Ventral Inlay Labia Minora Graft Urethroplasty for the Management of Female Urethral Strictures

Fikret Fatih Önol, Şinasi Yavuz Önol, Ahmet Tahra, and Uğur Boylu

OBJECTIVE To evaluate the functional outcomes of ventral inlay labia minora graft urethroplasty (VILGU) for the management of female urethral strictures.

METHODS Data of 7 consecutive women treated with VILGU between 2011 and 2013 were reviewed. Two patients had cystostomy tubes at repair, and 5 had undergone previous urethral dilations and urethrotomies. Clinical evaluation included assessment of the effect of voiding symptoms with American Urological Association (AUA) symptom score, uroflowmetry, voiding cystourethrography, and intraoperative urethrocystoscopy using a 6.5F pediatric ureterorenoscope. Preoperative AUA symptom score and peak urinary flow rate were compared with postoperative values. Cure was defined as the absence of any restenosis requiring additional intervention with subjective patient satisfaction at the last follow-up.

RESULTS Mean stricture length was 1.5 cm (range, 1-2.5), and mean operative time was 95 minutes (range, 70-110). With a mean follow-up of 18.2 months (range, 3-30), cure was achieved in 6 (86%) women. At the last follow-up, mean maximum urine flow (mL/s) increased from 3.9 ± 3.1 preoperatively to 22.7 ± 8.3 postoperatively (P <.001), and mean AUA symptom score decreased from 25.3 ± 5.2 preoperatively to 6.9 ± 3.7 postoperatively (P = .001). No fistulae developed after surgery. "De-novo" stress urinary incontinence was not evident in any case.

CONCLUSION VILGU effectively provides better urinary flow and significantly improves patient satisfaction in patients with female urethral stricture disease. UROLOGY 83: 460–464, 2014. © 2014 Elsevier Inc.

Urethral stricture in women is a rare entity, constituting only 4%-13% of female bladder outlet obstruction.[1] Etiology of urethral stricture is generally traumatic or iatrogenic of origin, such as prolonged catheterization, surgical repair of diverticulum, fistula, or incontinence. Inappropriate treatment of lower urinary tract symptoms with urethral dilatation has emerged as one of the leading causes of female urethral strictures.[2]

Various data recommend dilatation and urethrotomy for short urethral strictures, albeit high recurrence rates. The initial management of female urethral strictures has remained controversial. Female urethroplasty is a topic of increasing attention with multiple surgical approaches described, including the use of grafts (vaginal wall, oral mucosa, and labia minora) and flaps (anterior and lateral vagina).[3] Vaginal flaps have been widely used as a successful tool for urethral reconstruction in our experience[4] and the experience of others.[3,5,6] However, vaginal tissue might not be viable for grafting in all cases, and free grafts might be preferable in some patients, depending on patient characteristics. Few series have published outcomes with genital and extragenital mucosal grafts.[7-12] In this study, we evaluated the functional outcomes of ventral inlay labia minora graft urethroplasty (VILGU) for the management of female urethral strictures.

PATIENTS AND METHODS

All women presenting with lower urinary tract symptoms and diagnosed with urethral stricture disease from 2011 to 2013 were included in the study. The etiology for stricture was urethral caruncle excision in 2 patients and idiopathic in 5 patients (Table 1). Two patients had cystostomy tubes at repair because of severe bladder outlet obstruction. Five women (71.4%) had undergone previous urethral dilations and urethrotomies.

Preoperative investigation included history, subjective assessment of symptoms using the American Urological Association (AUA) symptom score, physical examination, urine analysis, uroflowmetry, and postvoid residual urine determination, along with voiding cystourethrography (Fig. 1). All cases had a urethral caliber of <12F and a free maximal urinary flow rate <10 mL/s. During surgery, urethroscopy was performed with a 6.5F pediatric ureterorenoscope to evaluate the extent

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From the Ümraniye Training and Research Hospital, Clinic of Urology, Istanbul, Turkey; and the Department of Urology, Bezmi Alem Vakif University Hospital, Istanbul, Turkey

Reprint requests: Fikret Fatih Önol, M.D., F.E.B.U., Ümraniye Training and Research Hospital, Clinic of Urology, Adem Yavuz cd. No. 1, 34766 Istanbul, Turkey. E-mail: ffonol@yahoo.com

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Table 1. Preoperative patient characteristics and outcomes at the last follow-up

Pt. No.	Age (y)	Etiology	Previous Treatments	Preop AUA Score	Preop. Q_{max} (mL/s)	Preop. Urethral Caliber	Stricture Site	Stricture Length (mm)	Postop AUA Score	Postop Q_{max} (mL/s)	Outcome	Follow-up (mo)
1	47	Unknown	Dilatation, urethrotomy	31	n.a.	4F	Mid and proximal	26	6	23	Cure	24
20	52	Caruncle excision	Dilatation, urethrotomy	22	3	6F	Mid and distal	15	8	10	Urethrotomy at eighth month	24
3	52	Unknown	Dilatation	29	n.a.	4F	Mid and distal	20	12	15	Cure	18
4	56	Caruncle excision	Dilatation	23	2	8F	Mid and distal	12	5	24	Cure	30
5	52	Unknown	None	27	1	7F	Mid and distal	15	8	29	Cure	18
6	39	Unknown	Urethrotomy	20	5	10F	Mid	10	2	31	Cure	10
7	49	Unknown	None	25	9	10F	Mid and distal	12	7	27	Cure	3

AUA, American Urological Association; Q_{max}, maximum urine flow.
n.a., not applicable because the patient has cystostomy tube.

of the stricture and competency of the bladder neck. All patients provided full written informed consent after available techniques for female urethroplasty were explained. Data were prospectively collected and retrospectively reviewed after approval by our institutional review board.

Surgical Technique

Ventral urethra was exposed through a midline anterior vaginal wall incision starting 0.5-1 cm, proximal from the external meatus extending toward the bladder neck. The fibrotic urethra was incised in the midline at 6 o'clock, extending a few millimeters into the healthy mucosa at distal and proximal site. After opening the urethra, the length of the stricture was determined by measuring the extent of the whitish, stenotic urethral mucosa. The patency of healthy distal and proximal urethra was confirmed with calibration with a 26-28F sound (Figs. 2 and 3). Then, a free graft of adequate length and width was harvested from the labia minora to fit the ventral urethral defect (Fig. 2A). The graft was augmented to the urethra as ventral inlay using a 4-5/0 polyglactin suture, starting from the proximal urethra and running distally on each side to finalize the anastomosis (Fig. 2B). All periurethral tissues were reapproximated in the midline (Fig. 3), followed by primary closure of the vaginal mucosa. A 20-22F Foley catheter was placed at the end of procedure and kept for 10-14 days.

The postoperative data were recorded during an initial visit 7 days after catheter removal, first, third, sixth months, and annually thereafter. During each visit, the patients underwent assessment of voiding symptoms with the AUA symptom score and urinary incontinence, if any, and uroflowmetric studies with postvoid residual determination. Cure was defined as the ability to void with a maximal urinary flow rate of >15 mL/s with a normal-appearing flow curve at the last postoperative visit and the absence of any restenosis requiring additional intervention. Failure was defined as the recurrence of stricture as determined by a need for additional intervention. The preoperative AUA symptom score and maximum urine flow rate (Q_{max}) were compared with postoperative values obtained at the last follow-up using the Wilcoxon signed-rank test. A P value of $<.05$ was considered statistically significant.

RESULTS

A total of 7 consecutive women (age, 39-56 years) with mid to distal urethral stricture were treated with VILGU (Table 1). External urethral meatus was not involved in any case in this cohort. Mean stricture length was 1.5 cm (range, 1-2.5), and mean operative time was 95 minutes (range, 70-110). With a mean follow-up of 18.2 months (range, 3-30), cure was achieved in 6 (86%) women. Five patients completed a minimum of 1-year follow-up. One patient complained of a gradual decrease in urinary flow after having been cured for 6 months. She received internal urethrotomy at postoperative eighth month for a short stricture diagnosed at the distal anastomotic site. She has completed 6 months after this endoscopic intervention and is still symptom-free. Postoperative urinary tract infection occurred in 1 patient and was cured with antibiotics without any consequences throughout follow-up.

At the last follow-up, maximum urine flow (mL/s) increased from a mean of 3.9 ± 3.1 preoperatively to 22.7

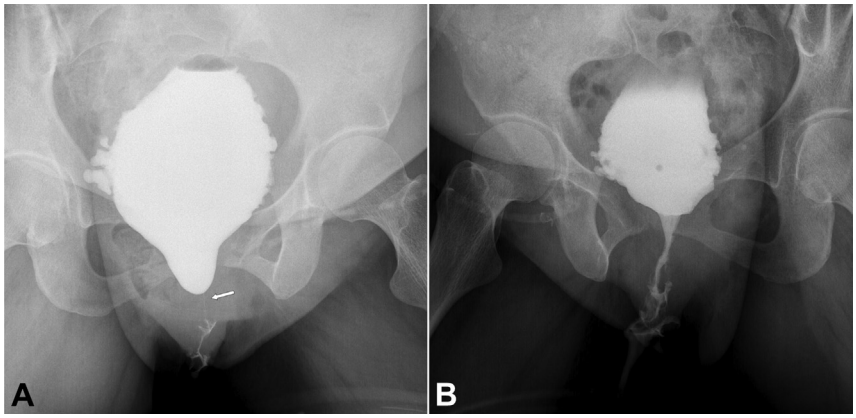

Figure 1. Voiding cystourethrography: preoperative study in a cystostomized patient demonstrates midurethral stricture (arrow) with proximal urethral dilatation and disruption of bladder anatomy with formation of multiple diverticulae **(A)**. Postoperative study shows patent urethral passage with resolution of dilatation proximal to the stricture **(B)**.

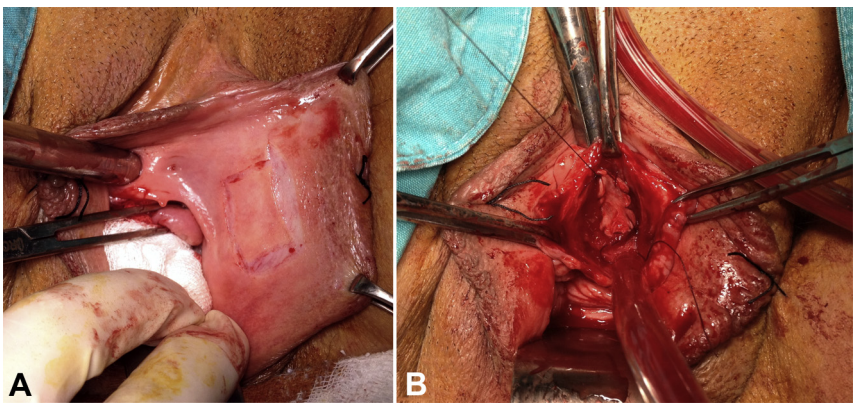

Figure 2. Free graft is shown to be outlined from the left labia minora **(A)**. Strictured urethra is incised ventrally at 6 o'clock, extending a few millimeters into the healthy mucosa at proximal and distal urethra. After confirmation of the adequacy of this incision with urethral calibration via a 26-28F sound, the free graft is sutured as "ventral inlay" to fill the urethral defect. The final appearance of VILGU is demonstrated **(B)**. VILGU, ventral inlay labia minora graft urethroplasty. (Color version available online.)

± 8.3 postoperatively (P <.001), and mean AUA symptom score decreased from 25.3 ± 5.2 preoperatively to 6.9 ± 3.7 postoperatively (P = .001). No fistula developed after surgery. "De-novo" stress urinary incontinence was not evident in any case.

COMMENT

The initial management of female urethral stricture disease is controversial. There has been a recent interest in reconstructive surgery because of the high success rates achieved with a single intervention as opposed to the minimally invasive measures (ie dilatation or urethrotomy). Various series have reported considerable success using grafts and flaps.[3-12] However, some of these procedures might require expertise in complex urethral dissection (such as dorsal urethrolysis through suprameatal incision) and familiarity of the surgeon with various graft and flap transfer techniques. Although vaginal flap techniques were used more frequently, no guidelines or large series for female urethral stricture disease exists to recommend how to choose the most appropriate surgical approach for an individual patient.

In this study, we used VILGU as an effective tool for the management of female urethral stricture disease. The technique has the advantage of providing a straightforward access to the ventral urethra through a dissection, which is well known to most surgeons. With a mean follow-up of 18.2 months, VILGU provided cure in 6 of the 7 (86%) women in our cohort. Using a similar technique, Rehder et al[7] reported success in 7 of 8 women 1 year after surgery. In accordance with our results, they did not encounter any case of "de-novo" stress urinary incontinence. Despite small differences between the techniques, midline splitting of the omega-shaped striated sphincter in the ventral urethra has likely avoided the disruption of female continence mechanism. These results confirm the efficacy and safety of ventral urethral grafting.

Ventral grafting in the female urethra can be achieved with both genital and extragenital mucosal grafts. Buccal

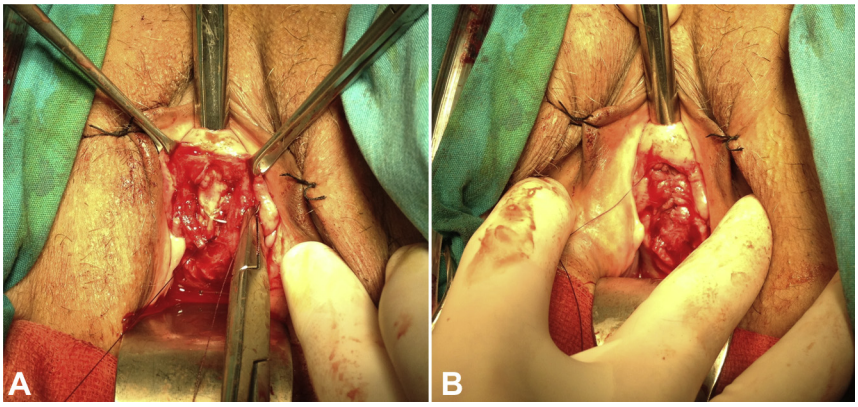

Figure 3. Periurethral tissues are reapproximated in the midline with a running polyglactin suture to support back the continence mechanism and avoid fistula formation. During this closure, small "bites" might be taken from the graft to facilitate graft stabilization during healing process **(A)**. Final appearance of the periurethral closure **(B)**. (Color version available online.)

mucosal grafts are the most commonly used extragenital grafts, with success rates reported between 83% and 100%.[3,4,10,11] Nevertheless, buccal mucosal graft urethroplasty requires graft harvesting from a distant site as an additional procedure and has potential complications such as parotid duct and mental nerve injury. In this regard, VILGU might avoid the potential donor site morbidity although maintaining the high success rates achieved with oral mucosal grafts. A graft length of 3-4 cm can be readily harvested from the labia minora.[7] This length is sufficient for the reconstruction of most female urethral strictures, which are confined to the mid to distal urethra in most cases. However, in the uncommon case with long stricture extending toward the bladder neck, oral mucosa can yield a larger amount of graft tissue for reconstruction. The advantages and disadvantages of genital vs extragenital mucosal grafting need to be elucidated with further studies.

Reconstructive management of female urethral strictures depends on the critical factors of stricture location and length and adequacy of the vaginal hiatus for surgical exposure and viability of local tissues for donation. Vaginal mucosal flaps have been used as a versatile tool for female urethral reconstruction.[3-6] The advantage of vaginal flap urethroplasty is the familiarity of most urologists and gynecologists to transvaginal technique because of the widespread use of midurethral slings. Nevertheless, vaginal wall might not be adequate for flap donation in all cases. In addition, vaginal flap urethroplasty requires the division of external urethral meatus even if the meatus is not involved by fibrosis. Inward urinary stream or urinary spraying can be a problem if careful meatal reconstruction is not performed during vaginal flap urethroplasty.[4] It could be argued that many women with urethral stricture disease do not have meatal involvement and do not necessitate its incision. VILGU might facilitate a more physiological reconstruction in such patients.

Currently, there are no high quality data to suggest whether flaps or grafts provide superior long-term outcomes in female urethral stricture disease. Theoretically, vaginal mucosal flaps might atrophy with advancing age and cause delayed stricture recurrences. Most recurrences in the published data after female urethroplasty were reported to occur with the first year of surgery.[7,9,12] Early recurrences are possibly related to technical issues. Notably, in one of the largest case series, Blaivas et al[3] reported late recurrences (5.5 and 6 years after initial management) in 2 of 17 women who underwent urethroplasty. Interestingly, these 2 recurring patients were treated with a vaginal mucosal flap urethroplasty, whereas no recurrences were reported in women with buccal mucosal graft urethroplasty.

Limitations of this study include few number of patients, absence of a control group, and the retrospective design. However, the rarity of this disease has limited us to design a randomized prospective trial. Despite its limitations, we decided to report our experience on the basis of the relative paucity of information regarding the management of female urethral strictures. VILGU might be a simple and effective alternative for reconstruction of female urethral strictures and might potentially eliminate the need for oral mucosal graft harvesting if the surgeon opts to use a graft-based technique. Advantages and disadvantages of various surgical approaches will only be clarified with good-quality, randomized large-series studies with long-term follow-up.

CONCLUSION

Female urethral stricture is a rare cause of female bladder outlet obstruction. Various female urethroplasty techniques offer an effective treatment for this condition with a single intervention. VILGU effectively provides better urinary flow and significantly improves patient satisfaction in patients with female urethral stricture disease.

References

1. Keegan KA, Nanigian DK, Stone AR. Female urethral stricture disease. *Curr Urol Rep.* 2008;9:419-423.

2. Santucci RA, Payne CK, Saigal CS, Urologic Diseases in America Project. Office dilation of the female urethra: a quality of care problem in the field of urology. *J Urol.* 2008;180:2068-2075.
3. Blaivas JG, Santos JA, Tsui JF, et al. Management of urethral stricture in women. *J Urol.* 2012;188:1778-1782.
4. Onol FF, Antar B, Kose O, et al. Techniques and results of urethroplasty for female urethral strictures: our experience with 17 patients. *Urology.* 2011;77:1318-1324.
5. Schwender CEB, Ng L, McGuire E, et al. Technique and results of urethroplasty for female stricture disease. *J Urol.* 2006;175:976-980.
6. Gormley EA. Vaginal flap urethroplasty for female urethral stricture disease. *Neurourol Urodyn.* 2010;29(suppl 1):S42-S45.
7. Rehder P, Glodny B, Pichler R, et al. Dorsal urethroplasty with labia minora skin graft for female urethral strictures. *BJU Int.* 2010;106:1211-1214.
8. Gozzi C, Roosen A, Bastian PJ, et al. Volar onlay urethroplasty for reconstruction of female urethra in recurrent stricture disease. *BJU Int.* 2011;107:1964-1966.
9. Sharma GK, Pandey A, Bansal H, et al. Dorsal onlay lingual mucosal graft urethroplasty for urethral strictures in women. *BJU Int.* 2009;105:1309-1312.
10. Berglund RK, Vasavada S, Angermeier K, et al. Buccal mucosa graft urethroplasty for recurrent stricture of female urethra. *Urology.* 2006;67:1069-1071.
11. Migliari R, Leone P, Berdondini E, et al. Dorsal buccal mucosa graft urethroplasty for female urethral strictures. *J Urol.* 2006;176:1473-1476.
12. Petrou SP, Rogers AE, Parker AS, et al. Dorsal vaginal graft urethroplasty for female urethral stricture disease. *BJU Int.* 2012;110:E1090-E1095.