African Journal of Urology (2016) **22**, 18–23

African Journal of Urology

Official journal of the Pan African Urological Surgeon's Association
web page of the journal

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Review

How to harvest buccal mucosa from the cheek

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Received 28 September 2015; accepted 28 September 2015
Available online 2 December 2015

KEYWORDS
Buccal mucosa;
Cheek;
Surgical technique;
Urethroplasty;
Complications

Abstract
The paper provides the reader with the step by step of our current technique of harvesting buccal mucosa from the cheek. We describe how to prepare the patients, the use of the Kilner-Doughty mouth retractor, the Stensen duct identification, the size and the shape of the graft. We discuss how to repair the donor site and how to manage the graft for urethral implantation. Finally the paper presents the preoperative patient evaluation, postoperative course and complications.

Introduction

The use of buccal mucosa as a substitute material in surgery dates back to 1873, when Stellwag von Carion, an ophthalmologist from Vienna, Austria, used mucosa from the lip to treat conjunctival defects, with further ophthalmologic applications following in 1880 [1]. In 1894, Sapezhko, a surgeon from Kiev, Ukraine, was the first to fully describe the use of buccal mucosa from the lip and mouth, in 4 patients requiring urethral surgery for different urethral stricture diseases [2,3]. In 1902, Tyrmos, a surgeon from Odessa, Ukraine, also reported the use of buccal mucosa in 2 patients requiring urethroplasty [2,3]. Among western countries, the first use of buccal mucosa from the lip was reported many years later in 1941 by Humby from London, to repair a urethral fistula after a failed hypospadias repair in an 8-year-old child [4]. Starting in 1992, the use of buccal mucosa from the lip to repair primary and failed hypospadias in paediatric cases emerged in the literature [5,6]. In 1993, El-Kasaby et al. from Cairo, Egypt, first described the use of buccal mucosa from the lip to repair penile and bulbar strictures in adult patients [7].

Early on, from 1894 to 1995, the lip was reported as the preferred site for harvesting buccal mucosa [1–7]. In 1996, Morey and McAninch suggested a new technique for harvesting buccal mucosa from the cheek in order to minimize the risk of scarring and lip deviation or retraction [8]. These authors introduced a relevant innovation in the cheek harvesting technique: the use of a special mucosa stretcher and a 2-team approach in which 1 team harvests the graft from the mouth, while the urethral team simultaneously exposes the stricture [8]. The use of 2 teams decreases operative time and prevents wound cross contamination [8]. We began using the technique described

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Peer review under responsibility of Pan African Urological Surgeons' Association.

http://dx.doi.org/10.1016/j.afju.2015.09.001

by Morey and McAninch in 1996 and we recently reported on early and late complications as well as patient satisfaction in a series of 553 patients treated with this technique [9]. Buccal mucosa is now recognized as the gold standard material for urethral reconstruction, particularly due to its special biological properties [10–12].

We describe here, step by step, our current technique of harvesting buccal mucosa from the cheek, including the preoperative patient evaluation, postoperative course and complications. The aim of this study is to make this safe technique easily reproducible in the hands of any surgeon.

Subjects and methods

Pre-operative evaluation and preparation of patient

Before planning to harvest the buccal mucosa from the cheek the patient should be fully evaluated to check the extension of the mouth opening, the size of available tissue on both cheeks and the presence of scars due to chronic cheek biting or previous surgeries. The following groups of patients are not ideal candidates for oral mucosa cheek harvesting:

- Patients who chew areca nut products (betel quid, pan masala, gutka, mainpuri, mawa, kaini) may develop oral submucosa fibrosis a disease characterized by a severe progressive fibrosis of the oral cavity resulting in dysphagia and a reduced ability to open the mouth [13].
- Patients who chew tobacco (Fig. 1).
- Patients who currently have an infectious disease affecting the mouth (candida, lichen, varicella-virus, herpes-virus and other).
- Patients who have had previous surgery in the mandibular arch prohibiting a wide opening of the mouth.
- Patients who play wind instruments.
- Patients working as speakers.

In patients who have undergone previous graft harvests from the cheek, harvesting a new graft is possible although a little more difficult due to the fibrosis and the fact that the graft will need to be smaller than the previous one. The patient and the anaesthetist should be notified prior to surgery when bilateral buccal mucosa graft harvesting is planned. Three days prior to surgery, the patient should begin using chlorhexidine mouthwash for oral cleansing twice a day. The day before surgery the patient receives intravenous prophylactic antibiotics.

Figure 1 Oral mucosa in a patient who chews tobacco.

Instruments for buccal mucosa graft harvesting

In the operating room, the patient is draped in 2 separated parts, and 2 surgical teams work simultaneously. Each team has its own set of surgical instruments, including suction and cautery.

The following instruments are suggested for easier graft harvesting from the cheek:

- A Kilner-Doughty mouth retractor (Fig. 2). This retractor, available in any oral surgery department provides a wide and safe mouth opening due its large tongue depressor. In toothless patients the hooks of the retractor may damage the gums and should therefore be protected by a small piece of gauze. Using this retractor only one assistant is necessary to harvest the graft.
- A 10-ml syringe with 10 ml solution with bupivacaine HCL 2.5 mg/ml and epinephrine acid tartrate 0.0091 mg (0.005 mg epinephrine).
- Bipolar electrocautery.
- 5-zero polyglactin sutures (or similar).

Preparation of patient for surgery

The patient is placed is a standard supine position for penile urethroplasty and in a simple lithotomy position for bulbar urethroplasty, with the calves placed in Allen stirrups with sequential inflatable compression sleeves and the lower extremities suspended by placement of the patient's feet within the stirrup boots. The patient is draped in two separated parts so that two surgical teams can work simultaneously. Each team has its own set of surgical instruments. One team harvests and prepares the oral graft, while the second team exposes the urethra.

The patient is intubated through the nose, allowing the mouth to be completely free. Nasal intubation is not mandatory but presents the following advantages:

- The nasal tube is smaller and softer than the oro-tracheal tube and thus more comfortable for the patient.
- Nasal intubation is more useful in patients with a small mouth or a limited mouth opening.
- Nasal intubation is more useful at the beginning of our learning curve.
- Nasal intubation is more useful in patients requiring double graft harvestings.

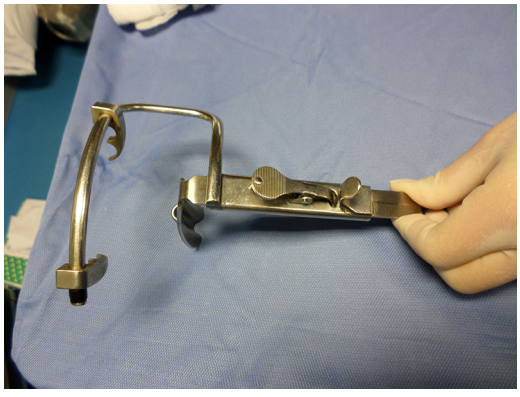

Figure 2 The Kilner-Doughty mouth retractor, with two hooks for the teeth and a tongue depressor.

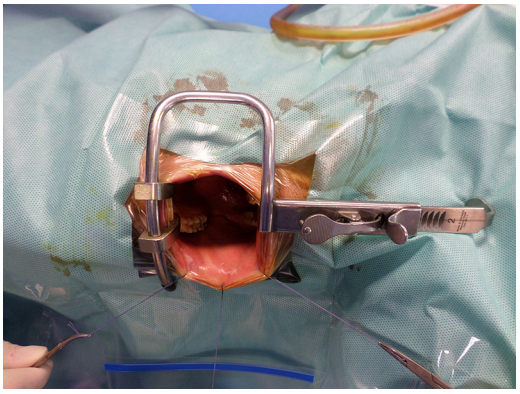

Figure 3 The Kilner-Doughty mouth retractor in place with three stay sutures to stretch the oral mucosa.

Surgical technique

The external and inner mucosal surfaces of the right cheek are prepared, disinfected and draped.

The Kilner-Doughty mouth retractor is put in place and three stay sutures are placed along the edge of the mouth to stretch the oral mucosa (Fig. 3). The Stensen duct is identified in proximity of the second molar (Fig. 4). If the Stensen duct cannot be clearly identified, applying some drops of lemon juice to the tongue can stimulate secretion from the parotid gland. For 1-stage urethroplasty the graft is designed in an ovoid shape, 1.5 cm from the Stensen duct and 1.5 cm from the external edge of the cheek (Fig. 5A and B). Although the size of the graft varies according to the cheek size and stricture length, for standard 1-stage penile or bulbar urethroplasty it should be 4 cm long and 2.5 cm wide (Fig. 5A and B). A 10 ml solution with bupivacaine HCL 2.5 mg/ml and epinephrine acid tartrate 0.0091 mg (0.005 mg epinephrine) are injected along the edges of the graft to facilitate haemostasis and dissection (Fig. 6). The graft is dissected in the plane between the mucosa and the muscle (Fig. 7). The donor site is accurately examined and bleeding is controlled with bipolar electrocautery. The Stensen duct should be clearly visible. Two traction stitches are passed at the distal and proximal apex of the donor site, and when traction is applied to these stitches the 2 lateral margins of the donor site tend to approximate towards the midline, which makes primary closure easier and tension-free with running 5-zero polyglactin sutures (Fig. 8A and B). If necessary, another graft can be harvested from the contralateral cheek using the same

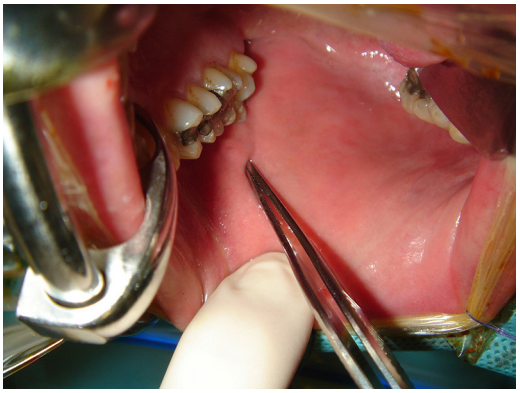

Figure 4 The Stensen's duct in proximity of the second molar.

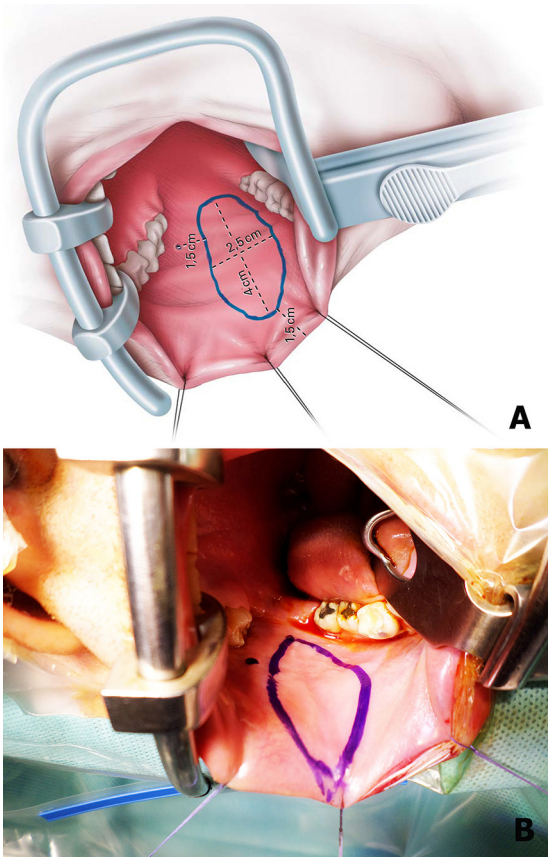

Figure 5 (A and B) The graft is designed in an ovoid shape, 1.5 cm from the Stensen duct and 1.5 cm from the external edge of the cheek.

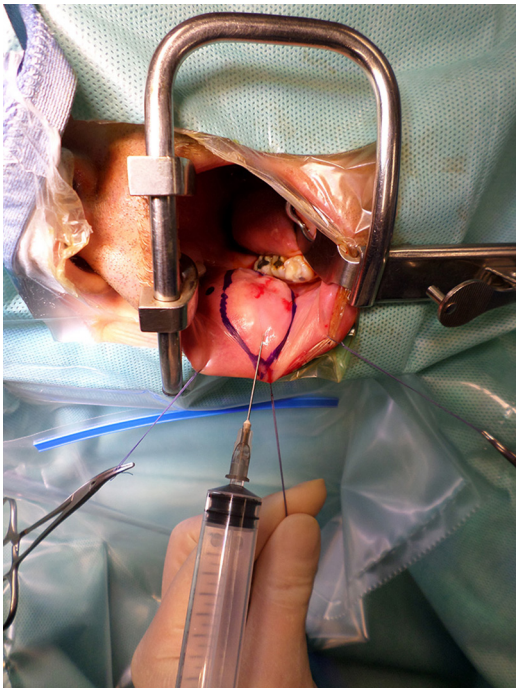

Figure 6 Ten millilitre solution with bupivacaine HCL 2.5 mg/ml and epinephrine acid tartrate 0.0091 mg (0.005 mg epinephrine) are injected to facilitate haemostasis and dissection.

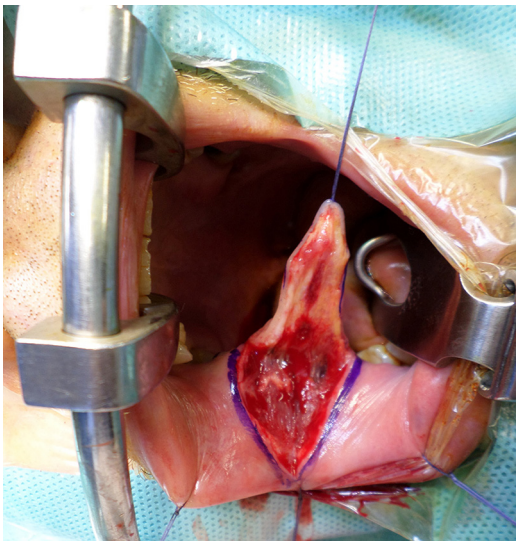

Figure 7 The graft is dissected in the plane between the mucosa and the muscle.

technique. The graft is stabilized on a silicone board to remove the submucosal tissue and tailored according to the stricture characteristics. A 4 cm long graft will stretch up to 6 cm due to the elasticity of the oral mucosa. Two 6 cm grafts (one from each cheek) are enough to repair the vast majority of penile or bulbar strictures. In patients requiring big rectangular graft (4 cm × 4 cm) (Fig. 9A) for staged urethroplasty the harvesting site is left opened (Fig. 9B).

Post-operative care

An ice bag is applied to the cheek for 24 h to reduce pain and the risk of haematoma formation. The patient consumes a cold clear liquid diet on the first postoperative day before advancing to a regular diet the next day, ambulates on postoperative day 1 and is discharged from the hospital 3 days after surgery. The patient continues using a chlorhexidine mouthwash for oral cleansing twice a day for 3 days after surgery and is maintained on oral antibiotics until the catheter is removed.

Early complications

In a series of 553 patients the incidence of early (first 10 postoperative days) complications was reported as follows: bleeding (3.4%); severe or moderate pain (1%); severe or moderate oral swelling (1.1%); 57% of patients resume a normal diet 3 days after surgery [9].

Late complications

In a series of 553 patients the incidence of late (4 months after surgery) complications was reported as follows: severe or moderate numbness due to the oral stitches (1.1%); severe or moderate numbness due to the oral scar (0.2%); oral infection (1.8%); severe or moderate difficulty opening the mouth (0%); problems smiling (0%) [9]. In response to the question, "Would you undergo oral mucosa graft harvesting using this technique again?" 543 patients (98.2%) replied yes and 10 (1.8%) replied no [9]. Of these 10 patients 5 had a successful urethroplasty and 5 experienced treatment failure [9]. Moreover, 3 patients who experienced stricture recurrence underwent oral mucosa harvesting a second time using the same technique (after 14 months, 36 months and 62 months respectively), and they accepted the procedure without problem [9].

Discussion

The technique of harvesting buccal mucosa from the cheek, using the instruments and steps here presented, is feasible and safe with negligible early and late complications and easily reproducible in the hand of any surgeon [9,14].

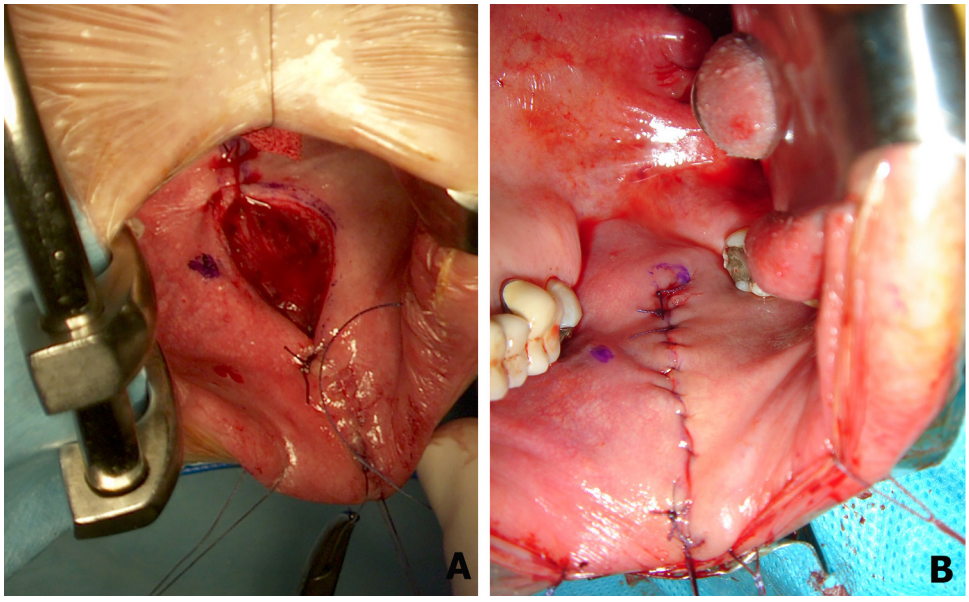

Figure 8 (A and B) Two traction stitches are passed at the distal and proximal apex of the donor site, and when traction is applied to these stitches the 2 lateral margins of the donor site tend to approximate towards the midline, which makes primary closure easier and tension-free with running 5-zero polyglactin sutures.

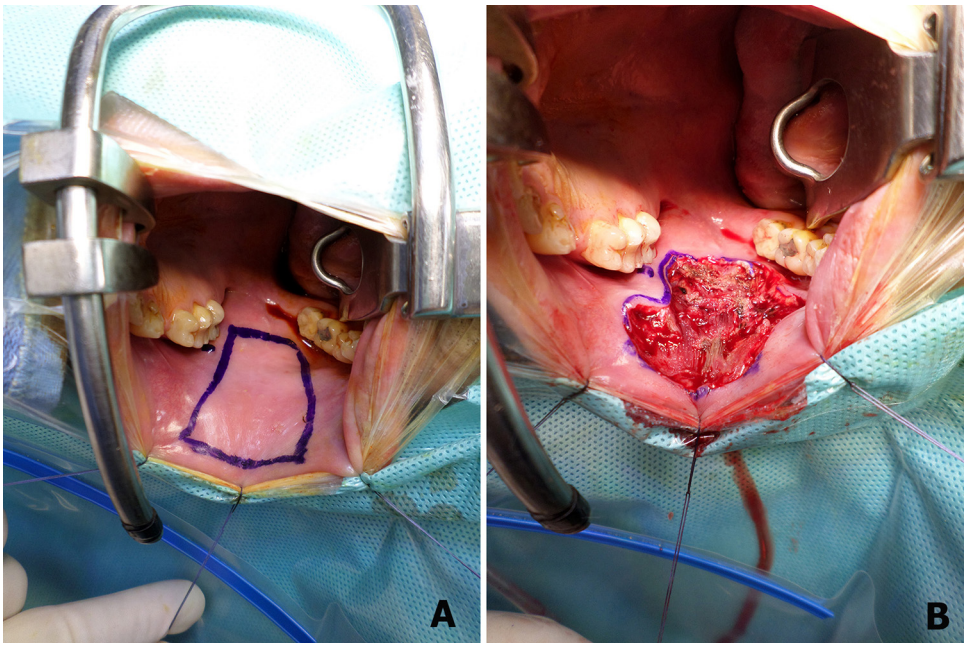

Figure 9 (A and B) In patients requiring big rectangular graft (4 cm × 4 cm), the harvesting site is left opened.

Few studies have suggested that the incidence of postoperative complications in patients who undergo oral graft harvesting is mainly influenced by the closure vs. non-closure of the donor site [15–17]. Although some of these studies were randomized, the majority of these reports grouped together different harvesting sites and techniques, without reporting the size and shape (rectangular vs. ovoidal) of the graft and included small samples (±20 cases in each group) with poor statistical significance [15–22]. Furthermore, some authors even included patients who underwent harvesting of a graft longer than 6 cm or a long graft from the lower lip extended to the cheek [15–22].

It is impossible to compare the postoperative oral complications in patients who underwent harvesting of a 4 cm ovoidal graft to those who underwent harvesting of a 9–12 cm graft from the lower lip extended to the cheek [15–22]. The closure of the donor site is of a completely different appearance after harvesting a long and wide rectangular graft (4 cm × 4 cm) compared to an ovoid shaped graft (4 cm × 2.5 cm), and this great difference in the anatomical shape of the donor site should influence the closure vs. non-closure [9,14]. The surgical closure of an ovoidal shaped donor site is easy, anatomical and a free-tension closure, contrary the surgical closure of a rectangular shaped donor site which is difficult and under tension. It is evident that the same procedure (closure of the harvesting site) may have a great difference on postoperative pain, discomfort and sequelae. For these reason we believe that discussing about closure vs. non-closure is a big mistake: we suggest the closure of an ovoidal shaped donor site and the non-closure of a rectangular shaped donor site.

We have already emphasized the lack of an adequate number of randomized controlled trials for the evaluation of the results of reconstructive urethral surgery [23,24]. Although the randomized controlled trial represents the standard of experimental and clinical research, the lack of an adequate number of patients enrolled in the study, as well as the absence of accurate sample size calculations and stringent statistical analysis may underpowered the external validity of these studies [23,24]. We believe that our retrospective descriptive analysis of prospective data collected from a cohort of 553 patients who underwent buccal mucosa graft harvesting at our centre, between September 1998 and September 2012, is both valuable and informative [9]. The main strength of our study was the multivariable statistical analysis showing that the number of buccal mucosa grafts was the only significant predictor of patient dissatisfaction. This factor may be extremely important in planning mouth graft harvesting and in consulting patients. Moreover, our study appears to be the first in which graft harvesting complications were prospectively evaluated in a homogeneous group of patients.

We are now working on updating our results using this surgical technique in 1000 patients.

Conclusions

Our current technique of harvesting the buccal mucosa from the cheek is safe and easily reproducible in the hands of any surgeon with negligible incidence of intra- and post-operative complications or sequelae and high patient satisfaction.

Conflict of interest

None of the contributing authors has any conflict of interest, including specific financial interests or relationships and affiliations relevant to the subject matter or materials discussed in the manuscript.

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