
Dorsal Buccal Mucosa Graft Urethroplasty for Female Urethral Strictures

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Purpose: We describe the feasibility and complications of dorsal buccal mucosa graft urethroplasty in female patients with urethral stenosis.

Materials and Methods: From April 2005 to July 2005, 3 women 45 to 65 years old (average age 53.7) with urethral stricture disease underwent urethral reconstruction using a dorsal buccal mucosa graft. Stricture etiology was unknown in 1 patient, ischemic in 1 and iatrogenic in 1. Buccal mucosa graft length was 5 to 6 cm and width was 2 to 3 cm. The urethra was freed dorsally until the bladder neck and then opened on the roof. The buccal mucosa patch was sutured to the margins of the opened urethra and the new roof of the augmented urethra was quilted to the clitoris corpora.

Results: In all cases voiding urethrogram after catheter removal showed a good urethral shape with absent urinary leakage. No urinary incontinence was evident postoperatively. On urodynamic investigation all patients showed an unobstructed Blaivas-Groutz nomogram. Two patients complained about irritative voiding symptoms at catheter removal, which subsided completely and spontaneously after a week.

Conclusions: The dorsal approach with buccal mucosa graft allowed us to reconstruct an adequate urethra in females, decreasing the risks of incontinence and fistula.

Key Words: urethra, urethral stricture, mouth mucosa, female, transplants

Urethral strictures in women have long been debated with regard to their etiology and impact on voiding patterns.^{1,2} Some groups suggest that most female urethral strictures are iatrogenic and apart from radiation inducing urethral fibrosis they may be the consequence of prolonged urethral catheterization or surgical repair of diverticulum, fistula or anti-incontinence procedures.³⁻⁷ Often overzealous urethral dilation with subsequent fibrosis due to bleeding and extravasation are among the most frequent causes of iatrogenic urethral strictures. Surgical treatment in these cases is still debated. It varies from a simple vaginal flap to pedicle labial skin tube urethroplasty wrapped with labial fat or omentum depending on stricture complexity.⁸⁻¹²

BMG represents the gold standard for urethral reconstruction in males with complex hypospadias or urethral strictures.^{13,14} In male strictures graft urethroplasty using a dorsal approach to the urethra has shown improved urethral reconstruction due to a decrease in fistulas and graft weakening by urethral diverticula.¹⁵ We suggest the technique of urethral stricture correction in females using BMG for urethroplasty with a dorsal approach.

MATERIALS AND METHODS

From April 2005 to July 2005, 3 women 45 to 65 years old (average age 53.7) with urethral stricture disease under-

went urethral reconstruction using dorsal BMG. All patients complained of preoperative recurrent urinary infection, straining and a burning sensation during voiding, terminal dribbling and decreased flow.

Stricture etiology was unknown in 1 patient, ischemic in 1 due to prolonged catheterization for coma reversal and iatrogenic in 1 due to diverticulum repair. Two patients who refused daily clean intermittent catheterization underwent multiple prior dilations, which failed before surgical treatment. Only 1 patient elected to start a regular program of clean intermittent catheterization, which was interrupted after 3 months. One patient had experienced failure after previous urethroplasty.

To evaluate stricture length all patients were evaluated preoperatively with voiding cystourethrography (fig. 1). In all patients urodynamic evaluation showed a stable bladder with low flow and low detrusor pressure with Qmax less than 12 ml per second and detrusor pressure at Qmax more than 20 cm H₂O. Post-void residual volume was 90 to 200 ml. At clinical evaluation the urethral meatus was fibrotic, while the urethra was rigid and stenotic. No patients complained of urinary stress incontinence.

Surgical Technique

With the patient under general anesthesia in the dorsal lithotomy position a 10Fr silicone urethral catheter is positioned. BMG is harvested from the right inner cheek. The BMG is 5 to 6 cm long and 2 to 3 cm wide. All patients undergo free graft urethroplasty using the dorsal approach to the urethral lumen.

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FIG. 1. Case 2. Preoperative voiding cystourethrography

The dorsal part of the urethra is exposed by a reversed U-shape incision over the meatus starting from the 3 o'clock to the 9 o'clock position. The vulvar mucosa is separated from the urethral channel and a plane is developed between the underlying urethra and overlying clitoral cavernous tissue to free the entire length of the urethra (fig. 2). Dissection is done with care taken not to damage the bulbs and the clitoral body crura by staying close to the fibrous tissue of the urethra. During dissection the anterior portion of the striated urethral sphincter is identified and moved upward.

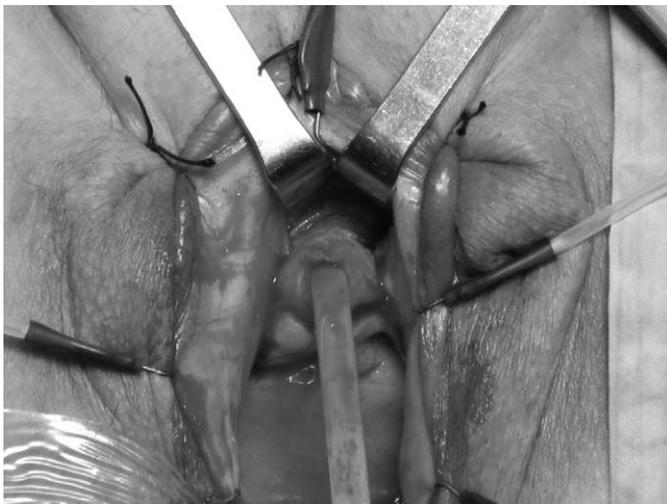


FIG. 2. Whole dorsal part of urethra is dissected free from surrounding tissue. Note anterior part of striated urethral sphincter.

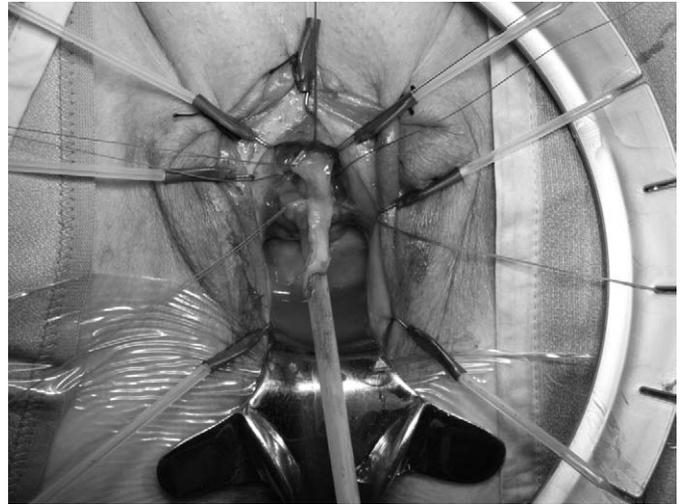


FIG. 3. Buccal mucosa graft tailored about 1.5 cm wide and 4 cm long is positioned on dorsal part of opened urethra.

The bladder neck is identified by the catheter balloon. A 5-zero stitch is placed on the dorsal surface of the urethra as close as possible to the bladder neck to mark it. An incision is made through the entire thickness of the dorsal urethra (mucosa and spongiosal tissue) from meatus to bladder neck. By traction with 6 stitches on the edges of the opened urethra the ventral urethral plate is well exposed (fig. 3).

Subsequently the BMG is sutured to the right margin of the urethral plate and then to the left margin (fig. 4). The augmented dorsal urethra is quilted to the clitoris body to cover the new urethral roof. Distal the BMG is tailored and split to achieve a normal meatal slit-like appearance. Finally, the vulvar mucosa is reapproximated with 5-zero polyglecaprone sutures.

Patients were discharged home after 2 days. After 15 days the catheter was removed. Voiding cystourethrography showed a normal-appearing urethra.

RESULTS

In all cases voiding urethrogram after catheter removal showed a good urethral shape with absent urinary leakage.

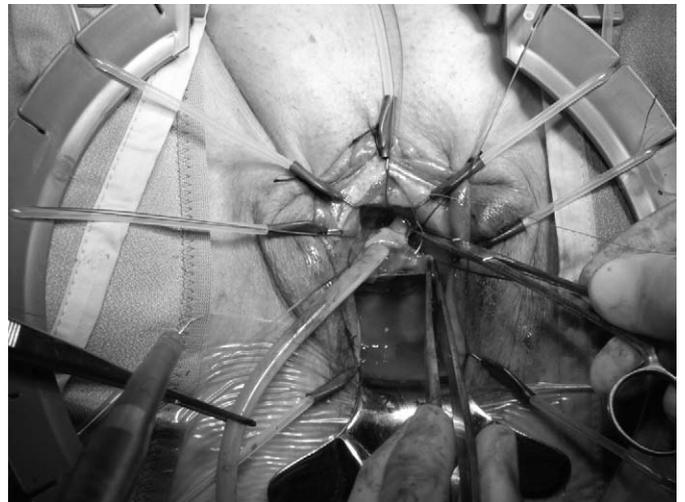


FIG. 4. Left side of buccal mucosa graft is sutured to epithelial margin of opened urethra using 6-zero interrupted stitches with knots inside lumen.

On uroflowmetry normal voiding was achieved and no urinary incontinence was evident. Two patients complained about irritative voiding symptoms at catheter removal, which subsided completely and spontaneously after a week.

On urodynamic investigation all patients had an unobstructed Blaivas-Groutz nomogram with Qmax more than 12 ml per second and detrusor pressure at Qmax less than 20 cm H₂O. After 6 months the patients were well, residual urine was absent and cosmetic results were satisfactory.

DISCUSSION

Recently normal clitoral anatomy in healthy volunteers has been well revealed by magnetic resonance imaging using fat saturation techniques without any contrast agents and this study complements cadaveric studies of clitoral anatomy.^{16,17} The bright erectile tissue of the clitoris surrounds the urethrovaginal complex anterolaterally and provides strong dorsal support to the urethra. The clitoral bulbs on either side continue anterior to the urethra and meet together ventral to the urethra. Dissection studies show that they are not continuous across the midline. The exact role of the bulbs in urethral support and sexual function is not clear even if recent studies suggest that they have a significant role in urethral continence. A concern about the dorsal approach to the urethra is in regard to a possible lesion of the neurovascular bundles to the clitoris. The large clitoral neurovascular bundles ascend along the ischiopubic ramus to the under surface of the pubic symphysis in the midline, from which they run along the cephalad surface of the clitoral body toward the glans. Therefore, they are quite far from the dissection area.

Several histological studies as well as microdissection¹⁷ of the female urethra revealed that the female urethra has 2 thick muscular layers, that is an inner longitudinal layer and an outer oblique or circular layer. The 2 layers are direct continuations of the detrusor muscle. The urethral musculature is thickest close to the bladder and the mid urethra, and it decreases as it is followed distally. The inner and outer layers end sharply in the distal fourth of the urethra by gaining insertion into dense collagenous tissue. From this level down to the external meatus the urethral wall is composed primarily of collagenous and elastic tissues.

Another concern about the dorsal approach to the female urethra is a possible lesion of the striated urogenital sphincter. This muscle in its upper two-thirds lies in a primarily circular orientation. Distally it leaves the confines of the urethra and encircles the vaginal wall as the urethrovaginal sphincter or it extends along the inferior pubic ramus above the perineal membrane (urogenital diaphragm) as the compressor urethra. Thus, the urethra in its upper ventral third is well separable from the adjacent vagina but its lower portion is fused with the wall of the latter structure. On the dorsal aspect the urethra is only juxtaposed to the clitoral structures, which must be carefully preserved during dissection.

The infrapubic approach to urethrolysis, whether retro-pubic, infrapubic or vaginal, has been advocated to cure voiding dysfunction following incontinence surgery with similar outcomes. With this approach emergent stress incontinence, even without resuspension, has indeed been rare, thus, confirming that the dorsal approach to the urethra

does not cause an increased risk of urinary incontinence.¹⁸⁻²⁰

In the recent past a dorsal approach to male urethral reconstruction has been proposed.¹⁵ The dorsal graft is mechanically supported by the corpora cavernosa and receives its vascular supply from the surrounding corpus spongiosum. This avoids graft weakening due to diverticula and decreases the risk of fistula.

Similarly in women dorsal onlay graft urethroplasty offers strong mechanical support, which allows it to fold on itself, decreasing the chance of neovascularization as well as the caliber of the reconstructed urethra. Moreover, sacculation at the graft side, which might further compromise the state of the adjacent urethra, facilitating recurrent stricture disease, is avoided. Graft apposition on the dorsal surface of the urethra leads to physiological urethral reconstruction, providing the possibility of modeling a urethral meatus that is directed upward. It leads to more physiological voiding because the urinary stream is directed upward and not toward the vagina. Another positive aspect of this urethroplasty is that it maintains the ventral part of the mid urethra intact, leaving the possibility of an anti-incontinence procedure on the mid urethra.

Although it requires optical magnification, this procedure is easy to perform. In cases of stenosis of the distal urethra or external meatus as well as in cases of longer urethral stenosis involving the mid urethra our dorsal onlay urethroplasty technique provides a simple, safe and effective therapeutic alternative, especially when vaginal fibrosis limits the use of a pedicled flap. The innovation of dorsal free graft repair may be tested in larger series and long-term followup to evaluate whether a free buccal mucosal graft for female urethral strictures may be offered as a primary procedure and whether it is anatomically healthier in the dorsal rather than in the ventral position.

Abbreviations and Acronyms

BMG	=	buccal mucosa graft
Qmax	=	maximum urine flow

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