

Interdisciplinary Management of Orthodontically Associated Gingival Recession Using a Two-Stage Approach

Dr. Mitisha Anant Sawant¹; Dr. Rupali Saroshe²;
Dr. Madhu S. Ratre³; Dr. Shaleen Khetarpal⁴

PG Student¹; MDS Periodontology²; Professor & Head³; Reader⁴

¹Department of Periodontology, Govt. College of Dentistry, Indore (M.P.), India

²Department of Periodontology, Govt. College of Dentistry, Indore (M.P.), India

³Department of Periodontology, Govt. College of Dentistry, Indore (M.P.), India

⁴Department of Periodontology, Govt. College of Dentistry, Indore (M.P.), India

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Abstract:

➤ Background:

Gingival recession is a frequent mucogingival condition associated with root hypersensitivity, esthetic concerns, and compromised periodontal stability, particularly in patients with thin phenotype or a history of orthodontic treatment. Adequate keratinized tissue is a key determinant for predictable root coverage outcomes.

➤ Aim:

This case report describes the interdisciplinary management of localized gingival recession with inadequate keratinized tissue using a two-stage surgical approach involving free gingival graft (FGG) followed by coronally advanced flap (CAF) with subepithelial connective tissue graft (SCTG).

➤ Case Description:

A 20-year-old female undergoing orthodontic therapy presented with Miller Class II gingival recession in the mandibular anterior region. Clinical findings included 7 mm recession depth, 1 mm keratinized tissue width, and thin gingival phenotype. Initial treatment included phase I therapy followed by Stage I FGG to augment keratinized tissue. After a 3-month healing period, Stage II CAF with SCTG was performed for root coverage. Clinical parameters were recorded at baseline, post-Stage I, and at 6 months following Stage II surgery.

➤ Results:

At 6 months, recession depth reduced from 7 mm to 2 mm, with keratinized tissue width increasing from 1 mm to 4 mm. Improved tissue thickness and stable gingival architecture were observed with uneventful healing at both surgical sites.

➤ Conclusion:

The two-stage approach combining FGG preconditioning and CAF + SCTG may enhance predictability of root coverage in sites with inadequate keratinized tissue and thin phenotype. This protocol represents a viable option in anatomically challenging cases requiring staged periodontal plastic surgery.

Keywords: *Gingival Recession, Free Gingival Graft, Coronally Advanced Flap, Connective Tissue Graft, Mucogingival Surgery, Orthodontics.*

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I. INTRODUCTION

Gingival recession is defined as the apical displacement of the gingival margin relative to the cemento-enamel junction (CEJ), resulting in exposure of the root surface. It is a prevalent condition encountered in periodontal practice with reported prevalence ranging from 22% to 100% in various adult populations depending on the diagnostic criteria applied.^{1,2}

Gingival recession carries significant clinical consequences including root hypersensitivity, root caries susceptibility, compromised aesthetics, and in progressive cases, threats to the long-term prognosis of the affected tooth.³

It is not uncommon for patients presenting with gingival recession to have a prior history of orthodontic treatment, and this association has been a subject of growing interest. While orthodontic therapy undoubtedly confers functional and aesthetic benefits, it is not without potential periodontal consequences. The mandibular anterior region appears particularly vulnerable, with a long-term study reporting a 47% increase in recession prevalence five years following the completion of treatment.⁴ A recent systematic review has indicated that recession is encountered more frequently and more severely in orthodontically treated individuals than in untreated counterparts.⁵ But not every patient who undergoes orthodontic treatment develops recession. Individual susceptibility, shaped by gingival biotype, keratinized tissue dimensions, and the presence of pre-existing recession; plays a considerable role in determining clinical outcomes.^{5,6}

Multiple surgical techniques have been described for root coverage, including the pedicle flap procedures (coronally advanced flap, laterally positioned flap), free soft tissue autografts (free gingival graft, subepithelial connective tissue graft), and guided tissue regeneration.⁷ The CAF combined with SCTG is widely considered the gold standard for root coverage based on systematic reviews, owing to its predictability of complete root coverage and superior aesthetic outcomes compared to other procedures.^{8,9}

However, a prerequisite for successful CAF execution is the availability of sufficient keratinized tissue coronal to the recession defect. In sites with inadequate keratinized tissue (less than 2 mm in width or 0.5-1mm in thickness), achieving tension-free coronal advancement of the flap becomes challenging.¹⁰ In such scenarios, a preliminary FGG may be performed to augment the zone of keratinized tissue, providing an optimal tissue bed for subsequent root coverage surgery.^{11,12}

This case report describes the clinical management of a patient presenting with gingival recession and inadequate keratinized tissue using two-stage surgical protocol: Stage I: free gingival graft to augment keratinized tissue; Stage II (at 3 months post stage I surgery) by employing coronally advanced flap combined with subepithelial connective tissue graft to achieve root coverage.

II. CASE REPORT

➤ Patient Profile and Chief Complaint

A 20-year-old female patient referred to the Department of Periodontology with a chief complaint of sensitivity and receding gums in the lower anterior tooth region. Her medical history was non-contributory. The patient had been undergoing fixed orthodontic treatment.

➤ Clinical and Radiographic Examination

Intraoral examination revealed a Miller Class II recession defect #31, measuring 7 mm in depth and 3 mm in width. The probing pocket depth was 1 mm with presence of an aberrant frenal attachment #31. The width of keratinized tissue was 1 mm with tissue thickness of 1mm measured using a transgingival probing method. [Figure 1]



Fig 1 Pre Operative Clinical Photographs

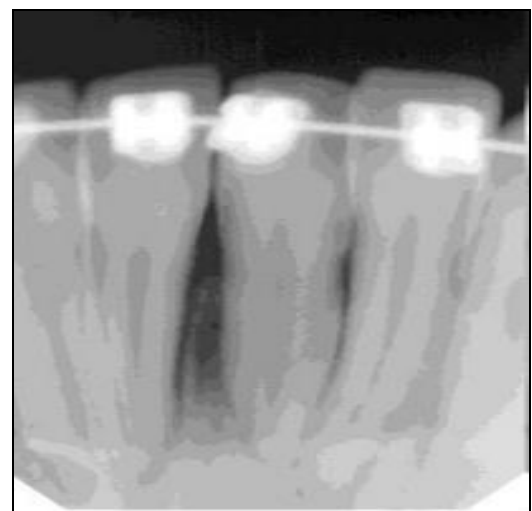


Fig 2 Pre Operative RVG

Periapical radiographs showed no significant alveolar bone loss in the interproximal regions of the affected tooth, consistent with a Miller Class II defect. No endodontic pathology was detected. [Figure 2]

➤ Diagnosis and Treatment Planning

Based on clinical and radiographic findings, a diagnosis of localized gingival recession with inadequate keratinized tissue was established. The treatment plan comprised initial periodontal therapy followed by the two-stage mucogingival surgical intervention:

- Stage I: Free Gingival Graft (FGG) to augment the zone of keratinized tissue and create a vascular, thickened tissue bed at the recipient site.
- Stage II (3 months post-Stage I): Coronally Advanced Flap (CAF) combined with Subepithelial Connective Tissue Graft (SCTG) for root coverage.

Informed consent was obtained from the patient. Initial phase I periodontal therapy included oral hygiene instructions with emphasis on brushing technique, professional supra and subgingival debridement, and elimination of traumatic occlusal contacts. The patient was re-evaluated at 4–6 weeks to confirm adequate plaque control (full-mouth plaque score <20%) before proceeding with surgical intervention.

➤ *Stage I Surgery: Free Gingival Grafting*

Surgery was performed under local anaesthesia using 2% lignocaine with 1:100,000 epinephrine. The recipient site was prepared by making a horizontal incision at the mucogingival junction extending 3 mm mesially and distally to the recession. [Figure 3]



Fig 3 Initial Incision for FGG

A split-thickness dissection was carried apically to the periosteum over a depth sufficient to accommodate the graft. The recipient bed measured approximately 10 mm × 10 mm. [Figure 4]



Fig 4 Recipient Bed Preparation

The donor site was the hard palate, between the distal aspect of the canine and the mesial aspect of the first molar, at least 2 mm apical to the gingival margin. A free gingival graft of dimensions 10 mm × 10 mm × 1 mm thickness was harvested. Gel sponge was placed on the donor site and was stabilized and sutured. [Figure 5]



Fig 5 Harvesting of Free Gingival Graft from Palate

The harvested graft was then trimmed to remove excess fatty tissue. Periosteal sutures were placed to secure the partial thickness flap and the graft was then sutured to the recipient bed using 6-0 polyamide interrupted sutures, ensuring complete immobilization and intimate contact between the graft and the recipient site. [Figure 6]



Fig 6 FGG Sutured at the Recipient Site

Post-operative instructions including antibiotics (Tab. Amoxicillin 500 mg TDS for 7 days), analgesics (Tab. Ibuprofen 400 mg TDS for 5 days), chlorhexidine 0.12% twice daily, and were prescribed. Sutures were removed at 15 days. Healing was satisfactory. Patient was motivated and reinforced for plaque control.

➤ *Post- Operative Assessment at 3 Months (Pre Stage II Evaluation)*

At the three-month post-operative review, clinical parameters were reassessed. The FGg had healed uneventfully with complete integration and maturation of the graft. There was a gain of 3mm of keratinized tissue and the recession defect depth decreased from 7 mm to 5mm. The site was deemed clinically appropriate for the second-stage procedure. [Figure 7]



Fig 7 3 Months Post-op After Stage I Surgery

➤ *Stage II Surgery: Coronally Advanced Flap (CAF) with SCTG*

The second surgery was performed at three months following Stage I. Local anaesthesia (2% lignocaine with 1:100,000 epinephrine) was administered.

Horizontal sulcular incisions were made around the crevice extending one tooth mesial and distal to the defect without vertical releasing incision. [Figure 8]



Fig 8 Incision for Coronally Advanced Flap

A sharp surgical blade was then used to elevate a split-full-split thickness flap while preserving the interdental papilla. The dissection was extended apically past the mucogingival junction to create a tension free flap. [Figure 9]



Fig 9 Elevation of Split-Full-Split Thickness Flap

SCTG was harvested from the palate and placed directly over the exposed root surfaces and stabilized using fine absorbable sutures. [Figure 10]

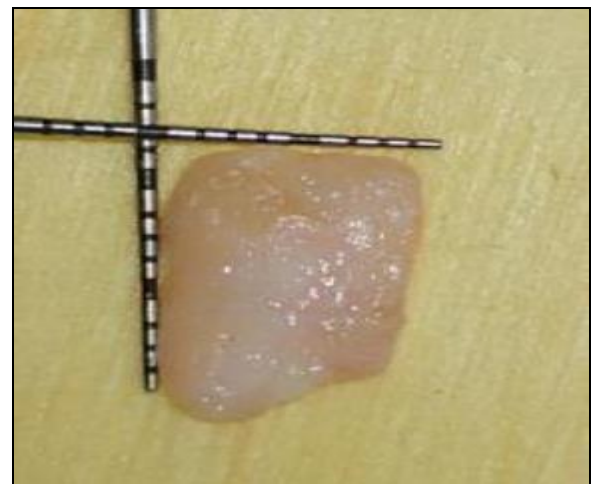


Fig 10 Harvested SCTG

The envelope flap was then advanced coronally over the graft and secured tightly over the root surface using independent sling sutures. [Figure 11]



Fig 11 SCTG Adapted and Sutured Over the Recipient Site with Coronal Advancement of the Flap

Post-operative instructions were identical to Stage I. Sutures were removed at 15 days post-operatively.

III. RESULTS

The patient was followed up at 2 weeks, 1 month, 3 months, and 6 months following Stage I and Stage II surgery.

Healing was uneventful at all time points at both the donor and recipient sites with no evidence of flap dehiscence, infection, or adverse reactions. The clinical outcomes are summarized in Table 1.

Table 1 Summary of Clinical Parameters Across Treatment Stages

Parameter	Stage I Pre-op	Stage I Post-op (3 months)	Stage II Pre-op	Stage II Post-op (6 months)
Recession Depth (mm)	7mm	5mm	5mm	2mm
Recession Width (mm)	3mm	2mm	2mm	1mm
Probing Pocket Depth (mm)	1mm	1mm	1mm	1mm
Keratinized Tissue Width (mm)	1mm	4mm	4mm	4mm
Keratinized Tissue Thickness (mm)	1mm	2mm	2mm	2mm

At the six-month post-operative evaluation (six months from Stage I), the recession depth had reduced from 7 mm to 2 mm. There was still presence of 1mm gingival recession. The keratinized tissue width increased from a pre-Stage I value of 1 mm to 4mm at the final evaluation. A marked improvement in tissue thickness was also observed. [Figure 12]



Fig 12 3 Months Post Stage II Surgery

The donor sites at the palate healed without complications. A slight color mismatch was noted but no tooth mobility or textural discrepancy was seen at the final visit.

IV. DISCUSSION

This case report highlights the successful clinical application of a sequential two-stage surgical protocol for root coverage in a site characterized by inadequate keratinized tissue. The Miller classification (1985),¹³ later supplemented by the Cairo classification (2011),¹⁴ which categorizes recession defects into recession types (RT1, RT2, RT3) based on interproximal attachment loss, serves as a valuable guide for clinicians in selecting appropriate surgical approaches and predicting treatment outcomes.

The conceptual foundation for this staged approach was established by Bernimoulin et al., who first described the use of a free gingival graft (FGG) to augment keratinized tissue

prior to coronal repositioning of the flap.¹⁵ Maynard and Ochsenbein further highlighted that successful root coverage in sites with a thin or deficient gingival phenotype often requires prior soft tissue augmentation to improve predictability.¹⁶

Orthodontically induced gingival recession is a recognized clinical entity, particularly in patients with predisposing anatomical factors. Careful interdisciplinary planning, including correction of tooth position prior to mucogingival surgery, helps reduce mechanical stress on the periodontium and improves the long-term stability of root coverage procedures.¹⁷

The rationale for performing an initial FGG followed by a coronally advanced flap combined with subepithelial connective tissue graft (CAF + SCTG) addresses a critical limitation of single-stage procedures, namely, inadequate tissue thickness and keratinized tissue width. While SCTG has largely replaced FGG for root coverage due to superior aesthetic outcomes and color blending, FGG continues to play a pivotal role in phenotype modification, particularly in sites with minimal keratinized tissue.⁹ FGG can be performed as either one stage or two stage procedure and has long been considered as a gold standard for augmenting the keratinized tissues. The FGG in the first stage increases the width and thickness of keratinized tissue and creates a more vascular and resilient recipient site. After a healing period of approximately three months, the matured graft tissue provides adequate substrate for coronal advancement and connective tissue grafting in the second stage, thereby enhancing predictability of root coverage.¹⁸

The selection of a three-month healing interval between the two surgical stages is well supported by histological evidence. Following FGG placement, tissue healing progresses through phases of plasmatic diffusion and revascularization (0–14 days), epithelial maturation (2–4 weeks), and eventual structural integration and keratinization by approximately 10–12 weeks. Performing the second-stage procedure within this timeframe ensures optimal tissue thickness, vascularity, and biomechanical resilience.¹⁹

Evidence from systematic reviews further supports the use of SCTG-based techniques for root coverage. Cairo et al., in a comprehensive meta-analysis, reported that CAF +

SCTG achieves the highest rates of complete root coverage (66.7–76.3%) and mean root coverage (89.1–94.8%) among available techniques.²⁰ Similarly, Chambrone et al. and Jepsen K et al. have demonstrated superior long-term stability and predictability of connective tissue graft procedures, particularly in challenging gingival phenotypes.^{8,21}

From a patient-centered perspective, the primary drawback of the two-stage approach is the increased morbidity, as it necessitates two surgical interventions and repeated donor site harvesting. Palatal discomfort and postoperative morbidity must therefore be carefully discussed during treatment planning. In the present case, informed consent was obtained after thoroughly explaining the staged nature and associated risks, and patient compliance contributed significantly to the favorable outcome.

The clinical outcomes observed in this case are consistent with previously published long-term studies. Agudio et al. reported stable root coverage and increased keratinized tissue over a 25-year follow-up period using a two-stage approach (FGG followed by coronally positioned or lateral sliding flap).²² Likewise, Bernimoulin et al. described the biologic rationale for staged grafting procedures, emphasizing improved predictability in sites with a thin gingival phenotype.¹⁵ More recent studies by Zuhr et al. have further underscored the importance of soft tissue thickness as a key determinant of successful root coverage outcomes.

Despite these encouraging results, certain limitations must be acknowledged. The present report represents a single-case observation, which limits the generalizability of the findings. Well-designed randomized controlled trials comparing single-stage versus staged protocols are needed to quantify the additional benefit of pre-conditioning with FGG. Furthermore, longer follow-up periods are essential to evaluate the long-term stability of both root coverage and augmented keratinized tissue.

V. CONCLUSION

This case report highlights the effectiveness of a two-stage mucogingival approach (FGG followed by CAF + SCTG) in the management of gingival recession associated with inadequate keratinized tissue. Pre-conditioning of the recipient site with FGG resulted in increased tissue width and thickness, thereby facilitating tension-free coronal advancement and predictable root coverage in the second stage. Within the limitations of a single-case observation, this approach appears to improve clinical outcomes in anatomically compromised sites and may be considered when baseline keratinized tissue is insufficient for direct root coverage procedures.

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