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Original Article: Clinical Investigation

Dorsal onlay lingual mucosal graft urethroplasty: Comparison of two techniques

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Objectives: To compare the results of two different techniques of dorsal onlay lingual mucosal graft (LMG) urethroplasty for anterior urethral strictures.

Methods: Thirty patients underwent dorsal onlay LMG urethroplasty by Barbagli's technique (group I) and 25 through a ventral sagittal urethrotomy approach (group II). All of the patients were followed up with a pericatheter urethrography at 3 weeks, retrograde urethrography with micturating cystourethrography and uroflowmetry at 3, 6 and 12 months.

Results: Mean follow up was 22 months and 13 months in group I and II, respectively. The mean peak flow rate increased from 4.2 mL/s preoperatively to 35.5, 25.06 and 25 mL/s at 3, 6, and 12 months, respectively, in group I and from 7.8 mL/s to 34.2, 28.4 and 26.2 mL/s at 3, 6 and 12 months, respectively, in group II. Five patients in group I and two patients in group II had an anastomotic stricture at 12 months. Meatal narrowing was seen in five patients in group I and three patients in group II. The overall success rate was 83.4% and 76.6% in group I and 90% and 80% in group II at 6 and 12 months, respectively. One patient had chordee in group I and no patient had chordee in group II. There was a shorter operative time and less blood loss in group II.

Conclusions: Dorsal onlay LMG urethroplasty through a ventral sagittal approach is better than the Barbagli's technique in terms of results and complications.

Key words: anterior urethral stricture, lingual mucosal graft, substitution urethroplasty, ventral sagittal approach.

Introduction

There is a wide variety of options for managing anterior urethral strictures starting from urethral dilatation to end-to-end spatulated anastomosis to substitution urethroplasty for long strictures. There are again many options for substitution urethroplasty ranging from local flaps to different grafts. Buccal mucosa graft remains the most commonly used graft material today for managing long anterior urethral stricture disease.[1] There are only a few publications regarding the use of lingual mucosa as a graft material for managing such long strictures. This was first reported by a group in Italy[2,3] and successively by our group[4] and then Barbagli *et al*.[5] Lingual mucosal graft (LMG) has got similar advantages to buccal mucosal graft (BMG), with less donor site morbidity and greater ease of harvesting.[6] All of these publications of substitution urethroplasty used the Barbagli's technique of dorsal onlay for placement of the graft.[7] We faced difficulty while anastomosing the graft with the cut urethral margins at both the proximal and distal ends resulting in a difficult anastomosis, so we changed our technique to a dorsal onlay through a ventral sagittal urethrotomy approach. We compared the results of these two techniques.

Methods

This is a retrospective analysis of the results of two techniques of substitution urethroplasty for the management of anterior urethral strictures. All of the patients were operated on by a single surgeon (P. B. S.).From March 2006 to December 2006, 30 patients who underwent dorsal onlay LMG urethroplasty by Barbagli's technique were included in Group I. From January 2007 to May 2008, 25 patients who underwent dorsal onlay LMG urethroplasty through a ventral sagittal urethrotomy approach were included in Group II. All of the patients had completed at least 12 months of follow up.

Patients with a stricture <3 cm long and complex strictures which required a multistage urethroplasty were excluded from the study. All the patients were examined thoroughly and evaluated preoperatively with uroflowmetry, retrograde urethrography with micturating cystourethrography (RGU + MCU) and cystourethroscopy (if required) to assess the rest of the urethral mucosa.

The patient was laid in lithotomy position. A midline perineal incision was made. In Group I, the urethral stricture segment was identified and mobilized. It was then rotated 180° with the help of four to six stay sutures placed dorsolaterally on either side of the stricture segment. Dorsal urethrotomy was performed on the stricture segment upto the normal looking mucosa. If meatus was involved as in balanitis xerotica obliterans, the dorsal urethrotomy was continued distally through the glanular urethra with a No. 15 surgical blade liberally to allow a 30 Fr sound.

Tongue mucosa was harvested from the ventrolateral aspect with a width of about 1.5 cm from one side of the tongue. If a long graft was required it was extended to the opposite side across the midline in continuity (Fig. 1). The donor site was then closed with a 4–0 polyglactin suture. The graft was tailored by removing the submucosal fibrovascular connective tissue and muscle fibers off the full thickness mucosal graft.

The graft was then quilted to the tunica albuginea in the midline opposite the dorsal urethrotomy wound. The proximal end of the graft was than sutured to the proximal margin of the urethrotomy wound with three interrupted sutures of 4–0 polyglactin. Then the right and left margins of the graft were anastomosed to the corresponding margins of the urethrotomy wound in a continuous running fashion. If meatus was

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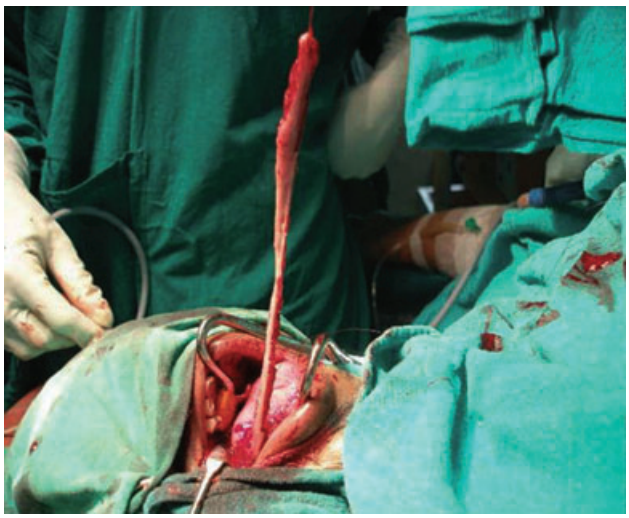

Fig. 1 Lingual mucosal graft harvesting.

involved then the graft was taken out through the glanular urethra and was fixed with three to four interrupted 4–0 polyglactin sutures to the margin of the meatotomy wound.

In group II, the stricture segment was identified but not mobilized. A ventral sagittal urethrotomy was performed over the stricture segment (Fig. 2). The dorsal urethral plate was then incised until the partial thickness of the corpus spongiosum was reached, which was then split with the blades of mosquito forceps to get an elliptical space for graft placement (Fig. 3). Hemostasis was achieved with a bipolar cautery. The graft was placed and fixed to the margins of the dorsal split (Fig. 4). Then the ventral urethrotomy was closed over a 16 Fr pure silicon Foley catheter (Fig. 5).

All of the patients were followed up with a pericatheter urethrography at 3 weeks and the catheter was removed if no extravasation was seen. They were subsequently followed up with uroflowmetry and RGU + MCU at 3, 6 and 12 months. Thereafter they were followed up with interval uroflowmetry and subjective symptoms.

SPSS software was used for statistical analysis. A *P*-value of lower than 0.05 was regarded as a significant difference or correlation.

Results

The mean age of patients in group I and II was 28 years (range 18–58) and 30 years (range 20–57), respectively. Characteristics of the strictures in Group I and II are shown in Table 1. The mean period of follow up was 22 months and 13 months in group I and II respectively. In Group I, three patients had mild extravasation of contrast at the proximal anastomotic site whereas no patient had the same in Group II. Wound infection was seen in two patients and one patient in Group I and Group II, respectively. Peak flow rate increased from a preoperative value of 4.2 to 35.5, 25.06 and 25.0 mL/s at 3, 6 and 12 months, respectively, postoperatively in Group I and from 7.8 to 34.2, 28.4 and 26.2 mL/s at 3, 6 and 12 months, respectively, in group II. In Group I, five patients had a recurrence of stricture (three at the proximal and two at the distal anastomotic site). One patient had this complication noted at 6 months and four patients had it noted at 1 year. All were managed by visual internal urethrotomy (VIU). At 6 months of follow up, no patient had a recurrence of stricture in Group II. At 12 months follow up, two patients had a recurrence of stricture (proximal anastomotic site) managed successfully with VIU. Meatal narrowing was seen in

Fig. 2 Ventral urethrotomy of stricture segment.

five patients in Group I, of which most (4) were within 6 months. In Group II, three patients had a meatal narrowing at 12 months, all of which appeared within 6 months. Three patients in each group needed a meatotomy whereas two patients in Group I, who had flimsy adhesions at the meatus, required self meatal calibration to obtain a good stream of urine. One patient had mild curvature of the penis during erection noticed at the second month of follow up which subsided during the third month. Chordee was not seen in Group II patients. Postoperative erectile dysfunction was not seen in either group of patients.

The overall success rate was 83.4% at 6 months and 76.6% at 12 months in Group I and 90% at 6 months and 80% at 12 months in Group II. The mean operative time was significantly more in Group I compared to that in Group II (140 min *vs* 112 min, $P < 0.001$). Parallel to the operative time was the blood loss (100 mL *vs* 70 mL, $P < 0.001$). Though clinically not significant, statistically they are.

Discussion

Substitution urethroplasty is the mainstay of the management for long-anterior urethral strictures. Though BMG is the gold standard at present, studies have been published using LMG[2–5] with equal efficacy but less donor site morbidity. BMG or LMG has been seen to be superior to other grafts or at least equally effective as the vascularized flaps. Ventral onlay of these grafts is easy to perform but it has the chance of ballooning, diverticulum formation and pooling of urine with subsequent stricture formation as these grafts lack a spongiosal support. Barbagli's technique has eliminated these complications as the

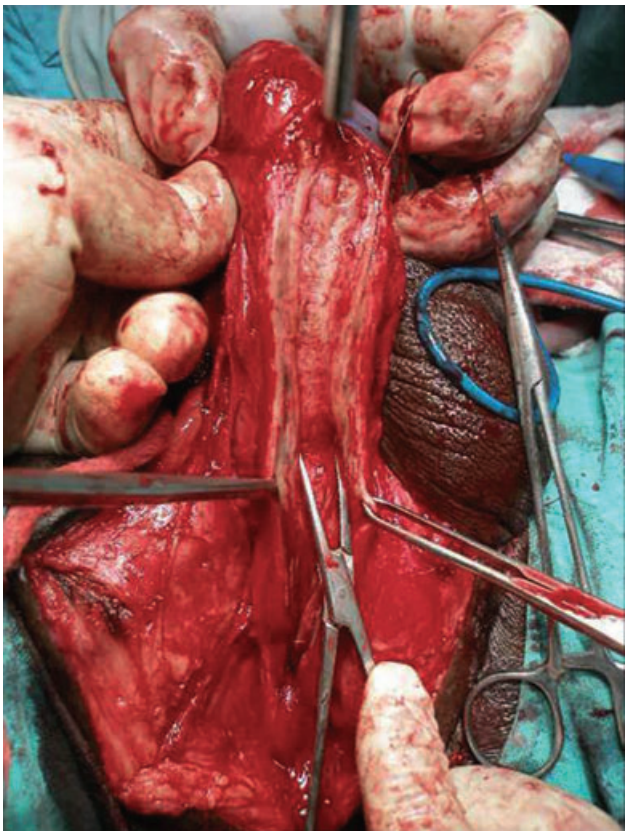

Fig. 3 Dorsal urethrotomy through ventral sagittal approach.

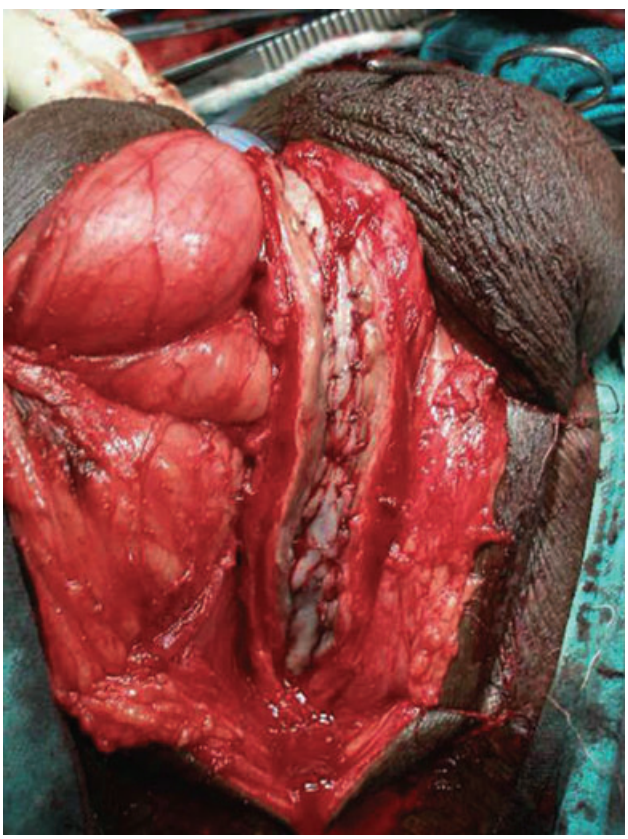

Fig. 4 Graft sutured over the prepared bed.

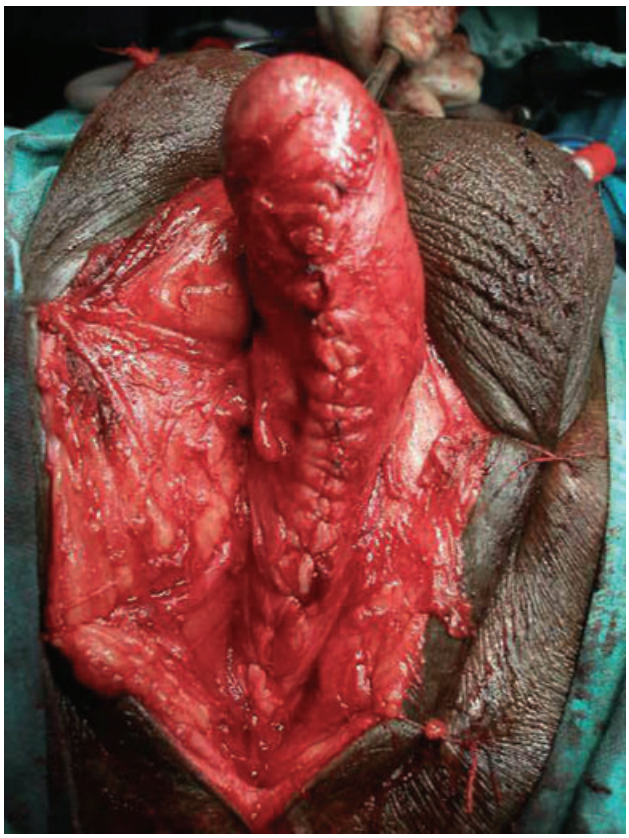

Fig. 5 Closure of ventral urethrotomy.

Table 1 Characteristics of stricture in both groups

Characteristics	Group-I	Group-II
Mean stricture length in cm (range)	10.2 (3.7–16.5)	9.8 (3.5–12.9)
Site of stricture	*n* (%)	*n* (%)
Penile	6 (20)	5 (20)
Bulbar	6 (20)	8 (32)
Pan-urethral	18 (60)	12 (48)
Etiology of stricture	*n* (%)	*n* (%)
BXO	18 (60)	13 (52)
Infective	6 (20)	3 (12)
Post-traumatic	4 (13.3)	3 (12)
Iatrogenic	1 (3.3)	4 (16)
Idiopathic	1 (3.3)	2 (8)
Total no. of patients	30	25

BXO, balanitis xerotica obliterans.

graft is supported by corporal bodies. In this technique, however, the urethra has to be mobilized completely all around at the stricture site.

The two halves of the urethra derive its blood supply from the circumflex and perforating vessels along with the two bulbar arteries which run longitudinally in both sides of the midline and a retrograde supply. By mobilizing the urethra (as in Barbagli's technique) from the tunica albuginea, the circumflex and perforating vessels are severed.

The first report of dorsal onlay through a ventral sagittal urethrotomy approach was given by Asopa *et al.*[8] in 2001, where they incised the dorsal urethral plate upto the tunica albuginea and created an elliptical space of approximately 2 cm for placing the graft. Subsequently Gupta *et al.*[9] reported a series of 12 patients with the same approach with a 91% success rate. One patient required a VIU for a recurrent stricture. We modified the technique. We incised the dorsal urethral plate to a partial thickness and the margins were split by the blades of mosquito forceps to create the same space with ease. This has the advantage of a partial thickness vascular spongiosal support along with the tunica albuginea for possible better graft take.

In a study at our centre, out of 43 patients who underwent BMG dorsal onlay urethroplasty by Barbagli's technique, five patients developed stricture at the anastomotic site.[10] This is a typical feature of stricture recurrence after any substitution urethroplasty. In the present study using LMG as a dorsal onlay graft by Barbagli's technique, five (out of 30) developed stricture at the proximal and distal anastomotic site at 1 year and one patient developed ventral chordee. No patient had stricture or chordee out of 30 patients who underwent dorsal onlay LMG urethroplasty through a ventral sagittal approach at 6 months but two patients had recurrence of stricture at one year follow up. This could be due to less vascular compromise and non mobilization of the urethra.

Conclusion

LMG urethroplasty as a dorsal onlay through a ventral sagittal approach has got certain advantages over the conventional Barbagli's technique. There is particularly lesser chance of anastomotic stricture and postoperative chordee, which still has to be validated with long term follow up. The operative time and the blood loss is also less with this newer approach.

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