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Case Report

Orthodontic–periodontal interdisciplinary therapy for periodontitis stage III associated with type 3 gingival recession: A case report

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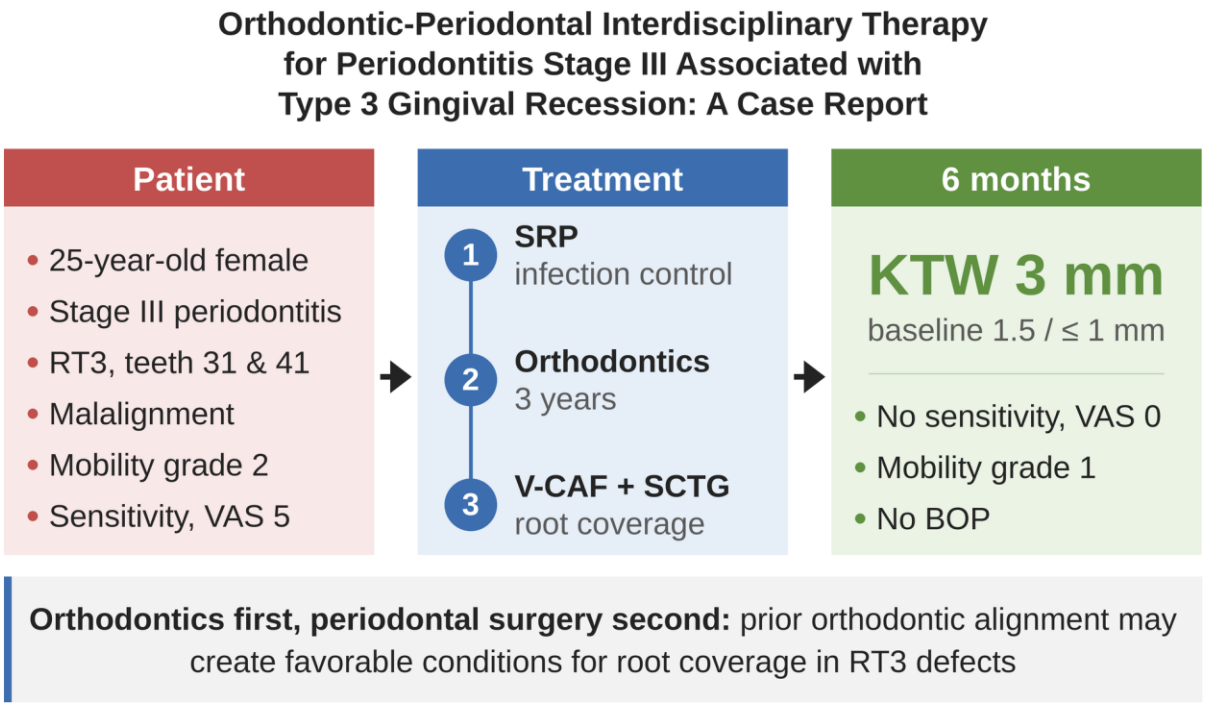
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Abstract

Periodontitis stage III associated with Cairo type 3 (RT3) gingival recession is a challenging condition that requires coordinated orthodontic–periodontal management. We report a 25-year-old female with stage III periodontitis, severe RT3 recessions on the mandibular central incisors (teeth #31 and #41), tooth malalignment, and dentin hypersensitivity (VAS = 5). Treatment comprised three sequential phases: non-surgical periodontal therapy with scaling and root planing for infection control, a 3-year active orthodontic phase, and periodontal plastic surgery using a vertically coronally advanced flap (V-CAF) combined with a subepithelial connective tissue graft (SCTG). At the 6-month follow-up, hypersensitivity had fully resolved, keratinized tissue width increased to 3 mm, and tooth mobility decreased from grade 2 to 1. Repositioning the teeth into a favorable alignment before soft tissue grafting can improve defect morphology, and an orthodontics-first, surgery-second sequence, consistent with the recommendations of the European Federation of Periodontology, may offer an efficient approach for managing complex RT3 defects.

Graphical Abstract



Key words: Case report, connective tissue graft, coronally advanced flap, gingival recession, periodontal regeneration, periodontitis.

Introduction

Periodontitis is a multifactorial inflammatory disease characterized by the progressive destruction of tooth-supporting tissues, including the gingiva, periodontal ligament, cementum, and alveolar bone.[1] According to the 2017 World Workshop Classification, stage III periodontitis is defined by a clinical attachment loss (CAL) of ≥5 mm, radiographic bone loss extending to the middle or apical third of the root, periodontal pocket depths (PPD) ≥6 mm, and ≤4 teeth lost due to periodontal reasons.[2] A complication of such advanced periodontal destruction is pathological tooth migration (PTM), which affects approximately 50–74% of patients suffering from stage III–IV disease.[3–5] PTM typically manifests as tooth rotation, irregular spacing, and labial flaring, arising from the combined forces of reduced periodontal support, occlusal trauma, and unfavorable soft tissue pressures.[4]

The resulting tooth misalignment generates detrimental non-axial occlusal forces, establishing a cycle that accelerates further bone loss and attachment destruction.[6] The clinical complexity escalates when PTM is accompanied by severe gingival recession. According to the Cairo et al.[7] (2011) classification, recession defects are categorized based on interdental clinical attachment loss (ICAL): RT1 (no interdental loss), RT2 (ICAL ≤ buccal CAL), and RT3 (ICAL > buccal CAL). RT3 defects represent the most challenging clinical entity; profound loss of interdental bone and soft tissue support precludes predictable, complete root coverage because the compromised interdental papilla provides inadequate vascular supply.[7,8] Consequently, randomized clinical trials routinely exclude RT3 defects, leaving limited evidence-based protocols for managing these complex scenarios.

In modern interdisciplinary management, orthodontic treatment has shown benefits in restoring functional and structural stability in periodontally compromised patients.[5,9] Orthodontic alignment aimed at correcting rotations and repositioning migrated teeth back into their physiological alveolar bone housing is an essential prerequisite before soft tissue augmentation. Relocating teeth within optimal structural boundaries increases soft tissue phenotype thickness, reduces the risk of bone resorption, and establishes favorable anatomical conditions for subsequent surgical stability.[10,11]

Subepithelial connective tissue graft (SCTG) is considered effective for root coverage and phenotype modification because of its unique dual blood supply mechanism and predictable ability to convert a thin gingival phenotype into a thick one.[12,13] Previous data demonstrate that SCTG combined with a coronally advanced flap (CAF), particularly a vertically coronally advanced flap (V-CAF), offers sustainable root coverage outcomes,[14–16] compared with other methods such as the free gingival graft technique, especially in shallow vestibule depth.[17]

Despite these insights, several gaps remain in the literature. High-level evidence on periodontal–orthodontic interactions in stage III periodontitis remains limited, with most protocols based on empirical expert opinion rather than standardized trials.[5,9] Moreover, the specific chronological sequence of performing SCTG + V-CAF after orthodontic alignment, to leverage the newly achieved physiological tooth position within the bone, has not been documented for RT3 defects.[18,19] Therefore, this case report aims to present a successful interdisciplinary protocol for a patient with stage III periodontitis and RT3 recession, structured into three sequential phases: (1) inflammation control;[9] (2) orthodontic alignment; and (3) SCTG + V-CAF. Clinical outcomes, including PPD, CAL, keratinized tissue width (KTW), bleeding on probing (POB) and mobility were evaluated.

Case Report

This case is reported in accordance with the CARE (Case Report) Guidelines.[20]

Patient Information

A 25-year-old female presented to Nhu Ngoc Dental Clinics, Hanoi, Vietnam, in March 2021. Her chief complaints were severe misalignment of her teeth in the anterior regions, and gum recession accompanied by constant hypersensitivity under cold water, and during brushing in her lower incisors over the past five years. The patient reported occasional gingival bleeding during brushing. She denied any history of systemic diseases, smoking, or medications that could compromise periodontal status. Her oral hygiene habit includes brushing twice a day, with a soft toothbrush, no dental floss, water toothpick, or mouthwash.

The patient had undergone basic scaling and root planning three years ago at another clinic, but discontinued supportive care once her sensitivity temporarily resolved. Family history was positive for misaligned teeth and poor periodontal health (tooth loss, gingivitis). The patient demonstrated high compliance and strong motivation for comprehensive, interdisciplinary intervention, expressing full understanding of the prolonged treatment duration.

Clinical Findings

Extraoral Examination

Extraoral evaluation revealed a symmetrical face, normal mandibular plane angle, a slightly convex profile, and competent lips at rest. No temporomandibular joint (TMJ) tenderness, clicking, or muscular dysfunction was found (Figure 1).

Intraoral Examination

Intraoral examination disclosed an Angle Class I molar relationship bilaterally. In maximum intercuspation, incisal contact showed an edge-to-edge incisor relationship. The mandibular midline was slightly deviated to the right.

The maxillary arch exhibited a classic U-shape with moderate anterior crowding and interdental spacing between the anterior teeth. The mandibular arch showed a U-shape, with teeth #31 and #41 exhibiting substantial labial flaring, extrusion, and distal migration, which led to wide, prominent interdental spacing between teeth #31 and #41, and teeth #41 and #42. The cementoenamel junction (CEJ) of both teeth was exposed due to gingival recession (Figure 2).

Periodontal Status

A comprehensive full-mouth periodontal probing was conducted at six sites per tooth using a Williams periodontal probe. Localized periodontal destruction was observed and evaluated in the two mandibular central incisors. One examiner performed periodontal measurements using a periodontal probe. Probing pocket depth (PPD) was measured from the gingival margin to the base of the pocket, with the probe positioned parallel to the long axis of the tooth and inserted gently until resistance was encountered at the base of the pocket. Clinical attachment level (CAL) was measured from the CEJ to the base of the pocket, with the exposed CEJ serving as a stable anatomical reference point. When gingival recession is present, CAL is calculated according to the following formula:

$$\text{CAL} = \text{PPD (Periodontal Probing Depth)} + \text{GR (Gingival Recession)}$$

Keratinized tissue width (KTW) was measured at the mid-buccal aspect of the teeth, defined as the distance from the gingival margin to the mucogingival junction, and was recorded to the nearest millimeter. The findings are summarized in Table 1. Gingival recession classification[8] showed RT3 recession at both teeth #31 and #41's sites (Figure 2). Dentin hypersensitivity was assessed using a 0–10 visual analog scale (VAS), with 0 indicating no pain and 10 indicating the worst imaginable pain. The patient reported a baseline VAS score of 5 in response to a controlled cold air-blast stimulus.

Radiographic Evaluation

Panoramic and CBCT images, acquired using an HDX Will CBCT (HDX WILL Corp., South Korea) unit under standardized exposure parameters (90 kVp, 8 mA, 16-second exposure time), showed severe, localized vertical alveolar bone loss at the mandibular incisor sites. The central bone crest between teeth #31 and #41 had collapsed dramatically, extending to the apical third of both roots (Figure 3).

Diagnosis

The patient was diagnosed with localized stage III periodontitis in the mandibular anterior segment, presenting with severe attachment loss, deep periodontal pockets, and Class II mobility

at teeth #31 and #41, complicated by severe RT3 gingival recession with a complete loss of interdental papillary and bone support, resulting in severe dentin hypersensitivity.

Additionally, the patient exhibited an Angle Class I malocclusion along with an edge-to-edge incisal contact, causing severe secondary occlusal trauma, accelerating the labial drifting of the mandibular central incisors and worsening the localized alveolar bone resorption.

Case Management

The comprehensive interdisciplinary treatment plan was structured into three phases, summarized in Figure 4.

Phase 1: Initial Periodontal Therapy

The initial phase focused on eliminating active periodontal infection and stabilizing the foundational tissues. Treatment consisted of full-mouth scaling and root planing combined with local subgingival irrigation with 0.2% chlorhexidine, along with intensive patient oral hygiene education. After 12 weeks, the periodontal tissues demonstrated complete resolution of inflammation and no BOP. This established a healthy, stable subgingival environment, which was clinically mandatory before initiating any active tooth movement.

Phase 2: Comprehensive Orthodontic Management

The orthodontic phase expanded for 3 years, using light, continuous forces to safely manage PTM within a reduced periodontium. Fixed low-friction appliances were bonded, and posterior composite bite turbos were temporarily placed on the mandibular molars to unlock the edge-to-edge anterior contact. Patients were recalled at 4-week intervals for plaque control and force reactivation, ensuring physiological bone remodeling without risking root resorption. By the end of this phase, the mandibular midline diastema was closed, labial flaring was corrected, and a stable anterior occlusion was achieved. Although the severe RT3 mucosal defects remained, the mobility of teeth #31 and #41 significantly decreased from index 2 to 1 (Figure 5). Immediately upon debonding, a wire lingual-bonded retainer was fixed from teeth #33 to #43 to ensure stabilization and prevent relapse before surgery.

Phase 3: Periodontal Plastic and Regenerative Surgery

The final phase addressed the severe gingival recession at the mandibular central incisors.

Local anesthesia with 2% lidocaine (1:100,000 epinephrine) was infiltrated into both the recipient site (mandibular anterior segment) and the donor site (palatal vault).

At the recipient site, a vertically coronally advanced flap (V-CAF) was prepared using a split-full-split thickness approach. A horizontal incision was made at the base of the interdental papillae, combined with two micro-surgical vertical releasing incisions extending past the mucogingival junction. The flap was sharply dissected to split its thickness, leaving the periosteum and a thin connective tissue layer intact to preserve the blood supply. To eliminate all muscle pull, the vertical incisions were extended deeper into the vestibule, where the mentalis muscle fibers were meticulously removed from the periosteum. This deep muscular release ensured completely tension-free flap mobility.

Upon flap reflection, severe alveolar bone loss and the exposed roots were clearly visualized. The roots were thoroughly instrumented with Gracey curettes and ultrasonic scalers to remove subgingival calculus and endotoxins, followed by chemical biomodification with 22% EDTA for 2 minutes to remove the smear layer and expose the underlying collagen matrix.

A subepithelial connective tissue graft (S-CTG) was harvested from the palatal vault at teeth #14 and #15 using a four-incision technique. The graft was trimmed to remove residual adipose or epithelial tissue, yielding a uniform, dense, highly fibrous connective tissue band.

The harvested SCTG was then transferred to the recipient site and positioned directly over the root surfaces of teeth #31 and #41, extending across the central interdental bone defect. The graft was secured and stabilized to the surrounding interdental papillae and baseline tissues using 7.0 absorbable sutures, ensuring a tight adaptation over the root surfaces.

Finally, the flap was placed to fully envelop the SCTG and cover the exposed roots without any residual tension. The flap was immobilized using sling sutures anchored around the necks of the mandibular incisor teeth, while the lateral releasing incisions were closed with isolated simple interrupted sutures (Figure 6a-e).

The patient was recalled for suture removal after two weeks. Clinical examination showed promising healing with soft tissue integration, with no signs of necrosis or infectious complications. V-CAF combined with the SCTG achieved a high percentage of root coverage, demonstrating an improvement at teeth #31 and #41 despite the severity of the initial defects. After 6 months, the patient returned for a regular checkup (Figure 6f-g). The same examiner reassessed periodontal parameters using the same periodontal probe and measurement protocol as at baseline. At the recipient site, gingival thickness increased (Table 2). Although a residual black triangle persisted between the central incisors due to the pre-existing severe recession and advanced interdental alveolar crest loss, the interdental papillary tissues exhibited encouraging thickening and active remodeling. Regarding sensitivity, as root exposure had disappeared, the patient reported no pain in response to a cold air-blast stimulus at the 6-month follow-up (VAS = 0).

Discussion

The decision to employ an "orthodontics-first, periodontal surgery-second" protocol follows the official S3-Level Clinical Practice Guidelines for Stage IV Periodontitis formulated by the European Federation of Periodontology (EFP), which indicate that orthodontic tooth movement (OTM) must begin after the definitive elimination of subgingival inflammation.[5,9] Biomechanically, this sequencing provided many clinical advantages: the slow, physiological consolidation of the wide diastema and correction of the labial flaring redirected masticatory loads along the long axes of teeth #31 and #41, effectively eradicating secondary occlusal trauma and promoting alveolar bone remodeling.[19,22,23] In contrast, this protocol may accelerate or propagate existing mucosal recession during the alignment phase, since OTM within a reduced, thin periodontium shifts the center of resistance apically, increasing the risk of mechanical bone resorption before a soft tissue graft protective barrier is introduced. Furthermore, because braces can alter the oral bacterial balance and increase harmful pathogens, maintaining a strict oral hygiene routine during treatment is essential.[19,24]

To reach the structural stability of the newly regenerated periodontium and prevent disease relapse, a permanent, rigid retention scheme combined with a lifelong supportive periodontal care (SPC) program is mandatory. Because teeth #31 and #41 originally presented with mobility secondary to advanced attachment loss and occlusal trauma, a wire fixed retainer was bonded lingually from teeth #33 to #43 after orthodontics. This structural splinting is essential to distribute functional loads across the entire anterior segment, eliminate harmful micro-movements that could re-trigger osteoclastic bone resorption, and resist orthodontic relapse.[25–27] Simultaneously, per the EFP consensus for stage III periodontitis, the patient must follow a strict recall interval of every 3 months during the first year, which may be adjusted to a 3–6-month window thereafter based on

individualized risk profiling.[5,9] Each maintenance recall must include full-mouth plaque (FMPS) and BOP evaluation, using ultrasonic tips or mini-curettes at sites with residual pocketing, and continuous reinforcement of oral hygiene instruction. The modified Stillman brushing technique, combined with calibrated interdental brushes, helps control mechanical trauma to the newly grafted margins while preventing plaque accumulation along the highly retentive fixed lingual retainer.[28]

Although the clinical presentation at 6-month recall showed early healing with soft tissue integration, this brief observation period is insufficient for a conclusive evaluation of mucogingival outcomes. At 6 months, the microstructures of the epithelium, connective tissue, and alveolar bone demonstrate substantial maturation.[29] However, definitive clinical verification of final root coverage percentage, mature biotype conversion, and true KTW gain can only be established after a minimum longitudinal follow-up of 6–12 months, once the extracellular matrix has fully matured into dense collagenous tissue.[30] Additionally, while interdental "black triangles" persisted after 6 months due to the pre-existing severe destruction of the interproximal alveolar bone crest, extensive longitudinal studies indicate that tissues treated with an SCTG complex often undergo a phenomenon known as "creeping attachment."[31] This post-surgical migration of the gingival margin in a coronal direction, occurring typically between 1 month and 1 year post-surgery,[31,32] is driven by the contractile properties of specialized myofibroblasts and active remodeling of the papillary base, promising a progressive reduction of the open embrasure space over time.

Complete regeneration of interdental papilla height and volume in stage III periodontitis complicated by RT3 gingival recession remains challenging. The primary obstacle is the severe deficit of supporting tissues, due to alveolar crestal bone loss, along with enzymatic degradation and structural disruption of the underlying connective tissue.[33] Compared with RT1 and RT2, complete root coverage is less predictable in RT3 recession defects because of the associated interproximal attachment loss.[34,35] Evidence regarding the stability of root coverage in advanced recession defects is also scarce, with systematic evidence particularly limited for RT3 defects.[36] Therefore, the favorable clinical root coverage observed in this case should be interpreted cautiously and should not be considered representative of the expected outcome for RT3 defects in general.

In this case, partial reconstruction of the interdental papilla between the lower incisors was achieved; however, "black triangles" remained. Because these sites are in the mandible of a patient with a medium smile line, and the lower incisors are not exposed during smiling, this condition does not compromise aesthetics. The patient was satisfied with the current treatment outcome, which met her expectations for masticatory function and hypersensitivity. Nonetheless, this was only the patient's subjective assessment reported temporarily. Beyond the VAS score used to assess tooth hypersensitivity, no broader standardized tools were used to comprehensively assess the patient's oral health-related quality of life, which is a limitation of this case report.

Conclusion

This case report demonstrates an interdisciplinary protocol, effective for managing stage III periodontitis with RT3 recession. The strategic sequencing of orthodontic movement prior to periodontal plastic surgery establishes a stable structural foundation by repositioning teeth within their physiological bone housing. Although complete papilla reconstruction remains challenging in RT3 defects, combining SCTG and V-CAF considerably improves clinical parameters, eliminates hypersensitivity, and increases

patient satisfaction. In addition, treatment stability depends on rigid retention and lifelong supportive periodontal care.

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Declaration of Generative AI and AI-assisted Technologies in the Writing Process
During the preparation of this work, the authors used ChatGPT (OpenAI; GPT-5.5) to improve the manuscript's readability and language and to assist in preparing a graphical abstract to meet the required indexes. The authors reviewed and verified the accuracy of its content and take full responsibility for it. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the published article.

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Competing Interests
The authors declare no conflicts of interest.

Consent to Publication
Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Data Availability
The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Figure 1. Patient's facial images.



Figure 2. Patient's intraoral images.

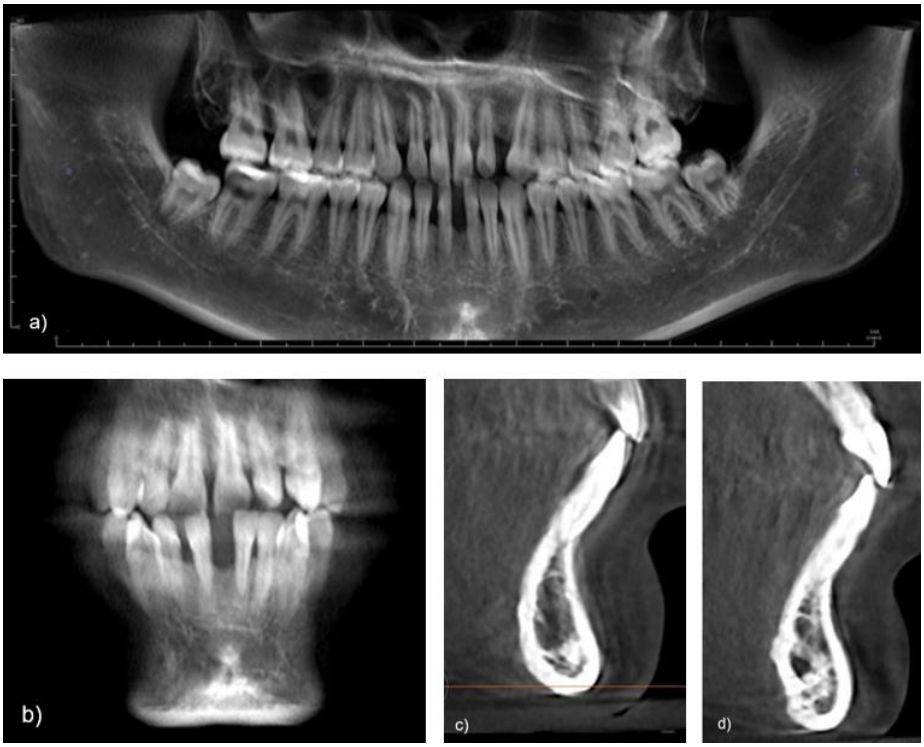


Figure 3. Patient's radiographic images: a) Panoramic image. b) CBCT image, coronal section. c) CBCT image, sagittal section of tooth 41. d) CBCT image, sagittal section of tooth #31.

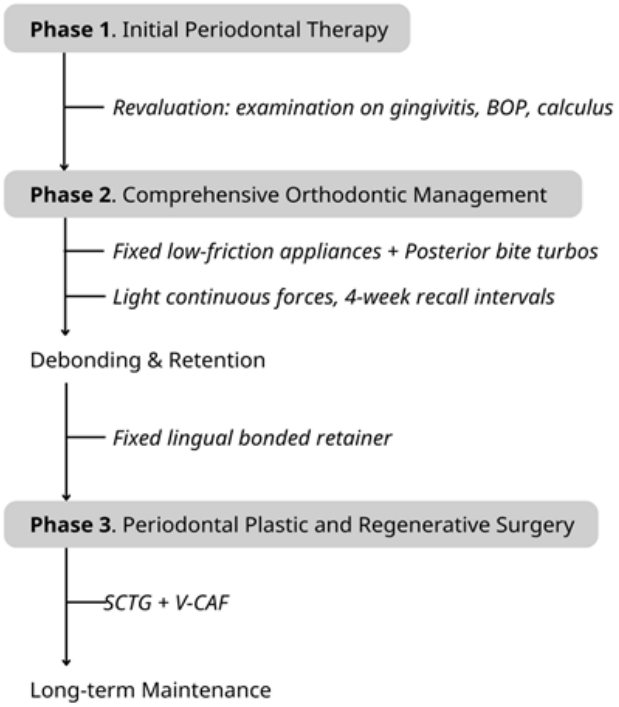


Figure 4. Flowchart illustrating the treatment plan.



Figure 5. Teeth #31 and #41 sites after orthodontic treatment.



Figure 6. Surgical steps: a) Vertically coronally advanced flap (V-CAF). b) Managing exposed roots using Gracey curettes, ultrasonic scalers, and EDTA 22%. c) A subepithelial connective tissue graft (SCTG) harvested from the palatal vault. d) Placing the SCTG. e) Suturing the flap. f) Two weeks after treatment. g) Six months after treatment.

Table 1. Clinical findings regarding teeth #31 and #41 and periodontal status

		Parameters				
Tooth		**PPD (mm)**	**CAL (mm)**	**KTW (mm)**	**BOP (+/-)**	**Mobility (Miller)[21]**
#31	**Buccal**	3	7	1.5	+	2
	Interproximal	4	8			
#41	**Buccal**	3	8	≤1	+	2
	Interproximal	5	9			

Table 2. Outcome parameters

Parameters		**Tooth 31**			**Tooth 41**		
		Baseline	**Two weeks after surgery**	**Six months after surgery**	**Baseline**	**Two weeks after surgery**	**Six months after surgery**
PPD (mm)	**Buccal**	3	2	1.5	4	2	1.5
	Interproximal	4	3	2.5	4	3	2
CAL (mm)	**Buccal**	7	5	3	8	6	3.5
	Interproximal	8	6	4.5	9	7	4.5
KTW (mm)		1.5	2.5	3	≤1	2.5	3
BOP (+/-)		+	-	-	+	-	-
Mobility (Miller)[21]		2	1	1	2	1	1