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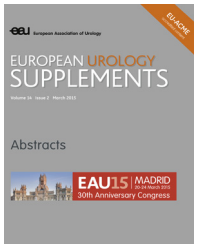

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Reconstructive Management with Buccal Urethroplasty

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Abstract

We present the historical evolution of the use of buccal mucosa in reconstructive surgery, from the first application in ophthalmology to paediatric surgery and, finally, urethral surgery. This process spanned 99 yr, from 1894 to 1993. The harvesting of buccal mucosa from the cheek requires careful preoperative patient evaluation and selection. To avoid postoperative complications related to the harvesting site, we provide some suggestions based on a large series of patients. The use of a one- or two-stage repair procedure in penile urethroplasty is discussed, and some step-by-step surgical techniques are suggested. The reconstruction of the bulbar urethra using buccal mucosa in traumatic and nontraumatic strictures is also discussed, and different techniques are presented. Finally, appraisal and discussion of some challenging topics (eg, evidence for efficacy, complications, implications, worldwide use) concerning the use of buccal mucosa for urethral stricture reconstruction are presented based on the current literature.

Patient summary: We looked at the history and evolution of the use of buccal mucosa for reconstructive urethral surgery and found that harvesting the buccal mucosa from the cheek is a safe procedure. The use of buccal urethroplasty represents the gold standard in the management of patients with anterior urethral strictures.

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1. Introduction

Reconstructive urethral surgery has greatly improved in safety, variety, and effectiveness over the past three decades [1]. Although endoscopic treatment can transiently improve urinary flow, open urethroplasty is now regarded as the gold standard treatment for urethral strictures [2]. The use of buccal mucosa in one- or two-stage repair procedures has greatly improved the surgical techniques and results in the reconstructive management of urethral strictures.

The use of mucosa from the mouth was primarily suggested in plastic and reconstructive surgery to repair some conjunctival defects [3–5]. In the urologic community, the use of buccal mucosa was first greatly popularised by paediatric urologists for the repair of primary or failed hypospadias in children [6–8]. Later, buccal mucosa was also recommended for the repair of penile and bulbar urethral strictures [9–11].

We present the history and evolution of the use of buccal mucosa in reconstructive surgery, the technique for

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harvesting the mucosa from the mouth, and some surgical techniques for its use in the reconstructive management of anterior urethral strictures, with appraisal and discussion of all aspects of the topic.

2. History of buccal mucosa for urethral stricture management

The first report on the application of buccal mucosa as a substitute material for conjunctiva dates back to 1873 when Karl Stellwag von Carion, an ophthalmologist at Vienna General Hospital, used mucosa from the lip to treat conjunctival defects, with further ophthalmologic applications following in 1880 [3]. The use of buccal mucosa for the repair of urethral defects was first reported by the Russian surgeon Kirill Mikhailovic Sapezhko from Kiev in 1894 [4,5]. Sapezhko performed experimental studies with animals to evaluate the properties of the mucosa that resulted in a full description of the five sequential biological phases of the transplanted mucosa as a graft, starting with the imbibition and inosculation phases, and his observation that the mucosa completed the biological processes for taking root 10 d after the transplant [4,5]. As a result of these experimental studies, Sapezhko used buccal mucosa in four patients requiring urethral surgery for different urethral stricture diseases [4]. In 1902 a Russian surgeon from Odessa, I.A. Tyrmos, also reported two cases of urethroplasty using buccal mucosa transplants with successful outcomes [4,5].

Among Western countries, the first use of buccal mucosa in urethral surgery was reported 47 yr later in 1941 by the British surgeon Graham Humby of London [6]. Humby reported the use of oral mucosa from the lip to repair penoscrotal fistula after a failed hypospadias repair in an 8-yr-old child [6]. In March 1992, Bürger et al from Germany reported the use of buccal mucosa in paediatric and adult patients with failed hypospadias surgery, epispadias, and a short urethra [7]. A month after the Bürger et al article, Dessanti et al from Italy reported the use of buccal grafts in paediatric primary one-stage hypospadias repair [8]. Following these two articles that appeared in rapid succession, many reports on the surgical use of buccal mucosa for paediatric cases emerged in the literature [3].

The first published article on the use of buccal mucosa for the repair of anterior urethral strictures in adults was written by El-Kasaby et al from Egypt in February 1993. These authors fully described penile (12 cases) and bulbar (8 cases) one-stage urethroplasty using buccal mucosal grafts with satisfactory outcomes [9].

The new era of urethral reconstruction with buccal mucosa began in 1996 when Morey and McAninch described the ventral onlay graft urethroplasty and Barbagli et al described the dorsal onlay graft urethroplasty to repair adult anterior urethral strictures [10,11]. Following these two publications, a myriad of reports on the use of buccal mucosa for one- or two-stage techniques to repair anterior urethral strictures from any site, aetiology, and length began to appear each year in the literature, and buccal mucosa became the gold standard material for urethral substitution or augmentation, particularly due to its special biological properties [12,13].

3. Techniques for harvesting buccal mucosa

From 1894 to 1995, the lower lip was the preferred site for harvesting buccal mucosa [3–9]. Starting in 1996, a few articles pointed out the importance of a technique for harvesting buccal mucosa from the cheek, to minimise the risk of scarring and lip deviation or retraction [14–16]. In 1996 Morey and McAninch suggested a relevant innovation in the cheek harvesting technique: the use of a special mucosa stretcher and a two-team approach in which one team harvests the graft from the mouth while the urethral team simultaneously exposes and calibrates the stricture [14]. This two-team approach decreases operative time considerably and prevents wound cross-contamination [14]. A full description of the step-by-step technique for harvesting buccal mucosa from the cheek, mainly based on Morey and McAninch's suggestions, was published in 2014, along with predictions of early and late complications, as well as patient satisfaction ratings, using a multivariable statistical analysis from a cohort of 553 patients [17].

3.1. Surgical technique: harvesting the buccal mucosa from the cheek

The patient is intubated through the nose, and two teams work simultaneously at the donor and recipient site, each using their own set of instruments. Nasal intubation is useful for surgeons at the beginning of their learning curve or in patients with a small mouth opening. A Kilner-Doughty mouth retractor is put in place (Fig. 1A–1C). The Stensen duct is marked in proximity of the second molar, and three stay sutures are placed along the edge of the mouth to stretch the oral mucosa (Fig. 2A). The graft should be harvested 1.5 cm from the Stensen duct and 1.5 cm from the external edge of the cheek (Fig. 2A). The size of the graft varies according to the stricture length. For one-stage urethroplasty, the graft is designed in an ovoid shape (Fig. 2A). A 10-ml solution with bupivacaine hydrogen chloride 2.5 mg/ml and epinephrine acid tartrate 0.0091 mg (0.005 mg epinephrine) is injected along the edges of the graft to facilitate haemostasis and dissection (Fig. 2B). The graft is dissected in the plane between the mucosa and the muscle (Fig. 3). Bleeding from the donor site is examined and controlled with bipolar electrocautery. The Stensen duct should be clearly visible. In a patient who underwent an ovoid graft harvesting the donor site is closed with running 5-0 polyglactin sutures (Fig. 4A and 4B). In a patient who underwent, for two-stage urethroplasty, a big rectangular shape graft, harvesting the donor site is left opened (Fig. 5A and 5B). If necessary, another graft can be harvested from the contralateral cheek using the same technique. The graft is stabilised on a silicone board to remove the submucosal tissue. The patient consumes a clear liquid diet on the first postoperative day before advancing to a regular diet the next day, ambulates on postoperative day 1,