

Clinicodemographic and Stricture-Related Factors Influencing Surgical Outcomes Following One-Stage Versus Staged Buccal Mucosal Graft Urethroplasty

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ABSTRACT

Introduction: Anterior urethral stricture is a common urological disorder that is often diagnosed and is characterised by the fibrotic tissue formation and narrowing of the urethral canal which leads to obstructive voiding symptoms, urinary infections, and a decrease in quality of life. **Methods & Materials:** This quasi, experimental study was carried out in Department of Urology, National Institute of Kidney Diseases & Urology (NIKDU), Dhaka, for one year from 15 June 2023 to 14 June 2024. The target population of the study was 84 male patients admitted with long, segment anterior urethral stricture. The data were analysed using SPSS Statistics for Windows, version 26.0. **Result:** The mean age was 38.48 ± 11.90 years in Group A and 37.64 ± 10.52 years in Group B ($p = 0.596$). Mean stricture length in overweight patients was 7.16 ± 3.83 cm in Group A and 6.67 ± 4.19 cm in Group B ($p = 0.559$), while in obese patients it was 9.25 ± 4.18 cm and 10.67 ± 3.95 cm, respectively ($p = 0.113$). Per-operative parameters showed significantly shorter operative time in Group A (180.47 ± 3.63 min) versus Group B (254.52 ± 8.02 min; $p < 0.0001$) and lower blood loss (502.38 ± 31.14 ml vs. 619.76 ± 58.91 ml; $p < 0.0001$), while blood transfusion requirement was comparable (8 [19%] vs. 13 [30%]; $p = 0.208$). Stricture site distribution was also similar, with the penile urethra most common in Group A (35.7%) and bulbo-penile urethra in Group B (35.7%; $p = 0.194$). **Conclusion:** In a comparative study of one, stage and staged buccal mucosal graft urethroplasty in patients with long, segment anterior urethral strictures, it was found that the two groups were similar with respect to age, BMI, stricture length, and anatomical site of the urethral stricture.

Keywords: Urethroplasty, Urethral Stricture, BMI.

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INTRODUCTION

Anterior urethral stricture disease is a common urological disorder that causes the narrowing of the urethral lumen due to fibrosis. This eventually leads to obstructive lower urinary tract symptoms, recurrent urinary tract infections, urinary retention, and a substantial loss in the quality of life [1]. The challenge of dealing with urethral stricture disease is most severe in the developing countries. There, patients often come only when the disease is at an advanced stage, have aetiologically infectious factors, and frequently receive several endoscopic treatments [2]. Long segment anterior urethral strictures are among the most difficult types of cases for surgical repair due to their length, complexity, and the risk of recurrence being higher. Currently, urethroplasty is the only definitive treatment for anterior urethral strictures and the most preferred procedure due to its higher long, term success rate in comparison with minimally invasive strategies like urethral dilation and direct vision internal urethrotomy (DVIU), particularly for long or recurrent strictures [3]. Nonetheless, the results of urethroplasty continue to differ markedly in spite of the development of surgical techniques and that of flap materials. Depending on the type of patients, condition of the stricture, and surgical procedure, success rates as high as

70% to more than 90% have been reported [4]. By studying the factors that influence the outcomes, one can help improve the pre, operative planning and patient counselling. It has been demonstrated that clinicodemographic variables like age, body mass index (BMI), smoking status, and comorbidities may affect the results of surgery after urethral reconstruction. Aging has been linked to less efficient tissue healing and higher rates of recurrence in some studies, whereas others indicate that old age by itself should not be a reason to avoid urethroplasty [5]. Becoming overweight has been identified as one of the possible risk factors in the light of changes in wound healing processes, surgeries being more difficult, and a greater chance of perioperative morbidity [6]. Moreover, systemic conditions such as diabetes mellitus could potentially be detrimental to graft take and urethral healing due to microvascular compromise [7]. Stricture, related factors contribute just as significantly in determining the success of the surgery. Length of stricture is among the commonly reported predictors of result, with longer strictures showing greater incidences of recurrence after reconstruction [8]. The cause of the disease also has a major impact on the prognosis; inflammation, infection, and lichen sclerosus-related strictures are linked with

worse outcomes than idiopathic or traumatic strictures [9]. Furthermore, the site of anatomical involvement, the number of previous interventions, and whether pan, urethral disease is present contribute to the complexity of surgery and hence the effect on long, term results. For long, segment anterior urethral strictures, substitution urethroplasty with buccal mucosal grafts is currently the most preferred reconstructive procedure due to the graft's resilient epithelial nature, the simple harvesting process, and good long, term results [4]. Nevertheless, the decision between one, stage and staged operations still depends quite a lot on stricture length, tissue quality, infection status, and patient, related factors. This study aimed to evaluate clinicodemographic and stricture-related factors influencing surgical outcomes following one-stage versus staged buccal mucosal graft urethroplasty in patients with long-segment anterior urethral strictures.

METHODS & MATERIALS

This quasi, experimental study took place at the Department of Urology, National Institute of Kidney Diseases & Urology (NIKDU), Dhaka, over the duration of one year from 15 June 2023 to 14 June 2024. The study population were male patients with long, segment anterior urethral stricture admitted to the hospital. A

purposive sampling method was used, and the total number of patients was 84, 42 patients in each group. Group A was the one, stage buccal mucosal graft urethroplasty group and Group B was the staged buccal mucosal graft urethroplasty group. Male patients aged between 18 and 60 years with anterior urethral stricture length more than 2 cm were included in the study. Patients who had urethroplasty, post, traumatic urethral stricture, genitourinary malignancy, or were younger than 18 years or older than 60 years were not included in the study. All the data were collected and processed in IBM SPSS Statistics for

Windows, version 26.0. Continuous variables were expressed as mean standard deviation, whereas categorical variables were presented as counts and percentages. The Chi, square test was applied to assess the differences in qualitative variables between the groups. At the same time, the Independent Sample t, test was used for quantitative variables. A p, value less than 0.05 was considered statistically significant. Before the start of the research, ethical approval for the study was secured from the Ethical Committee of the National Institute of Kidney Diseases & Urology (NIKDU), Dhaka.

RESULTS

Most patients in both groups were in the 21-40 years age group in the current study which was 52.38% in Group A and 45.24% in Group B. Patients aged 41, 60 years were 40.48% in Group A and 50.00% in Group B, while only few participants were aged 18, 20 years in both groups. The average age of the patients was 38.48± 11.90 years in Group A and 37.64± 10.52 years in Group B. The difference in age distribution between the two groups was not statistically significant p = 0.596 (Table I).

Table I
Distribution of the Study Subjects According to Age (n = 84).

Age group (Years)	Group A (n = 42)	Group B (n = 42)	p value
18–20	3 (7.14%)	2 (4.76%)	0.596
21–40	22 (52.38%)	19 (45.24%)	
41–60	17 (40.48%)	21 (50.00%)	
Mean ± SD	38.48 ± 11.90	37.64 ± 10.52	-

Data expressed as frequency, percentage, and Mean ± SD. p-value obtained using the Chi-square test. Group A: One-stage buccal mucosal graft urethroplasty. Group B: Staged buccal mucosal graft urethroplasty

In the overweight category (BMI 25–<30 kg/m²), the mean stricture length was 7.16 ± 3.83 cm in Group A and 6.67 ± 4.19 cm in Group B, with no statistically significant difference (p = 0.559). Among obese

patients (BMI ≥30 kg/m²), the mean stricture length was higher in both groups; however, the difference between Group A (9.25 ± 4.18 cm) and Group B (10.67 ± 3.95 cm) was not statistically significant (p =

0.113). Overall, no significant association was observed between BMI and mean stricture length in either group p > 0.05 (Table II).

Table II
Relationship of BMI with Mean Stricture Length in Study Subjects (n = 84).

BMI category (kg/m ²)	Mean stricture length (cm) Group A (n = 42)	Mean stricture length (cm) Group B (n = 42)	p value
Overweight (25–<30)	7.16 ± 3.83	6.67 ± 4.19	0.559
Obese (≥30)	9.25 ± 4.18	10.67 ± 3.95	0.113
Mean ± SD	8.91 ± 4.24	10.24 ± 4.28	0.156

Data expressed as Mean ± SD. p-value obtained using the Independent Sample t-test. Group A: One-stage buccal mucosal graft urethroplasty. Group B: Staged buccal mucosal graft urethroplasty

The mean operation time was significantly shorter in Group A compared to Group B (180.47 ± 3.63 minutes vs. 254.52 ± 8.02 minutes; p < 0.0001). Similarly, mean intra-operative blood loss was significantly lower in Group A than in Group B (502.38 ± 31.14

ml vs. 619.76 ± 58.91 ml; p < 0.0001). Although the requirement for blood transfusion was lower in Group A (19%) compared to Group B (30%), this difference was not statistically significant (p = 0.208). It is noteworthy that the operation time,

blood loss, and blood transfusion requirement in Group B represent the cumulative values of both stage I and stage II procedures (Table III).

Table III
Comparison of Per-operative Parameters of the Study Subjects (n = 84).

Per-operative parameter	Group A (n = 42)	Group B (n = 42)	p value
Operation time (min)	180.47 ± 3.63	254.52 ± 8.02	<0.0001
Blood loss (ml)	502.38 ± 31.14	619.76 ± 58.91	<0.0001
Blood transfusion required (units)	8 (19.0%)	13 (30.0%)	0.208

Data expressed as Mean ± SD and frequency (%). p-value obtained using the Independent Sample t-test. Group A: One-stage buccal mucosal graft urethroplasty. Group B: Staged buccal mucosal graft urethroplasty

In Group A, the site most frequently involved was the penile urethra (35.7%), then the bulbo, penile urethra (23.8%) and the bulbar urethra (21.4%). In Group B, the bulbo, penile urethral involvement was the

most common (35.7%) followed by the penile urethra (21.4%) and the bulbo, penile urethra with meatal involvement (21.4%). Patients with bulbar urethral strictures constituted 21.4% of Group A and 9.5% of

Group B. The difference in the distribution of stricture sites between the two groups was not statistically significant p = 0.194 (Table IV).

Table IV
Distribution of the Study Subjects According to Site of Involvement ($n = 84$).

Site of involvement	Group A (n = 42)	Group B (n = 42)	p value
Bulbar urethra	9 (21.4%)	4 (9.5%)	0.194
Penile urethra	15 (35.7%)	9 (21.4%)	
Bulbo-penile urethra	10 (23.8%)	15 (35.7%)	
Penile urethra + meatus	3 (7.1%)	5 (11.9%)	
Bulbo-penile urethra + meatus	5 (11.9%)	9 (21.4%)	

Data expressed as frequency and percentage. p-value obtained using the Chi-square test. Group A: One-stage buccal mucosal graft urethroplasty
Group B: Staged buccal mucosal graft urethroplasty.

DISCUSSION

The majority (52.48% and 45.24%) of the study subjects were in the age group of 21-40 years. Mean±SD age was 38.48±11.90 years and 37.64±10.52. Another study found a mean age of 38.4 years in their study, which is similar to this study [10]. Mean±SD length of stricture was 8.91±4.24 cm and 10.24±4.28 cm in both groups, respectively. But significant relationship between BMI and length of the urethral stricture in this study, which is dissimilar to the findings of one other study showing obese patients had significantly longer urethral strictures (Mean 6.7±4.7) cm than non-obese patients ($p < 0.001$) [11]. Maybe it is due to geographical variation or aetiology affecting the stricture. The stricture was in the bulbar urethra (21.4% and 9.5%), penile urethra (35.7% and 21.4%), bulbo-penile (23.8% and 35.7%), penile with meatal (7.1% and 11.9%) and bulbo-penile with meatal (11.9% and 21.4%). There were no significant ($p = 0.195$) differences in stricture location between groups, where a different study informed that the majority of strictures (58.6%) involved the bulbar urethra [11]. The incidence of different site involvement may be due to geographical variations. This study revealed operation time (180.47±3.63 vs 254.52±8.02) was significantly ($p < 0.0001$) less in one-Stage Buccal Mucosal Graft Urethroplasty than staged Buccal Mucosal Graft Urethroplasty, as in the staged procedure patient had to face the surgical procedure twice. Per-operative bleeding (502.38±31.14 vs 619.76±58.91) ml was also very significantly ($p < 0.0001$) less in one-Stage Buccal Mucosal Graft Urethroplasty than staged Buccal Mucosal Graft Urethroplasty, the latter one included two surgical procedures. Bleeding was estimated by the deduction of the dry mop's weight from wet ones, and also by measuring from the suction bottle. There was a different study had also reported mean operative time was 162.7±12.156 minutes to 181.36±7.429 minutes in BMG urethroplasty [12]. They measured intraoperative blood loss by the decrease in haemoglobin after surgery up to (1.79±1.009 mg/dl). Another study revealed that the surgical time varied from 130 to 424 minutes, with the mean surgical time being 211 minutes in various types of urethroplasties [13]. In this study, the

distribution of the sites of anterior urethral stricture was similar between the two groups. ($p = 0.194$). In Group A, penile urethral involvement was most common (35.7%), followed by bulbo-penile (23.8%) and bulbar strictures (21.4%). Group B, on the other hand, mostly had bulbo, penile strictures (35.7%), while penile urethral strictures and bulbo, penile strictures with meatal involvement were 21.4% each. Hence, it may be inferred that those who had staged urethroplasty were more likely to have multi, segment or complex disease. Palminteri et al. found that penile and bulbo, penile strictures account for a large share of long, segment anterior urethral strictures requiring substitution urethroplasty, which is in line with the high occurrence of these sites in both groups of our study [2]. Barbagli et al. exposed that the bulbo, penile area is mostly affected in long strictures hence the repair trip which was also seen in group B was of complicated nature [4]. Kulkarni et al. reported that penile and pan, urethral strictures are more likely to be associated with longer disease duration and severe spongiofibrosis, which usually determines the decision to do a staged repair [9]. Furthermore, Kinnaird et al. pointed out that the involvement of different urethral segments is a common feature of long strictures and does not, by itself, predict surgical failure. This is in line with the similar distribution of the two groups in our study [8].

LIMITATIONS

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

Between one, stage and staged buccal mucosal graft urethroplasty groups, patients with long, segment anterior urethral strictures had similar age, BMI, stricture length, and site. One, stage urethroplasty resulted in a significantly shorter operative time and less blood loss, however, transfusion rates were similar. These data suggest that the one, stage repair has perioperative benefits not impacted by baseline clinicodemographic or stricture, related factors.

RECOMMENDATION

Stage buccal mucosal graft urethroplasty should probably be the first choice for patients who are suitable and have long, segment anterior urethral strictures because it involves less operative time and blood loss, among other factors. A thorough preoperative evaluation of stricture features and patient factors should determine the surgical approach, and staged surgeries are to be kept for very complicated or extensive strictures when the tissue quality or length does not allow single, stage reconstruction.

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CONFLICT OF INTEREST

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