

Therapeutic Alternatives of Buccal Mucosa Grafting in Extraoral Reconstructions: a Case of Fournier's Gangrene

Alternativas Terapéuticas del Injerto de Mucosa Bucal en Reconstrucciones Extraorales: un Caso de Gangrena de Fournier

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ABSTRACT: Buccal mucosal grafts are versatile in medical practice, documented minimally despite potential in otolaryngology, ophthalmology, dermatology, plastic surgery and urology. They offer advantages such as being hairless, easily obtained, and infection-resistant, with a thin, highly vascularized epithelial layer aiding absorption and reducing contracture risk. Complications from oral donor sites, like pain and sensory changes, are known, relevant in conditions such as Fournier's gangrene, necessitating urgent surgical intervention and often reconstruction. We present a case report of a 45-year-old male with Fournier's gangrene treated jointly by urology and maxillofacial surgery. Buccal mucosal grafts were harvested from the inner cheek mucosa for simultaneous urethral reconstruction. The procedure preserved the parotid duct, obtaining a graft comprising mucosal, submucosal, and glandular tissues, applied to the urethral defect with bovine dermis coverage. Postoperative recovery was uneventful, with successful catheter removal in 2 weeks and complete donor site healing in 6 months. Buccal mucosal grafts prove effective in complex reconstruction, offering structural integrity and minimal morbidity. Despite challenges like graft contraction and limited tissue availability in severe cases, buccal mucosal grafts are favored for reliability and patient satisfaction in reconstructive needs, notably urethral reconstruction. The evidence shows a high success rate in most of the uses of buccal mucosal grafts, so it is recommended as an effective and safe graft for extraoral reconstructions, particularly urethral reconstruction, where the Maxillofacial Surgeon is part of the interdisciplinary team. Awareness of potential complications and procedural limitations ensures optimal outcomes and patient care.

KEY WORDS: mouth mucosa/transplantation, surgical flaps, transplantation, autologous, Fournier gangrene, urologic surgical procedures, urethra/surgery.

INTRODUCTION

Buccal mucosa grafts (BMGs) have been under-documented in the literature, with a lack of information regarding their potential use across various medical specialties, including otolaryngology, ophthalmology, dermatology, plastic surgery, and urology (Gordon *et al.*, 2017). BMGs are applicable in multiple body areas such as the nose, eyelids, vocal fold, nail bed, and urethra, due to the oral cavity's accessible source of versatile soft tissues, ranging from robust, enduring tissues (free gingival graft), to adaptable adipose tissue

(buccal fat pad), and pliant mucosal tissue (buccal mucosa graft) (Gordon *et al.*, 2017).

The existing literature outlines significant advantages of BMGs; they are devoid of hair, easy to procure, and immunologically resilient to infections. Moreover, their inclusion of a thin, highly vascularised sheet facilitates graft absorption, with their thick epithelium reducing graft contracture (Aldaquadossi *et al.*, 2019).

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While the procedure yields excellent outcomes, complications from the oral donor site have been documented post-graft collection (Soave *et al.*, 2018; Aldaqadossi *et al.*, 2019). These include pain, oedema, mouth opening difficulties, altered sensitivity in the lower lip or cheek due to nerve damage, parotid duct injury (Fauzi *et al.*, 2024), as well as issues related to salivation and diet (Soave *et al.*, 2018; Fauzi *et al.*, 2024). Paresthesia, characterized by abnormal sensations such as numbness, is the most prevalent complication, usually transient for the majority of patients (Fauzi *et al.*, 2024).

This study presents a case of Fournier's gangrene (FG), characterized as a rare, rapidly progressing necrotising infection of perineal, perianal, and genital soft tissues (El-Qushayri *et al.*, 2020; Lewis *et al.*, 2021).

It is often accompanied by thrombosis of the feeding arteries, resulting in skin and subcutaneous tissue gangrene, with severe intoxication and multiple organ failure manifestations, predominantly affecting immunocompromised individuals (Chernyadyev *et al.*, 2018).

Given its mortality rate exceeding 40%, treatment focuses on restoring hydroelectrolytic balance and administering broad-spectrum antibiotics to enable aggressive, prompt surgical debridement. Subsequently, survivors of the infection require reconstructive surgery (Boughanmi *et al.*, 2021).

BMGs are considered optimal for urethral reconstruction, delivering predictable outcomes and high success rates; they are the primary graft choice for managing this form of pathology (Gordon *et al.*, 2017).

CASE REPORT

A 45-year-old male patient presented to the Urology Service of the Red Salud Clinic of Vitacura in Chile with symptoms of Fournier's gangrene (FG). In collaboration with the Maxillofacial Surgery team, a simultaneous procedure was planned to obtain a buccal mucosal graft (BMG) for urethral reconstruction under general anaesthesia.

The BMG was harvested by marking the inner cheek mucosa, followed by local anesthetic infiltration with vasoconstrictor (2 % lidocaine with 1:100,000 epinephrine). An incision was made in the buccinator

muscle, and mucosal and submucosal tissue was carefully obtained while preserving the Stensen duct integrity. A 2 x 3 cm graft containing mucosal, submucosal, and underlying glandular tissue was successfully harvested (Fig. 1).

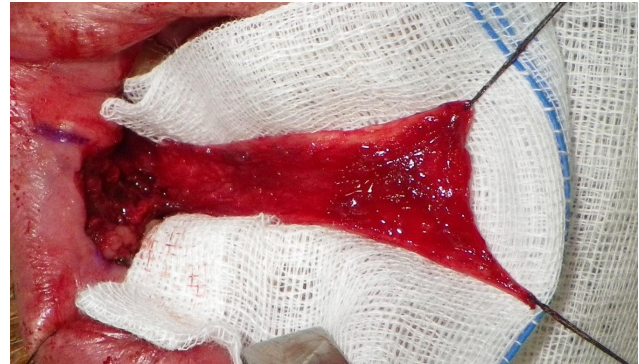


Fig. 1. Procurement of buccal mucosa graft (jugal mucosa).

Concurrently, the urology team resected the affected urethral segment. The BMG was thinned, excess glandular tissue was removed, and it was tailored to fit the urethral defect. The buccal mucosa bed was covered with bovine dermis graft and sutured with vicryl 4-0 (Fig. 2).

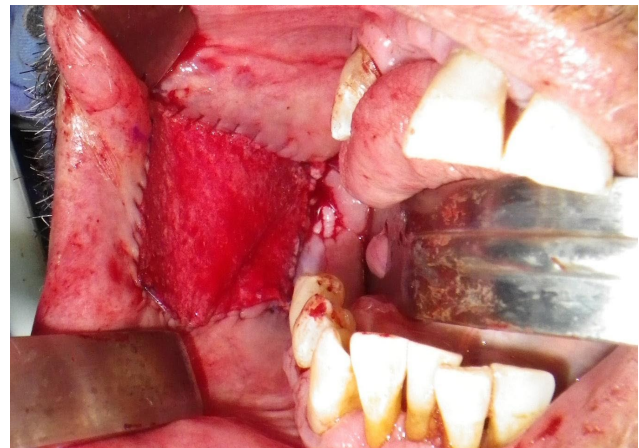


Fig. 2. Coating of buccal graft bed with bovine dermis graft.

The patient experienced no immediate postoperative complications. Follow-up visits were scheduled weekly, at 2 weeks, 1 month, 3 months, and 6 months. The urology team reported a successful outcome with no complications, and the urethral catheter was removed at 2 weeks. The buccal mucosa healed well with the bovine dermis acting as a protective barrier, facilitating epithelialization. The Maxillofacial Surgery team monitored the donor site, confirming complete healing without fibrosis six months post-surgery, upon which the patient was discharged.

DISCUSSION

Mucous free grafts can be successfully applied in many surgical approaches (Aydogmus *et al.*, 2016). There are two types of oral soft tissue grafts such as; free gingival grafts (FGG) or mucoperiosteic grafts, obtained from the hard palate, palate mucosa, edentulous ridges or mucosa of the tuberosity, and buccal mucosa grafts (BMG) (Gordon *et al.*, 2017). BMGs are flexible and easily accessible, formed by stratified squamous epithelium with slightly vascularized underlying connective tissue, and have a larger surface area compared to other intraoral grafts (Gordon *et al.*, 2017).

BMGs have numerous favorable characteristics, such as accessibility, resistance to infection, compatibility with a humid environment and a thick epithelium with a thin own sheet that facilitates early inoculation (Arlen *et al.*, 2010). Their use has been reported in Peyronie's disease, epispadias (Gordon *et al.*, 2017) and hypospadias (Aldaquadossi *et al.*, 2019), all with high success rates in urethral reconstruction, which supports the use of BMGs as the graft of choice over other grafts (Gordon *et al.*, 2017).

In addition, BMGs can be used in the reconstruction of the female reproductive organ, using oral mucosal meshes to create functional neo-vaginas safely and effectively in case of vaginal agenesis (Wu *et al.*, 2020).

Complications of BMGs are rare and related to the donor site; the most common include scarring and contracture. However, bleeding and bruising have also been reported in less than 1 % of cases, in addition to mild pain and discomfort for up to 4 weeks and limitation of oral opening (Cahill *et al.*, 2022).

Postoperative complications associated with the graft recipient site, such as infection and necrosis (Gordon *et al.*, 2017), have also been reported. Fournier's gangrene is a rare and rapidly progressive necrotizing fasciitis of the genital and perianal tissues, caused by a polymicrobial infection that progresses to endarteritis obliterating with microthromboses of cutaneous and subcutaneous arterioles and perifascial spread of bacteria, causing gangrene of the suprafascial tissues (Insua-Pereira *et al.*, 2020).

After primary treatment, patients may need a reconstruction secondary to skin and soft tissue defects, these may be through secondary healing,

primary closure, or reconstructive procedures with skin grafts or flaps. Various reconstructive techniques can achieve coverage of soft tissue defects, including partial or full-thickness skin grafts, locally advanced flaps, scrotal and prepucial flaps, fasciocutaneous flaps, muscle or myocutaneous flaps, piercing flaps, and testicular transposition (Insua-Pereira *et al.*, 2020).

Urethral reconstruction may be necessary in mucosal defects or urethral stenosis. Recently, BMG instead of prepucial skin have been used in a large number of patients undergoing urethroplasty with ventral patch. Although the incidence of mechanical weakening of the buccal mucosa graft is unknown, it is thicker and has a higher density of elastic fibers than the prepucial skin; it is likely to be more resistant to mechanical weakening over time (Barbagli *et al.*, 2003; Fauzi *et al.*, 2024).

On the other hand, in addition to their unique immunological properties, preclinical studies have shown that fibroblasts of the buccal mucosa induce less fibrosis compared to those of the skin and have a distinctive biological profile (Horiguchi, 2017).

The BMG is the most commonly used method for urethral reconstruction. However, its use may be limited in cases of severe stenosis due to the limited amount of tissue available for the graft. Research suggests that, to minimize complications, the graft area on each cheek should not exceed 2.5 cm wide by 4 cm long (Barbagli *et al.*, 2010).

To address the limitations related to graft size, it is necessary to collect bilateral oral mucosal grafts (Djordjevic, 2014); although such collection produces scar-free results, it shows greater patient dissatisfaction compared to unilateral (Barbagli *et al.*, 2014).

It is also important to consider the anticipated contraction of the graft, as a reduction in the size of buccal mucosal grafts has been reported to be up to 20% of their original dimensions after harvesting (Lauer *et al.*, 2001).

However, there are criteria in which it is not feasible or advisable to obtain it as a graft, such as for example in oral leukoplasia, inadequate oral hygiene combined with chewing/intense smoking, prior irradiation and prior buccal mucosa grafting procedures (Lumen *et al.*, 2012).

In recent years, robotic urethroplasty with BMG has been developed, useful in the reconstruction of complex urethral stenosis, which has been associated with low perioperative morbidity and excellent results in the medium term (Lee *et al.*, 2021).

In the case reported in this article, a BMG was used for penile urethral reconstruction in a case of FG, with a successful result, which is consistent with the current literature reporting a high success rate of 81 % (Levine *et al.*, 2007), this may be due to the fact that the buccal mucosa graft has favorable characteristics, including a thick epithelium with a high elastic fiber content, a thin own sheet, and abundant availability with a simple collection and low morbidity. Added to the above, the oral mucosa, being a stratified, non-keratinizing squamous epithelium, is significantly similar to that of the penile and glandular urethra (Foreman *et al.*, 2023).

The procedure presented no intraoperative or postoperative complications at the recipient site. This was achieved thanks to careful consideration of anatomical reference points during graft collection, which significantly decreased the patient's morbidity.

CONCLUSION

BMGs can be an effective alternative for extraoral reconstruction. Evidence indicates a high success rate in most applications, particularly in urethral reconstruction. This type of graft is recommended because it is effective and safe, causing a simple wound, associated with a high level of patient satisfaction. However, the use of BMGs is not without complications and limitations, which should be considered when choosing them as a therapeutic alternative.

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RESUMEN: Los injertos de mucosa bucal son versátiles en la práctica médica, documentados mínimamente a pesar de su potencial en otorrinolaringología, oftalmología, dermatología, cirugía plástica y urología. Ofrecen ventajas como la ausencia de vello, facilidad de obtención y resistencia a infecciones, con una capa epitelial delgada y altamente vascularizada que favorece la absorción y reduce el riesgo de contractura. Se conocen complicaciones de los sitios donantes orales, como dolor y cambios sensoria-

les, que son relevantes en condiciones como la gangrena de Fournier, que requieren intervención quirúrgica urgente y a menudo reconstrucción. Presentamos el reporte de caso de un hombre de 45 años con gangrena de Fournier tratado de manera conjunta por Urología y Cirugía maxilofacial. Se obtuvo injertos de mucosa bucal de la mucosa interna de la mejilla para la reconstrucción uretral simultánea. El procedimiento preservó el conducto parotídeo, obteniendo un injerto que comprendía tejidos mucosos, submucosos y glandulares, aplicado al defecto uretral con cobertura de dermis bovina. La recuperación postoperatoria curso sin complicaciones, con la retirada exitosa del catéter a las 2 semanas y la completa cicatrización del sitio donante en 6 meses. Los injertos de mucosa bucal demuestran ser efectivos en reconstrucciones complejas, ofreciendo integridad estructural y mínima morbilidad. A pesar de los desafíos, como la contracción del injerto y la disponibilidad limitada de tejido en casos severos, los injertos de mucosa bucal son preferidos por su fiabilidad y satisfacción del paciente en necesidades reconstructivas, especialmente en la reconstrucción uretral. La evidencia muestra una alta tasa de éxito en la mayoría de los usos de injertos de mucosa bucal, por lo que se recomienda como un injerto eficaz y seguro para reconstrucciones extraorales, particularmente en la reconstrucción uretral, donde el cirujano maxilofacial forma parte del equipo interdisciplinario. La conciencia sobre las posibles complicaciones y limitaciones del procedimiento asegura resultados óptimos y un adecuado cuidado del paciente.

PALABRAS CLAVE: mucosa bucal/trasplante, colgajos quirúrgicos, trasplante autólogo, gangrena de Fournier, procedimientos quirúrgicos urológicos, Uretra/cirugía.

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