PROBLEMS OF DENTAL MEDICINE

Problems of Dental Medicine 52: 1–6
DOI: 10.3897/pdm.52.e216343

Case Report

Application of a Vertically Coronally Advanced Flap for Root Coverage and Vestibule Depth Increase in a Mandibular Incisor: A 7-Year Follow-Up

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Received: 20 September 2026 **Accepted:** 18 October 2026 **Published:** 04 November 2026

Citation: Kotsilkov K, Kotsilkov L, Application of a Vertically Coronally Advanced Flap for Root Coverage and Vestibule Depth Increase in a Mandibular Incisor: A 7-Year Follow-Up. Problems of Dental Medicine 52: 1–6. doi: 10.3897/pdm.52.e216343.

Abstract

Introduction. Gingival recessions affecting mandibular incisors are difficult to treat because of the thin buccal bone plate, the narrow band of keratinized tissue, the high frenal insertions and, above all, the shallow vestibule, which limits passive coronal advancement of the flap. The vertically coronally advanced flap (V-CAF) combined with a connective tissue graft (CTG) was proposed to obtain root coverage and simultaneously increase vestibule depth, but long-term documentation is scarce.

Aim. To present the long-term clinical outcome of a vestibule depth increase alongside with root coverage of a deep isolated gingival recession of a mandibular central incisor treated with V-CAF + CTG and followed for seven years on a 35-year-old female.

Results. Vestibule depth, minimal at one month because of the extensive coronal advancement, increased progressively during soft tissue maturation and, at 3 and 7 years, reached the level of the adjacent anatomical regions.

Keywords

Gingival Recession; Vestibule Depth Increase, Root Coverage, Coronally Advanced Flap, Connective Tissue Graft.

Introduction

Gingival recession (GR) is defined as the apical displacement of the gingival margin with respect to the cemento-enamel junction; it is associated with attachment loss and with exposure of the root surface to the oral environment. In the 2018 classification of periodontal and peri-implant diseases and conditions, GR was placed among the mucogingival conditions and its diagnosis was linked to the assessment of the gingival phenotype, the

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interproximal attachment level, the width of keratinized tissue and the presence of a cervical lesion or step [1]. GR is one of the most common findings in the adult dentition. A systematic review of population-based studies including 37 460 participants reported a pooled prevalence of 78.2% at the minimal reported threshold and of 84.9% for defects of at least 1 mm [2], and a more recent meta-analysis estimated a prevalence of 81.1% for recessions ≥ 1 mm, 48.4% for ≥ 3 mm and 16.2% for ≥ 5 mm, with male sex, smoking and alcohol consumption identified as risk factors [3,4]. Beyond the aesthetic complaint, exposed root surfaces are associated with dentine hypersensitivity, root caries, non-carious cervical lesions and impaired plaque control. The mandibular incisor region deserves separate consideration. The most important predisposing factor for the development of GR is bone dehiscence, in most cases related to a tooth position outside the bony housing. Mandibular incisors naturally present a thin buccal bone plate, and this condition is frequently combined with previous orthodontic movement, lingual fixed retainers, parafunctional oral habits, a thin gingival phenotype, frenal pull, suboptimal oral hygiene and improper tooth brushing, or a combination of these factors [5,6].

The outcome of root coverage surgery is strongly operator- and site-dependent [7,8,9]. Stefanini et al. introduced a difficulty score based on eight anatomical parameters – anatomy of the papilla, apical and lateral width of keratinized tissue, apical and lateral frenulum, vestibule depth, scar tissue and mucosal invagination – and demonstrated its reproducibility among experienced clinicians (interclass correlation coefficient 0.95) [10]. Vestibule depth, although traditionally regarded as an unfavorable anatomical condition, had never been measured nor considered a clinical parameter influencing the result of root coverage until the introduction of the vertically coronally advanced flap (V-CAF) [11]. In this technique the horizontal incision is not dictated by the depth of the recession but is placed so that a band of approximately 2 mm of keratinized tissue remains apical to it, the vertical releasing incisions are parallel and extended into the mucosa of the lower lip, and a second split-thickness dissection separates the mucosa from the muscle layer, allowing the muscles to retract apically. In a series of twenty patients with single recessions of mandibular incisors treated with V-CAF + CTG, the immediate increase in vestibule depth was 5.9 ± 1.2 mm and remained stable at 4.8 ± 1.1 mm after twelve months; mean root coverage was 98.3 ± 5.2% and complete root coverage was obtained in 90% of the sites [11]. When the buccal displacement of the root is extreme, a combined orthodontic-mucogingival approach may precede the surgical phase: selective correction of the malposition converted all isolated deep defects into Cairo type 1 and 2 recessions and was followed by 90% complete root coverage, a recession reduction of 5.6 ± 1.5 mm and a gain in gingival thickness of 1.24 ± 0.24 mm one year after V-CAF + CTG [4]

Long-term data are of particular relevance for mucogingival surgery. A multicentre re-evaluation of CAF-treated sites documented that the position of the gingival margin obtained with CAF procedures can be maintained over several years [12]. A systematic review restricted to studies with at least five years of follow-up concluded that the stability of the gingival margin is favored by phenotype modification, that is by the increase of keratinized tissue width and gingival thickness achieved with the graft [13], and the protective role of the connective tissue graft against recession relapse has recently been reconfirmed [14]. Patient-reported outcomes and professional aesthetic evaluation also favor graft-associated procedures, with high patient satisfaction maintained at twelve months [15]. Aim. The purpose of this article is to present the seven-year clinical outcome of a deep isolated gingival recession affecting a mandibular central incisor with complete loss of vestibule depth, treated with a vertically coronally advanced flap combined with a connective tissue graft.

CASE DESCRIPTION

A 35-year-old female patient, a non-smoker with no reported systemic conditions or medications, presented with a significant isolated gingival recession on the mandibular left central incisor (tooth 31). Substantial calculus deposits were observed on the exposed root surface, attributed to the patient's avoidance of cleaning the area because of concerns regarding progression of the recession (Fig. 1).

Fig. 1. Initial status – large calculus deposit on the exposed root surface of tooth 31.

Treatment commenced with Step 1 of the clinical practice guidelines of the European Federation of Periodontology [16]. This phase focused on behavioral modification, patient education regarding supragingival dental biofilm removal, and management of systemic and local risk factors – in this specific case traumatic brushing. Professional mechanical plaque removal was also performed. After effective and atraumatic oral hygiene had been established (Fig. 2), the improved soft tissue conditions allowed the root coverage procedure to be planned. A comprehensive case analysis identified several conditions unfavorable for successful root coverage:

- loss of interdental papilla height;
- a shallow mesial papilla with a limited band of keratinized gingiva;
- extensive buccal root proclination;

- a deep recession combined with absence of keratinized gingiva apical to the defect;
- complete loss of vestibule depth;
- a short lateral frenulum attached in close proximity to the recession.

Fig. 2. Status after Step 1 of periodontal therapy, demonstrating effective inflammation control and improved soft tissue conditions.

According to the difficulty score for isolated recessions [10], the site combined several high-scoring parameters – reduced papilla dimension, absence of apical keratinized tissue, lateral frenulum insertion and absent vestibule depth. Considering these factors, the vertically coronally advanced flap (V-CAF) technique described by Stefanini et al. [11] was regarded as the most appropriate approach, since it allows root coverage and an increase of vestibule depth to be obtained simultaneously in mandibular incisors.

SURGICAL PROCEDURE

Incision design. Horizontal and vertical incisions were made to outline a trapezoidal flap (Fig. 3). In contrast to the standard coronally advanced flap protocol described by Zucchelli and De Sanctis [8], the position of the horizontal incision is not dictated by the depth of the recession; it is placed so that a 2 mm band of keratinized tissue remains apical to the incision. The vertical releasing incisions were designed parallel to each other and extended into the mucosa of the lower lip.

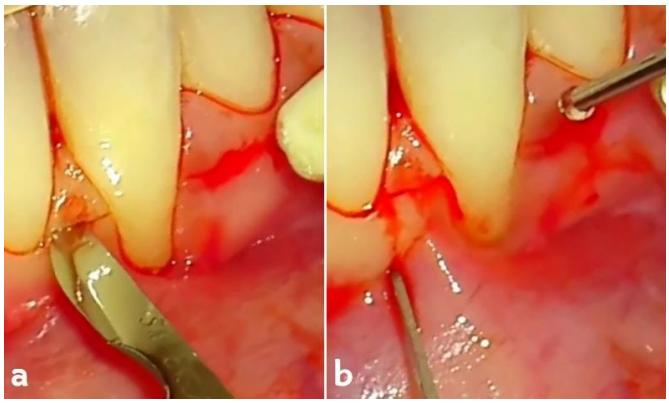

Fig. 3. a) Horizontal incisions positioned 2 mm coronal to the muco-gingival junction; b) vertical releasing incisions extended to the lip mucosa.

Flap preparation. Flap elevation followed the established steps of the classical split-full-split CAF procedure (Fig. 4). The papillae were prepared with a split-thickness technique, with particular attention to the mesial papilla (Fig. 4a). A full-thickness buccal flap was elevated to the bone crest, followed by a split-thickness incision parallel to the crest designed to separate the mucosa and muscle layer from the periosteum; the apical extent of this incision reaches the desired future depth of the vestibule (Fig. 4b). Passive coronal advancement was obtained by a second split-thickness incision separating the mucosa from the muscle layer, thereby allowing the muscles to retract apically and promoting the increase in vestibule depth. This incision was extended into the mucosa of the lower lip in order to ensure sufficient tissue for root coverage (Fig. 4c). Flap preparation was completed with de-epithelialization of the papillae coronal to the horizontal incisions (Fig. 4d).

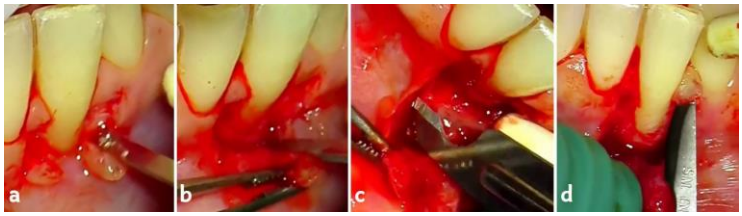

Fig. 4. Preparation of the vertically coronally advanced flap (V-CAF).

Graft harvesting. A connective tissue graft was harvested from the palate and subsequently de-epithelialized. The graft dimensions were 5 mm in height, a width sufficient to cover completely the bases of the papillae, and a thickness of 1.5–2 mm after de-epithelialization (Fig. 5). The harvesting technique and the management of the palatal wound follow the principles summarized in the current literature on donor site morbidity [17].

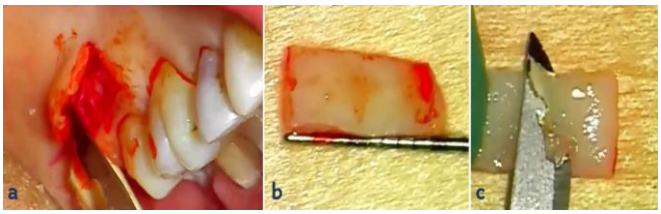

Fig. 5. Connective tissue graft harvested from the hard palate. a) Graft harvesting; b) graft dimensions; c) graft de-epithelialization.

Graft fixation and suturing. The final stage of the intervention consisted of fixation of the de-epithelialized graft to the bases of the de-epithelialized papillae (Fig. 6a), followed by coronal flap advancement and closure (Fig. 6b). The suture protocol was designed to ensure appropriate flap verticalization. A sling suture was first performed with 6/0 PGA suture material to achieve adequate flap positioning and advancement. Flap verticalization was secured by two periosteal fixating sutures at the base of the vertical releasing incisions (6/0 PGA). The vertical releasing incisions were closed with O-type sutures (7/0 PGA). Final flap closure was ensured by a second sling suture.

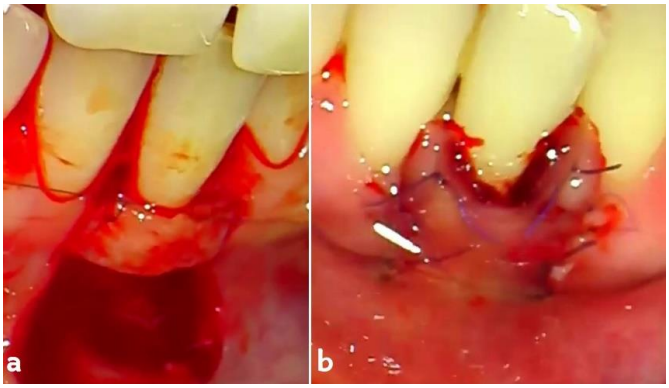

Fig. 6. a) Fixation of the connective tissue graft to the bases of the de-epithelialized papillae with 7/0 PGA suture material; b) coronal flap advancement, verticalization and fixation.

Post-operative protocol. Concomitant medication included amoxicillin + clavulanic acid 825/125 mg twice daily for 7 days (starting the day before surgery), ibuprofen 400 mg twice daily for 5 days, and 0.12% chlorhexidine mouth rinse three times daily for four weeks. Mechanical cleaning of the surgical area was suspended during this period.

Results

The initial healing period was uneventful and the sutures were removed 14 days after surgery (Fig. 7). Complete root coverage was already observed at this stage.

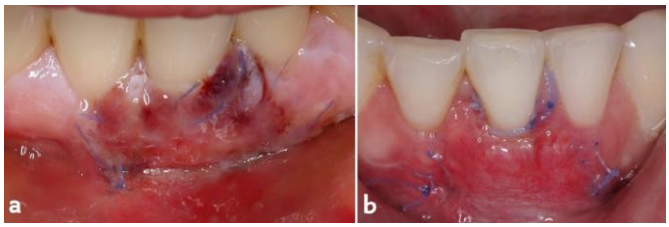

Fig. 7. a) Healing on the 3rd day; b) healing on the 14th day, before suture removal.

The outcome at one month demonstrated complete root coverage; however, only a minimal vestibule depth was recorded, as a consequence of the extensive coronal flap advancement performed during surgery (Fig. 8).

Fig. 8. Result at the 1st month.

The evaluation at six months, after soft tissue maturation, showed maintenance of complete root coverage together with an initial increase in vestibule depth (Fig. 9).

Fig. 9. Result at the 6th month.

Mid- and long-term follow-up assessments at three years (Fig. 10) and seven years (Fig. 11) demonstrated a continuous augmentation of the vestibule depth, which

ultimately reached the level of the adjacent anatomical regions, while complete root coverage and an adequate band of keratinized tissue remained stable.

Fig. 10. Result at the 3rd year.

Fig. 11. Result at the 7th year.

Discussion

The presented case combined almost all of the anatomical parameters that are recognised as unfavourable for root coverage in the difficulty score for isolated recessions – reduced papillary dimension, absence of keratinized tissue apical to the defect, lateral frenulum insertion and complete loss of vestibule depth [10]. The result obtained is in agreement with the outcomes reported for the original V-CAF series, in which complete root coverage was achieved in 90% of the treated mandibular incisors and the increase in vestibule depth remained stable at twelve months [11]. The present observation extends that documentation to seven years and shows that the vestibule depth continued to increase during the maturation phase rather than relapsing, which is consistent with the concept that apical retraction of the muscle layer, combined with the connective tissue graft, produces a lasting phenotype modification [13, 14]. The main limitation of this report is inherent to its design: a single case treated by one operator does not allow generalization, measurements were not performed with a standardized digital protocol, and the aesthetic and patient-reported outcomes were not quantified with validated indices [15].

Within the constraints of the presented case, the V-CAF technique combined with a connective tissue graft can be regarded as an effective approach for the management of isolated gingival recessions in mandibular incisors, particularly in complex situations in which both root coverage and an increase in vestibule depth are required, and the result achieved appears to be stable in the long term.

Additional information

Funding statement

None.

Ethical compliance

Written informed consent was obtained from the patient for publication of this case report and any accompanying clinical images. All reasonable measures were taken to ensure patient anonymity and confidentiality.

Conflict of interest

The authors declare that they have no conflict of interest and no affiliations with or involvement in any organization or entity with any financial interest in the subject matter or materials discussed in this manuscript.

Author contributions

Conceptualization: KK. Investigation: KK. Methodology: KK. Project administration: KK. Resources: LK. Supervision: KK. Visualization: LK. Writing - original draft: KK. Writing - review and editing: LK.

Acknowledgements

None

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