

# The Outcomes of Kulkarni's Dorsal Onlay Buccal Mucosal Graft Urethroplasty in Patients with Anterior Urethral Stricture: A Single Center Experience

Majed A Mohammad<sup>1</sup> and Hussain Odey Fahad<sup>2</sup>

## ABSTRACT

**Objective:** To assess the success & the complications of Kulkarni's dorsal onlay buccal mucosal graft urethroplasty in patients with anterior urethral stricture.

**Study Design:** Prospective trial study

**Place and Duration of Study:** This study was conducted at the Basra Urology Center, Iraq between April 2022 and September 2024.

**Methods:** 20 patients with anterior urethral stricture received Kulkarni's dorsal onlay buccal mucosal graft urethroplasty. Retrograde urethrogram was done one week after removing the Foley's catheter, and urine flowmetry is usually done 3 & 6 months following the urethroplasty. Patients were kept on follow-up every 3 & 6 months.

**Results:** The averages of age was 40.65 years, urethral stricture length was 4.25 cm, operative time was (175±7.78 minutes, hospitalization period was 2.35±0.81 days, American Urological Association Symptom Score was (22.1±3.22) and Q max was 5.47±0.69 ml/s. Successful urethroplasty was achieved in 17 (85%) patients, while 3 patients (15%) had recurrent stricture. There was an improvement in the average maximal urine flow rate to 16.87±0.87 ml/s and 16.42±0.67 ml/s postoperatively at 3 and 6 months respectively. The improvement in the Q max was neither correlated with patients' age nor with the stricture length. The American Urological Association Symptom Score was improved to 5.15±1.26 and 6.20±1.00 postoperatively at three and six months.

**Conclusion:** The dorsal onlay buccal mucosal graft urethroplasty procedure, developed by Kulkarni, shown a low risk of complications and a high success rate.

**Key Words:** Buccal mucosa, Urethral stricture, Urethroplasty; American Urological Association Symptom Score

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## INTRODUCTION

Numerous surgical approaches have been used to treat urethral stricture throughout the history of urology. Procedures that provide a long-lasting result, little morbidity, and minimal sexual adverse effects have been the cornerstone of treatment. With failure rates of 20% to 30%, local flaps of the penile and scrotal skin were the mainstay of early treatment for urethral stricture illness.<sup>1</sup> The buccal mucosa was referred to as the perfect graft tissue when Sapezhko initially used buccal mucosal grafts (BMGs) for urethral repair in the

early 19th century due to its robust epithelium, resistance to infection, and simplicity of transfer.<sup>1,2</sup>

The dorsal onlay technique with BMGs for bulbar urethral strictures was made famous.<sup>3</sup> Kulkarni et al<sup>4</sup> reported a unilateral dorsal onlay with BMGs. Buccal mucosa is currently the most common graft used in substitute urethroplasty.<sup>5</sup> Scarring causes the urethra's lumen to narrow, a condition known as urethral stricture, which can obstruct the lower urinary system. By producing micturition issues and destroying the entire urinary system, this obstruction can have a major negative effect on the patient's quality of life and cause irreversible kidney damage.<sup>6</sup>

The symptoms of the patients must be evaluated, potential causes should be noted, prior therapies and problems should be noted, and related factors that could affect the surgical outcome should be identified.<sup>7</sup> The majority of presenting symptoms 54.3% were lower urinary tract symptoms. Urinary retention 22.3%, catheterization difficulties 4.8%, and urinary tract infections UTI 6.1% were other less frequent presentations.<sup>8</sup>

Weak stream 49%, inadequate emptying 27%, and urine frequency 20% were the most prevalent complaints. 73% of patients have postvoid dribble.<sup>9</sup>

<sup>1</sup> Department of Urology, College of Medicine, University of Basra Iraq

<sup>2</sup> Department of Urology, Basra Teaching Hospital, Basra, Iraq

Correspondence: Majed A Mohammad, Department of Urology, College of Medicine, University of Basra Iraq.

Contact No: +9641392433

Email: majed.muhammad@uobasrah.edu.iq

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Another typical symptom that affects 22.9-71% of people is pain.<sup>1,2</sup> More severe symptoms of the lower urinary system are associated with pain, which is typically felt in the bladder and/or urethra. Pain is more common in younger boys and usually goes away following reconstructive surgery.<sup>10</sup> Other manifestations include incontinence 1-4%, urgency 14%, urethral abscess or necrotizing fasciitis 2.3% and visible hematuria 3.1-5%.<sup>8</sup> This study aimed to assess the success and the complication rate of BMG urethroplasty by dorsal onlay (Kulkarni technique) in anterior urethral stricture.

## METHODS

This prospective study was done in the Basra Urology Center between April 2022 and September 2024 vide letter No. 341 dated 15<sup>th</sup> March 2022. Twenty individuals with anterior urethral stricture underwent buccal mucosa graft urethroplasty using Kulkarni's technique. All the patients underwent at least a single urethrotomy. Selected patients were kept on suprapubic catheters. Preoperative assessment included history and physical examination, general urine examination, renal function test, retrograde urethrogram, uroflowmetry, and urethroscopy (not routinely done). Individuals who have anterior urethral stricture, regardless of the cause of the stricture were included. Those with a history of failed previous urethroplasty were excluded.

Firstly, the patient is intubated either orally or by the nose. In order to prevent peroneal nerve damage, the patient is put in a basic lithotomy posture with their heels properly positioned to reduce pressure on their calves. The skin of the scrotum, perineum, and suprapubic region is cleaned, shaved, and covered. Using different sets of tools, two surgical teams operate concurrently at the donor and recipient locations. The standard approach involves harvesting the oral mucosal graft from the cheek and using 4/0 polyglactin sutures to seal the donor site in a running way. 7 Fr is used to do a urethroscopy.

Semirigid ureteroscope with a guide wire insertion, which confirms the exact proximal end of the stricture and helps guide the extent of urethrotomy. A small well-lubricated Foley's catheter (10-12 Fr) was inserted, which helps in urethral delineation and orientation during surgery. The central tendon of the perineum and the bulbospongiosus muscle remain intact when the bulbar urethra separates from the corpora cavernosa just along the left side, starting at the distal tract where no muscles are present. Because the urethra is entirely integrated into the corpora cavernosa, its lateral vascular blood supply is maintained along the right side. It is possible to execute penile invagination into the perineal wound for penile or pan-urethral strictures. With the urethra slightly mobilized toward the left. The surface of the lateral urethra is exposed. After mobilization is complete, the dorsal urethral surface is sliced along the midline to determine the distal extent of the stenosis.

The urethrotomy is then extended both proximally and distally to incise the stricture over its whole length. After being cut to the proper size based on the urethrotomy's length and width, the oral mucosal graft is spread firmly across the tunica albuginea. Using 4/0 polyglactin sutures, the urethrotomy's proximal and distal apices are attached to the two graft apices. The urethral mucosal plate's left edge is sutured to the oral transplant's right margin in a running pattern. Inserted is a silicone catheter featuring a Foley 16 F groove. The bulbospongiosus muscle is left intact as the urethra rotates back to its original place over the graft. Using interrupted 4/0 polyglactin sutures, the urethral margins are secured to the corpora cavernosa over the left side graft. The urethra and muscles cover the graft fully at the end of the surgery. For three weeks, the catheter remains in place. All patients are kept on injectable followed by oral antibiotics for a few days.

Urine flowmetry is typically performed three and six months after urethroplasty, and calibration using Foley's catheters and RUG was completed one week after the removal of the Foley's catheter, three & six months postoperatively, patients were monitored for the emergence of any obstructive urinary symptoms that would suggest the need for a repeat RUG or urethroscopy. Normal micturition without the necessity for any additional procedures (endoluminal or open reconstructive) was considered a successful urethroplasty. The data was entered and analyzed by SPSS-24. Spearman correlation coefficient was applied.  $P < 0.05$  was considered significant.

## RESULTS

The mean age was 40.65 with a range of 18-63 years, buccal mucosal graft urethroplasty using Kulkarni's dorsal onlay technique. 55% of strictures were idiopathic, 30% were caused by BXO/lichen sclerosis and inflammation, and 15% were caused by trauma (Table 1).

The strictures site was penile in 50% of patients, bulbar in 40%, and panurethral in 10% of patients, and the mean length of the stricture was 4.25 cm. The average AUASS was  $22.1 \pm 3.22$  and mean Q max (ml/s) was  $5.74 \pm 0.69$ . The associated comorbidities were found in 40% of patients, 20% of them have DM, 10% have HTN and 10% have IHD (Table 2). The average duration of the procedure was  $175.85 \pm 7.78$  minutes, and the average length of hospitalization was  $2.35 \pm 0.81$  days (Table 3).

Three patients experienced postoperative wound infections, all of which were effectively treated by changing antibiotics in response to a wound swab sensitivity test and culture. Two patients experienced post-void dribbling, which was treatable with conservative measures. Incontinence of urine, de novo erectile dysfunction, or surgical diverticulum formation did not occur. Successful urethroplasty was achieved in 17 (85%) patients, while three patients (15%) developed strictures at three- and six-months period of follow up. Reduced urine flow (peak urine flow  $< 15$

ml/s), dysuria, and recurrent UTIs were observed in patients with recurrent strictures.

**Table No. 1: The reasons for the anterior urethral stricture (N=20)**

Cause	No.	%
Idiopathic	11	55
BXO/lichensclerositis/inflammatory	6	30
Iatrogenic	3	15

**Table No. 2: Pre-operative parameters**

Pre-operative parameters	Value
Mean age (range 18-63 years)	40.65±13.58
Mean stricture length (range 2.3-8 cm)	4.25±1.37
<b>Stricture site</b>	
Penile	10 (50%)
Bulbar	8 (40%)
Pan urethral	2 (10%)
Mean AUASS	22.1±3.22
Mean Q max(ml/s)	5.74±0.69
<b>Associated comorbidities</b>	
DM	4 (20%)
HTN	2 (10%)
IHD	2 (10%)
No comorbidities	12 (60%)

**Table No. 3: parameters of the patients post-operatively**

Post-operative parameters	Mean±SD
Mean time of operation (minutes)	175.85±7.78
Mean hospital stays (days)	2.35±0.81

**Table No. 4: Outcomes and Complications of the operation**

Complications	No.	%
No complication	12	60.0
Surgical site infection	3	15.0
Post void dribbling	2	10.0
Recurrent stricture (failure at 3 months)	2	10.0
Recurrent stricture (failure at 6 months)	1	5.0

All of the failed instances reacted favorably to DVIU; One exhibited two stenotic rings at the proximal and distal sites of anastomosis, and two developed a distal anastomotic stricture (Table 4). The improvement in the Q max was neither correlated with patients' age nor with the stricture length (Table 5).

At three and six months, the AUASS dramatically dropped from a mean of 22.1±3.22 before surgery to 5.15±1.26 and 6.20±1.00 afterward (p<0.001). The mean peak urine flow rate (Q max) increased from 5.74±0.69 ml/s before surgery to 16.87±0.87 ml/s and 16.42±0.67 ml/s after surgery at three and six months, respectively (p<0.001) [Table 6]

**Table No. 5: Correlation between patient age, stricture length, and Q max improvement**

Variable	Q max improvement	
Age	R*	0.421
	P value	0.065
Stricture length	R*	0.167
	P value	0.481

R\*Spearman's correlation coefficient

**Table No. 6: Follow-up parameters**

Follow-up parameters	Mean±SD	P value
AUASS (preoperative)	22.1±3.22	<0.001
AUASS (at 3 months)	5.15±0.26	
AUASS (at 6 months)	6.20±1.00	
Q max (ml/s) preoperative	5.74±0.69	<0.001
Q max (ml/s) over three months	16.87±0.87	
Q max (ml/s) over six months	16.42±0.67	

## DISCUSSION

The gold standard for treating USD is urethroplasty, which has the highest documented success rates and is reasonably priced. In contemporary practice, a wide range of urethroplasty techniques are employed. However, regardless of the method, the common objectives are durability (long-term outcomes), safety (minimum adverse effects), and efficacy (normal voiding without obstruction).<sup>11</sup>

The stricture's location, duration, and causedetermine the various urethroplasty methods, as demonstrated by Hapson et al.<sup>12</sup> Nevertheless, increased morbidity and stricture recurrence are associated with many of the methods.<sup>13</sup> Many reconstructive urologists eventually dislike resection and spatulated end-to-end anastomosis, exceptfor traumatic causes of urethral strictures following appropriate counselling.<sup>14</sup> Substitution urethroplasty should be used to treat anterior urethral strictures longer than 2 cm to prevent the development of chordees after surgery. Graft distortion, diverticulum formation, and recurrent stricture are among the problems that have been linked to the use of In replacement urethroplasty procedures, free skin grafts are used as patch or tube grafts.<sup>15</sup>

Urinary stasis and ejaculatory dysfunction are more likely to result from fistula, saculation, and diverticula formation following ventral onlay graft. The improved vascularity across the corporal bodies and stronger mechanical support for improved graft uptake, as well as a lower likelihood of saculation and fistula formation, are advantages of the dorsal onlay graft technique for the stricture of the anterior urethra.<sup>16</sup>

Bagchi et al<sup>17</sup> assessed 42 patients with stricture of the anterior urethra (mean age 38.7 years, ranging from 17 to 62 years) who had BMG urethroplasty using Kulkarni's dorsal onlay technique over a six-month follow-up period (16). 57.1% of strictures were idiopathic, 30.9% were BXO/lichen sclerositis and

inflammatory, and 11.9% were iatrogenic. 80.9% of people were successful. Success is defined by Bagchi et al<sup>17</sup> as requiring no additional procedures after surgery and having a maximal flow rate of more than 15 ml/s during the follow-up period. Forty-eight patients with a follow-up period of one to five years were included in Pathak et al<sup>18</sup>, which found a success rate of 79%.

In their trial, which comprised 68 patients with a mean age of 28.16±14.12 and a 12-month follow-up period, Prakash et al<sup>19</sup> found a 91% success rate. Kartal et al<sup>20</sup> reported the Kulkarni technique, the success rate was 87.1%.<sup>20</sup> Islam et al<sup>21</sup> included 12 patients with a 48-month follow-up period, had an 83% success rate employing the Kulkarni approach.

All these studies have a success rate comparable to our study (85%). Success rate was defined by Prakash et al<sup>19</sup> as the final follow-up revealed no stricture, no obstructive symptoms, a maximum flow rate >15 ml/s, a urethral diameter >12 Fr, and no need for further treatment. The success rate in research by Pathak et al<sup>18</sup> was characterized as no voiding symptoms, no urethrography abnormalities, a maximum flow rate of more than 15 ml/s, and no need for further intervention. In Bagchi et al<sup>17</sup> The average duration of the operation was 175±22.6 minutes, and the average period of hospitalization was 4.5±2.2 days, which was comparable to our study (175.85±7.78 min) & the hospital stay was (2.35±0.81days). Prakash et al<sup>19</sup> reported mean time of operation was (143.3 min), which was shorter than our study. Kartal et al<sup>20</sup> reported the average length of hospital stay and surgery were 179.5±30 min and 3.5±1.2 days, which were comparable to our study.

Numerous parameters, including site, length, degree of spongiofibrosis, number of strictures, and presence of BXO, affect the results of urethroplasty. Risk factors for recurrence include a lengthy history of USD, numerous prior surgeries that resulted in severe spongiofibrosis, periurethral fibrosis, and false passages.<sup>22</sup>

Regarding urinary flow rate, Bagchi et al<sup>17</sup>, at three and six months after surgery, the mean peak urine flow rate (Q max) increased ranging from 5.65±2.47 ml/s on average to 17.75±4.05 ml/s and 16.82±3.42 ml/s separately. Pisapati et al<sup>23</sup> reported the mean peak urinary flow rate (Q max) improved from 6.8 (5.3-7.7) preoperatively to 20.2 (12.3-23.4) postoperatively in a period of follow-up of 17 months.

Islam et al reported an improvement in maximum flow rate (Q max) from 6-10 ml/s preoperatively to >15 ml/s in 93.5 % of patients in a period of follow-up of 3 and 6 months postoperatively.<sup>21</sup> In our study mean urinary flow rate (Q max) improved from 5.74±0.69ml/s preoperatively to 16.87±0.87 ml/s and 16.42±0.67 ml/s postoperatively in 3 and 6 months. The improvement in the Q max was neither correlated with patients' age nor with the stricture length. Regarding the improvement in AUASS score, Bagchi et al<sup>17</sup> reported a significant decrease from a mean of 22.1±5.06 preoperatively to 5.16±3.84 and 6.05±4.12 postoperatively at 3 and 6

months. Spencer et al<sup>24</sup> reported a decrease in AUASS score from 23 (7-24) to 10 (1-17) on a follow-up period of 44 months.

In the present study, the AUASS decreased considerably from a mean of 22.1±3.22 before surgery to 5.15±1.26 and 6.20 ±1.00 postoperatively at 3 and 6 months (p value <0.001), which is comparable to Bagchi's results. Regarding the complications of surgery, Bagchi et al<sup>17</sup> reported surgical site infection in 3 patients (7.14%), and Prakash et al<sup>19</sup> reported wound infection in 2 patients (2.94%).

According to Kartal et al<sup>20</sup> experience, there was no wound infection following Kulkarni's urethroplasty. In this study, we had three patients (15%) who suffered from wound infection, which were all effectively treated by switching antibiotics based on sensitivity and culture.

Regarding postoperative post-void dribbling, Bagchi et al<sup>17</sup> reported that five patients (11.9%) developed post-void dribbling, whereas Prakash et al<sup>19</sup> reported that two patients (2.94%) had post-void dribbling. In our study, two patients (10%) developed post-void dribbling, and all of them were managed conservatively. Regarding postoperative recurrent stricture, Bagchi et al<sup>17</sup> reported that eight patients (19%) developed stricture at 3 and 6 months, all of them responded well to DVIU.

Zumrutbas et al<sup>25</sup> reported that six patients (17%) had recurrence, one of them managed by urethral dilatation, two of them were managed by DVIU, one by meatoplasty & the remaining underwent re-urethroplasty. Wan et al<sup>23</sup> reported that five patients (14.3%) developed recurrent stricture, two of them were managed by DVIU & the remaining three patients were managed by staged urethroplasty. In our study, three patients (15%) developed recurrent stricture at three and six months of follow-up, all of them were managed successfully with DVIU.

Bagchi et al<sup>17</sup> reported no diverticulum formation postoperatively, incontinence of urine, or erectile dysfunction, which is similar to our study. In our study, all patients experienced good donor site healing through primary closure. The absence of long-term morbidity is consistent with the findings of Kartal et al.<sup>20</sup> In Bagchi et al<sup>17</sup> experience, one patient (2.4%) experienced donor site complications and had temporary trouble opening his mouth.

## CONCLUSION

Kulkarni's method of one-sided oral mucosa graft urethroplasty is a reliable, acceptable surgery with a high success rate and few complications.

### Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Majed A Mohammed, Hussain Odey Fahad
Drafting or Revising Critically:	Majed A Mohammed, Hussain Odey Fahad
Final Approval of version:	All the above authors

Agreement to accountable for all aspects of work:	All the above authors
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