Outcomes of Double-Face Buccal Mucosal Urethroplasty for Treating Anterior Urethral Stricture in Adult Males

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ABSTRACT

Objective: To assess the results of double-face buccal mucosal graft urethroplasty (BMG) for treating anterior urethral stricture in adult males.

Study Design: An observational study.

Place and Duration of the Study: Department of Urology, Sindh Institute of Urology and Transplantation, Karachi, Pakistan, from 2021 to 2022.

Methodology: The inclusion criteria were adult males, aged 15 to 70 years, with a previous surgical procedure for hypospadias and the presence of long penile and bulbar strictures measuring over 2 cm, resulting from a straddle injury. Forty-three patients were selected who underwent urethroplasty in 2021 and completed a one-year follow-up in 2022. Uroflowmetry (UFM) and the International Index of Erectile Function (IIEF) assessment data were obtained from the patients' medical records. Success was defined as the patient attaining catheter freedom and achieving a maximum flow rate exceeding 15 ml/sec after one year.

Results: The mean UFM at one year was 20.89 ml/s. Four patients underwent endo-urological intervention (direct visual internal urethrotomy), and one patient needed a second double-face urethroplasty. After one year, the double-face BMG urethroplasty achieved an overall success rate of 88.4%.

Conclusion: Double-face BMG urethroplasty is a reliable and effective surgical technique for the treatment of near obliterative or obliterative long anterior urethral strictures.

Key Words: *Buccal mucosal graft urethroplasty, Direct visual internal urethrotomy, Anterior urethral stricture, Buccal mucosal graft, Urethral dilatation*.

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INTRODUCTION

Urethral stricture is a prevalent issue globally, primarily impacting the male urethra (1 in 10,000 to 1 in 1,000).[1] Failure to address the urethral stricture appropriately, can have adverse effects on the social and economic well-being of patient.[2] Managing urethral strictures is a complex field of reconstructive surgery since it involves dealing with different causes, locations, levels of scarring, and previous surgeries.[3] The surgical management of strictures is constantly advancing.[4] The gold standard treatment for urethral strictures is urethroplasty. However, for lengthier strictures that are greater than 2.5 cm in length, substitution and augmented buccal mucosal graft (BMG) urethroplasty is necessary.[5] In recent years, the use of BMG for difficult urethral restoration has gained popularity and has been linked to highly favourable results.[2,6,7]

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The results of both dorsal onlay grafts and ventral onlay grafts in bulbar urethroplasty are comparable. Double-faced urethroplasty provides enhanced results for treating complex urethral strictures.[8] Palminteri *et al*. suggested the application of double-graft bulbar restoration, a technique that utilises buccal mucosal grafts for both ventral and dorsal sides of the urethra.[9] This approach has demonstrated significant results in situations with strictures of intermediate length, with an average stricture length of 3.6 cm. The success rate was 90%, on an average follow-up period of 22 months.[10]

Previously, the treatment for near-obliterative and obliterative long penile and bulbar urethral strictures involved the use of penile skin and a two-stage procedure. However, with the introduction of double-face buccal mucosal urethroplasty, these strictures can now be addressed with a single-stage procedure, yielding excellent results. The rationale of this study was to notify the results of applying this treatment in Pakistan, with the purpose of inspiring other surgeons to adopt this surgery and allowing patients to leverage its advantages. The objective of this study was to assess the results of double-face buccal mucosal urethroplasty for treating anterior urethral stricture in adult males.

METHODOLOGY

This was an observational study, undertaken in the Urology Department of the Sindh Institute of Urology and Transplantation, Karachi, Pakistan. The study lasted for a period of 2 years. The records of patients were examined who underwent urethroplasty in 2021 and completed their one-year follow-up in 2022. The sample size for this investigation was determined based on a previous estimate of a 90% success ratereported in a similar study,[10] with a margin of error of 3% and a 95% confidence range. Therefore, a total of 43 patients were selected for this study. The sample selection was conducted using a non-probability consecutive sampling method. The participants in this study were adult males, aged 15 to 70, who had previously undergone hypospadias surgery. These patients had long penile and bulbar strictures, measuring over 2 cm, which were either obliterative or nearly obliterative. Participants who were over the age of 70, had a stricture size lower than 2cm, and had undergone prostate surgery were excluded.

The study was undertaken following the approval of the Ethical Review Committee of the Institute. An assessment was conducted on the medical records of patients who had provided informed consent. Strict confidentiality had been ensured. The serial uroflowmetry (UFM) and International Index of Erectile Function (IIEF) scores were recorded at the 3rd week, 6th week, 3rd month, 6th month, and one year from the files. If the patient did not urinate after the catheter removal, or if the patient underwent evaluation using the flexible cystoscopy and experienced wound dehiscence or urethrocutaneous fistula, these were considered failures of the procedure. The sexual functions of the patients were evaluated using the International Index of Erectile Function-5 (IIEF-5) score at follow-up visits.

The data were analysed using SPSS v22.0. Continuous variables such as age and UFM were provided as means and standard deviations. Categorical variables such as UFM, erectile dysfunction, surgery preceding urethroplasty, and results were reported as frequency and percentage. The study assessed the impact of age on the duration of stricture, erectile dysfunction, and treatment failure cases. The Chi-square test was used to evaluate the effect modifiers, while the One-sample t-test was applied to compare the mean at different time intervals (3rd week, 6th week, 3rd month, 6th month, and one year) for UFM. A p-value of ≤0.05 was considered significant.

RESULTS

A total of 43 patients were enrolled in the study, with a mean age of 39.74 ± 13.38 years. The majority of the patients fell between the ages of 30 to 45 years. The majority of patients (23) had no prior surgical history, while 5 patients had undergone urethroplasty, 9 patients had a history of urethral dilatation, and 6 patients previously had direct visual internal urethrotomy. The majority of patients had strictures with a length ranging from 5 to 10 cm, with a mean length of 6.07 ± 1.96 cm (Table I).

Table I: Length of stricture / treatment of complication / erectile function after urethroplasty.

Age	Length of stricture			p-value
	<5cm		5-10cm	
18 - 30 years	1		11	
30 - 45 years	3		12	0.232
45 - 60 years	4		7	
>60 years	0		5	
Age	**Treatment of complication**			**p-value**
	No treatment	**DVIU**	**Re-do surgery**	
18 - 30 years	11	1	0	
30 - 45 years	14	0	1	0.003
45 - 60 years	11	0	0	
>60 years	2	3	0	
Age	**Erection**			**p-value**
	Normal erection	**Weak erection**		
18 - 30 years	12	0		
30 - 45 years	13	2		0.382
45 - 60 years	9	2		
>60 years	5	0		

Redo surgery = double-face urethroplasty after the failure of the first surgery, DVIU = Direct Visual Internal Urethrotomy (Chi-square test was applied).

Table II: Uroflowmetry of patients after double-face BMG urethroplasty.

UFM (ml/sec)	N	Mean	Std. deviation	Std. error mean	p-value
3 weeks	43	22.77	9.526	1.453	
6 weeks	39	23.32	8.153	1.306	
3 months	38	22.80	7.566	1.227	<0.0001
6 months	38	21.89	7.742	1.256	
1year	38	20.89	6.989	1.134	

UFM = Uroflowmetry, Std. = Standard (One-sample t-test was applied).

During the third week, four patients experienced urinary retention, three patients needed endourological intervention, and one patient required a repeat surgery. At six weeks, another patient withdrew from the study due to urinary retention and subsequently needed endourological intervention. Four individuals experienced a mild form of erectile dysfunction, which was effectively treated with a phosphodiesterase 5 inhibitor (Table I). Four patients underwent endourological operation, and one patient required a redo of double-face urethroplasty (Table I). The overall success rate of double-face BMG urethroplasty at one year was 88.4%. Out of all the patients, 11.4% required either endo-urological procedures or repeat surgery (Table I).

The mean UFM at 3 weeks was 22.77 with a standard deviation of 9.52. At six weeks, the mean UFM was 23.32 with a standard deviation of 8.15. At 3 months, the mean UFM was 22.80 with a standard deviation of 7.56. At six months, the mean UFM was 21.89 with a standard deviation of 7.74. At one year, the mean UFM was 20.89 with a standard deviation of 6.98. The information is presented in Table II.

DISCUSSION

Double-face urethroplasty should be performed following the intraoperative assessment of the urethral calibre using cystourethroscopy or by passing a 6FR nelaton catheter.[11] Double-face augmentation urethroplasty is a viable and secure choice for bulbar urethral strictures that are nearly obliterated. Double-faced BMG urethroplasty was performed on patients with near-obliterative or obliterative strictures.[12,13] In this study, 23 patients had no prior history of urethroplasty, 5 patients had undergone urethroplasty, 9 patients had a history of urethral dilatation, and 6 patients had undergone DVIU in the past. The majority of patients had strictures with a length ranging from 5 to 10 cm, with a mean length of 6.07 cm and a standard deviation of 1.96 cm. In another study, the mean length of the stricture was reported as 4.6 cm, with a range of 3.1 to 8.3 cm.[14] In contrast to earlier investigations, the length of the stricture in the latest study is remarkably large. The mean UFM rate at different time points in this study was as follows: At 3 weeks, it was 22.77 ± 9.52 ml/sec; at 6 weeks, it was 23.32 ± 8.15 ml/sec; at 3 months, it was 22.80 ± 7.56 ml/sec; at six months, it was 21.89 ± 7.74 ml/sec; and at one year, it was 20.89 ± 6.98 ml/sec. During the third week, four patients experienced urinary retention, three patients needed endourological intervention, and one patient required a repeated surgery. At six weeks, another patient withdrew from the study due to urinary retention and subsequently underwent endourological intervention. Similarly, Selim M *et al*. reported 10.5% complication rate in patients following buccal mucosal graft urethroplasty.[15]

The study conducted by Joshi *et al*.[16] demonstrates a comparable finding. The median postoperative maximum flow rate was 24 mL/s, with an interquartile range (IQR) of 8-32 mL/s. The median length of the graft was 7 cm, with an IQR of 7-9 cm, and the median breadth of the graft was 2.0 cm, with an IQR of 1.5-2.0 cm.[17] A significant prevalence of erectile dysfunction is documented in the literature. According to the study conducted by Erickson *et al*., up to 44% of patients experienced erectile dysfunction following the anterior urethroplasty. However, it is important to note that in the majority of cases, these issues were temporary and cured within a period of 6 months.[18] In this study, four individuals encountered a mild manifestation of erectile dysfunction, which was successfully treated using a phosphodiesterase 5 inhibitor, comparable to previous research.

Barbagli *et al.* reported that the initial success rates of using dorsal and ventral onlay with BMG were 96% and 85%, respectively.[19] This study found that the success rate after one year was 88.4%, while 11.6% of patients needed therapy in the form of DVIU or urethroplasty. The majority of failures were observed within the initial year of the follow-up. This observation was consistent with findings reported in other studies.[19,20]

The current study has several shortcomings that need to be addressed. The study's retrospective methodology and limited follow-up period impeded the control of biases. To validate the findings of this study, further investigation and a significant sample size are necessary.

CONCLUSION

The double-face BMG urethroplasty is a reliable and effective technique of management in near-obliterative or obliterative long anterior urethral stricture. The procedure had lower complications especially lower erectile dysfunction and a higher success rate. However, larger studies with longer follow-ups are required to confirm the durability and the long-term outcome of this technique.

ETHICAL APPROVAL:

The study was conducted after taking the approval of the Ethical Review Committee of SIUT (Approval No.: SIUT-ERC-2023/A-415).

PATIENTS' CONSENT:

The study was conducted on the medical records of patients who had provided informed consents.

COMPETING INTEREST:

The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

TG, SR, MZ, UQ: Conception and design, collection and analysis of data, and primary drafting of the manuscript.
SB, MH: Acquisition of data, critical review of the paper.
All authors approved the final version of the manuscript to be published.

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