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# BUCCAL MUCOSAL URETHROPLASTY FOR BALANITIS XEROTICA OBLITERANS RELATED URETHRAL STRICTURES: THE OUTCOME OF 1 AND 2-STAGE TECHNIQUES

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ABSTRACT

Purpose: Balanitis xerotica obliterans (BXO) related strictures are complex and generally managed by 2-staged urethroplasty. We present our results with 1-stage dorsal onlay and 2-stage buccal mucosal urethroplasty for such strictures.

Materials and Methods: Between January 2000 and April 2004, 39 patients underwent buccal mucosal urethroplasty for BXO related anterior urethral strictures. The 25 patients with a salvageable urethral plate (group 1) were treated with 1-stage dorsal onlay urethroplasty using a cosmetic incision. The 14 patients with a severely scarred urethral plate, focally dense segments or active infection (group 2) underwent 2-stage urethroplasty. Outcomes in terms of cosmetic appearance, stricture recurrence and complications in the 2 groups were assessed.

Results: At a mean followup of 32.5 months (range 3 to 52) 3 patients (12%) in group 1 had recurrent stricture, of which 2 and 1 were treated with optical urethrotomy and urethral dilation, respectively. All patients had a normal slit-like meatus and none had chordee or erectile dysfunction. Four group 2 patients (28.6%) required stomal revision and 2 had glans cleft narrowing after stage 1 urethroplasty. Following stage 2, 3 patients had recurrent stricture, of whom 2 were treated with optical urethrotomy and 1 underwent repeat urethroplasty.

Conclusions: In BXO related strictures with a viable urethral plate 1-stage dorsal onlay buccal mucosal urethroplasty provides excellent intermediate term results. The cosmetic incision described provides a normal, wide caliber, slit-like glans. Two-stage procedures provide satisfactory outcomes but they are associated with a higher revision rate.

KEY WORDS: urethra; urethral stricture; balanitis; transplantation, autologous; penis

Balanitis xerotica obliterans (BXO) is a form of lichen sclerosus et atrophicus affecting the skin of the glans and prepuce.[1] Urethral involvement by BXO can be seen in up to 30% cases[2] and it varies from meatal stenosis to more extensive panurethral strictures. Factors to be considered when choosing the most appropriate method of reconstruction of these strictures are the restoration of a normal caliber urethra and achievement of a good cosmetic result with a normal slit-like meatus with long-term durability of the tissue used for reconstruction. One-stage skin flap urethroplasty using uninvolved penile skin provided encouraging short-term results but long-term outcomes have been unsatisfactory.[3] Recurrent BXO in the penile skin has been observed to be a frequent problem. Therefore, some reconstructive surgeons advocate a 2-stage approach involving excision of the diseased urethra and buccal mucosal grafting, followed by stage 2 urethroplasty after 4 to 6 months.[4,5] Although successful, this approach has a high revision rate and up to 50% of cases may need a third operation.[6] Also, sexually active young men are likely to prefer a 1-stage procedure with minimum violation of the penile skin.

To our knowledge the use of buccal mucosa for 1-stage reconstruction of BXO related urethral strictures has not been previously described in the literature. Kulkarni et al presented a technique of 1-stage buccal mucosal urethroplasty for meatal and anterior urethral strictures due to BXO using a single perineal incision with promising short-term results.[7] We have adopted a more flexible approach to BXO related strictures and we base our surgical technique on careful assessment of the urethral plate. For strictures with a salvageable urethral plate we prefer a 1-stage approach when feasible. We present our experience with 1 and 2-stage buccal mucosal urethroplasty.

## MATERIALS AND METHODS

Between January 2000 and January 2004, 39 patients with a mean age of 32.2 years (range 11 to 48) with strictures related to BXO underwent buccal mucosal substitution urethroplasty at our institution. Nine patients presented with a suprapubic catheter that had been placed elsewhere and 30 had a mean peak flow rate of 3.6 ml per second (range 2.8 to 6.5). Assessment was done using a retrograde urethrogram and micturating cystourethrogram. All patients had meatal stenosis. In addition, 9 patients had involvement of the pendulous urethra and 30 had combined pendulous and bulbar urethral strictures.

## OPERATIVE TECHNIQUE

To assess the urethral mucosa and urethral stricture caliber preliminary urethroscopy is attempted with a 6Fr pediatric cystoscope in all patients. One-stage reconstruction is performed only if stricture caliber is greater than 6Fr and it appears feasible that the urethral plate would accept a flap or graft as an onlay (group 1). If there is severe spongiosal scarring and the urethral lumen is less than 6Fr caliber, or if

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there are multiple, focally dense segments, a 2-stage approach is used (group 2).

*One-stage urethroplasty.* For strictures limited to the pendulous urethra a circumcoronal incision is made and the penile skin is degloved until proximal to the stricture. If the proximal stricture extent extends beyond the penoscrotal junction, we use the technique described by Kulkarni et al, which involves a single midline perineal incision.[7]

The corpus spongiosum is dissected free of the corpora cavernosa and mobilized dorsal up to the meatus (fig. 1). This requires invagination of the penis when approached by a perineal incision (fig. 1). Dorsal urethrotomy is performed, extending from the proximal uninvolved urethra to the meatus (fig. 1). A generous dorsal meatotomy is then performed and connected with the dorsal urethrotomy over the pendulous urethra (fig. 2, *b*). Buccal mucosa is harvested from the cheeks and lower lip if required, and multiple grafts are quilted onto the corpora cavernosa. For meatal reconstruction the mucosa is sutured to the dorsally cut margins of the meatus, tunneled through the glans and then spread fixed onto the corpora cavernosa proximal (fig. 2, *c*). Urethroplasty is done over a 16Fr Foley catheter by suturing the cut margins of the urethra with the graft using continuous 4-zero polyglactin sutures. A micturating cystourethrogram is performed on the postoperative day 21. Catheter duration is prolonged by another week if any extravasation is noted.

All patients were followed with 3 monthly uroflowmetry studies and urethral calibration with a 16Fr Foley catheter for the first 2 years. Subsequent followup was done at 6-month intervals. Contrast studies were performed as and when required. Details of postoperative sexual function were recorded at followup.

*2-Stage urethroplasty.* A midline penile shaft skin incision is made extending into the scrotum depending on stricture length. The diseased corpus spongiosum is excised and proximal urethrostomy is performed. The dartos fascia is then sutured in the midline and buccal mucosal grafts are spread fixed onto the corporeal bodies. The patient is discharged home between postoperative days 8 and 10 after ensuring graft take. Stage 2 urethroplasty is performed after 6 months.

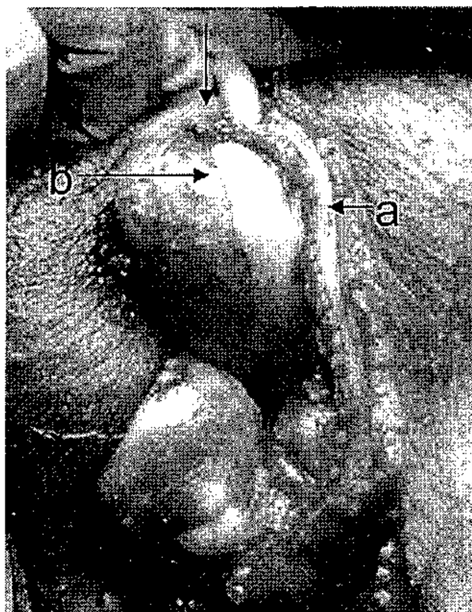


FIG. 1. One-stage dorsal onlay urethroplasty through single perineal incision. Corpus spongiosum is dissected free of cavernosa to meatus (downward arrow), dorsal stricturotomy is performed (*a*) and buccal mucosa is quilted on corpora up to meatus (*b*). Meatal reconstruction is performed by suturing cut meatal margins (fig. 2, *c*).

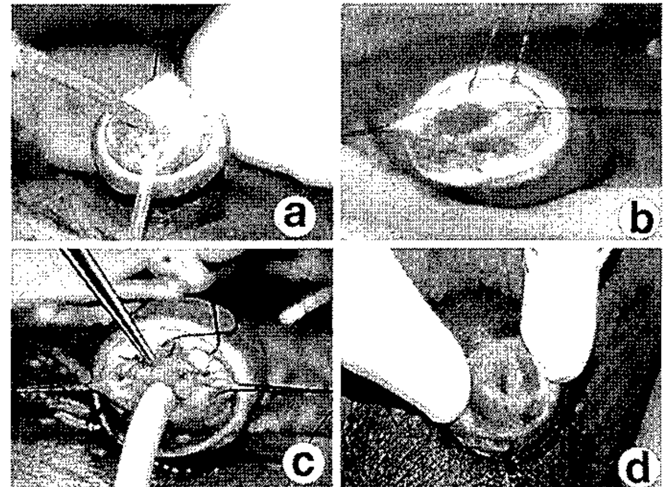


FIG. 2. *a*, BXO with tight meatal stenosis. Dorsal meatal incision is made. *b*, generous dorsal meatotomy. *c*, 1-stage dorsal onlay buccal mucosal grafting of meatus. *d*, postoperative meatal appearance.

## RESULTS

Four group 1 patients had meatal and pendulous urethral stricture, whereas in 21 stricture also involved the bulbar urethra (mean length 7.2 cm, range 4 to 17). Five group 2 patients had pendulous strictures and 9 also had bulbar involvement (mean length 8.2 cm, range 6 to 19, see table). Mean followup in groups 1 and 2 was 33.4 (range 3 to 52) and 32 months (range 6 to 50), respectively.

In group 1, 22 patients (88%) have remained recurrence-free. Three patients had failure (recurrent stricture), of whom 2 (1 at 3 months and 1 at 6 months of followup) had a short recurrence in the pendulous urethra, which was treated with direct vision internal urethrotomy (DVIU). One patient with a recurrent panurethral stricture after 1 year of followup underwent urethral dilation and has been maintained on clean intermittent catheterization. Postoperatively all patients had a normal slit-like meatus and none reported splaying of the urinary stream (fig. 3). None of the patients reported erectile dysfunction or penile chordee.

Four group 2 patients (28%) required urethrostomy revision prior to stage 2. During stage 2 reconstruction it was not possible to reconstruct an adequate caliber meatus in 2 patients due to insufficient tissue in the glandular urethra. Hence, a subcoronal meatus was created. One patient had complete graft loss and underwent re-grafting. Following stage 2 urethroplasty 1 patient with dehiscence of the anastomosis due to infection underwent reconversion to a proxi-

*Stricture demographics and outcome in groups 1 (1 stage) and 2 (staged) urethroplasty for BXO related urethral strictures*

| | Group 1 | Group 2 |
|---|---|---|
| No. pts | 25 | 14 |
| Mean cm stricture length (range) | 7.2 (4–17) | 8.5 (3–17) |
| No. stricture site: | | |
| Meatus + pendulous urethra | 4 | 5 |
| Panurethral | 21 | 9 |
| Complications after stage 1: | 0 | |
| Graft loss | | 1 |
| Stomal revision | | 4 |
| Glans cleft narrowing | | 2 |
| No. recurrence (%) | 3 (12) | 3 (21.4) |
| Mean mos to failure (range) | 7 (3–12) | 5.3 (1–9) |
| No. recurrence management: | | |
| DVIU | 2 | 2 |
| Urethral dilation | 1 | |
| Stage 3 urethroplasty | | 1 |
| Mean mos followup (range) | 33.4 (3–52) | 32 (6–50) |

FIG. 3. *a*, preoperative voiding cystourethrogram plus micturating cystourethrogram in patient with BXO related meatal and panurethral stricture. *b*, postoperative voiding cystourethrogram 6 months after 1-stage dorsal onlay urethroplasty with 2 buccal mucosal grafts.

mal urethrostomy. Stage 3 urethroplasty with a tunica vaginalis cover was performed 6 months later. Two patients had short, recurrent bulbar strictures within 9 months of followup, which were treated with DVIU in straightforward fashion. In these patients hair growth was noted in the region of the bulbar urethra. Thus, the overall success rate in this group was 11 of 14 cases (78.5%).

## DISCUSSION

Our results demonstrate that 1-stage dorsal onlay buccal mucosal urethroplasty provides satisfactory results in select cases of BXO related anterior urethral strictures. This study also indicates that, when the urethral plate is adequate, dorsal buccal mucosal grafting can be successfully used for reconstructing any urethral segment, including the meatus. To our knowledge prior to this study there have been no reports in the literature describing 1-stage buccal mucosal dorsal onlay urethral reconstruction for BXO strictures. Our approach is based on the technique of Kulkarni et al, who presented their experience with 33 patients with panurethral strictures related to BXO treated with 1-stage dorsal onlay buccal mucosal urethroplasty using a single perineal incision.[7]

Penile skin flap urethroplasty has been used for 1-stage reconstruction of BXO strictures with encouraging short-term results.[8–10] However, the long-term outcomes of this technique have been uniformly disappointing.[3–5] Venn and Mundy reported an almost 100% recurrence rate for 1-stage urethroplasty with genital skin flaps.[4] In their series all 12 patients with 1-stage penile skin reconstruction had failure within 2 years with evidence of BXO in the diseased segment. Depasquale et al also observed a high re-stricture rate when penile skin was used for 1-stage reconstruction.[5] Therefore, they recommended a 2-stage approach using nongenital skin or buccal mucosa for BXO urethral strictures.

We have also noted recurrent BXO when penile skin flaps have been used for 1-stage reconstruction (unpublished data). However, we are not convinced that all BXO related urethral strictures should be treated with 2-stage techniques. Clearly most patients in this age group would prefer a 1-stage procedure when possible. In BXO involvement of the urethra ranges from meatal stenosis to complete circumferential urethral involvement with panurethral disease. In our experience in most instances the most severe spongiosal scarring in BXO is seen at the meatus and pendulous urethra. More proximal urethral involvement is often associated with lesser scarring and a wider caliber urethra. Our approach to urethroplasty in BXO cases is dictated by the condition of the urethral plate, as assessed intraoperatively. We perform preliminary urethroscopy with a 6Fr pediatric cystoscope to assess stricture caliber. If the urethra accepts the cystoscope with ease, we proceed with 1-stage reconstruction. We have observed that when the cystoscope easily negotiates the entire length of the strictured urethra, graft onlay is usually possible. Easy passage of a 6Fr cystoscope would indicate that stricture lumen caliber is at least 7Fr. In our experience this is usually sufficient diameter to accept a flap or graft as an onlay. A final assessment of the urethral plate is made intraoperatively. A similar approach has also been practiced by others who consider that careful intraoperative urethral assessment is essential for choosing the appropriate reconstruction technique.[11]

In our study all patients had pendulous urethral stricture. Since the description of the Orandi procedure,[12] the preferred technique for pendulous urethral stricture reconstruction has been penile skin flap urethroplasty.[9,13] Wessels and McAninch reported poor results for ventral onlay free graft urethroplasty of the pendulous urethra.[14] They cautioned against the use of grafts on the pendulous urethra on the premise that the corpus spongiosum is deficient and poorly vascularized in this segment. As a consequence, graft take may possibly be compromised. These concerns may be valid when applying the graft on the ventral aspect of the spongiosum. In dorsal onlay grafting graft take depends posterior on the corpora cavernosa. With this technique the spongiosum does not contribute significantly to graft support or uptake. The other matter of concern is whether detaching a long segment of urethra from the corpora cavernosa would compromise its vascularity. However, the distal urethra receives its blood supply retrograde from the glans, which is maintained during dorsal dissection.

Barbagli et al reported successful dorsal free grafting in 12 cases of pendulous urethral strictures.[15] Subsequently Morey reported dorsal free graft augmentation of pendulous strictures combined with a ventral onlay penile skin flap.[16] Our results corroborate those of Brady et al, who reported their experience with 1-stage buccal mucosal urethroplasty combined with other techniques in 24 patients, of whom 10 had BXO, with pendulous urethral strictures with a mean stricture length of 7.65 cm (range 1 to 19).[17] They reported an 87.5% success rate at a mean followup of 26.6 months.

Meatal involvement in BXO related strictures is universal and the most accepted technique for reconstruction has been the ventral island fasciocutaneous flap, as described by Jordan,[18] and Armenakas and McAninch.[19] To date meatal reconstruction with dorsal buccal mucosal grafting has not been reported to our knowledge. An advantage of the Kulkarni technique that we have used is that the meatal component of the stricture can be dealt with simultaneously with proximal stricture repair. The distal-most buccal mucosal graft is onlayed on the dorsal aspect of the meatus and fossa navicularis. The final outcome is a normal slit-like appearance of the meatus. The technique is also cosmetically appealing because it involves minimum violation of the penile skin with minimal glans dissection.

In patients in whom the urethral plate is severely stenosed or there are multiple, focally dense segments we prefer a 2-stage approach. In this study 4 (28%) patients required proximal urethrostomy revision following stage 1. We were unable to reconstruct an adequate caliber meatus in 2 patients during stage 2 repair. This situation is likely to have occurred due to graft shrinkage over the glans. Two patients were noted to have hair growth within the scrotal segment following the stage 2 operation. Similar problems with stage 2 urethroplasty have been noted by others. Andrich et al reported an almost 50% revision rate using 2-stage techniques.[6] In their series stomal stenosis and shallowing of the glans cleft were regular problems that required revision.

BXO recurrence after 1-stage reconstruction with penile skin usually manifests within 2 years,[3,4] although it can occur up to 6 to 10 years later.[3] Lee et al recently reported BXO recurrence in buccal mucosa following stage 1 urethroplasty.[20] We have not noted recurrent BXO following staged or 1-stage reconstruction at a mean followup of

32.5 months. We await with interest the long-term results of this procedure.

## CONCLUSIONS

In the presence of a favorable urethral plate 1-stage dorsal onlay buccal mucosal urethroplasty provides excellent intermediate term results for BXO related strictures. However, only long-term results would give evidence about the viability of this procedure. Although successful, 2-stage procedures are associated with technical problems and multiple revisions.

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