GENERAL UROLOGY
Original Article

Double-face augmentation urethroplasty for bulbar urethral strictures: Analysis of short-term outcomes

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Cite this article as: Enganti B, Reddy MS, Chiruvella M, Bendigeri MT, Ragoori D, Ghouse SM, et al. Double-face augmentation urethroplasty for bulbar urethral strictures: Analysis of short-term outcomes. Turk J Urol 2020; 46(5): 383-7.

ABSTRACT

Objective: To present our initial experience with double-face augmentation urethroplasty for near-obliterative bulbar urethral strictures and analyze the short-term outcomes.

Material and methods: We retrospectively evaluated a prospectively maintained database of patients with near-obliterative bulbar urethral strictures (>2 cm), who underwent double-face augmentation urethroplasty. The patients' demographic characteristics, clinical data, and data regarding the investigations conducted were analyzed. Near-obliterative urethral stricture was defined as lumen <6 Fr. Double-face urethroplasty was performed using a ventral approach, during which dorsal inlay and ventral onlay buccal mucosal graft (BMG) augmentation were performed. A successful outcome was defined as normal voiding without the need for any instrumentation to improve the urinary flow rate.

Results: A total of 37 patients with a mean age of 50±11.7 years, who underwent this procedure were included in the study. The mean stricture length was 5.2±0.95 cm. The mean length of the dorsal inlay BMG augmentation was 3.1±0.5 cm and that of the ventral onlay BMG augmentation was 6.3±1.2 cm. Post-void dribbling (18.9%) was the most commonly reported complication. The maximum flow rates and symptom scores significantly improved in both groups compared with the preoperative parameters (p<0.001). The incidence of both erectile dysfunction and ejaculatory failure was reported in 6 (16.2%) patients; respectively. The overall success rate was 86.5% at a median follow-up period of 36 months (IQR: 26.5–43).

Conclusion: Double-face augmentation urethroplasty is a safe and feasible option for near-obliterative bulbar urethral strictures, and our study showed satisfactory short-term outcomes for the same.

Keywords: Buccal mucosa graft; urethroplasty; urethral stricture.

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Submitted:
06.04.2020

Accepted:
07.05.2020

Available Online Date:
01.06.2020

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Introduction

Traditionally, short-segment obliterative traumatic bulbar urethral strictures (<2 cm) are managed by excision and end-to-end anastomotic urethroplasty (EEA).[1] However, non-traumatic bulbar urethral strictures (>2 cm) that are not amenable to EEA can be managed by augmentation urethroplasty.[1] The current trend in the management of bulbar urethral strictures is non-transection, minimal urethral mobilization, and augmentation of the urethra.[2] Augmentation bulbar urethroplasty can be performed using a dorsal or ventral approach, depending on the length, extent, and caliber of the stricture.[1] Various techniques for bulbar urethral reconstruction with favorable outcomes have been described in the available literature.[1-3] Combined dorsal and ventral onlay augmentation urethroplasty technique was described by Palminteri et al.[4] for bulbar urethral reconstruction. In this paper, we present our initial experience with the double-face augmentation urethroplasty technique for near-obliterative bulbar urethral strictures and the analysis of the short-term outcomes of this technique.

Material and methods

This study was a retrospective evaluation of a prospectively maintained database of patients with non-traumatic near-obliterative bulbar urethral strictures (>2 cm), who underwent

Turk J Urol 2020; 46(5): 383-7
DOI: 10.5152/tud.2020.20106

double-face augmentation urethroplasty at our institute from June 2016 to December 2018. Patients with a minimum follow-up period of 1 year were included in the study. We received the approval to conduct the study from our institutional scientific and ethical committee. Informed consent was obtained from all patients prior to the surgical intervention. Patients' clinical data, American Urological Association (AUA) symptom score, blood investigations, radiological imaging such as abdomen ultrasounds, retrograde urethrograms (RGU), and maximum urinary flow rate (UFR-Q_{max}) were retrieved from our hospital's online database system. Near-obliterative urethral stricture was defined as lumen <6 Fr.[5]

Surgical technique

The operative procedure was performed with the patient under general anesthesia with nasotracheal intubation. Two teams operated simultaneously: one team for the perineal procedure and the other for the buccal mucosa graft (BMG) harvesting. All the perineal procedures were performed by a single surgeon. Urethroscopy was performed with a 6-Fr ureteroscope to assess the urethral stricture caliber. A 5-Fr ureteric catheter was placed to enable the identification of the urethral lumen during the procedure. BMG was used for augmentation of the urethra in all the patients. BMG was harvested from the inner cheek, and the donor site was left open after complete hemostasis.

A midline perineal incision was created. The landmark distal extent of the bulbospongiosum muscle was identified. Ventral approach of urethroplasty was considered when the distal extent of the bulbar urethral stricture was proximal to the aforementioned landmark. The bulbospongiosum muscle was identified and incised in the midline to expose the bulbar urethra. The width of the corpus spongiosum was measured, and the ventral approach was considered when the width was >15 mm. Ventral sagittal urethrotomy was performed, and the urethra with the stricture was opened and guided over the preplaced ureteric catheter. The urethral stricture and the plate were assessed and extended 1 cm proximally and distally to the normal urethral lumen. Double-face (dorsal plus ventral onlay) BMG augmentation was considered when there was a narrow urethral plate (<6 mm) or focal spongiofibrosis longer than 2 cm. The dorsal urethral plate was incised with a scalpel in the midline until the tunica albuginea of the corpora cavernosa. An elliptical area was created for the dorsal inlay graft augmentation without mobilizing the lateral urethral plate. The BMG was harvested and quilted in the elliptical area over the dorsal urethral plate with polyglactin (5-0) sutures. The urethral lumen was augmented ventrally with the BMG. Both the urethral margins were sutured with the BMG using polyglactin (5-0) sutures over a 16-Fr silicone catheter. The ventral onlay BMG was quilted with the corpus spongiosum using interrupted polyglactin (4-0) sutures. The adventitia of the corpus spongiosum was approximated till adequate hemostasis was achieved. The bulbospongiosum muscle was closed over the ventral urethrotomy suture line, and the perineal surgical site was approximated (Figure 1).

Main Points:

- Double-face augmentation urethroplasty is a feasible option for near-obliterative bulbar urethral strictures.
- In this technique, there is no mobilization or rotation of the urethra, which aids in the preservation of the vascular and erectile functions.
- Preservation of the urethral plate with watertight urethral mucosa and graft augmentation can be performed with a wide urethral lumen.
- The short-term outcomes of double-face augmentation urethroplasty were satisfactory for near-obliterative bulbar urethral strictures.

Follow-up and outcomes

In the postoperative period, the patients were administered intravenous antibiotics for 3 days and provided with surgical site care. All patients were started on a 5-mg daily dose of tadalafil for 3 months. At 3 weeks, a pericatheter voiding cystourethrogram was performed for all patients (Figure 2). If there was no contrast extravasation, the per-urethral catheter was removed. If there was contrast extravasation, the catheter was retained for another 2 weeks. The patients were followed up with AUA symptom scores, uroflowmetry, and ultrasound for post-void residual urine every 3 months for the first year and every 6 months thereafter. A successful outcome was defined as normal voiding without the need for any instrumentation to improve UFR-Q_{max}. If a patient complained of bothersome symptoms with poor UFR-Q_{max} (<12 mL/sec), RGU was performed and appropriate treatment was planned. The short-term outcomes of double-face augmentation urethroplasty were analyzed at the 1-year follow-up. Erectile dysfunction and ejaculatory dysfunction were evaluated at each follow-up visit using the International Index of Erectile Function-5 (IIEF-5) questionnaire and the Male Sexual Health Questionnaire for Ejaculatory Dysfunction (MSHQ-EjD) short form, respectively.[6]

Statistical analysis

The clinical survey categorical data that followed a normal distribution were presented as mean±standard deviation (SD). Data that did not follow a normal distribution were presented as median (interquartile range, IQR). Some categorical data were presented as percentages. A chi-squared (χ^2) test was used to compare pre- and post-operative data. Moreover, $p<0.05$ was considered statistically significant. All calculations were carried out using IBM Statistical Package for the Social Sciences Statistics 20 (IBM SPSS Corp.; Armonk, NY, USA).

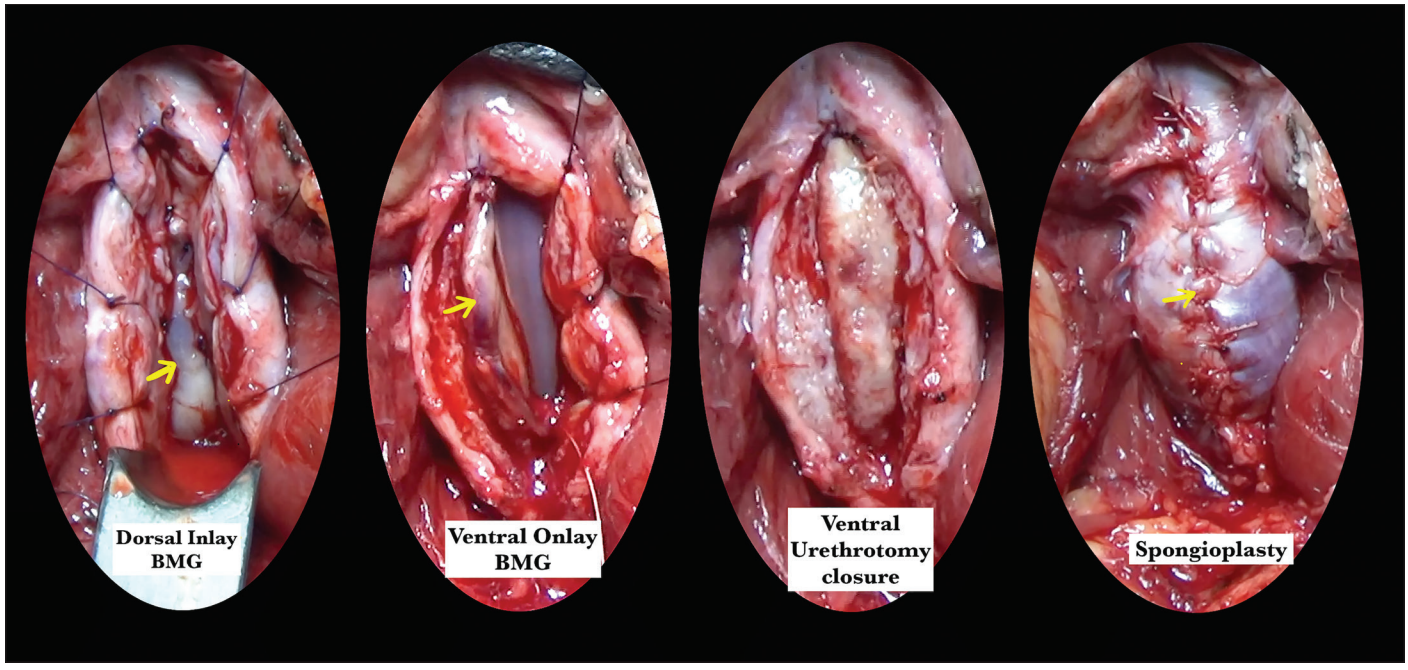

Figure 1. Double-face augmentation urethroplasty: dorsal inlay buccal mucosal graft (BMG) and ventral onlay BMG augmentation followed by ventral urethrotomy closure with spongioplasty

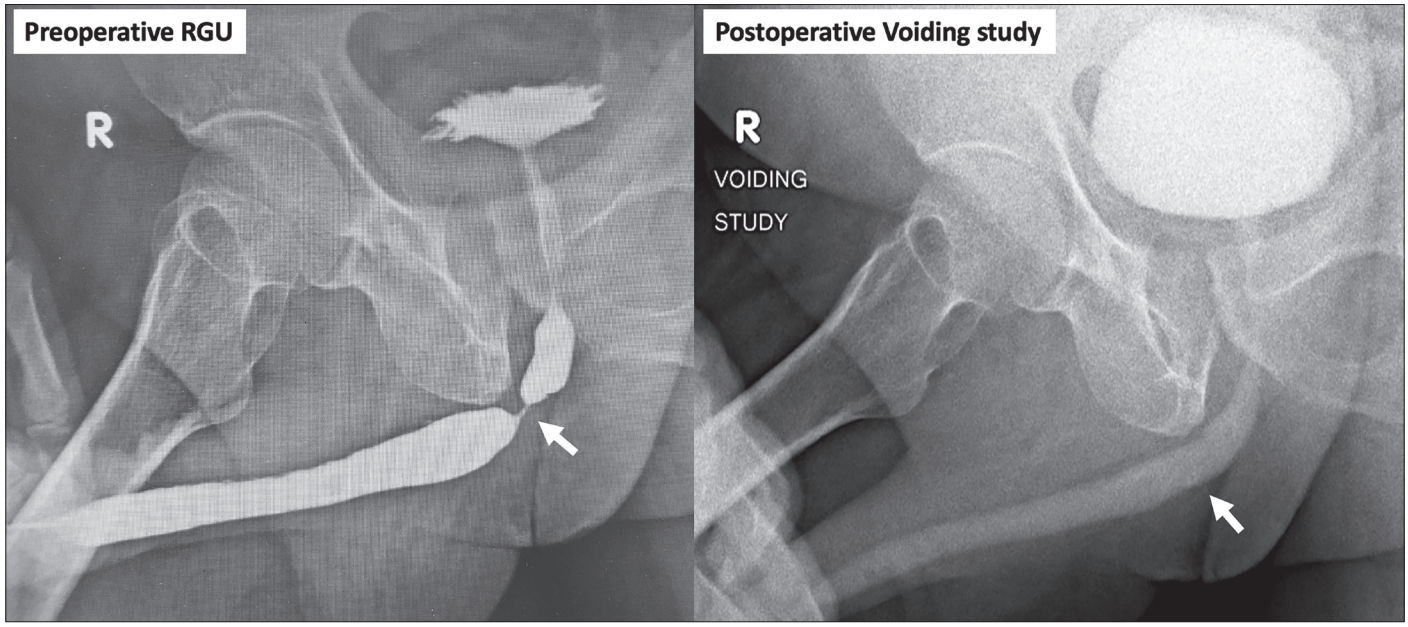

Figure 2. Preoperative retrograde urethrogram and postoperative voiding urethrogram of a patient who underwent double-face augmentation urethroplasty

Results

A total of 41 patients underwent double-face augmentation urethroplasty for near-obliterative bulbar urethral strictures. Of these, 37 patients were included in the study; 4 patients were lost to follow-up and were excluded from the study. The preoperative demographics parameters are shown in Table 1. Majority of the patients had undergone prior optical internal urethrotomy (OIU) (89%). The mean corpus spongiosum width was 16.2±1.3 mm; mean length of the dorsal inlay BMG augmentation was 3.1±0.5 cm and that of the ventral onlay BMG augmentation was 6.3±1.2 cm. The mean operative time was 80±9 min. None

Turk J Urol 2020; 46(5): 383–7
DOI: 10.5152/tud.2020.20106

Table 1. Preoperative demographic characteristics of the study cohort

Parameter	Mean±SD, n (%)
Age (years)	50±11.7
Etiology	
Idiopathic	12 (32.4)
Catheter induced	8 (21.6)
Infection	7 (19.0)
Instrumentation	10 (27.0)
Stricture disease duration (years)	5.4±2.5
Previous treatment	
Optical internal urethrotomy	33 (89.0)
Primary treatment	4 (11.0)
Stricture length (cm)	5.2±0.95
Urethral plate (mm)	5.08±1.01

SD: standard deviation

Table 2. Perioperative complications in the study cohort

Categories	n (%)
Early complications	
Surgical site infection	2 (5.4)
Donor site bleeding	1 (2.7)
Epididymo-orchitis	1 (2.7)
Late complications	
Post-void dribbling	7 (18.9)
Erectile dysfunction	6 (16.2)
Ejaculatory dysfunction	6 (16.2)
Urethral diverticulum	1 (2.7)
Stricture rate	5 (13.5)

of the patients required any blood transfusion. The mean duration of hospital stay was 3.5±0.5 days. The early and late complications following the surgery are shown in Table 2. Erectile dysfunction, assessed by the IIEF-5 questionnaire (mean±SD: 15.9±7.3), was noted in 6 (16.2%) patients as early as in the third month following the surgery. Erectile dysfunction had resolved in 4 patients at the 1-year follow-up. Ejaculatory dysfunction (mean±SD: 8.6±2.7) manifesting as delayed ejaculation (MSHQ-EjD short form) was noted in 6 (16.2%) patients.

Patients were regularly assessed for UFR-Q_{max} and AUA symptom score during the follow-up. There was a significant improvement in the UFR-Q_{max} at the 3-year follow-up (26±5.4) compared with the preoperative parameters (6.8±3.1). The AUA symptom score improved significantly at the 3-year follow-up (10.4±1.7) compared with the preoperative parameters (23±4.4). Both parameters used in the assessment of outcome success were statistically significant ($p<0.001$).

The overall success rate of double-face augmentation urethroplasty was 86.5% at a median follow-up period of 36 months (IQR: 26.5–43). The recurrence of urethral stricture was noted in 5 (13.5%) patients of which 3 were noted in the first year of follow-up. All patients with the recurrence of stricture underwent OIU. One patient had a distal anastomotic ring with urethral diverticulum. OIU and dilatation followed by redo-urethroplasty (urethral diverticulum excision and closure of the urethra) were attempted.

Discussion

Our study highlights the technical implications of double-face augmentation urethroplasty for near-obliterative bulbar urethral strictures.[4] We consider the Palminteri technique of urethroplasty for near-obliterative bulbar urethral strictures.[4] This technique offers the possibility of a wide urethral lumen with good urinary outcomes and preservation of sexual function. This technique has the following 4 advantages: 1) the ventral approach is technically easy; 2) there is no mobilization or rotation of the urethra, which preserves the vascular and erectile function; 3) preservation of the urethral plate with watertight urethral mucosa and graft augmentation can be performed with a wide urethral lumen; 4) both dorsal and ventral grafting can be performed depending on the narrow urethral plate.[4]

Double-face augmentation urethroplasty is an intraoperative decision based on several points. First, endoscopic assessment of the urethral caliber and the quality of the urethral plate should be considered in all cases for adequately planning the appropriate approach.[5] Second, the distal aspect of the bulbospongiosum muscle is the landmark to be identified. The relationship of the distal extent of the bulbar stricture to this landmark needs to be assessed by passing a soft catheter per-urethrally.[1] If the distal extent of the bulbar urethral stricture is proximal to the above landmark, the ventral approach can be considered.[1] Third, the width of the corpus spongiosum should be at least 15 mm to safely perform the ventral approach, wherein the underlying spongiosum gives adequate support to the free graft.[7] The ventral approach should be avoided in the region of the distal one-third of bulbar urethra because the corpus spongiosum and bulbospongiosum muscles are thin and inadequate.[1] Fourth, after ventral urethrotomy, the stricture length and the width of the urethral plate should be assessed. This technique should be considered only if the urethral plate width is <6 mm or if there is focal spongiofibrosis of length >2 cm.[7] While considering the dorsal plus ventral onlay graft augmentation, the urethral plate incision for dorsal inlay augmentation should be less than the that for the ventral urethrotomy incision to prevent overlapping suture lines

and anastomotic strictures. This technique is suitable for patients with proximal bulbar urethral stricture, redo-urethroplasty, or morbid obesity.[7] In contrast, the disadvantages of the ventral approach are bleeding following ventral urethrotomy and damage to the spongious tissue.[8]

Following urethroplasty for stricture disease, post-void dribbling and sexual and ejaculatory dysfunction may pose a concern. The reported prevalence of post-void dribbling following anterior urethral reconstruction was as high as 40%.[9] In our study, post-void dribbling was reported in 18.9% of the patients. This prevalence was similar to that reported by Palminteri et al.[10] The median time for successful follow-up in our study was 36 months. Majority of the failures were noted in the first year of follow-up. This observation was similar to that noted in other studies.[11,12] The incidence of ejaculatory and erectile dysfunction (16.2%) was similar in our study, which was higher than that reported by Palminteri et al.[11] There are some limitations of this study. This was a retrospective study with a small study population and a short-term follow-up.

In conclusion, double-face augmentation urethroplasty is a safe and feasible option for near-obliterative bulbar urethral strictures. Our study showed satisfactory results with acceptable short-term outcomes for near-obliterative bulbar urethral strictures.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Asian institute of Nephrology and Urology (Protocol number: AINU03/2016).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – B.E.; Design – B.E.; Supervision – M.C., M.T.B., D.R, S.M.G., P.R.; Resources - Nil; Materials – B.E.; Data Collection and/or Processing - B.E., M.S.R.; Analysis and/or Interpretation – B.E., M.S.R.; Literature Search – B.E., M.S.R., M.T.B.; Writing Manuscript – B.E., M.S.R., M.T.B.; Critical Review – M.C., M.T.B., D.R., S.M.G., P.C.; Other - Nil.

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

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