

# Management of Urethral Stricture in Women

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## Abbreviations and Acronyms

BMG = dorsal buccal mucosal graft

BOO = bladder outlet obstruction

PVS = pubovaginal sling

VFU = vaginal flap urethroplasty

VUDS = videourodynamics

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**Purpose:** We describe the diagnosis and treatment of urethral strictures in women.

**Materials and Methods:** We retrospectively identified female urethral strictures from 1998 to 2010. Study inclusion criteria were 1) clinical diagnosis of stricture, 2) stricture seen on cystoscopy, 3) urethral obstruction on videourodynamics according to the Blaivas-Groutz nomogram and/or 4) urethral caliber less than 17Fr. Postoperative recurrence was defined by the preoperative criteria.

**Results:** We identified 17 women with a mean age of 62 years (range 32 to 91) with stricture. Stricture was idiopathic in 8 patients, iatrogenic in 6, traumatic in 2 and associated with a urethral diverticulum in 1. Videourodynamics could not be done in 3 women due to complete obliteration of the urethra. Ten of 14 patients satisfied videourodynamic criteria for obstruction and 4 had impaired detrusor contractility. Nine women underwent vaginal flap urethroplasty, including 5 who also had a pubovaginal sling and 1 who had a Martius flap. One patient received a buccal mucosal graft as primary treatment after initial dilation. There was no recurrence at a minimum 1-year followup but 2 strictures recurred 5½ and 6 years postoperatively, respectively. These 2 women received a buccal mucosal graft and were stricture free 12 to 15 months postoperatively. Of 17 patients initially treated with urethral dilation recurrence developed in 16, requiring repeat dilations until urethroplasty was performed.

**Conclusions:** In select women vaginal flap urethroplasty and buccal mucosal graft have high success rates, including 100% at 1 year and 78% at 5 years. Urethral dilation has a 6% success rate. Long-term followup is mandatory. Treatment should be individualized.

**Key Words:** urethra, urinary bladder neck obstruction, urethral stricture, transplants, female

BLADDER outlet obstruction in women is relatively uncommon. Among women with lower urinary tract symptoms the prevalence of BOO ranges from 2% to 29%.<sup>1-3</sup> Common presenting symptoms include overactive bladder, weak stream or dribbling and recurrent urinary tract infections.<sup>4</sup> The etiology includes prior surgery in 14% to 37% of cases, pro-

lapse in 16% to 31%, primary bladder neck obstruction in 6% to 12%, detrusor external sphincter dyssynergia in 4%, learned voiding dysfunction in 4% to 33% and urethral diverticulum in 1% to 6%.<sup>1-3</sup> Urethral stricture disease accounts for 4% to 18% of women with BOO.<sup>1,2</sup> The etiology of stricture is not well known. Some strictures are

**Table 1.** Etiology

	No. Pts	No. Associated Stress Incontinence
Iatrogenic	6	1
Idiopathic	8	1
Trauma	2	1
Associated with diverticulum	1	0
Totals	17	3

iatrogenic (radiation or postoperative) and others are thought to be related to inflammation or trauma.

The diagnosis of urethral stricture requires a high index of clinical suspicion with the definitive diagnosis made by cystoscopy and urethral calibration. However, normal parameters for female urethral calibration are not well defined. In our experience a urethra too narrow to admit a 17Fr flexible cystoscope that has the feel of scar tissue by cystoscopic haptic feedback is diagnostic for stricture. Urethral obstruction is diagnosed by detrusor pressure/uroflow studies and obstruction is assessed by voiding cystourethrogram (during VUDS) and cystoscopy.<sup>1-3</sup> The approach to treatment is multifactorial and depends on the initial presentation, recurrence, location and concomitant presence of or potential for stress urinary incontinence.

We describe the diagnosis, management and outcome of urethral strictures in a series of women evaluated at a large referral institution.

## MATERIALS AND METHODS

This was a retrospective study of female urethral strictures identified from a database of patients seen at a single tertiary care center from 1998 to 2010. Study inclusion criteria consisted of 1) a clinical diagnosis of urethral stricture, 2) urethral stricture seen on cystoscopy, 3) urethral obstruction on VUDS according to the Blaivas-Groutz nomogram and/or 4) urethral caliber less than 17Fr.<sup>1</sup> Clinical diagnosis of stricture was characterized by visual circumferential narrowing of the urethra with the appearance of scar tissue that did not admit a 17Fr cystoscope without dilation.

All patients were asked to describe preoperative symptoms. They underwent preoperative uroflowmetry, estimation of post-void residual urine, VUDS and cystoscopy. Urethral obstruction was graded based on the Blaivas-Groutz nomogram for female BOO, including grade 0—no obstruction, grade 1—mild obstruction, grade 2—moderate obstruction and grade 3—severe obstruction.<sup>1</sup>

An important component of VUDS is the stress cystogram. The patient is asked to cough and perform the Valsalva maneuver with a comfortably full bladder. If there is leakage of contrast material into the urethra proximal to the stricture, she is considered to be at high risk for sphincteric incontinence.

Stricture etiology was determined by a thorough clinical history obtained from each patient. Treatment was

individualized to each patient based on the location and anatomy of the stricture and anterior vaginal wall, and patient preference. The decision to place a biological pubo-vaginal sling was made if there was concomitant stress urinary incontinence symptoms, these symptoms was seen during stress cystogram or the sphincteric mechanism was believed to be abnormal at surgery.

All patients were scheduled for followup at intervals ranging from 1 month, 3 to 6 months and yearly thereafter depending on treatment type. Following treatment, it is not our practice for women to perform clean intermittent catheterization. To calculate the range of followup, records from prior physicians were included, when available. At the first followup patients were asked to describe postoperative symptoms and postoperative uroflow was recorded. Postoperative recurrent stricture was defined by the same criteria used preoperatively if uroflow suggested recurrent stricture. Institutional review board approval was obtained for this study.

## RESULTS

We identified 17 women with a mean age of 62 years (range 32 to 91) with stricture. Mean followup was 6 years (median 4, range 1 to 12). Tables 1 and 2 list presenting symptoms and stricture etiologies.

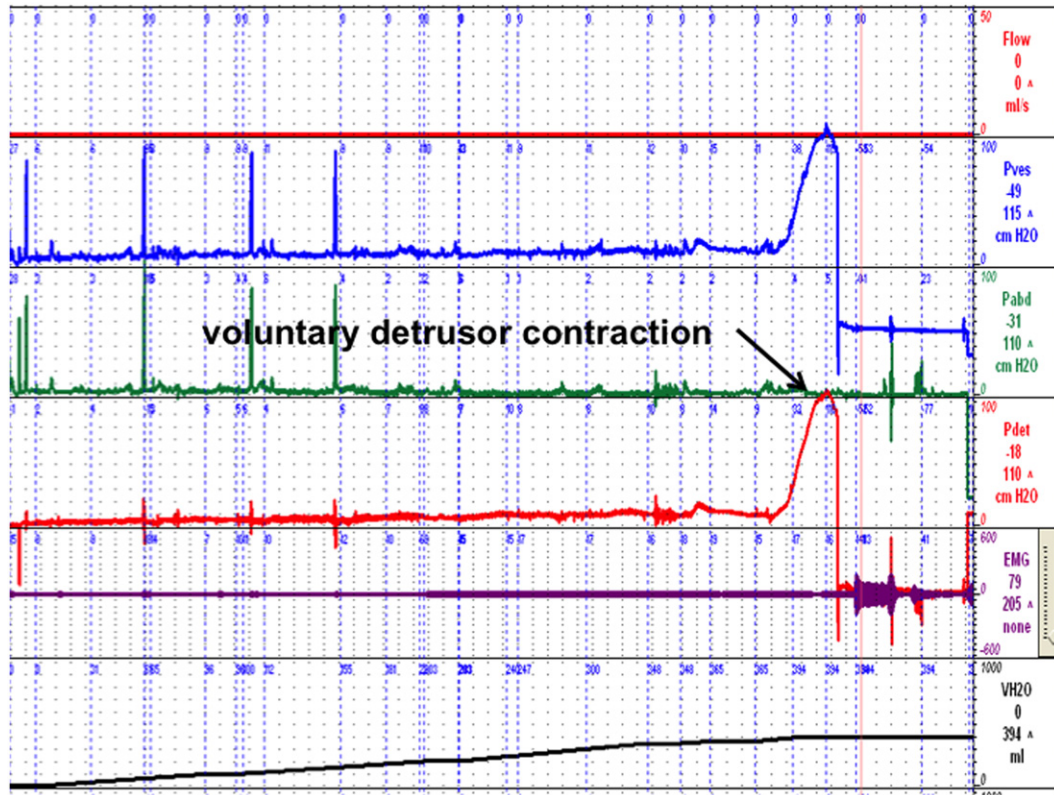
Although preoperative VUDS could not be done in 3 women due to complete obliteration of the urethra, 10 of 14 satisfied VUDS criteria for obstruction (fig. 1), while 4 had impaired detrusor contractility. The urethral site of obstruction at diagnosis was proximal in 7 patients, mid in 3, distal in 6 and panurethral in 1. All patients were treated with at least 1 prior urethral dilation months to years before presentation and urethroplasty but the exact number could not be determined because of incomplete records. Based on endoscopic appearance at first presentation, 1 patient underwent negative biopsy of the stricture before repair. Nine women underwent VFU, of whom 5 had concomitant biological PVS and 1 had a Martius flap. One patient underwent dorsal BMG as primary treatment after being initially dilated at calibration.

There was no recurrence after urethroplasty in the first 5 years of followup. All women had a normal urinary flow pattern but in 2 a weak stream rapidly

**Table 2.** Presenting symptoms

	No. Pts*
Weak stream	3
Dysuria	6
Frequency	12
Incontinence	6
Urgency	9
Urinary retention	2
Nocturia	5
Straining	2

\* Patients usually presented with more than 1 symptom.



**Figure 1.** Urodynamic tracing shows attempted volitional voiding without flow and high voiding pressure (Pdet = 118 cm H<sub>2</sub>O) consistent with BOO.

developed and they were found to have recurrent strictures 6 years postoperatively. These 2 women underwent salvage BMG and were stricture free 12 to 15 months postoperatively. Recurrence developed in 16 of 17 women who underwent initial urethral

dilation. They went on to repeat urethral dilations or urethroplasty for a 6% success rate for the duration of followup (mean 2 years, range 0.5 to 4). Table 3 shows treatment approaches. No women reported incontinence postoperatively.

**Table 3.** Treatment and followup

Pt No.	Stricture Site	Primary		Secondary	
		Treatment*	Followup (mos)	Treatment	Followup (mos)
1	Distal	VFU	12		
2	Mid	VFU	62	BMG	15
3	Mid	Dilation	4	Dilation	15
4	Proximal	Dilation	14	Dilation	6
5	Mid	VFU, PVS	77		
6	Proximal	Dilation	8	Dilation	33
7	Panurethral	Dilation	17	Dilation	6
8	Proximal	VFU, PVS, Martius flap	45		
9	Distal	VFU	19		
10	Proximal	VFU	144		
11	Distal	VFU, PVS, Martius flap	12		
12	Proximal	VFU, PVS, Martius flap, fistula apical repair	12		
13	Distal	VFU + diverticulectomy	72	BMG	12
14	Proximal	Dilation	144		
15	Distal	VFU, PVS, Martius flap	72		
16	Proximal	Dilation	3	BMG	48
17	Proximal	Dilation, no improvement in flow or symptoms	12	Refused	

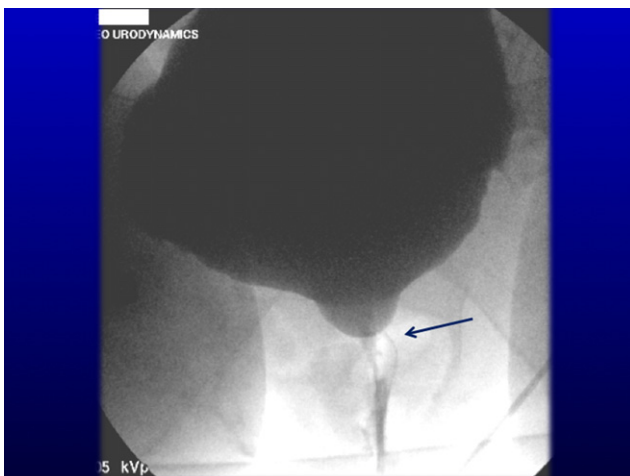
\* All patients underwent initial urethral dilation elsewhere months to years before primary treatment.

## DISCUSSION

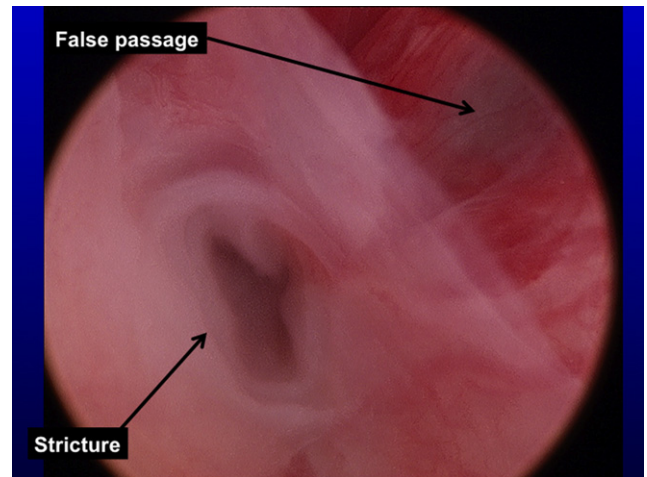
Urethral strictures in women are uncommon, accounting for only about 15% of women with BOO.<sup>4</sup> Large series are lacking. Urethral obstruction in women is functional (detrusor-external sphincter dyssynergia, pseudodyssynergia or primary bladder neck obstruction) or anatomical.<sup>1,5</sup> When obstruction is anatomical, it can be secondary to compression or scar (stricture) (figs. 2 and 3). Compressive obstruction can result from prolapse, urethral diverticulum or tumor. Strictures may be iatrogenic (postoperative or radiation), idiopathic or traumatic, or due to atrophy.<sup>5</sup>

Because they are so uncommon and high quality studies are sparse, the management of urethral strictures in women is largely empirical. Treatment options include urethral dilation, self-catheterization, urethrotomy and urethroplasty.<sup>6</sup> Although data are limited, the literature suggests that urethral dilation is of benefit only in the short term, which is measured in months and not years.

Smith et al described a series of 7 women with urethral strictures who received dilation to 30Fr, followed by clean intermittent catheterization.<sup>7</sup> During the 6 to 34-month followup 3 of 7 women required multiple repeat urethral dilations, although they achieved a significant 10-point improvement in the American Urological Association symptom score.<sup>7</sup> Massey and Abrams reported a 76% cure rate for women without detrusor overactivity and an intramural cause of obstruction, including stricture.<sup>8</sup> The success rate of each treatment (catheterization, dilation or urethrotomy) was not described. In an early report of internal urethrotomy the only 2 females included had a successful outcome.<sup>9</sup> To our knowledge there are no reports of head-to-head comparisons of these different procedures in women.



**Figure 2.** Cystogram with mid urethral stricture



**Figure 3.** Cystoscopic view of patient with longstanding, previously undiagnosed urethral stricture in whom false passage was made during attempted catheterization.

In our study only 1 of 17 patients had a sustained response to urethral dilation alone. These data suggest that definitive surgical treatment (urethroplasty) should be considered when conservative measures fail or stricture is associated with partial or complete loss of the urethral wall.<sup>10</sup> Various surgical techniques have been described for urethral strictures in women, including VFU, dorsal urethroplasty with labia minora, lingual graft, skin graft or pedicle flap, vestibular flap urethroplasty and buccal mucosal graft urethroplasty.<sup>10–21</sup> Each uses a variation on 2 basic urethroplasty approaches, that is the vaginal flap or buccal mucosal and vaginal wall grafts.

Vaginal flap neourethral reconstruction for urethrovaginal fistula was first described in 1935 by Harris<sup>22</sup> and improved by Ellis and Hodges.<sup>23</sup> After urethral catheterization, a U-shaped flap is made on the anterior vaginal wall. The stricture is incised and the flap is advanced, which avoids grafting or tunneling the tissue and has few complications.<sup>12</sup> Buccal mucosal graft urethroplasty has been applied successfully to male and female urethral stricture disease.<sup>15,16</sup> Advantages include hairless tissue that is accustomed to a moist environment and has elasticity. It is an option when there is inadequate vaginal tissue for grafting. Ventral and dorsal approaches have been described.<sup>17–19</sup>

At our institution the urethra is incised dorsally until healthy proximal urethra is identified. We use the resistance felt during the withdrawal of progressively larger bougies-à-boule to assess residual stricture. Subsequently, the graft is sutured into the urethra with running absorbable monofilament sutures and covered with periurethral tissue.<sup>17–19</sup>

Currently, there are no guidelines for or large series of female urethral stricture disease. The literature is sparse in recommending how to choose the most appropriate surgical approach. Based on our series, we offer our recommendations.

The most critical factors when selecting the surgical approach is the location and length of the stricture, and whether it or surgical dissection is likely to affect continence. If incontinence is a risk, a decision must be made whether to plan a 2-stage procedure or repair the stricture and incontinence in a single operation. We strongly favor the latter and our success rate with this approach was well documented in a large series of women treated with urethral reconstruction for various reasons.<sup>24</sup>

Furthermore, we believe that when a dorsal approach is chosen, even if repair extends all the way to the bladder neck, continence is unlikely to be affected. In contrast, when a ventral approach is chosen, dissection through the proximal urethra is

likely to cause sphincteric incontinence unless a synchronous pubovaginal sling is placed.<sup>25</sup> For more distal strictures, if the sphincter does not appear to be at risk, the length of the stricture and the availability of local tissue for flaps vs free grafts of buccal or vaginal mucosa should dictate the procedure chosen.

## CONCLUSIONS

Urethral stricture is rare in women and the literature is sparse. In our experience with 17 consecutive women with urethral stricture seen in a 12-year period, urethral dilation was rarely effective. Urethroplasty had a 100% success rate at 1 year in 9 women but strictures recurred at 6 years in 2 who underwent ventral vaginal flap urethroplasty, requiring repeat urethroplasty with a buccal mucosal graft. Women with urethral stricture should be followed in the long term due to the small risk of distant recurrence.

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