

NEW 2-STAGE BUCCAL MUCOSAL GRAFT URETHROPLASTY

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ABSTRACT

Purpose: Previously buccal mucosal grafts used for repairing adult bulbourethral stricture with the 1-stage dorsal technique has provided a satisfactory outcome in our experience. We present the wider use of buccal mucosal grafts for 2-stage urethroplasty.

Materials and Methods: A total of 24 men 25 to 60 years old (median age 45) with a complex bulbar stricture underwent 2-stage urethroplasty using a buccal mucosal graft to repair the perineostomy. The primary etiology of stricture was traumatic in 4 cases, inflammatory in 16 and unknown in 4. The 2 × 6 cm. graft was harvested from the inner cheek and sutured to the left margin of the urethral mucosal plate with running 6-zero polyglactin suture. Patients were discharged from the hospital within 3 days with a 14Fr silicone urethral catheter in place. Radiological studies and urethroscopy were done 1 year after closure.

Results: A final successful outcome with no recurrent stricture was achieved in 23 of 24 men (92.8%) at a median followup of 18 months (range 13 to 32). In 1 case a urethrocutaneous fistula at the initial radiological assessment closed spontaneously after 14 days of catheterization. No urethral diverticula developed. The mean postoperative peak flow rate is 22 ml. per second (range 18 to 25).

Conclusions: Our new 2-stage buccal mucosal graft urethroplasty may be an excellent technique for complex bulbar urethral stricture disease. Our suggestions may increase usefulness of the 2-stage technique for repairing complex strictures due to the avoidance of classic complications.

KEY WORDS: urethra, mouth mucosa, transplants, urethral stricture

Most anterior urethral strictures can be repaired by 1-stage techniques but approximately 10% of patients who undergo urethroplasty have at least 1 complicating factor that precludes safe 1-stage surgery.¹ A 2-stage urethroplasty is more appropriate for complex strictures associated with adverse local conditions, such as extensive scarring, fistula or infection, graft factors or flap survival.¹ In such patients the stricture tends to be long, previous urethroplasty has failed or there is a lack of usable penile skin for flap or graft repair.¹ In these circumstances staged urethroplasty provides the best chance for a prolonged successful outcome.¹ In addition, in patients with a panurethral anterior stricture due to lichen sclerosus (balanitis xerotica obliterans) 2-stage or multistage procedures may interfere positively with the natural history of the disease.²⁻⁵ Urinary diversion via a perineal stoma avoids continuous urine extravasation into the corpus spongiosum and facilitates urethral tissue healing, as suggested by Blandy and Fowler,⁶ who pioneered the 2-stage procedure. We observed these benefits in our extensive experience at our center.

Two-stage procedures using a scrotal skin inlay have some disadvantages. Scrotal skin is hair bearing and intraurethral hair growth may lead to infection and stone formation, further predisposing to recurrent stenosis. Another common problem is diverticulum formation. In 1989 Schreiter and Noll proposed staged meshed graft urethroplasty using split-thickness or full-thickness skin.⁷ The meshed graft inlay placed around the marsupialized urethra at stage 1 to replace scrotal skin improved the results since the graft is nonhair bearing, less permeable to urine penetration and easier to size, decreasing the risk of a diverticulum.⁸ Previously buccal mucosal grafts for repairing bulbourethral stricture in adulthood with a 1-stage dorsal technique has provided a satisfactory outcome in our

experience.⁹ We present the wider use of buccal mucosal grafts for 2-stage urethroplasty.

MATERIALS AND METHODS

Between 1997 and December 1999, 24 men 25 to 60 years old (median age 45) with a complex bulbar stricture underwent 2-stage urethroplasty. All patients had a long history of extensive stricture disease that was treated with repeated urethral dilation in 5, internal urethrotomy in 7 and/or failed urethroplasty in 9. The primary etiology of stricture was traumatic in 4 cases, inflammatory in 16 and unknown in 4. The stricture was 4 to 6 cm. long, located in the bulbar urethra and in 3 cases it was complicated by fistula and periurethral abscess. All patients were evaluated preoperatively by retrograde and voiding urethrography. Preoperatively the peak flow rate was 3 to 8 ml. per second (mean 5).

At stage 1 an inverted U scrotal-perineal incision is made, and a posterior based scrotal flap is developed.^{6,10} The urethra is marsupialized ventral, extending the urethrostomy 2 cm. proximal and distal into healthy urethral tissue. Fibrotic tissue is excised at the urethral margin. Preservation of the urethral plate and corpus spongiosum tissue is mandatory for subsequent reconstruction using a buccal mucosal graft. The scrotal flap is sutured to the opened urethral margin with a resultant perineal urethrostomy. A bolstered perineal dressing remains in place for 2 to 3 days. The 20Fr Foley catheter is removed 6 days after surgery.

At stage 2 the 2 × 6 cm. buccal mucosa is harvested from the inner cheek without stretching. The scrotal skin is removed all around the perineostomy (fig. 1). A strip of mucosa urethral plate remains in place with the surrounding corpus spongiosum (fig. 2). The buccal mucosal graft is sutured to the left urethral plate margin using running 6-zero polyglactin suture with the knots inside (fig. 3). The graft is tailored and stretched according to local conditions and needs. In all



FIG. 1. Scrotal skin is removed around perineostomy and surgical incision is made along mark.

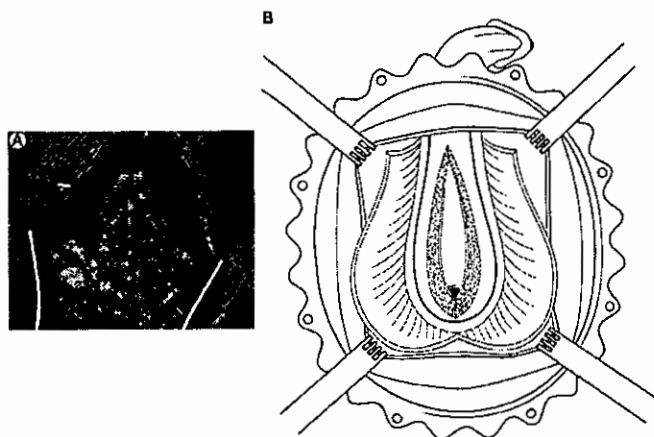


FIG. 2. Strip of hairless urethral mucosa remains in place with surrounding corpus spongiosum well evident.

patients normal stretching of the graft according to the elastic properties of buccal mucosa enabled coverage of the urethral plate along its whole length. The buccal mucosa graft is rotated over the urethral plate with the mucosal surface on the inside and sutured to the right urethral margin with the knots outside (fig. 4). The corpus spongiosum is sutured over the graft to ensure an excellent opportunity for graft neovascularization (fig. 5). The bulbocavernosus muscles are approximated over the reconstructed urethra and a 14Fr silicone catheter remains in place.

Patients were discharged from the hospital within 3 days and returned in 21 for voiding cystourethrography after catheter removal. They were followed by uroflometry and urine culture every 4 months for year 1 and yearly thereafter. Radiological studies and urethroscopy were performed 1 year after closure.

RESULTS

During the observation period between stages 1 and 2 proximal ostial stenosis in 4 cases required revision by Y-V meatoplasty and surgical incision with lysis of skin cross adhesions over the urethral roof strip was required in 2. Median time from stage 1 to closure was 15 months (range 12 to 18). To simplify the evaluation of the results the clinical

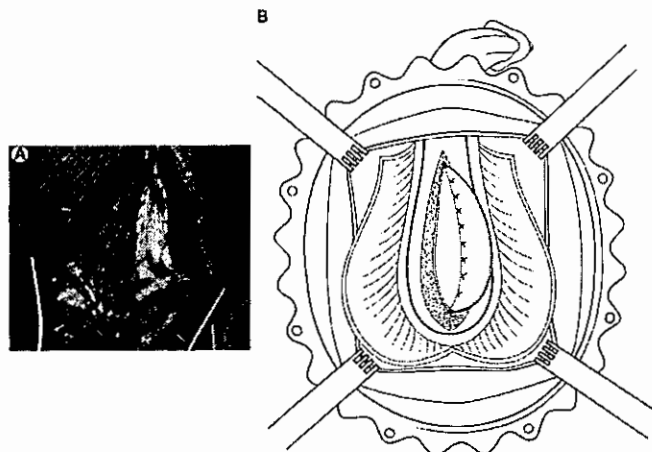


FIG. 3. Buccal mucosa graft is tailored, stretched and sutured to left urethral mucosal margin with knots inside and buccal mucosal surface turned to inside.

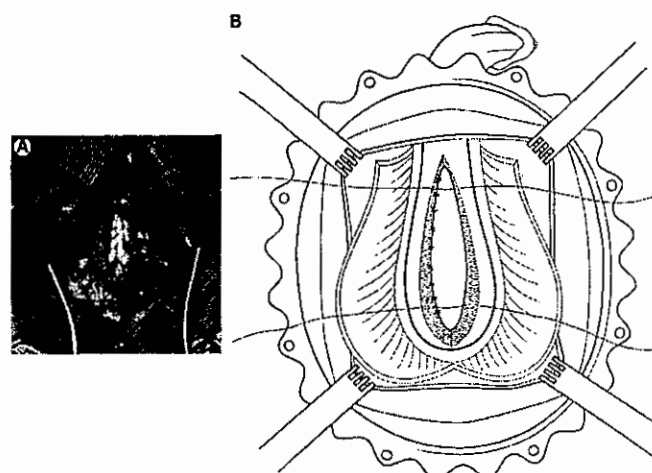


FIG. 4. Buccal mucosa graft is rotated over urethral plate and sutured to right urethral margin with knots outside.

outcome was considered a success or a failure at the time of any postoperative instrumentation, including dilation.

A final successful outcome with no recurrent stricture was achieved in 23 of the 24 men (92.8%) at a median followup of 18 months (range 13 to 32). The single failure was due to recurrent stricture at the distal anastomotic line of the neourethra. Urethrography showed complete narrowing of the urethral lumen for 2 cm. and flexible cystoscopy was unsuccessful. This patient underwent repeat perineal urethrostomy. In another case a urethrocutaneous fistula at the initial radiological assessment closed spontaneously after 14 days of catheterization. In 10 of 23 cases retrograde urethrography showed an irregular lumen in the reconstructed urethral tract but on the voiding x-ray no obstruction or dilatation was present. In these patients rigid cystoscopy demonstrated a good urethral lumen without any evident obstruction. In the remaining 13 patients urethrography and cystoscopy failed to reveal any significant urethral irregularity. No urethral diverticula developed. Postoperatively the mean peak flow rate was 22 ml. per second (range 18 to 25). No complications were observed at the donor site.

DISCUSSION

Two-stage urethral repair represents the most appropriate treatment for complex bulbar strictures, in which a long

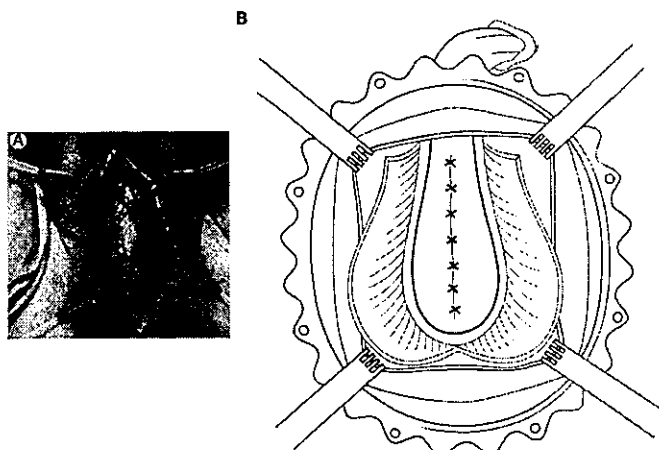


FIG. 5. Corpus spongiosum is sutured over graft using interrupted stitches.

stricture is associated with local adverse conditions, such as fistula, periurethral inflammation, perineal abscess and extensive local scarring, or previous failed urethroplasty.^{1-6,8,11} The 2-stage technique involves considerable patient inconvenience and increased risk of morbidity because of multiple anesthetic administration. Therefore, they should only be performed when specifically indicated by adverse of the stricture features that would significantly decrease the success of a 1-stage procedure. In these cases the interim period after stage 1 urethral marsupialization allows one to observe adequate urethral healing before closure and perform local revision of the urethral roof strip as necessary.⁸

Historically the various 2-stage scrotal skin inlay procedures differ only in flap design and inlay technique.^{6,10,12-15} In these techniques stage 1 involves marsupialization of the strictured portion of the urethra to the scrotal skin margin. At stage 2 the neourethra is reconstructed using the remaining strictured urethral roof strip and adjacent inlaid scrotal skin. The results of scrotal inlay urethroplasty have been less than optimal. Scrotal skin is a poor urethral substitute due to its dry epithelial surface. Since it is unaccustomed to prolonged exposure to moisture, eczematous dermatitis tends to develop with consequent later cicatrization. The skin is hair bearing and intraurethral hair growth may lead to infection and stone formation, further predisposing to recurrent stenosis. Therefore, frequent depilation is mandatory as an interim procedure. Diverticula are also common because it is difficult accurately to tailor scrotal skin at stage 2.^{11,16} Therefore, the ideal urethral substitute tissue should have a characteristic moisture resistant quality and be hairless.¹¹

Schreiter and Noll suggested combining urethral marsupialization with a meshed full-thickness or split-thickness skin graft, so that the neourethra is subsequently formed from it rather than the scrotum.⁷ A meshed graft inlay around the marsupialized urethra at stage 1 instead of scrotal skin improved the results of simple scrotal inlay repair since the graft is hairless, appears to have better waterproofing qualities and forms into a uniform sized urethra, decreasing the risk of diverticulum.⁸ However, a disadvantage is cross-bridging the graft and exuberant granulation in the interval before closure. Furthermore, graft shrinkage is considerable, particularly when it is laid onto nonsupportive tissue, such as fat. In addition, suture fixation of the mesh graft in the deep perineal funnel may be difficult.¹¹

We propose a modified 2-stage urethroplasty using a buccal mucosal graft for overcoming the disadvantages associated with staged procedures for bulbar urethral reconstruction. A buccal mucosal graft is used at stage 2 to form the ventral wall at closure of the perineal urethral opening. Buc-

cal mucosa is easy to tailor during mucosa-to-mucosa anastomosis formation by stretching the partially attached graft and excising the redundant portions. At stage 1 it is mandatory to preserve the corpus spongiosum, which at stage 2 is approximated over the graft to ensure an excellent opportunity for graft neovascularization and avoid mechanical weakening of the grafted area. Buccal mucosa has an epithelial surface accustomed to contact with moisture, it is hairless and its thickness provides good ventral support for the urethra, avoiding pseudodiverticulum formation. Therefore, buccal mucosa represents a superior quality graft for staged bulbar urethral reconstruction with results that are better than those of simple 2-stage procedures (92.8% versus 78.6% success).^{4,17,18}

CONCLUSIONS

Staged repair using buccal mucosal graft offers some advantages over other types of 2-stage urethroplasty and the results appear superior to those of simple scrotal inlay repair with scrotal skin. Therefore, this new 2-stage buccal mucosal graft urethroplasty may be excellent for complex bulbar urethral stricture disease. Our suggestions may increase range of the 2-stage technique for repairing complex strictures due to the avoidance of classic complications.

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