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Dorsal Buccal Mucosal Graft Urethroplasty for Anterior Urethral Stricture by Asopa Technique

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Abstract

Background: Buccal mucosal graft (BMG) substitution urethroplasty has become popular in the management of intractable anterior urethral strictures with good results. **Excellent long-term results have been reported by both dorsal and ventral onlay techniques. Asopa reported a successful technique for dorsal placement of BMG in long anterior urethral strictures through a ventral sagittal approach.**

Objective: **To evaluate prospectively the results and advantages of dorsal BMG urethroplasty for recurrent anterior urethral strictures by a ventral sagittal urethrotomy approach (Asopa technique).**

Design, setting, and participants: From December 2002 to December 2007, a total of 58 men underwent dorsal BMG urethroplasty by a ventral sagittal urethrotomy approach for recurrent urethral strictures. Forty-five of these patients with a follow-up period of 12–60 mo were prospectively evaluated, and the results were analysed.

Intervention: The urethra was split twice at the site of the stricture both ventrally and dorsally without mobilising it from its bed, and the buccal mucosal graft was secured in the dorsal urethral defect. The urethra was then retubularised in one stage.

Results and limitations: The overall results were good (87%), with a mean follow-up period of 42 mo. Seven patients developed minor wound infection, and five patients developed fistulae. There were six recurrences (6:45, 13%) during the follow-up period of 12–60 mo. Two patients with a panurethral stricture and four with bulbar or penobulbar strictures developed recurrences and were managed by optical urethrotomy and self-dilatation. The medium-term results were as good as those reported with the dorsal urethrotomy approach.

Long-term results from this and other series are awaited. More randomised trials and meta-analyses are needed to establish this technique as a procedure of choice in future.

Conclusions: The ventral sagittal urethrotomy approach is easier to perform than the dorsal urethrotomy approach, has good results, and is especially useful in long anterior urethral strictures.

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1. Introduction

Management of intractable anterior urethral strictures poses a continuing urological challenge. Buccal mucosal graft (BMG) urethroplasty has been the gold standard in the past decade for substitution urethroplasty, and the medium-term results have been good [1–3]. Traditionally, grafts have been placed on the ventral aspect of the urethra, because it allows easier access and better visualisation of the stricture [4], and ventrally placed grafts are likely to be associated with a higher rate of graft failure and diverticulae formation [5]. Barbagli et al [6] introduced dorsally placed grafts and postulated that dorsal placement is advantageous because the underlying corpora gives better mechanical support for the graft as well as blood supply.

Asopa [7] described a ventral sagittal urethrotomy approach for dorsal free-graft urethroplasty and claimed that the procedure is easier to perform and better because the urethra is not mobilised. Hays and Malone [8] described a similar approach as a salvage procedure in the management of meatal and urethral stenosis following hypospadias repair. We report our ongoing experience with the Asopa technique for intractable anterior urethral strictures.

2. Methods

2.1. Patients

Between December 2002 and December 2007, 58 male patients with a mean age of 41 yr (range: 19–62 yr) underwent BMG urethroplasty for recurrent anterior urethral stricture by the Asopa technique. Of these, 45 patients with a minimum follow-up period of 12 mo were prospectively evaluated. Tables 1–3 show the aetiology, site, and length of the stricture, respectively.

Forty-two patients had a previous history of intervention with urethral dilatation in 11 patients, optical urethrotomy (OU) in 23 patients, meatotomy in 4 patients, and urethroplasty in 4 patients. All

Table 1 – Etiology of stricture

Balanitis xerotica obliterans (BXO)	17
Inflammatory	15
Traumatic	3
Iatrogenic	2
Idiopathic	8

Table 2 – Site of stricture

Bulbar urethra	25
Penile urethra	5
Penile and bulbar urethra	12
Pan anterior urethral stricture	3

Table 3 – Length of stricture

1–3 cm	5
3.1–5 cm	26
5.1–10 cm	8
>10 cm	6



Fig. 1 – Retrograde urethrogram (RUG) panurethral stricture.

patients underwent urinalysis, urine culture, uroflowmetry (UFR), renal function tests, and ultrasonography of the kidney, ureter, and bladder (KUB) area. Retrograde urethrogram (RUG) was performed in all patients to evaluate the stricture. Buccal mucosa was harvested from one or both cheeks as well as the lower lip, depending on the length of the stricture. Mouth washes with povidone-iodine oral solution were started 2 d prior to graft harvesting and continued postoperatively for 3 d. Patients with documented urinary tract infection (UTI) were treated with appropriate antibiotics. Urine was rendered sterile before surgery. A prophylactic broad-spectrum antibiotic (cephalosporin) was administered before surgery and continued 5 d postoperatively. The longest stricture (panurethral) reconstructed by this method was 17 cm (Fig. 1).

2.2. Technique

Combined epidural and general anaesthesia was used. The patient was placed in the lithotomy position. In case of bulbar strictures, a midline perineal incision was made. In the case of penile strictures, a subcoronal circumferential incision was made, and the penis was degloved. In long pan-urethral strictures, both incisions were used to access whole anterior urethra. No attempt was made to mobilise the urethra or dissect the bulbospongiosus muscle and Buck's fascia. The urethra was split open ventrally over a bougie, and the stricture was laid open. The incision was carried into the healthy urethra for about 1–2 cm both proximally and distally. The normal, healthy urethra was recognised by its pink colour, mucosal rugosity, and methylene blue staining (if the latter had been instilled). The full thickness of the dorsal urethra was then incised in the midline with the incision carried into the healthy urethra for about 1–2 cm both proximally and distally. The margins of the incised dorsal urethra were dissected from the tunica albuginea by sharp dissection with the edge of the scalpel blade without lifting the two halves of the bisected urethra. This provided an elliptical raw area of up to 1.5–2 cm between the incised dorsal edges of the urethra over the tunica albuginea. BMGs were harvested and placed over the raw area to cover the defect. The margins of the graft were anchored to the edges of the incised urethra and to the underlying tunica with 5-0 interrupted polyglactin sutures (Fig. 2). The graft was further anchored to the underlying tunica albuginea by applying quilting sutures at several points by using 5-0 polyglactin sutures to prevent dead space. The urethra was retubularised by continuous 5-0 monocril sutures over a 16F silicone Foley catheter (FC) and reinforced with interrupted 5-0 polyglactin sutures. The perineal wounds were closed in layers, and pressure dressing was applied after leaving a suction drain. In the case of circumcoronal incisions, the skin was sutured back in place. Dressings were removed after 48 h and drains in 3–5 d.



Fig. 2 – Panurethral stricture: urethra laid open by ventral urethrotomy. Buccal mucosal grafts (BMGs) are being sutured and quilted dorsally over the corpora cavernosa.

At the end of 3 wk, a pericatheter urethrogram was performed to demonstrate any leak of contrast, and the FC was removed. FC removal was delayed by a week if there was a leak. All patients were followed at 3, 6, and 12 mo postoperatively and every 6 mo thereafter. A careful history was obtained, and UFR, urine culture, and urethroscopy were performed in all patients at the end of 3 mo. An RUG was ordered to rule out recurrence of stricture if the patient was symptomatic for poor flow and the peak flow was found to be <15 ml/s on UFR.

Forty-five patients were followed for a minimum period of 12 mo to a maximum of 60 mo (mean: 42 mo). One patient underwent live related kidney transplantation 3 mo after urethroplasty and was followed up for 20 mo.

3. Results

Seven patients had postoperative wound infection (Table 4). Five patients developed urethrocuteaneous fistula (11%); all of them healed spontaneously except one, who also developed infection and recurrent stricture subsequently at 3 mo. There were six recurrences (13%), including two panurethral, two bulbar, and two penobulbar strictures; all of those patients had a long history of stricture disease and

had previously undergone multiple procedures. Three patients out of six who developed recurrence had changes of balanitis xerotica obliterans (BXO). The recurrence was distal to the graft site in two patients (penobulbar), multiple in one patient (panurethral), and a diffuse narrowing in three patients (two bulbar and one panurethral). Patients with recurrent stricture presented with diminished urinary flow (peak flow <15 ml/s), dysuria, and fever resulting from UTI. All of them responded well to OU and self-dilatation for varying periods of time (1–3 mo).

The donor site was closed primarily, and no patients had any long-term complications. Two patients had difficulty opening the mouth, and one had a salivary flow problem in the first 3 mo after surgery but later overcame the disability.

The overall success rate was 87% with a mean follow-up of 42 mo. Success was defined as no intervention either in the form of dilatation or OU, and the flow rate was >15 ml/s during the follow-up period.

4. Discussion

The last word has not yet been said about the ideal urethral stricture-management technique. Reconstruction of the urethra poses continuing challenges to the urologist. Although several tissues and substitutes have been used in urethral reconstruction [6,9,10], the buccal mucosa has become the favoured tissue for use as urethral substitute in the past decade.

There are several variables, including length, site, number of strictures, amount of spongiofibrosis, and the presence of BXO, on which the results of urethroplasty depend. The six strictures, which recurred in our series at 3, 12, 30, and 48 mo follow-up, were complicated strictures. These patients had a long history (>10 yr) of stricture disease and had undergone multiple procedures with resultant severe spongiofibrosis, false passages, and periurethral fibrosis. Two of the recurrent strictures (penobulbar) occurred at the distal site of anastomosis (Fig. 3a and b). The actual graft site was wide and looked normal at endoscopy.

New strictures occurred despite the stricture incision being carried out on either side into normal urethra during urethroplasty. It is possible that there was an underlying process of spongiofibrosis already going on, despite the apparently “normal” appearance of the tissues at urethroplasty. Both of these patients responded well to OU and self-dilatation. Two other patients with panurethral strictures

Table 4 – Results (recurrence)

Site no.	Site of stricture	Time of recurrence—postop	Procedure done	Total follow-up period
1	Panurethral	3 mo	Endoscopic dilatation	60 mo
2	Panurethral	12 mo	OU	36 mo
3	Bulbar	3 mo	OU	60 mo
4	Bulbar	3 mo	OU	38 mo
5	Penobulbar	48 mo	OU	56 mo
6	Penobulbar	30 mo	OU	38 mo

OU, optical urethrotomy.

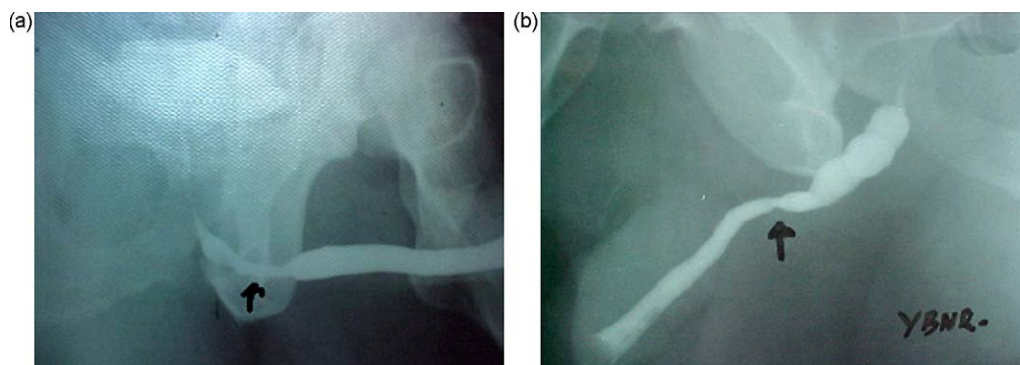


Fig. 3 – Retrograde urethrogram (RUG): (a) bulbar urethral stricture (arrow), preoperative; (b) stricture recurrence distal to the graft site (arrow) at follow-up.

and associated BXO changes had recurrences on follow-up at 3 mo and 1 yr after surgery, respectively. Urethroscopy revealed diffuse narrowing in one patient and multiple strictures in the other patient. Both the patients responded well to endoscopic dilatation and OU. They further continued self-dilatation with a soft catheter for 3 mo and are on close follow-up.

The overall success rate was 87% in our patients. Others using the Asopa technique have reported similar results [11]. None of our patients with skin changes over the genitalia suggestive of BXO had lichen sclerosis (LS) histologically. The biopsy of the prepuce or glanular mucosa only showed chronic fibrosis with inflammatory cell infiltration. LS often involves the urethra in men and results in extensive anterior urethral stricture disease [12,13]. BXO/LS-related strictures are complex and generally managed by two-stage urethroplasty.

Two-stage urethroplasty has been advocated for complex and extremely narrow panurethral strictures in which the urethral plate cannot be salvaged [14]. However, Joseph et al suggested that stricture recurrence may be inherent in multistage procedures because of local factors, including poor tissue quality and a compromised vascular supply [15]. Dubey et al reported excellent intermediate-term results in BXO-related strictures with a viable urethral plate one-stage dorsal onlay buccal mucosal urethroplasty [16]. We managed three panurethral strictures by sequential progressive continuous dilatation (SPCD); after reaching an adequate lumen size (from 6F/8F to 14F/16F) in 10 d, BMG urethroplasty was undertaken by the one-stage ventral sagittal urethrotomy approach. Although the strictures recurred, they responded well to self-dilatation and OU, which was preferable to a prolonged multistaged repair in a resource-poor setting like ours. The SPCD technique enabled us to preserve the urethral plate and facilitated BMG urethroplasty in this setting.

Success of any urethroplasty in this setting, as in others, depends on a good vascular supply. Mobilisation of the urethra compromises critical supply from the circumferential arteries. As the urethra was not mobilised in this technique, the blood supply (circumferential artery) of the diseased and ischemic urethra was not further compro-

mised by dissection, thereby improving the chances of a good outcome, as described by Asopa [7]. However, long-term follow-up and randomised studies are necessary to buttress these presumptions.

The other distinct advantage of this technique is that it is simpler and easier than the dorsal urethrotomy technique, as there is no mobilisation and rotation of urethra. Moreover, the stricture site is directly seen, and the BMG can be tailored to the dorsal urethrotomy defect; in the dorsal urethrotomy approach, visualisation is rendered difficult by the rotation necessary for urethral incision dorsally. This technique may also be more suitable when the urethra is adherent to underlying corpora cavernosa as a consequence of repeated OUs and in obese patients where a dorsal approach may be particularly difficult [3]. The bleeding from the edges of the spongy urethra from the ventral urethrotomy site is more than in the dorsal urethrotomy technique but can usually be controlled effectively with diathermy or sutures. The elliptical dorsal urethrotomy defect can be as wide as 1.2–1.7 cm in the penile urethra and 2 cm in the bulbar area, yielding an adequate urethral lumen at the end of the surgery.

Four of the fistulae in our series occurred in the first 20 cases. The leak was mainly from the ventral surface of the urethra and healed spontaneously. The postoperative fistula formation can be minimised or prevented by closing the ventral urethrotomy defect meticulously with continuous absorbable sutures and with reinforcement from interrupted sutures. Local infection should be prevented by irrigating the wound with antibiotic solution before closure. The donor site healed well in all patients by primary closure. No long-term morbidity was observed. However, persistent postoperative discomfort, neurosensory deficits, and salivary flow changes were reported in men whose grafts were harvested from the lower lip [17].

5. Conclusion

Dorsal BMG urethroplasty by ventral sagittal urethrotomy approach is technically simple because there is no mobilisation and rotation of the urethra. This technique is promising in the management of panurethral strictures

because there is good and direct exposure of the stricture segment. The intermediate-term results are comparable to those of published series using the dorsal BMG through the standard dorsal sagittal urethrotomy approach.

Author contributions: VLN Murthy Pisapati had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Pisapati.

Acquisition of data: Paturi, Reddy.

Analysis and interpretation of data: Paturi, Pisapati.

Drafting of the manuscript: Pisapati, Jada.

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Editorial Comment on: Dorsal Buccal Mucosal Graft Urethroplasty for Anterior Urethral Stricture by Asopa Technique

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The surgical technique presented in this article represents an important step in the evolution of one-stage procedures suggested in the treatment of anterior urethral strictures of different aetiology [1]. No single technique is appropriate for all situations, and this statement is true for this technique. In patients with a narrow urethral plate, the midline incision of the mucosal plate is difficult and the urethral mucosa is damaged by this approach. For this reason, in these patients, the dorsal onlay graft technique provides a better chance of success because the narrow

urethral plate is adequately augmented by a wide graft applied on the corpora cavernosa. The ventral inlay technique provides 1.5-cm widening of the original urethral plate, and the dorsal onlay technique provides 2.5-cm widening of the original urethral plate. This difference is particularly important in patients with urethral stricture due to lichen sclerosus who show a scarred urethral plate and a high recurrence rate of stricture. The technique (ventral inlay vs dorsal onlay) should be selected according to the stricture etiology and width of the original urethral plate and should not be based on the surgeon's preference, as the authors suggested in this article.

Another question arising from this article is about terminology. The authors used the term *balanitis xerotica obliterans*. This term is only used in the old urological literature. In 1995, the American Academy of Dermatology

recommended that the term *lichen sclerosus* should be used in future reports to define its true incidence and its malignant potential (reference 12 in the text). In the future, the authors should use correct and up-to-date terminology because lichen sclerosus is not balanitis, xerotica, or obliterans but a chronic inflammatory skin disease of unknown origin, and its immunological pathogenesis has not yet been completely characterised (reference 12 in the text).

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