Bulbospongiosus Muscle Sparing Urethroplasty Versus Standard Urethroplasty: A Comparative Study

Ehab Elkady, Tamer Dawod, Mohamed Teleb, and Waleed Shabana

OBJECTIVE To compare outcome of muscle and nerve-sparing bulbar urethroplasty with standard bulbar urethroplasty as regard ejaculatory dysfunction and postvoid dribbling.

METHODS This prospective randomized study included 50 patients with bulbar urethral stricture underwent urethroplasty over a period of 5 year. All patients were operated by ventral onlay buccal mucosal graft urethroplasty and randomly divided into 2 groups. Group I (n = 25) was operated by standard bulbar urethroplasty. Group II (n = 25) was operated by bulbar urethroplasty with preservation of bulbospongiosus muscle and nerve. Postoperative follow-up was performed at 1-, 6-, and 12-month and annually thereafter. Urethrography was done at 1-month, while uroflowmetry was performed at 6- and 12-month. Urethrography was indicated if Q_{max} <14 mL/sec. Success was defined as normal voiding without any auxiliary procedures.

RESULTS Success rate was 88% and 92% in Group I and II, respectively. Urethral sacculation was not detected in any patient in either group. One patient from Group I was complicated by urinary extravasation after catheter removal and required re-catheterization for another 1week. One patient in each group was complicated by postoperative wound infection managed by antibiotics. Postvoid dribbling was the complaint of 9 patients in Group I and 1 patient in Group II, while semen sequestration was present in 10 and 2 patients in Group I and Group II, respectively. Significant differences were observed between the 2 groups as regard postvoid dribbling and ejaculatory dysfunction.

CONCLUSION Bulbar urethroplasty with bulbospongiosus muscle and nerve-sparing seems to be a safe and effective alternative for standard bulbar urethroplasty. UROLOGY 126: 217–221, 2019. © 2018 Elsevier Inc.

Although urethral stricture has a great negative impact on patient's quality of life, its true incidence is not well known. The treatment of urethral stricture has undergone significant changes, passing from minimally invasive interventions with different degrees of success to definitive open urethroplasty.[1] Reconstruction of anterior urethral stricture remains a challenge for the urologists. Genital skin flaps and grafts from genital or extra-genital tissues have been studied for substitution urethroplasty. Oral mucosa graft (OMG) has gained popularity as a successful substitution in urethral stricture surgery.[2] Bulbospongiosum muscle is a paired muscle that covers the bulb of the urethra[3] and by rhythmic contractions; this muscle is encountered in expulsion of semen and urine specially the last drop.[4] The perineal nerve— a branch of the pudendal nerve—divides into motor and sensory portions. The motor portion supplies the bulbospongiosum muscle while the sensory portion supplies the perineal and scrotal skin with the ventral penile skin.[5] The success of urethroplasty is not only related to stricture recurrence but also to the impact on the erectile and ejaculatory functions in addition to postvoid dribbling.[6] In the current study, we tried to compare the functional outcome of the bulbospongiosum muscle sparing urethroplasty with the standard bulbar urethroplasty as regard postvoid urine dribbling and ejaculatory dysfunction specially semen sequestration.

PATIENTS AND METHODS

Study Design and Power of the Test

This prospective randomized study included patients with bulbar urethral stricture disease who underwent urethroplasty over a period of 5 year. Recurrent or salvage urethroplasty patients were excluded from the study. An informed consent from each patient was obtained and patients were permitted to withdraw from the study at any time. The difference in proportions of EjD and/or postvoid dribbling between the standard bulbar urethroplasty and the bulbospongiosus muscle and nerve-sparing techniques

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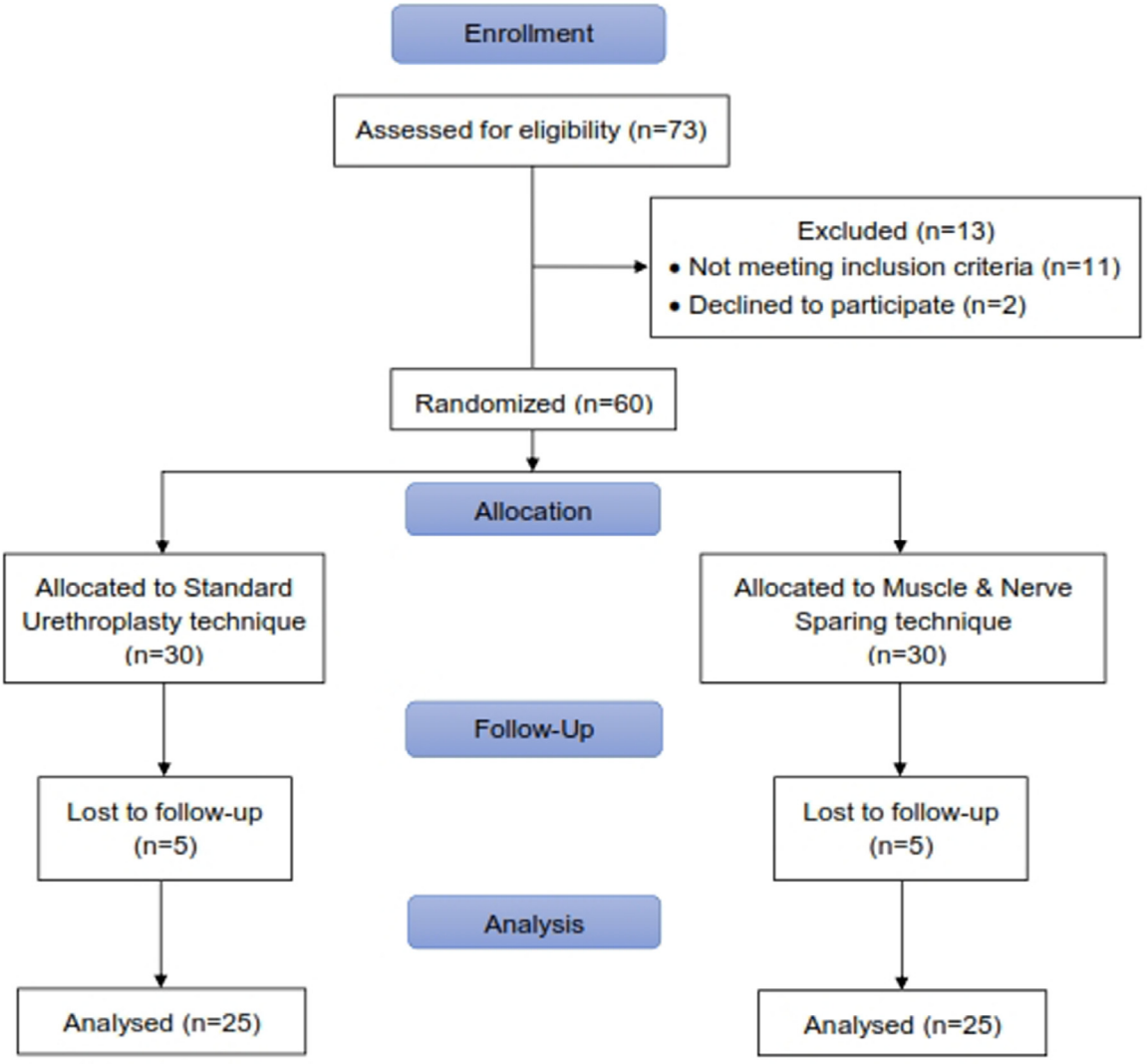

Figure 1. Consort flow diagram. (Color version available online.)

was estimated to be around 25% based on a previous study[7] and type II error of the test to be 20% at a confidence interval of 95%. This resulted in a minimum sample size of 25 patients for each individual group. Patients were randomly divided into 2 groups using shuffling cards method. A dropout rate of 20% was permitted so we allocated 30 patients to each study arm. Of all patients, 5 did lose to follow-up in each group. Eternally 50 patients were analyzed, 25 in each group. Group I (n = 25) was operated by the standard bulbar urethroplasty. Group II (n=25) was operated by bulbar urethroplasty with preservation of the bulbospongiosum muscle and nerve (Fig. 1).

Surgical Techniques

Two surgical teams performed all operations, 1 for urethroplasty and the other for BMG harvest. In group I, we started the procedure by midline perineal incision with dissection until reaching bulbospongiosum muscle that incised in the central tendon to expose the corpus spongiosum (Fig. 2A). We Injected methylene blue into the urethra to delineate the healthy urethral mucosa after that, a vertical midline incision in the corpus spongiosum was performed guided by gently inserting 20 Fr nelaton catheter to determine the distal limit of the stricture. The incision was completed proximally and distally aided by the color of the mucosa. Alternatively, in group II we separated carefully the bulbospongiosum muscle—rather than incised—from the corpus spongiosum using a small fine scissor to keep the central tendon and the lateral margins of the muscle intact. Then, we pulled down the muscle by fine stay sutures or small fine retractors (Fig. 2B). In both techniques, we measured the length and width of the stricture followed by proper BMG harvest from the cheek according to the standard technique. The edges of the BMG were sutured to the edges of the opened urethra using 5/0 vicryl sutures over 18 Fr nelaton catheter that remained for 3 weeks. Closure of the corpus spongiosum over the graft was performed using 4/0 vicryl sutures. In group I, bulbospongiosum muscle was sutured in the midline in contrast to group II, where pulling up and repositioning of bulbospongiosum muscle was performed. Follow-up for postoperative complications including EjD and postvoid urine dribbling was performed at 1-, 6-, 12-month, and annually thereafter. For assessing ejaculatory dysfunction, patients were subjected to the self-administered short form of Male Sexual Health Questionnaire (MSHQ-EjD Short Form).[8] Patients of both groups were asked to fill the patient-reported outcome measure (PROM) of urethral stricture surgery

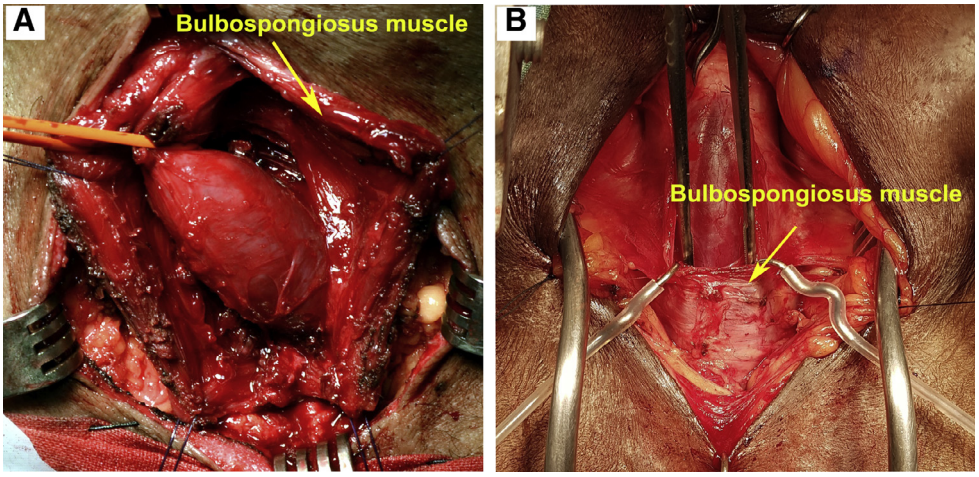

Figure 2. (A) Bulbospongiosum muscle is incised in the midline in the standard bulbar urethroplasaty technique. (B) Bulbospongiosum muscle is separated from the corpus spongiosum without incision in the bulbar urethroplasty with bulbospongiosus muscle and nerve-sparing. (Color version available online.)

questionnaire[9] to assess the postvoid dribbling. Preoperative and postoperative results of both questionnaires were analyzed and compared. Urethrography was done at 1-month, while uroflowmetry was performed at 6 month and 12 month for all patients. Urethrography was indicated if Q_{max}<14mL/sec.

Statistical Analysis

Data were checked, entered, and analyzed using MedCalc Software (version 18.10). Data are expressed as the mean (SD) for quantitative variables, and number and/or percentage for qualitative variables. We used the unpaired student *t* test and chi-square test to analyze data when appropriate. $P < .05$ was considered as statistically significant.

Outcomes

The primary outcome was the occurrence of postvoid dribbling and/or ejaculatory dysfunction in either group. While sacculation, urinary extravasation, wound infection, and/or re-stricture represented the secondary outcomes.

RESULTS

Patient's and stricture demographics were presented in Table 1. There were no statistically significant differences between both groups as regard mean age, BMI, and follow-up period. The mean stricture length (cm) was 3.29 ± 0.69 and 3.46 ± 0.58 for G I and G II, respectively with statistically insignificant differences. The mean (± SD) urethroplasty operative time (min) was 100 ± 15 and 105 ± 12 for G I and G II, respectively without significant difference. Urinary extravasation was noticed in 1 (4%) patient from G I after catheter removal. This necessitated re-insertion of urethral catheter for another 1-week. This patient did not present any long-term complications. One (4%) patient in each group was complicated by postoperative wound infection. These infections were superficial and successfully treated by proper antibiotics. Urethral sacculation was not encountered in any patient of either group. Three (12%) patients in G I and 2 (8%) patients in G II complained of weak urine stream during the first 6-month after catheter removal. Uroflowmetry was done for these patients and Q_{max} was <14 mL/sec for all. These 5 patients showed ring strictures in urethrography and were managed successfully by visual internal urethrotomy (VIU). Those patients were classified as failure cases, so the success rate was

Table 1. Patient's and stricture demographics plus MSHQ results

	G I (n = 25)	G II (n = 25)	*P* value
Patient's Demographics			
• Mean Age (years)	35.4 ± 6.23	32.3 ± 5.12	.17
• Mean BMI (kg/m^2)	25.2 ± 3.77	23.8 ± 3.41	.32
• Mean Follow-up (month)	18.25 ± 4.2	19 ± 2.5	.58
• Urethroplasty Operative Time (min)	100 ± 15	105 ± 12	.19
Stricture Demographics			
• Mean Stricture Length (cm)	3.29 ± 0.69	3.46 ± 0.58	.5
MSHQ Results			
• Mean Preoperative	15.7 ± 1.8	16.2 ± 1.1	.2
• Mean Postoperative 1 m	18.2 ± 1.2	19.1 ± 1.4	.01
• Mean Postoperative 6 m	18.5 ± 0.9	19.3 ± 1.7	.04
• Mean Postoperative 12 m	18.4 ± 0.8	19.2 ± 1.1	.01

Table 2. Postoperative complications according to modified Clavien classification

	Complication	Group I (n = 25)	Group II (n = 25)	*P* value
Grade I				
	• Urinary Extravasation	1 (4%)	0	1
	• Postvoid Dribbling	9 (36%)	1 (4%)	.01
	• Ejaculatory Dysfunction	10 (40%)	2 (8%)	.02
Grade II	Wound Infection	1 (4%)	1 (4%)	.47
Grade III	Re-stricture (Requiring Intervention Under Anaesthesia)	3 (12%)	2 (8%)	1
Grade IV	Life-threatening Complication	0	0	
Grade V	Death	0	0	

GA, general anaesthesia.

88% and 92% in G I and G II respectively (Table 2). Ten (40%) patients in G I and 2 (8%) patients in G II complained of EjD. The EjD was in the form of semen sequestration. EjD was evaluated using the MSHQ-EjD Short Form as shown in Table 1 with statistically significant difference between both groups ($P = .02$) (Table 2). Nine (36%) patients from G I and 1 (4%) from G II complained of postvoid dribbling with statistically significant difference between the two groups ($P = .01$) (Table 2). Postoperative complications were classified according to modified Clavien system[10] and presented in Table 2.

DISCUSSION

Ejaculatory dysfunction and postvoid dribbling remain major concerns of various techniques of bulbar urethroplasty. Trials had been made to minimize these sequelae for better quality of life. Muscle and nerve sparing urethroplasty technique was described by Barbagli et al as a modification of the standard technique to decrease the occurrence of these complications.[7] In our study, the success rate was 88% in the standard urethroplasty group. This result is comparable to the study of Andrich and Mundy[11] who operated 29 patients with follow-up period 48-60 months with success rate of 86%. Kane et al[12] did operate 53 patients with 25 months follow-up period and their success rate was 94%. Barbagli et al[13] treated 17 patients and followed them for 42 months with success rate of 83%. In the previously mentioned studies, the standard bulbar urethroplasty technique was used with ventral onlay buccal mucosa graft. In our muscle and nerve sparing urethroplasty group, we had a success rate of 92%. In his study, Barbagli et al,[7] evaluated this technique on 12 patients with follow-up period of 12.25 months and the success rate was 100%. The same technique was also evaluated by Ariel et al[14] with success rate of 94%. To our knowledge, the exact cause of post urethroplasty ejaculatory dysfunction and postvoid dribbling is not yet known. One of the hypotheses postulated to explain the fore-mentioned drawbacks is the occurrence of sacculation which may be due to lack of support of the graft. Another hypothesis is injury of the perineal nerve and bulbospongiosum muscle.[7] Incision of the bulbospongiosum muscle during standard bulbar urethroplasty injures the branches of the perineal nerve either during dissection or by cautery thus affecting the function of the muscle propelling the last drop of urine and semen.[7,15] In the current study, urethral sacculation was not detected in any patient in either group. We attribute this to the support of the graft by both corpus spongiosum and the bulbospongiosum muscle in both groups. This finding is supported by the work of Barbagli et al[7] who didn't encounter any urethral sacculation in his study. EjD and postvoid dribbling were significantly higher in the standard urethroplasty group despite the absence of sacculation in either group. Hence, we believe that preservation of bulbospongiosum muscle and nerve would help in maintaining the function of the muscle. Our study showed comparable results to that of Barbagli et al[7] as regard postvoid dribbling and semen sequestration. In contrast, Ariel et al[14] stated that there was no short-term difference between both techniques for postvoid dribbling. In addition, they found that there was no significant difference as regard ejaculatory function. Nevertheless, Ariel et al[14] postulated that there may be subjective improvement in ejaculatory function with muscle and nerve sparing technique. Muscle and nerve sparing bulbar urethroplasty is a promising modification of the standard urethroplasty technique with better quality of life. This technique requires more future evaluation with higher number of patients and longer follow-up periods.

CONCLUSION

Urethral reconstruction remains a challenge to urologists. Reconstructive surgeons always search for perfection of their work for the sake of the patients. EjD and postvoid dribbling are very annoying to the patients and compromise their quality of life despite success of urethroplasty. Bulbar urethroplasty with bulbospongiosum muscle and nerve sparing seems to be a safe and effective alternative for the standard bulbar urethroplasty.

References

1. Andrich DE, Mundy AR. What is the best technique for urethroplasty? *Eur Urol.* 2008;54:1031–1041.
2. Bhargava S, Chapple CR. Buccal mucosal urethroplasty: Is it the new gold standard? *BJU Int.* 2004;93:1191–1193.

3. Giuliano F, Clement P. Neuroanatomy and physiology of ejaculation. *Annu Rev Sex Res*. 2005;16:190.
4. Yang CC, Bradley WE. Somatic innervation of the human bulbocavernosus muscle. *Clin Neurophysiol*. 1999;110:412–418.
5. Uchio EM, Yang CC, Kromm BG, Bradley WE. Cortical evoked responses from the perineal nerve. *J Urol*. 1999;162:1983–1986.
6. Palminteri E, Berdondini E, De Nunzio C, et al. The impact of ventral oral graft bulbar urethroplasty on sexual life. *Urology*. 2013;81:891.
7. Barbagli G, De Stefani S, Annino F, et al. Muscle and nerve-sparing bulbar urethroplasty: A new technique. *Eur Urol*. 2008;54:335.
8. Rosen RC, Catania JA, Althof SE, et al. Development and validation of four-item version of Male Sexual Health Questionnaire to assess ejaculatory dysfunction. *Urology*. 2007;69:805.
9. Matthew J, John S, Altaf M, et al. Defining a patient-reported outcome measure for urethral stricture surgery. *Eur Urol*. 2011;60:68.
10. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: A new proposal with evaluation in a cohort of 6336 patients and results of a survey. *Ann Surg*. 2004;240:205–213.
11. Andrich DE, Mundy AR. Substitution urethroplasty with buccal mucosal-free grafts. *J Urol*. 2001;165:1131–1133.
12. Kane CJ, Tarman GJ, Summerton DJ, et al. Multi-institutional experience with buccal mucosa onlay urethroplasty for bulbar urethral reconstruction. *J Urol*. 2002;167:1314–1317.
13. Barbagli G, Palminteri E, Guazzoni G, Montorsi F, Turini D, Lazzeri M. Bulbar urethroplasty using buccal mucosa grafts placed on the ventral, dorsal, or lateral surface of the urethra: are results affected by the surgical technique? *J Urol*. 2005;174:955–957.
14. Ariel F, Bradley AE, Kristian S, Alex JV. Functional effects of bulbospongiosus muscle sparing on ejaculatory function and postvoid dribbling after bulbar urethroplasty. *J Urol*. 2017;197:738–743.
15. Barbagli G. Words of wisdom. Re: Neuroanatomy of the male urethra and perineum. *Eur Urol*. 2006;50:1367.