

Root coverage of an isolated gingival recession using the tunnel technique and a de-epithelialized connective tissue graft: an 8-month follow-up case report

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ABSTRACT

Gingival recession is a common mucogingival deformity that may lead to esthetic concerns, dentin hypersensitivity, and impaired plaque control. The tunnel technique combined with a connective tissue graft is widely used for root coverage because of its favorable clinical and esthetic outcomes. This case report describes the management of deep isolated Cairo RT1 gingival recession defects using the tunnel technique in combination with a de-epithelialized connective tissue graft. A 23-year-old healthy female presented with isolated gingival recession affecting teeth #25 and #26, accompanied by esthetic concerns, dentin hypersensitivity, and discomfort during toothbrushing. The recession depths were 6 mm and 8 mm, respectively, with limited keratinized tissue. Following root surface preparation, root coverage was performed using the tunnel technique and a de-epithelialized connective tissue graft harvested from the palate. Healing was uneventful throughout the postoperative period. At the 8-month follow-up, complete root coverage was achieved at tooth #25, whereas 75% root coverage was obtained at tooth #26. Keratinized tissue width increased at both treated sites, dentin hypersensitivity and toothbrushing discomfort resolved completely, and the patient reported a high level of esthetic satisfaction. In this case, the tunnel technique combined with a de-epithelialized connective tissue graft resulted in substantial root coverage, favorable soft tissue healing, and satisfactory esthetic and functional outcomes at the 8-month follow-up.

Keywords: Gingival recession, tunnel technique, connective tissue graft, root coverage

INTRODUCTION

Gingival recession (GR) is defined as the apical displacement of the gingival margin beyond the cemento-enamel junction (CEJ), resulting in exposure of the root surface. It is one of the most prevalent mucogingival deformities encountered in clinical practice and may occur in individuals with healthy periodontal tissues as well as in patients with a history of periodontal disease. The prevalence and severity of GR increase with age, although localized recession defects are frequently observed in young adults, particularly in the presence of predisposing anatomical or behavioral factors. The etiology of GR is multifactorial and includes thin periodontal phenotype, traumatic toothbrushing, plaque-induced inflammation, high frenal attachment, orthodontic tooth movement beyond the alveolar envelope, periodontal disease, and iatrogenic restorative or surgical procedures. In particular, inappropriate toothbrushing techniques, excessive brushing frequency, and the use of toothbrushes with hard bristles have been identified as potential contributing factors to gingival recession. In addition to compromising smile esthetics, gingival recession may lead to dentin hypersensitivity, root caries, non-carious cervical lesions, plaque retention, and impaired plaque control, ultimately reducing patients' oral health-related quality of

life. Consequently, successful management requires not only correction of the soft tissue defect but also elimination of the underlying etiologic factors. The 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions further improved the diagnostic and prognostic assessment of gingival recession through the Cairo classification, which is based on interproximal clinical attachment loss and has become the current reference system for root coverage procedures.¹⁻³

Numerous periodontal plastic surgical techniques have been described for the treatment of gingival recession, including free gingival grafts, laterally positioned flaps, coronally advanced flap (CAF), subepithelial connective tissue grafts (SCTGs), tunnel techniques, and the use of soft-tissue substitutes or biologic adjuncts. Among these approaches, SCTG combined with coronal soft tissue advancement is widely regarded as the gold standard because of its predictable root coverage, increased gingival thickness, enhanced keratinized tissue width, and excellent long-term stability. During the last decade, the tunnel technique has gained increasing popularity as a minimally invasive alternative because it preserves the interdental papillae, avoids vertical



releasing incisions, and maintains an adequate blood supply from both the overlying flap and the underlying periosteum. These biological characteristics favor graft revascularization, improve wound healing, minimize postoperative morbidity, and provide excellent esthetic integration. Recent systematic reviews and meta-analyses have demonstrated that tunnel-based procedures achieve root coverage outcomes comparable to or, in selected clinical situations, superior to those obtained with conventional CAF techniques while maintaining high patient satisfaction and favorable esthetic outcomes.⁴⁻⁷

More recently, increasing attention has been directed toward the use of de-epithelialized connective tissue grafts (DCTGs) harvested from free gingival grafts. Compared with conventionally harvested SCTGs, DCTGs provide a denser connective tissue architecture with reduced adipose and glandular tissue content, potentially facilitating graft adaptation and revascularization beneath the tunnel flap. Current evidence indicates that DCTGs provide clinical outcomes comparable to conventional SCTGs with respect to recession reduction, complete root coverage, clinical attachment gain, gingival thickness, and keratinized tissue width. Furthermore, careful case selection, microsurgical principles, and meticulous soft tissue handling have been recognized as key determinants of successful root coverage irrespective of the harvesting technique. Although high-level evidence supporting tunnel-based root coverage procedures continues to expand, well-documented clinical case reports remain valuable for demonstrating the practical application of contemporary surgical concepts and illustrating soft tissue healing and maturation under routine clinical conditions.⁸⁻¹¹ Therefore, this case report describes the management of gingival recession defects using the tunnel technique combined with a de-epithelialized connective tissue graft, highlighting the surgical protocol and the clinical outcomes observed at the 8-month follow-up.

CASE REPORT

A 23-year-old healthy female patient presented to the Department of Periodontology with the chief complaint of gingival recession associated with esthetic concerns, dentin hypersensitivity, and discomfort during toothbrushing in the left maxillary posterior region. The patient had no history of systemic disease, medication use, smoking, or previous periodontal surgery. Clinical examination revealed good oral hygiene with minimal plaque accumulation, and no bleeding on probing was detected at the affected teeth. The gingival phenotype in the involved region was classified as thick.

Clinical examination revealed localized gingival recession defects affecting teeth #25 and #26, both extending to the mucogingival junction and classified as Cairo recession type 1 (RT1). The recession depth, measured from the cemento-enamel junction (CEJ) to the free gingival margin, was 6 mm at tooth #25 and 8 mm at tooth #26. The width of keratinized tissue was 1 mm at tooth #25, whereas no measurable keratinized tissue was present at tooth #26. Probing depths were 1 mm at both sites, with no evidence of interproximal attachment loss. Both teeth responded positively to pulp vitality testing and exhibited no mobility. No non-carious cervical lesions, cervical abrasions, or radiographic evidence of alveolar bone loss were observed.

Based on the patient's history and clinical findings, the recession defects were considered to be primarily associated with traumatic toothbrushing. The localized hyperkeratinization of the interdental papilla between teeth #25 and #26 was considered to have encouraged excessive brushing in this area, thereby contributing to the development of the recession defects. Considering the depth of the recession defects, the inadequate width of keratinized tissue, the absence of interproximal attachment loss, and the patient's symptoms and esthetic concerns, root coverage using the tunnel technique combined with a de-epithelialized connective tissue graft (DCTG) was planned. The patient was informed about the proposed surgical procedure, alternative treatment options, potential risks, and expected outcomes, and written informed consent was obtained before surgery (Figure 1).



Figure 1. Preoperative clinical appearance demonstrating isolated deep Cairo RT1 gingival recession defects affecting teeth #25 and #26

RT1: Recession type 1

Surgical Procedure

Following completion of initial periodontal therapy and reinforcement of oral hygiene instructions, the surgical procedure was performed under local anesthesia using 2% lidocaine with 1:100,000 epinephrine. After achieving profound anesthesia at both the recipient and donor sites, thorough root surface debridement and root planing were performed using Gracey curettes, followed by copious irrigation with sterile saline solution to prepare the exposed root surfaces for graft adaptation. No chemical root surface conditioning or detoxification agents, such as ethylenediaminetetraacetic acid (EDTA) or citric acid, were applied during the procedure (Figure 2).



Figure 2. Root surface debridement and root planing performed using Gracey curettes before tunnel preparation



Intrasulcular incisions were made around teeth #25 and #26. A split-thickness tunnel was carefully prepared using a specialized tunneling instrument set (Procut Tunnel Kit), with preservation of the interdental papillae. The tunnel was extended beyond the mucogingival junction to allow passive coronal advancement of the flap without tension. Particular care was taken to preserve the periosteal bed, thereby maintaining adequate vascular supply and promoting graft revascularization.

A free gingival graft measuring approximately 12×5 mm was harvested from the palatal donor site and subsequently de-epithelialized extraorally to obtain a connective tissue graft approximately 1.5 mm in thickness. Following graft harvesting, a Spongostan® absorbable gelatin sponge was placed over the donor site to facilitate hemostasis, and the donor site was sutured with 3-0 silk sutures (**Figure 3**).

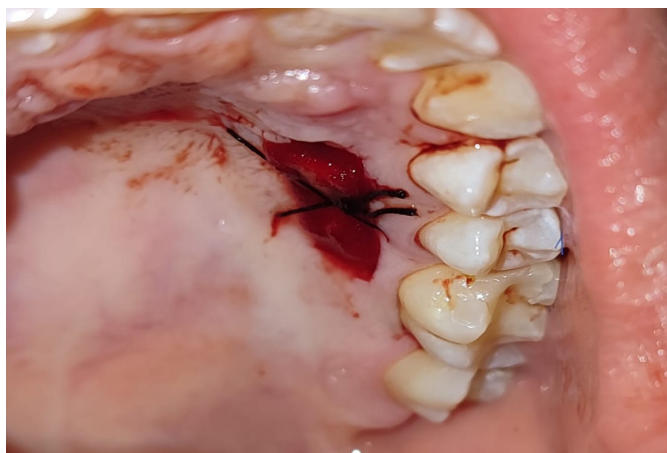


Figure 3. Palatal donor site immediately after graft harvesting, placement of Spongostan®, and closure with 3-0 silk sutures

The de-epithelialized connective tissue graft was gently inserted into the prepared tunnel and stabilized using 6-0 polypropylene sutures, ensuring intimate adaptation to the exposed root surfaces. Subsequently, the tunnel flap was passively advanced coronally to completely cover both the graft and the exposed root surfaces. Coronal positioning was maintained using suspended sling sutures, which were stabilized by bonding them to the buccal surfaces of the involved teeth with flowable composite resin. Flap stability and passive adaptation were verified before completion of the procedure, and adequate hemostasis was achieved (**Figure 4**).



Figure 4. Immediate postoperative clinical appearance following tunnel technique and placement of the de-epithelialized connective tissue graft

Postoperative instructions were provided, including avoidance of mechanical trauma and toothbrushing at the surgical site, adherence to a soft diet, and maintenance of appropriate oral hygiene measures. Postoperative medications included etodolac 400 mg (Etol Fort), administered twice daily for the first 3 days and subsequently as needed for pain management, and amoxicillin/clavulanic acid 1 g (Augmentin BID), prescribed twice daily for 7 days. In addition, the patient was instructed to use a mouth rinse containing 0.12% chlorhexidine gluconate and 0.15% benzydamine hydrochloride (Kloroben, Drogosan, Türkiye) two to three times daily for 10 days to support postoperative plaque control.

Clinical Outcomes and Follow-Up

The postoperative healing period was uneventful, and no complications, including infection, flap necrosis, graft exposure, or excessive bleeding, were observed. Sutures were removed 2 weeks after surgery, revealing satisfactory healing at both the recipient and donor sites (**Figure 5**). The palatal donor site demonstrated favorable epithelialization without signs of infection, delayed healing, or patient-reported discomfort, whereas the recipient site exhibited favorable soft tissue adaptation and maintenance of flap stability (**Figure 6**).



Figure 5. Recipient site at the 14-day postoperative follow-up before suture removal, demonstrating favorable early soft tissue healing



Figure 6. Palatal donor site after suture removal, demonstrating satisfactory healing and epithelialization

At the 3-month follow-up, the patient demonstrated inadequate plaque control in the treated area. Oral hygiene instructions were reinforced, and the patient was encouraged to improve plaque control to maintain the clinical outcomes (**Figure 7**).



Figure 7. Clinical appearance at the 3-month follow-up showing stable root coverage and early soft tissue maturation

At the 8-month follow-up, the clinical outcomes remained stable. Complete root coverage was achieved at tooth #25, whereas a residual recession depth of 2 mm remained at tooth #26, corresponding to approximately 75% root coverage. The width of keratinized tissue increased from 1 mm to 2 mm at tooth #25 and from 0 mm to 1 mm at tooth #26. Probing depths remained 1 mm, and no bleeding on probing was detected (**Figure 8**). The patient reported complete resolution of dentin hypersensitivity and discomfort during toothbrushing and expressed a high level of satisfaction with the esthetic outcome. Clinical examination revealed healthy periodontal tissues, satisfactory integration of the grafted tissues with the surrounding gingiva, and maintenance of the clinical improvements at the 8-month follow-up despite the temporary decline in plaque control observed at the 3-month visit (**Table**).



Figure 8. Clinical outcome at the 8-month follow-up demonstrating stable root coverage, increased keratinized tissue width, and favorable soft tissue integration

Table. Clinical outcomes following root coverage surgery				
Parameter	Baseline		8-month follow-up	
	Tooth #25	Tooth #26	Tooth #25	Tooth #26
Recession depth (mm)	6	8	0	2
Root coverage (%)	-	-	100	75
Keratinized tissue width (mm)	1	0	2	1
Probing depth (mm)	1	1	1	1
Bleeding on probing	Negative	Negative	Negative	Negative
Dentin hypersensitivity	Present		Resolved	
Toothbrushing discomfort	Present		Resolved	
Patient satisfaction	-		High	

Clinical measurements are presented separately for teeth #25 and #26 at baseline and at the 8-month follow-up. Root coverage percentages were calculated based on the reduction in recession depth relative to baseline measurements. Patient-reported outcomes, including dentin hypersensitivity, toothbrushing discomfort, and esthetic satisfaction, were assessed at the patient level

DISCUSSION

The primary objective of root coverage procedures is not only to achieve complete coverage of the exposed root surface but also to improve soft tissue quality, eliminate dentin hypersensitivity, and enhance patient satisfaction. In the present case, the tunnel technique combined with a de-epithelialized connective tissue graft resulted in complete root coverage at tooth #25 and 75% root coverage at tooth #26, accompanied by an increase in keratinized tissue width, complete resolution of dentin hypersensitivity and toothbrushing discomfort, and a high level of patient satisfaction after an 8-month follow-up. These findings are consistent with previous randomized clinical trials reporting favorable root coverage outcomes, satisfactory esthetic integration, and positive patient-reported outcomes following tunnel-based procedures.^{2,12}

Although subepithelial connective tissue grafts remain the reference standard for periodontal plastic surgery, de-epithelialized connective tissue grafts have recently emerged as a reliable alternative because they provide comparable clinical outcomes while allowing a more homogeneous connective tissue graft to be obtained. In a randomized clinical trial, Bakhishov et al.¹³ reported mean root coverage rates of $91.72\% \pm 16.59\%$ for de-epithelialized gingival grafts and $84.72\% \pm 19.72\%$ for conventionally harvested subepithelial connective tissue grafts combined with the tunnel technique at the 12-month follow-up. Histological analysis further demonstrated that de-epithelialized grafts contained less adipose and glandular tissue, supporting their biological suitability for mucogingival surgery. The favorable graft integration and soft tissue maturation observed in the present case are consistent with these findings, although longer follow-up is required to establish their stability.^{2,9,13,14}

The favorable outcome observed in this case may also be attributed to the biological advantages of the tunnel technique. Preservation of the interdental papillae and maintenance of the periosteal blood supply promote graft revascularization while minimizing surgical trauma. Furthermore, the absence of vertical releasing incisions improves tissue blending and reduces scar formation, particularly in esthetically demanding areas. González-Febles et al.¹² demonstrated that tunnel and coronally advanced flap techniques combined with connective tissue grafts provide comparable root coverage and esthetic outcomes, while tunnel procedures may offer favorable patient-reported outcomes because of their minimally invasive nature. Similarly, previous randomized clinical trials have shown that tunnel techniques are associated with high percentages of complete root coverage and excellent root coverage esthetic scores.^{12,15}

Complete root coverage was achieved only at tooth #25, whereas a residual recession of 2 mm remained at tooth #26. This difference may be explained by the greater baseline recession depth at tooth #26 (8 mm versus 6 mm), despite both defects being classified as Cairo RT1. Previous clinical studies have suggested that baseline recession depth is an important predictor of root coverage outcomes, with deeper recession defects generally exhibiting lower probabilities of complete root coverage. Nevertheless, despite incomplete root coverage at tooth #26, the patient reported complete resolution of symptoms and expressed a high level of esthetic satisfaction, emphasizing that treatment success should not be evaluated



solely according to complete root coverage but also according to patient-centered outcomes.^{2,7}

CONCLUSION

An interesting finding of the present case was the temporary deterioration in plaque control observed at the 3-month follow-up. Following reinforcement of oral hygiene instructions, plaque control improved, and the clinical outcomes remained stable at the 8-month evaluation. This observation highlights the importance of supportive periodontal therapy and continued patient motivation in maintaining favorable clinical outcomes following mucogingival surgery. The present case report has certain limitations. First, the findings are based on a single patient and therefore cannot be generalized to a broader population. Second, although favorable clinical outcomes were observed at the 8-month follow-up, this period is insufficient to establish the long-term stability of the achieved root coverage. Longer follow-up periods are necessary to assess potential changes in gingival margin position and soft tissue stability over time. Furthermore, the absence of a comparison group prevents conclusions regarding the relative effectiveness of this surgical approach compared with alternative root coverage techniques.

ETHICAL DECLARATIONS

Informed Consent

Written informed consent was obtained from the patient included in this report. Signed consent forms are retained by the authors and are available upon request.

Peer Review Process

This report underwent external peer review.

Conflict of Interest

The author declares no conflicts of interest.

Financial Disclosure

This case report did not receive any financial support.

Author Contributions

The author is solely responsible for the entirety of conception, execution, analysis, and writing of the manuscript.

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