

Boomerang Technique, The Buccal Mucosal Grafting Harvesting Model for Long Urethral Stricture Urethroplasty: A Case Series

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Purpose: Currently, three methods are implicated in cases of long urethral stricture including harvesting buccal mucosa of inner cheeks, harvesting lip mucosa and finally lingual mucosal graft. This study evaluated the feasibility, safety and morbidity of our “Boomerang shape” technique used for graft retrieval from the inner cheeks to repair long urethral defect cases which are usually 12-15 cm in length and 2.5 cm in width.

Materials and Methods: The Kilner-Doughty mouth retractor is inserted to give access to the donor site. Initially, the internal surface of the right/left cheek is cleaned with a solution containing 10% povidone-iodine. Then, Stensen’s duct, located at the level of the second molar is identified and the desired size of the graft is measured and marked in a boomerang shape, 1.5 cm from the Stensen’s duct and 1.5 cm from the edge of the cheek. To decrease submucosal bleeding from the harvest site, 1% lidocaine combined with a 1:100,000 epinephrine solution is injected using a 25-gauge long needle. The outlines of the graft are drawn by using a scalpel through the mucosa. Then, the outlined graft is sharply dissected and removed, leaving the muscle intact. A 5-0 polyglactin continuous suture is used for the closure of the harvest site. The standard graft harvested from the cheek should be 12-15 cm in length and 2.5 cm in width.

Results: Between 2017-2019, five adults have had their mucosal grafts harvested by the “Boomerang shape” technique in our center. No donor site complications were observed. Moreover, no urethral strictures or diverticulum occurred and the functional outcomes were satisfactory in all patients.

Conclusion: Our routine technique of harvesting the buccal mucosa from the cheek is secure and easily performable by any surgeon. It has minimal incidence of intra and post-operative complications.

Keywords: urethral stricture; urethral reconstruction; buccal mucosa graft; Boomerang technique; lingual mucosal graft

INTRODUCTION

Urethral stricture disease is a complicated condition representing a challenging management⁽¹⁻⁴⁾. During the past two decades, buccal mucosal grafting (BMG) has gained worldwide attention for urethroplasty⁽⁵⁻⁷⁾. For the first time in 1894, Sapezhko performed urethroplasty for four patients by using mucosal grafts from the lip and mouth⁽⁸⁾. However, the first study describing mucosal grafts in adult patients with urethral strictures was published in 1993 by El-Kasaby et al⁽⁹⁾. In the aforementioned articles, the oral mucosa was harvested from the mucosal membrane of the lower lip⁽¹⁰⁾.

In 1996, Morey and his colleague developed a novel approach in applying BMG for urethral reconstruction by harvesting graft from the cheek. They recommended the use of a Steinhauser mucosal retractor to improve access to the donor site and mark the desired area for graft retrieval which usually measured to 2.5 cm wide and 5-7 cm long⁽¹¹⁾. This technique was later completed and updated in 2014 by Barbagli et al⁽¹²⁾.

Currently, three approaches are implicated in cases with long urethral strictures: harvesting the buccal mucosa from both inner cheeks, from lip mucosa, and lingual mucosal graft (LMG)⁽¹³⁾. However, there are limitations

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Figure 1. A. Schematic Boomerang shape graft. B. Boomerang shape graft. C. Harvesting site closure.

associated with harvesting grafts from lip and lingual mucosa including tightness of the mouth, motor deficits, limited size of the graft, lip vermilion eversion^(14,15), scarring and lip retraction⁽¹⁶⁾, numbness in the operative area of tongue, paraesthesia, slurred speech, and difficulty in tongue protrusion^(17,18). On the other side, the thick, elastin-rich, non-keratinized epithelium and highly vascularized lamina propria of the buccal mucosa and the hands of a urologist familiar with BMG harvesting procedures offers a superb setting for reconstructive surgery⁽¹⁹⁾.

The advantage of long BMG harvesting for treating long urethral strictures includes fewer complications of bilateral donor site, reciprocal preservation for probable future surgeries, and also reduced urethral complications such as fistula and stenosis due to graft gap removal between the two separate mucosae. The present study aimed to evaluate the feasibility, safety and morbidity of our “Boomerang shape” technique for graft retrieval from the inner cheeks in patients with long urethral defects.

MATERIALS AND METHODS

Three days prior to surgery, the patient undergoes oral cleansing with chlorhexidine mouth wash and then normal saline serum irrigation is performed until three days after surgery. A day before surgery, antibiotics are administered to patients and are continued for three days after surgery. The patient is intubated through the nose, allowing the mouth to be completely free. Before the start of graft harvest, an oropharyngeal pack is placed in order to prevent aspiration of blood from bleeding mucosal edges.

Surgical technique

After stabilizing the donor site with the Kilner-Dougherty mouth retractor, the internal surface of the left/right cheek is prepared and cleaned with a solution containing 10% povidone-iodine. Then the bobcock forceps are placed along the outer edge of the cheek to stretch the buccal mucosa. After recognizing the Stensen’s duct which is placed at the level of the second molar, the desired graft size is measured and marked in a boomerang shape; 1.5 cm from the Stensen’s duct and 1.5 cm from the edge of the cheek (**Figure 1. A, B & C**). To decrease bleeding from the submucosa, 1% lidocaine combined with 1:100000 diluted epinephrine solution is injected using a 25-gauge long needle. After allowing 10 minutes for homeostasis, the outline of the graft is marked with a scalpel through the mucosa. Subsequently, the outlined graft is sharply dissected and removed, leaving the muscle and fat intact.

After carefully inspecting the donor site for bleeding, a 5-0 polyglactin continuous suture is used for closure (**Figure 1. C**). Then the oropharyngeal pack is removed at the end of the surgery and an ice bag is placed on the cheek for 24 hours to decrease pain and hematoma formation. Patients are treated with cold clear liquid diet on the first day post-surgery before advancing to a regular diet on the next day.

The graft is stabilized on a silicone board using insulin needles. After watchful defatting, the graft is tailored according to the site, length, and characteristics of the stricture. The standard graft harvested from the cheek (in minimal stretch) is 12-15 cm in length and 2.5 cm wide (**Figure 2. A, B & C**).

Ethical Considerations

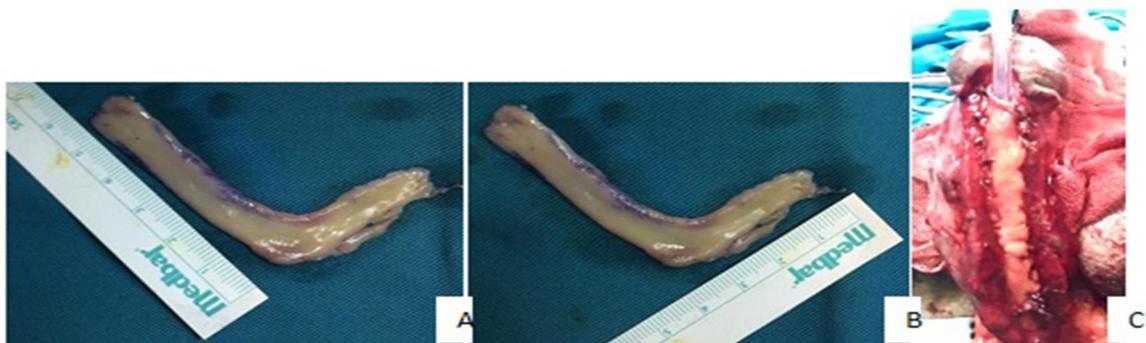


Figure 2. A and B. Defatted Buccal Mucosa Graft (BMG). C. Buccal mucosa grafted as ventral onlay.

Table 1. Patients' characteristics.

	Age	Stricture cause	Stricture length(Cm)	Previous intervention	Donor site complications***	Urethroplasty outcome***
Case 1	34	BXO*	11	Dilatation	None****	Satisfactory*****
Case 2	28	STD**	9	Internal uretrotomy, Dilatation	None	Satisfactory
Case 3	41	STD	10	Dilatation	None	Satisfactory
Case 4	58	Instrumentation	9	Dilatation	None	Satisfactory
Case 5	21	Failed hypospadias repair	10	Failed skin flap repair	None	Satisfactory

*Balanitis xerotica obliterans; **Sexually transmitted disease; ***Mean 11 month follow up; **** Numbness, tightness of the mouth, salivator ychanges, motor deficits, scarring and lip deviation; ***** Patent without stricture and diverticulae

This study was reviewed and approved by the Research Ethics Committee of Shahid Beheshti University of Medical Sciences. Full written informed consent were obtained from every patient before inclusion into the study.

RESULTS

During a period of two years (from June 2017 to June 2019), boomerang shape BMG urethroplasty was performed for five adults with complex long urethral defects. **Table 1** shows the baseline characteristics of patients. To date, no donor site complications including postoperative hemorrhage, hematoma, infection, undue discomfort, and lip or cheek malformation have been reported. Moreover, in all patients, the open posterior regions of the donor site entirely healed within 2 weeks after surgery (**Figure. 3**). Also, no urethral strictures or diverticulum were noted and the functional outcomes were satisfactory in all patients.

DISCUSSION

The utilization of buccal mucosa grafts for urethral reconstruction is becoming more and more popular in the clinical setting^(6,11,20-22). However, despite its many theoretical advantages, the lining of the oral cavity is limited. Thus, careful selection of the intra-oral donor site and applying a well-conceived harvesting technique is gaining more importance in order to acquire grafts with



Figure 3. The donor sites entirely healed within 2 weeks after surgery.

adequate dimension, decrease the number of circumferential suture lines, and reduce oral complications^(15,23).

The two most frequent sites of oral mucosa (OM) harvest for urethral repair are the mucosa from the inner cheek and the mandibular labial alveolar region⁽²⁴⁾. The prevalence of postoperative oral complications following OM harvest is still a controversial and challenging issue since most of the studies in literature do not report complications associated with each harvesting method individually and also do not provide details about the graft shape and size. Nevertheless, in a few studies, OM harvest was related to oral complications such as numbness, tension of the mouth, and motor deficits⁽²⁵⁻²⁷⁾. An overview of published data revealed no significant difference between the two donor sites, cheek or lip, in terms of complications and a morbidity rate of 3% to 4% for both sites. Harvest from the cheek is more commonly related to scarring and contracture due to the buccinator muscle underlying this site⁽²⁵⁾. However, labial harvest can affect mental nerve function leading to perioral numbness and other complications⁽²⁷⁾.

In case of oversized urethral defects exceeding six cm, due to the limited size of buccal mucosa graft, other methods should be applied. In this regard, tissue-engineered buccal mucosa might seem a promising alternative^(28,29). Nonetheless, clinical data on the first human series showed that this approach was not without complications, specially fibrosis, infection and contraction⁽³⁰⁾. Also, inconclusive results were observed in a number of studies⁽³¹⁾.

Lingual mucosa (LMG) is another type of graft used for urethral reconstruction⁽³²⁾. LMG is readily available, easy to harvest, and can adapt well to a wet environment. These features make it suitable for substitution urethroplasty⁽³³⁾. The downside is that the graft harvested from the tongue is thinner, more fragile, and more delicate to handle compared to a graft from the cheek⁽³⁴⁾. Also, since the series of patients treated by LMG is limited with a short follow-up time, it is not possible to draw any conclusions regarding the long-term outcomes of urethroplasty using LMG⁽³²⁾.

Limited studies with inconclusive outcomes reported as case series suggested combined tissue transfer techniques such as fasciocutaneous flap combined with buccal mucosa, bladder epithelium or skin grafts to repair long and multi segmented urethral strictures⁽³⁵⁻³⁷⁾.

In our technique, the buccal mucosa harvest is not initially tubular, however, it transforms into a tube-shape appearance through an indwelling catheter left in place

for an adequate period of time. Moreover, the graft is evenly expanded so that when tubularizing the spongy tissue, the lumen's caliber is not reduced by folding the graft on itself.

In our initial experience, patients who underwent BMG had no oral-related complications, although the duration of follow-up was short. The benefits of this method after ensuring Stensen's duct is not damaged includes intact oral mucosa on the contralateral side for possible future surgeries, availability of the appropriate length of graft for the treatment of long stenosis, and fewer side effects in the donor site and the urethra. The ideal surgical technique should be simple, safe, reliable, easily repeatable by any surgeon, and should be readily performed with currently available surgical instruments. We believe that the technique introduced in this article meets all of these criteria.

CONCLUSIONS

To retrieve grafts with satisfactory dimensions, decrease number of circumferential suture lines (required for a neourethra) and reduce oral complications, careful selection of the intra-oral donor site and a well-conceived harvesting technique is essential. Our routine technique of harvesting the buccal mucosa from the cheek in a boomerang-shape is secure and easily repeatable by any surgeon. It is also associated with insignificant rates of intra- and post-operative complications and good patient satisfaction. However, larger cohort studies with more prolonged follow-up periods are required to confirm these findings.

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