

Original Article



Comparison between Lingual Mucosal Graft Urethroplasty and Buccal Mucosal Graft Urethroplasty in The Management of Anterior Urethral Stricture.

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Abstract

Background: Urethral stricture is a chronic and common urological problem in Bangladesh and its management poses a big challenge to urologists. Surgical treatment of urethral stricture diseases is a continuously evolving process, and the superiority of one technique over another has yet to be clearly demonstrated. Urethrotomy is the most commonly used technique but long term results are not satisfactory. Long penile urethral strictures are best treated by substitution urethroplasty. The ideal graft material for substitution urethroplasty is constantly evolving. Buccal mucosa produces excellent result but is associated with many long term donor site complications. Lingual mucosa is an alternative donor site for graft urethroplasty and achieved good functional and aesthetic results. **Materials & Methods:** A hospital based prospective study was conducted in the department of urology, Dhaka Medical College Hospital from July 2016 to March 2017. Total 40 patients were included in this study. They were divided in two groups, group 1 was treated by lingual mucosal graft and group 2 was treated by buccal mucosal graft. All patients were followed up for six months noting pre and post-operative maximum urine flow rate (Q_{max}), voiding time and complications at both urethroplasty and donor site. **Results:** There were no significant differences in overall operative success rate between two groups of patients. But complications at donor site were higher in group 2 patients. **Conclusion:** Lingual mucosal graft urethroplasty may be preferred to buccal mucosa in anterior urethral stricture as it is easy to harvest and is associated with less short and long term donor site complications without significant difference in operative success rate.

Key words: Stricture Urethra, Urethroplasty, Lingual Mucosal Graft, Buccal Mucosal Graft.

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Introduction

Urethral stricture is a chronic and common urological problem in Bangladesh and its management poses a big challenge to urologists. Urethral stricture is a scarring process that involves epithelium as well as the spongy erectile tissue of the corpus spongiosum. Contraction of the scar tissue reduces the urethral lumen. In general, most anterior urethral strictures are the result of trauma. Inflammatory strictures associate with gonorrhoea are rarely seen. However, strictures associated with lichen sclerosis clearly behave like inflammatory strictures. We have often encountered stricture segments which are usually long and involve meatus. These long penile urethral strictures or

strictures because of BXO are best treated by substitution urethroplasty with non-genital mucosal graft.¹ The search for ideal graft material for substitution urethroplasty is constantly evolving. Since 1909, a large variety of free extra genital grafts tissues has been used for urethroplasty, such as the ureter, saphenous vein, appendix, full thickness skin, bladder mucosa and buccal mucosa. Currently, buccal mucosa is the most commonly used graft material for substitution urethroplasty.² However; buccal mucosa grafts (BMGs) have been associated with oral complications, e.g. numbness, tightness of the mouth, motor deficits, salivatory changes, bleeding, scarring and lip deviation or retraction.³ In addition, as the lining of the oral cavity is limited, it may not be possible to harvest enough material to

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repair complex, lengthy strictures. On the other hand, the mucosal covering of the lateral and under surface of the tongue is identical in structure with that lining the rest of the oral cavity. Therefore, like buccal mucosa, lingual mucosa has constant availability, easy harvesting, and favorable immunological properties (resistance to infection) and tissue characteristics (a thick epithelium, high content of elastic fibers, thin lamina propria and rich vascularization).⁴ The lateral aspect of the lingual mucosa has no particular functional features. Moreover, almost half of the tongue tissue can be sacrificed as donor tissue, as in cancer of the tongue, without imposing any functional limitations on it.⁵

Materials and Methods

Through purposive sampling technique, total 40 patients having anterior urethral stricture located in bulbar and or penile urethra 3 cm to 6 cm in size were included in this prospective study. It was designed as a Quasi Experimental study and conducted in department of Urology, DMCH from July 2016 to march 2017. Each patient was evaluated with a detailed case history, physical examination, AUA symptom score assessment, imaging study with retrograde urethrogram (RGU) and Micturiting cystourethrogram (MCU), uroflowmetry, urethroscopy, and other routine investigations required for anesthetic fitness. Patients were divided into two equal groups- Group I patients

were treated by LMG (lingual mucosal graft) urethroplasty and Group II patients were treated by BMG (buccal mucosal graft) urethroplasty. LMG harvesting done from the lateral aspect of the tongue and BMG was harvested from the inner cheek area below the Stenson's duct. Usually single inner cheek or lip was used for graft harvesting. Graft was also harvested from both cheeks when needed. The dorsolateral onlay free graft urethroplasty technique was followed in this study. All the patients were followed up for six months after surgery as following schedule: at 3rd week after removal of penile catheter with pericatheter urethrography and Uroflowmetry, at 3rd Month with History and examination, Uroflowmetry, RGU and MCU, Urethroscopy and at 6th Month with History and examination, Uroflowmetry, RGU and MCU, Urethroscopy. The oral complications were self-reported by the patients at their admission or at the follow-up visits. These were examined, evaluated and were recorded. All data processed manually and analyzed with the help of window based Microsoft program IBM SPSS (Statistical package for social sciences) Version 20.0. Quantitative data expressed as mean and standard deviation and comparison was done by student "t" test. Qualitative data expressed as frequency and percentage comparisons was carried by chi-square (X²) test. Other statistical test was done whenever it is necessary. A probability value (p) of less than 0.05 was considered to indicate statistical significance.



Pic 1: Lingual Mucosal Graft harvesting



Pic 2: Urethral mobilization and graft placement and tubularization.

Results

Age distribution between groups:

Age distribution of group I was between 21-56 years and group II was between 22-54 years. The mean \pm SD age of group I and group II were 36.75 \pm 8.75 and 35.90 \pm 8.21 years respectively. There was no significant difference of mean age between the two groups (P value >0.05)

Table I: Age of the Patients

Age range (years)	Group		p value
	Group I (n=20)	Group II (n=20)	
	No. (%)	No. (%)	
20-29	06(30)	05(25)	
30-39	09(45)	09(45)	
40-49	03(15)	04(20)	
50-56	02(10)	02(10)	
Total	20 (100.0)	20 (100.0)	
Mean \pm SD	36.75\pm 8.75	35.90 \pm 8.21	0.956 ns

T test was done to measure the level of significance.

Etiology of Stricture:

The most common etiology of stricture in both groups were lichen sclerosis- 8 out of 20(40%) in group I and 9 out of 20 (45%) in group II. The next common cause of stricture was inflammatory which was same 6(30%) in both groups. There was no significant different in terms of etiology of stricture between the two groups. (P>0.05)

Length of stricture:

Lengths of stricture were determined by retrograde urethrogram (RGU) and micturition cystourethrogram (MCU). Mean stricture length was 4.56 \pm 0.45 cm (3-6cm) and 4.55 \pm 0.43cm (3-6cm) in group I and group II respectively. There was no significant difference in stricture length between these two groups (p>0.05)

Table II: Lengths of stricture

Length of stricture	Group I (n=20)	Group II (n=20)	P value
	No (%)	No (%)	
3-5 cm	12(60)	14(70)	
5-6 cm	08(40)	06(30)	0.507ns
Total	20(100)	20(100)	

Site of Stricture:

Location of stricture was defined radiologically by urethrogram. Highest number of strictures 9(45%) were located in

bulbar part in group I and 10(50%) in group II. Penile urethral strictures were 5(25%) in group I and 06(30%) in group II. 6(30%) in group I and 4 (20%) in group II patients the stricture involved both bulbar and penile part. There was no significant difference of the location of stricture between the two groups (P value>0.05)

AUA Symptom score:

In Group I patients preoperative and postoperative AUA symptom score were 19.8 (12-30) and 5.4 (3-9) respectively. In group II patients preoperative and postoperative symptom score were 19.6 (12-28) and 4.9 (5-9) respectively. The difference between these two groups was not statistically significant (p>0.05) But there was statistically significant difference in preoperative and postoperative AUA symptom score in both groups (P <0.001).

Table III: Comparison between groups I and II; mean values with range in parentheses

Characteristics	Group I n=20	Group II n=20	P value
AUA symptom score			
preoperative	19.8 \pm 5.6(12-30)	19.6 \pm 6.9(12-28)	0.920ns
postoperative	5.4 \pm 2.25(3 - 9)	5.9 \pm 2.74(4 - 9)	0.477ns
p value	<0.001	<0.001	
Preoperative Qmax	7.1 \pm 3.1(414)	7.2 \pm 3.24(412)	0.757ns
Postoperative Qmax	22.8 \pm 7.96(14-30)	23.6 \pm 8.11(14-32)	0.754ns
p value	<0.001	<0.001	

Voiding Time:

Table IV: Distribution of patients according to voiding time in both groups.

Assessment time	Group I (Lingual graft)	Group II (Buccal graft)	P value
Pre operative	137.27 \pm 7.36	134.33 \pm 4.88	0.074s
1 st follow up	25.93 \pm 6.40	27.90 \pm 7.80	0.290s
2 nd follow up	27.33 \pm 9.71	28.86 \pm 11.45	0.578s
3 rd follow up	29.33 \pm 8.16	32.73 \pm 1383	0.251s
P value within group (pre-operative and last follow up)	<0.001s	<0.001s	

Overall Outcome:

At 6th months overall outcome between the two groups were

observed. In group I success rate was 80% and group II success rate was 75%. Success rate between the two groups were not statistically significant ($P>0.05$).

Table V: Overall outcome at 6th months

Outcome	Group I (n=20) No(%)	Group II (n=20) No(%)	P value
Success	16(80)	15(75)	0.705ns
Failure	4(20)	5(25)	

Post-operative complications:

85% of group I patients and 95% of group II patients experienced pain at the donor site on postoperative day 1. There was no significant difference of pain at donor on 1st POD between the two groups ($p>0.05$).

Table VI: Immediate (1st postoperative day) donor site complications.

Complications	Group I (n=20) No(%)	Group II (n=20) No(%)	P value
pain	17(85)	19(95)	0.291ns
Slurring of speech	4(25)	0	0.035 ns
Numbness at donor site	0	2(10)	0.146ns
Eversion of lip	0	3(15)	0.041 ns
Difficulty in mouth opening	0	2(10)	0.146ns
Salivatory disturbance	1(5)	3(15)	0.291ns

On postoperative day 6, only 5% of group I patients experienced pain at donor where as 45% of group II patients experienced pain at donor site. There was statistically significant difference of donor site pain at 6th POD between the two groups ($p<0.05$). Eversion of lip, salivatory disturbances, swollen cheeks and difficulty in mouth opening were seen group II only.

Table VII: Donor site complication at 6th POD

Complications	Group I (n=20) No(%)	Group II (n=20) No(%)	P value
pain	2(05)	9(45)	0.043s
Numbness at donor site	0	2(10)	0.146ns
Eversion of lip	0	3(15)	0.041s
Difficulty in mouth opening	0	2(10)	0.146ns
Delayed feeding	1(5)	3(15)	0.291ns

Table VIII: Long term complications (after 3months) at donor site.

Complications	Group I (n=20) No(%)	Group II (n=20) No(%)	P value
Tightness of mouth	0	2(10)	
Perioral numbness	0	3(15)	
Salivatory disturbances	0	1(05)	0.007
Persistent pain at donor site	0	2(15)	
No complications	20(100)	12(60)	

In group I, 2(10%) patients developed stricture at the anastomotic site. On the other hand group II 3 (15%) patients developed stricture at graft site. In terms of graft site complications there was no significant difference between the two groups ($P>0.05$).

Table IX: Graft site complications

Nature of complication	Group I (n=20) No(%)	Group II (n=20) No(%)	P value
Stricture at anastomotic site	2(10)	3(15)	0.705ns
Chorde	1(05)	1(05)	1.00ns
Meatal stenosis	1(05)	1(05)	1.00ns
No complications	16(80)	15(75)	0.705ns

Discussion

The identification of autologous material for replacing the urothelium in urethral reconstruction is challenging. As remarked by Turner Warwick, urethra is the best substitute for

urethra which is only possible when < 2 cm of urethra is to be excised and end-to-end anastomosis is performed. The scrotal and penile skin can be used which have potential to become hirsute, diverticula formation and skin excoriation with unacceptable the long-term efficacy.² Use of bladder mucosa for urethral reconstruction has been associated with problems with harvesting, drawback of abdominal incision and complications like meatal exuberance.⁶ Other free extra genital graft tissues that have been used for urethroplasty include ureter, saphenous vein, appendix or colonic mucosa, etc., but none of them gained popularity.⁷

Use of BMG for reconstructing the urethra was first reported by Humby in 1941, but Burger et al. (1992) were responsible for generating interest in its use for hypospadias repair and subsequently for urethral strictures. Buccal mucosa offered the advantage of being hairless, accustomed to a wet environment and prevention of cosmetic disadvantages (penile-glans torsion, subcutaneous deformity and chordee) caused by the use of local genital skin. Free tongue grafts have been used with good functional results in plastic surgery to correct lip defects and palatal fistulas (Cohen & Kawamoto, 1991) and its use in substitution urethroplasty was described by Simonato et al. (2006).⁷ Lingual mucosa has constant availability, favorable immunological properties (resistant to infection), excellent tissue characteristics (a thick epithelium, high content of elastic fibers, thin lamina propria and rich vascularization) and adaptation to a wet environment similar to buccal mucosa (Duckett et al, 1995). In addition, it provides the advantage of very easy harvesting (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 present study was designed to compare the effectiveness of urethroplasty and donor site morbidities with lingual mucosal graft and buccal mucosal graft for long segment anterior urethral stricture. Forty patients were included in this study. 20 patients underwent lingual mucosal graft urethroplasty (group I) and 20 patients underwent buccal mucosal graft urethroplasty (group II).

Age distribution of group I was 21-56 years and group II was from 22-54 years. The mean \pm SD age of group I and group II were 36.56 ± 6.27 and 35.13 ± 6.05 years respectively. Result of different international study like Simonato et al. (2006), Barbagli et al. (2007) and McAninch (1998) showed mean age of 46, 41 and 43 respectively.^{12,17,18}

The lengths of stricture were determined by retrograde urethrogram (RGU) and micturating cystourethrogram (MCU). Mean stricture length of group I was 4.56cm and group II was 4.55cm. In different international series of substitution urethroplasty for stricture of anterior urethra, the patients were selected with a stricture length of >2cm at penile part.^{1,6} Mean stricture lengths in different studies were 4.1cm for buccal mucosa and 4.5cm and 4.2cm for lingual mucosa.^{7,8}

In the present study patients who underwent lingual mucosal graft urethroplasty preoperative mean AUA symptom score was 19.8 (12-28) and postoperatively it was 5.4 (3-9). The AUA

symptom score decreased from a mean of 19.8 to 5.4. Patients who underwent BMG urethroplasty preoperative mean AUA symptom score was 19.6 (12-28) and postoperatively it was 5.9 (4-9). The AUA symptom score decreased from a mean 19.6 to 5.9. Kumar et al. (2010) showed the AUA symptom score decreased from a mean of 22.4 to 4.8 and 24.5 to 3.4 respectively in patients with LMG urethroplasty and BMG urethroplasty.⁸

Mean pre-operative voiding time was 137.27 ± 7.36 sec patients with LMG urethroplasty. At 3rd followed up, 3 months after operation the mean voiding time decreased to 29.33 ± 8.16 sec. On the hand patients with BMG urethroplasty the mean preoperative voiding time was 134.33 ± 4.88 . Postoperatively on 3rd followed up it was 32.73 ± 13.83 sec. There was significant decreased of voiding time in both groups of patients.

Uroflowmetry showed Qmax varied from 4 to 14ml/sec in this series preoperatively. Postoperatively after removal of urethral catheter in group I and group II mean Qmax were 22.8 (14-30) ml/sec, 23.6 (14-32) ml/sec respectively. Peak urinary flow rates improved from a mean of 7.1 to 22.8 ml/s and from 7.2 to 23.6 ml/s in groups I and II respectively. In LMG urethroplasty-Simonato et al. (2006) showed at peak flow rate improved from 6 (4 to 8.9) to 34.3 (19.1 to 64.1) ml/sec by uroflowmetry.³ Das et al. (2009) showed in LMG urethroplasty peak flow rate 35.5ml/sec and 25.06 ml/sec 3 and 6 month follow up, respectively and success rate was 83.3%.⁹

In this study the overall success rate of lingual mucosal graft urethroplasty was 80% which was similar to other studies.^{3,4,9} Simonato et al. (2006)³, Das et al. (2009)⁹ and Barbagli et al. (2008)⁴, also reported success rate were 87.5%, 83.3%, 90%, respectively.

Most common donor site complications of lingual mucosal graft and buccal mucosal graft were oral pain, numbness, tightness, slurring of speech, salivatory disturbance and delayed feeding. Present study showed most patients complained of pain on oral cavity. 85% of lingual mucosal graft patients experienced pain at the donor site on postoperative day 1. On postoperative day 6 only 5% lingual mucosal graft patients experienced pain at donor site. Kumar et al¹² showed no patient reported pain at donor site on 6th postoperative day. Simonato et al⁷ showed just slight oral discomfort within the third postoperatively. No patient of group I was experienced donor site numbness, eversion of lip and difficulty in mouth opening on 1st POD, 6th POD and 3months after operation. Kumar et al and Xu et al showed 6.6% patients reported perioral numbness persisted in the first follow up after one month and subsided by the second followup.^{12,14} Xu et al reported oral pain after LMG in 95% of patients at day 1 but in no patients after 7 days.¹⁴ Kumar et al and Das et al showed no perioral numbness.^{12,13} In lingual mucosal graft urethroplasty no patient complained of tightness in oral cavity on 1st, 2nd and third followed up. Das et al and Xu et al showed no tightness in oral cavity.^{13,14} In lingual mucosal graft urethroplasty 25% patients complained of slurring of speech at 1st POD. But no complained of slurring of speech on subsequent followed up. Kumar et al, Das et al and Xu et al showed no complained of slurring of speech.¹²⁻¹⁴

In buccal mucosal graft urethroplasty 95% patients experienced pain at donor site on 1st POD. On the 6th postoperative day

45% patients experienced pain at donor site. Wood et al, Barbagli et al and Dublin et al showed pain at graft site in 83%, 63%, and 64% patients in immediate postoperative follow up respectively.^{15,16} In the present study buccal mucosal graft urethroplasty patients were experienced numbness at donor site, eversion of lip, difficulty in mouth opening and salivatory disturbance 10%, 15%, 10%, 15% respectively. These morbidities were persisted even after 3 months of operation. Wood et al and Dublin et al showed numbness in 68% and 59% patients respectively in immediate postoperative followed up period.^{15,16} In the report by Wood et al, a retrospective study of 110 men of whom 49 responded, the main long-term complications were persistent peri-oral numbness in 26% of cases, salivatory changes in 11% and difficulty opening the mouth in 9%.¹⁵ Dublin et al. recently reported that oral numbness (16%) and tightness (32%) due to BMG harvesting still persisted even after 13.2 months of follow-up.¹⁶ Kamp et al. compared difference in morbidity between harvesting the mucosa graft from the inner cheek or the lower lip. They found that graft harvesting from the lower lip was resulted in a significantly greater long-term morbidity, which resulted in a lower proportion of satisfied patients.¹⁷

In this study it was observed that the mucosa of tongue, which is identical to the mucosa of the rest of the oral cavity, is a safe and effective graft material in the armamentarium for urethral reconstruction with potential minor risks of donor site complications.

Conclusion

Although buccal mucosa is a good material for urethroplasty, the harvesting procedure is not without morbidity. Lingual mucosal graft harvesting is easy to carry out and is associated with less long-term complications at the donor site. Also, it is a good substitute for BMG in patients whose buccal mucosa is diseased or had already been used. Therefore, lingual mucosal graft urethroplasty may be preferred to buccal mucosa in anterior urethral stricture.

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