total of 30 female patients diagnosed with urethral stricture, based on clinical history, uroflowmetry, urethroscopy, and/or voiding cystourethrogram (VCUG), were enrolled consecutively. Patients diagnosed as primary or recurrent urethral stricture included in the study and presented with symptoms consistent with bladder outlet obstruction.

Inclusion Criteria

- Female patients aged 18–65 years
- Diagnosed with primary or recurrent urethral stricture
- Refractory to urethral dilatation or clean intermittent catheterization

Exclusion Criteria

- Active urinary tract infection
- Presence of urological malignancy
- Neurogenic bladder or significant pelvic organ prolapse
- Patients unfit for surgery under general anesthesia

Preoperative Evaluation

All patients underwent detailed clinical assessment, including history and physical examination. Investigations included complete blood count, serum creatinine, urine culture, ultrasonography of the kidney-ureter-bladder (KUB), uroflowmetry (Qmax), post-void residual urine (PVR), and cystourethroscopy.

Surgical Procedure

All surgeries were performed under general anesthesia by experienced urologists. Buccal mucosa was harvested from the inner cheek or lower lip, depending on surgeon preference and graft length requirement.

After urethral mobilisation, a midline dorsal urethrotomy was made, and the graft was placed dorsally over the incised urethral plate in an onlay fashion and quilted to the corpora cavernosa. The urethra was then closed over a Foley catheter, and the graft site was closed with absorbable sutures. Based on intraoperative findings, postoperative catheterization was maintained for 14–21 days.

Postoperative Follow-Up

Patients were followed at 1, 3, 6, and 12 months postoperatively. Follow-up assessments included symptom evaluation, uroflowmetry, post-void residual measurement, and inquiry about complications such as infection, hematuria, or fistula. Success was defined as subjective symptom relief and objective improvement in Qmax and PVR without further dilatation or instrumentation.

Data Collection and Analysis

A structured data collection sheet was used to record demographic data, presenting symptoms, comorbidities, operative findings, graft details, and postoperative outcomes. Data were analyzed using SPSS version 26.0. Descriptive statistics were used to summarize categorical variables as frequencies and percentages, and continuous variables were expressed as mean ± standard deviation (SD).

Results

Table 1 presents the baseline characteristics of the study participants. The mean age of the patients was 42.6±9.2 years, and the average BMI was 25.3±3.1 kg/m². The majority were married (83.3%), and most resided in urban areas (63.3%), with the remainder from rural settings (36.7%). As shown in Table 2, the most common presenting symptom was a poor urinary stream, reported by 90% of the patients, followed by frequency and urgency (66.7%), recurrent urinary tract infections (56.7%), and urinary retention (23.3%). The mean duration of symptoms before presentation was 14.2±06.7 months. On average, patients underwent 3.1±1.6 prior urethral dilatations. Hypertension (33.3%) and diabetes mellitus (23.3%) were the most common comorbidities, while 16.7% had undergone previous urological surgeries. Table 3 highlights the operative findings and technical details. The mean stricture length was 1.4±0.6 cm. Preoperative uroflowmetry showed a mean Qmax of 5.2±1.3 ml/sec and a mean post-void residual (PVR) volume of 86.5±25.4 ml. The strictures were located most commonly in the mid-urethra (36.7%), followed by proximal (26.7%), distal (20%), and panurethral involvement (16.6%). Buccal mucosa harvested from the cheek was used in 83.3% of cases, while lip mucosa was used in 16.7%. The average graft length was 2.6±0.4 cm, with a mean operative time of 108.3±14.6 minutes and a mean catheterization duration of 16.2±2.1 days. Postoperative outcomes are summarized in Table 4. The mean follow-up duration was 12.8±4.3 months. A marked improvement in urinary flow was observed, with the mean post-op Qmax increasing to 18.4±3.1 ml/sec and the mean PVR decreasing significantly to 18.6±7.2 ml. Complete symptom relief was reported by 80% of patients, with 16.7% experiencing partial relief and only 3.3% reporting no improvement. Postoperative complications were infrequent, including urinary tract infection in 10%, hematuria in 6.7%, and a single case (3.3%) of urethrovaginal fistula.

Table I : *Baseline Sociodemographic Characteristics of the Study Population (n = 30)*

Variable	Frequency (n)	Percentage (%)
	Mean ± SD	
Age (years)	42.6 ± 9.2	
BMI (kg/m²)	25.3 ± 3.1	
Marital Status		
Married	25	83.3
Unmarried	2	6.7
Widowed/Divorced	3	10.0
Residence		
Urban	19	63.3
Rural	11	36.7

Table 2: *Clinical Presentation, Symptom Duration, Comorbidities, and Prior Interventions among Patients*

Variable	Frequency (n)	Percentage (%)
	Mean ± SD	
Presenting Symptoms		
Poor urinary stream	27	90.00
Frequency & urgency	20	66.7
Recurrent UTI	17	56.7
Urinary retention	7	23.3
Duration of Symptoms (months)		14.2 ± 6.7
Number of Dilatations	3.1 ± 1.6	
Comorbidities		
Hypertension	10	33.3
Diabetes Mellitus	7	23.3
Chronic Kidney Disease	1	3.3
Previous Urological Surgeries	5	16.7

Table 3: *Operative Details and Intraoperative Findings of Dorsal Onlay Buccal Mucosa Graft Urethroplasty*

Variable	Frequency (n)	Percentage (%)
	Mean ± SD	
Mean Stricture Length (cm)		1.4 ± 0.6
Mean Qmax (ml/sec) (Pre-op)		5.2 ± 1.3
Mean PVR (ml) (Pre-op)	86.5 ± 25.4	
Stricture Location		
Proximal	8	26.7
Mid	11	36.7
Distal	6	20.0
Panurethral	5	16.6
Graft Type		
Buccal (cheek)	25	83.3
Lip	5	16.7
Mean Graft Length (cm)	2.6 ± 0.4	
Mean Operative Time (minutes)	108.3 ± 14.6	
Mean Duration of Catheterization (days)	16.2 ± 2.1	

Table 4: *Postoperative Outcomes, Follow-Up Parameters, and Complications after Urethroplasty*

Outcome Variable	Frequency (n)	Percentage (%)
	Mean ± SD	
Mean Follow-up Duration (months)		12.8 ± 4.3
Mean Qmax (ml/sec) (Post-op)		18.4 ± 3.1
Mean PVR (ml) (Post-op)	18.6 ± 7.2	
Symptom Relief		
Complete	24	80.00
Partial	5	16.7
None	1	3.3
Postoperative Complications		
UTI	3	10.00
Hematuria	2	6.7
Fistula	1	3.3

Discussion

Female urethral stricture (FUS) is a rare but underdiagnosed condition characterized by lower urinary tract symptoms (LUTS), such as poor urinary stream, frequency, urgency, and recurrent urinary tract infections (UTIs). Due to the limited number of reported cases and the anatomical complexity of the female urethra, the optimal treatment strategy remains a subject of debate. This study evaluates the clinical outcome of dorsal onlay buccal mucosa graft (BMG) urethroplasty in female patients treated in a tertiary-level hospital in Bangladesh, contributing to the growing literature on this topic. The demographic profile of the study cohort, as shown in Table 1, indicates that the average age of presentation was 42.6 years, which aligns with previously published reports highlighting that FUS predominantly affects middle-aged women.[8] The relatively high BMI (mean: 25.3 kg/m²) might suggest a correlation between metabolic syndrome and urological conditions, although further investigation would be required to establish any causal association. Most patients resided in urban settings, reflecting better accessibility to specialized tertiary care in metropolitan areas. The clinical presentation (Table II) was consistent with findings from previous literature. A poor urinary stream, reported by 90% of patients, remains the hallmark symptom of FUS. Other significant symptoms included urgency (66.7%), recurrent UTIs (56.7%), and urinary retention (23.3%). The mean symptom duration of 14.2 months before diagnosis emphasizes the diagnostic delay often encountered in FUS cases partly due to its overlapping symptoms with overactive bladder or urinary tract infections.[13,14] The average of 3.1 prior urethral dilatations among the study subjects suggests an over-reliance on dilatation therapy despite evidence that repeated dilatations offer only temporary relief and may lead to scarring and stricture recurrence.[15] Operative findings (Table 3) reveal a mean stricture length of 1.4 cm, with the mid-urethra being the most commonly affected site (36.7%), followed by proximal and distal segments. These findings correlate with other studies indicating that the mid-urethra is most prone to stricture formation due to instrumentation or childbirth trauma [9]. The use of buccal mucosa harvested primarily from the cheek in 83.3% of cases reflects current best practice, given its favorable properties, such as thick epithelium, resistance to infection, and ease of harvest.[16] Lip mucosa was used in cases where cheek mucosa was inadequate, which has also been reported as a feasible alternative.[17] The dorsal onlay approach was chosen in all cases. This technique has gained widespread acceptance due to several advantages over the ventral approach, including better graft support by the corporal bodies,

reduced risk of sacculation or diverticulum formation, and preservation of continence mechanisms.[18] The mean operative time of 108.3 minutes and catheterization duration of 16.2 days are consistent with similar studies employing dorsal BMG urethroplasty.[19] Postoperative outcomes (Table 4) were encouraging. The marked improvement in uroflowmetry parameters mean Qmax increasing from 5.2 to 18.4 ml/sec and PVR decreasing from 86.5 to 18.6 ml reflects significant functional restoration. These objective findings correlate with subjective symptom relief, as 80% of patients reported complete improvement. This success rate aligns with reports by Gomez et al. and Goel et al., who observed 78-90% success rates with dorsal BMG urethroplasty in female stricture cases.[6,11] Complication rates in the present study were low, with UTI (10%) being the most common, followed by hematuria (6.7%) and a single case of urethrovaginal fistula (3.3%). These figures are comparable to other studies that reported low complication rates, reinforcing the safety profile of this technique.[11] Importantly, no cases of de novo incontinence were noted, which is one of the feared complications in female urethral surgery.

Limitations of the study: The study's relatively small sample size and single-center nature may limit generalizability. Additionally, longer-term follow-up is required to assess stricture recurrence. Moreover, standardized tools like the UDI-6 or ICIQ-FLUTS were not employed for symptom scoring, which could have enhanced the objectivity of patient-reported outcomes.

Conclusion and Recommendations

In conclusion, this study supports dorsal onlay buccal mucosa graft urethroplasty as a safe and effective surgical option for managing female urethral stricture, particularly in resource-limited settings like Bangladesh. The technique demonstrated high success rates, significant symptomatic relief, and minimal complications. These findings advocate for broader adoption of reconstructive techniques over repeated dilatation, thereby enhancing the quality of life of affected women.

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