A comparative study of lingual mucosal graft urethroplasty with buccal mucosal graft urethroplasty in urethral stricture disease: An institutional experience

Dilip Kumar Pal, Depak Kumar Gupta, Bastab Ghosh, Malay Kumar Bera
Department of Urology, Postgraduate Institute of Medical Education and Research, Kolkata, West Bengal, India

INTRODUCTION

Stricture disease of the urethra is a frequent urological problem in India, posing a big challenge in managing its chronic and recurrent course. The search for ideal graft material for substitution urethroplasty is constantly evolving. For many years, penile skin was the most popular substitution material used for urethroplasty, but today buccal mucosa is suggested as the gold standard.\(^1\)

In the eastern part of India, people have a habit of betel and tobacco chewing. In these persons, the buccal mucosa is often

**Aims**: A prospective study to compare the outcomes of lingual versus buccal mucosal graft urethroplasty in patients with long segment anterior urethral strictures disease.

**Materials and Methods**: The study included 30 patients for buccal mucosal graft urethroplasty (group I) and 30 patients for lingual mucosal graft urethroplasty (group II) for treatment of long segment (>3 cm) incomplete anterior urethral stricture disease using single-stage dorsal onlay free oral mucosal graft urethroplasty by Barbagli’s technique between February 2013 to September 2014. All patients underwent complete evaluation of the stricture including inspection of the oral cavity.

**Results**: The results of urethroplasty in between two group were not significant (\(P > 0.05\)) in terms of Qmax (\(P = 0.63\)), mean postoperative AUA symptom score (\(P = 0.83\)), operative time (\(P = 0.302\)) intra operative blood loss (\(P = 0.708\)), duration of postoperative hospitalization (\(P = 0.83\)), but slurring of speech complications was seen in group II, but not in group I. Long-term complications of salivary disturbance, tightness of the mouth, persistent pain at graft site, perioral numbness, seen only in group I (BMGU).

**Conclusion**: LMG urethroplasty is an excellent alternative to BMG urethroplasty with comparable results of urethroplasty and minimal donor site complications.

**Key Words**: Buccal mucosal graft urethroplasty, lingual mucosal graft urethroplasty, urethral stricture disease

**Address for correspondence:**
Prof. Dilip Kumar Pal, Department of Urology, Postgraduate Institute of Medical Education and Research, 244, AJC Bose Road, Kolkata - 700 020, West Bengal, India. E-mail: drdkpal@yahoo.co.in

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diseased and unfavorable for substitution urethroplasty. Until now no such prospective comparative study done in this region, so we started using lingual mucosa as a graft for substitution urethroplasty and compared our results with buccal mucosal graft urethroplasty (BMGU). The chief cause of urethral stricture in our study was balanitis xerotica obliterans (BXO), also known as lichen sclerosus atrophicus.

**MATERIALS AND METHODS**

After review board clearance, taking proper consent of the patient the study was done from August 2012 to February 2014, 60 men (30 BMGU and 30 lingual mucosal graft urethroplasty [LMGU]) aged 18–58 year with anterior urethral stricture, managed by single-stage free oral mucosal graft substitution urethroplasty, completed at least 6 months of follow-up. Every alternate patient taken for BMGU except the patient who has unhealthy buccal mucosa shifted for LMGU. The exclusion criteria were length of stricture <3 cm, complex stricture requiring multistage urethroplasty, having only metal stenosis or fossa navicularis stricture, oral neuropathy, history of oral malignancy or urethral malignancy, BPE (on ultrasonography and digital rectal examination in patients above 50 years) and patients who did not complete at least 6 months of follow-up after surgery.

All patients were evaluated preoperatively with detailed case history; physical examination uroflowmetry, urethroscopy, and retrograde or voiding urethrography [Figures 2a and 5a], AUA symptom scores were assessed. The oral cavity of all patients was inspected during the initial evaluation.

The criteria for successful repair are Qmax >15 ml/s with spontaneous voiding with insignificant postvoid residual urine. Even those cases which had Qmax <15 ml/s, but where amenable to minor corrective procedures such as metal dilatation or endoscopic dilatation, and subsequently voided normally with Qmax >15 ml/s were included in the success group.

The clinical assessment included the donor site morbidity with evaluation of presence of oral pain, difficulty in opening of mouth and speech, neurosensory deficits, facial deformity, and salivary changes.

**Procedure**

**Urethral mobilization**

All cases were operated under general anesthesia with nasotracheal intubation. Using a perineal approach, complete mobilization of the strictured segment was done. Urethrotomy was performed over the dorsal aspect and extended into the healthy urethra around 1 cm on each side.

**Graft harvesting**

A stay suture was taken at the tip of the tongue for traction. Then the length of graft required was marked on the ventrolateral aspect of the tongue.
aspect of the tongue from its posterior part with a width of 1.5 cm. Two stay sutures were taken at the proximal margin of the graft. Full thickness mucosal graft was harvested with a specially designed right angled scissor as per requirement even across the midline to the opposite side of the tongue if required. The harvested graft then immersed in a bowl of normal saline. Then it was processed by removing all submucosal adventitial tissue which is fat-free as described in the literature.\(^2,3\) If a longer graft was needed then, then harvesting was also done from the contralateral side of the tongue [Figure 1a and b]. The graft was then tailored according to the length of the stricture. Similarly for the buccal mucosal graft (BMG) the inner mucosal surface of the cheek marked for the required length of the graft [Figure 3a and b]. A solution of lignocaine with adrenaline was injected under the graft to enhance hemostasis and to raise the area to be harvested. Then it was harvested from the inner cheek avoiding injury to the Stenson’s duct without any stitches on the donor site. If the required graft length was longer, then harvesting was also done from the contralateral cheek [Figure 4a and b]. The graft was defatted with fine scissors and tailored according to the length of the stricture [Figure 6a and b]. In both cases, the harvested graft was spread, fixed and quilted to the overlying tunica albuginea of the corporal bodies opposite to the stricturotomy site on a 16 Fr, Foley’s catheter as described in the literatures.\(^4,5\)

**Postoperative management and follow-up**

Injectable antibiotics (ceftriaxone, amikacin, and metronidazole) were given for 5 days postoperatively and changed to oral ciproflaxacin 500 mg and ornidazole 200 mg BD subsequently. Injectable analgesic (diclofenac sodium 75 mg BD) was given for initial 2 days postoperatively and then changed to oral formulation. Patients were advised to continue povidone iodine mouthwash thrice daily. The perineal wound was left open from postoperative day-4 onwards. The perineal wound was closed by absorbable sutures, so there was no need for suture removal.

Orally, liquid diet was allowed on postoperative day 1 and from postoperative day 2 patients were allowed to take his normal diet. Patients were routinely discharged on the seventh postoperative day if otherwise fit. The catheter was removed if there was no extravasation of contrast in the pericatheter urethrography at 3 weeks. If extravasation was present, the catheter was kept for another 2 weeks. The patients were then followed at 3 months and 6 months with uroflowmetry. If the uroflowmetry was unsatisfactory, then urethrogram was done. All the patients were advised to review in the urology OPD or contact telephonically if they develop any complication.

**RESULTS**

On prospective analysis of 60 patients (30 BMG and 30 lingual mucosal graft [LMG]) who underwent urethroplasty by dorsal onlay free oral graft from February 2013 to September 2014, the following observations were noted.
In reference to the stricture etiology, BXO was the leading cause in both BMG and LMG groups, with more than half the patients attributed to it. Infective, traumatic, iatrogenic, and idiopathic were the other causes as seen in Figure 7a [Table 1].

Pan urethral strictures were the most common in both BMG and LMG groups at 70% and 73.3%, respectively. The rest had either a penile or a bulbar urethral stricture, as shown in Figure 7b.

The mean length of stricture as measured intraoperatively was 9.2 cm (range: 3.8–14.8 cm) in BMG group [Figure 5a] and 9.6 cm (range: 3.5–15.5 cm) in LMG group patients [Figure 2a].

The length of buccal/lingual mucosa harvested was measured intraoperatively. The mean length of mucosa was 10.23 cm in the BMG (Group 1) in comparison to 10.10 cm in the LMG (Group 2).

Mean follow-up was 15.2 mo (median: 16.3 mo; range: 6–19 mo) in Group 1 and 14.1 mo (median: 14.5 mo; range: 7–19 mo) in Group 2.

The intraoperative parameters recorded during surgery were the duration of surgery, graft harvesting time and blood loss.

The duration of surgery was observed to be slightly greater in those undergoing BMG (Group 1) in comparison to those having LMG (Group 2) with mean operative durations of 175.85 min (mean graft harvesting time 38 min) and 161.25 min (mean graft harvesting time 25 min), respectively. Intraoperative blood loss was found to be a little more in the BMG (Group 1) in comparison to the LMG (Group 2) with mean blood loss of 180 ml and 176.5 ml, respectively. These intraoperative parameters were not statistically significant ($P > 0.05$). Mean duration of hospitalization was 5.9 days (range 5–9) and 6.5 days (range 6–8) in Groups 1 and 2, respectively.

The mean $Q_{max}$ in both the groups showed improvement after surgery. In Group 1, the mean $Q_{max}$ improved from 8.6 ml/min to 29.56 ml/min (mean improvement 18.64) at 3 months postoperatively and in Group 2, the mean $Q_{max}$ changed from 7.43 ml/min to 30.29 ml/min (mean improvement 21.40).

Within the groups, the improvement seen in mean $Q_{max}$ was found to be statistically highly significant ($P < 0.001$). Between the two groups, the difference in improvement of $Q_{max}$ was not found to be statistically significant ($P > 0.05$).

The AUA symptom score decreased from a mean of 21.23 to 5.3 (mean decreased 16.1) and 20.67.5 to 5.37 (mean decreased 15.3), respectively, in Groups 1 and 2. Within the groups, decrease in symptom score was found to be statistically highly significant ($P < 0.013$). Between the two groups, the difference in the decrease in symptom score was not found to be statistically significant ($P > 0.05$) [Table 2].

Pericatheter study was done after 3 weeks of urethroplasty. Six patients of Group 1 and five patients of group 2 showed extravasation of contrast, which were managed successfully by extended catheterization for another 2 weeks. Repeat contrast study showed no leak and then voiding trial was given.

In Group 1, 3 patients developed stricture at the anastomotic site (1 distal anastomotic site, 2 proximal anastomotic sites), out of which 1 patient was managed with urethral dilatation and 2 patients required one attempt of visual internal urethrotomy. Four patients developed metal stenosis which was managed with metal self-calibration (3 patients) or meatotomy (1 patient).

In Group 2, 2 patients developed stricture at the anastomotic site. Both patients were managed successfully with one attempt of visual internal urethrotomy. Four patients developed metal stenosis which required meatotomy in 3 patients and 1 patient with flimsy adhesions were managed with metal self-calibration.

At 3 months postoperative, 2 patients in Group 1 and 3 in Group 2 had a poor flow rate ($Q_{max} < 15$ ml/min) and were declared as a failure. All these patients had wound infection and graft necrosis in the early postoperative period. At 6 months,
three more patients (two in Group I and two in Group 2) were observed to have a poor flow rate (Qmax <15 ml/min). Among these patients, two patient one in each group had developed wound hematoma in the early postoperative period. In the other patient, no cause could be determined for the failure. The overall success rates for BMG and LMG urethroplasty were 86% and 83%, respectively. Post operative urethrogram showed a good caliber urethra at 6 months in both groups [Figures 2b and 5b].

**Donor site evaluation**
The length of buccal/lingual mucosa harvested was measured intraoperatively. The mean length of mucosa was 10.23 cm in the BMGU (Group 1) range: 5.8–15.9 cm) (in comparison to 10.10 cm (range: 4.8–16.2 cm) in the LMGU (Group 2). Lingual mucosa width was slightly lesser than buccal mucosa.

96.6% of Group I patients and 90% of Group 2 patients experienced pain at the donor site on postoperative day 1, which subsided completely by postoperative days 5–6 in both groups except for in 3 patient in Group I in whom it persisted even after 3 months of follow-up.

Difficulty in tongue movement and slurring of speech was seen in II patients in Group 2, proportional to the length of graft harvested. This complication decreased as the pain subsided. The majority of patients had normal movement of tongue and speech by postoperative days 4 or 5. There was no bleeding hematoma or infection at donor site at the time of discharge.

Long-term complications (after 3 months) at donor site in the form of persistent pain at graft site, perioral numbness, tightness of mouth, salivary disturbance, scarring of the cheeks seen in Group 1 only [Table 3].

**DISCUSSION**

According to Turner Warwick, the urethra is the best substitute for urethra. However, this is only possible when <2 cm of the urethra is to be excised, and the end-to-end anastomosis is performed.

The use of local genital skin can cause penile/glans torsion, subcutaneous deformities, and chordee. Hence, the free extragenital tissue is needed to perform urethroplasty. An oral mucosal graft is considered the best tissue providing excellent clinical results.

Urethroplasty techniques are continuously improving with advancements in the field of substitution urethroplasty.

The ventrolateral aspect of the tongue offers mucosal tracts that are up to 7–8 cm long, depending on the tongue dimensions and has constant availability. Buccal mucosa and lingual mucosa has the same embryologic origin, are easy to harvest, have favorable immunologic properties (resistance to infection) and tissue characteristics (thick epithelium, high content of elastic fibers, thin lamina propria, and rich vascularization) that are favorable properties for imbibitions, inosculation, and revascularization of the graft.

LMG is easy to harvest (as the whole of the tongue can be pulled out of the mouth) and provides very long continuous grafts. This is especially advantageous over BMG harvesting in patients who had difficulty in mouth opening. The lateral aspect of the lingual mucosa has no particular functional features and almost half of the tongue tissue can be used as donor tissue, as in cancer of the tongue, without imposing any functional limitations on it.

In our study, we have compared LMG urethroplasty with BMG urethroplasty in terms of success rates, duration of postoperative hospitalization, blood loss, mean postoperative Qmax at 3 months and 6 months, and the mean postoperative AUA symptom score. There were insignificant differences for all the above parameters between the two groups (all have P > 0.05). These findings were
similar to previously done studies like the one reported by Kumar et al.\(^9\)

However, in our study, the donor site complications were more in BMG group. The main long-term donor site complications of BMG were persistent pain at graft site, perioral numbness, and difficulty in opening the mouth. Our findings are similar to those reported by Barbagli et al. and Dublin et al. but differed from the findings of Yongolo, who reported only short-term complications after BMG harvesting without any long-term complications.\(^{10,11,12}\)

As shown in Table 3, in the LMG group we never observed any major intraoral complications, such as persistent pain at the graft site, perioral numbness, and difficulties with mouth opening, deviations, or retractions. Patients with the graft harvested from the tongue reported difficulty in tongue protrusion and slurring of speech for <7 days. This was in sync with findings of previous studies done by Barbagli et al., Song et al. and Simonato et al. who reported minimal or no complications after LMG harvesting.\(^{12,13,14}\) These findings are summarized in Table 4.

**CONCLUSION**

Buccal mucosa and lingual mucosa are equally good for substitution urethroplasty, but BMG is not without donor site complication. LMG provides long grafts and is easy to harvest. Moreover, have minimal immediate or short-term donor site complications with no long-term complications. Hence, LMG may be used to substitute or supplement the already established procedure of BMG urethroplasty with minimal complications. With promising similar results from multicenter trials with larger sample size, LMG urethroplasty may become the gold standard in the future.

**Table 4: Other studies suggesting BMG has more donor site complication than LMG**

| Author and year | No. of pt | Site of graft | Early complication | Long term complication |
|----------------|-----------|---------------|--------------------|------------------------|
| Dublin et al. 2004\(^{11}\) | 30 | Cheeks | Tightness of mouth, pain at graft site, perioral numbness, swollen cheek | None |
| Bargbli et al. 2005\(^{10}\) | 90 | Cheek | Pain, swelling, bleeding | None |
| Yongolo 2005\(^{12}\) | 13 | Cheeks | Bleeding, hematoma, Infection, pain, cheek swelling, difficulty in feeding. | None |
| Bargbli et al. 2008\(^{13}\) | 10 | Tongue | None | None |
| Simonato et al. 2006\(^{14}\) | 8 | Tongue | Slight oral discomfort (100%) | None |
| Song et al. 2008\(^{15}\) | 10 | Tongue | None | None |

BMG: Buccal mucosal graft, LMG: Lingual mucosal graft

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**Conflicts of interest**

There are no conflicts of interest.