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Submarginal Modified Lateral Pedicle Flap for the Treatment of Isolated Upper Incisor Gingival Recession: A Case Report

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ABSTRACT

Background: Isolated gingival recession in the maxillary anterior esthetic zone presents significant cosmetic concerns and dentin hypersensitivity. While the traditional Grupe and Warren lateral sliding flap offers excellent root coverage by utilizing adjacent keratinized tissue, it carries a risk of donor site marginal recession. This case report describes a modified lateral pedicle flap technique incorporating a submarginal incision on the donor tooth (left maxillary lateral incisor) to spare the donor marginal gingiva while successfully treating an isolated Cairo RT1 recession on the left maxillary central incisor.

Methods: A 28-year-old male presented with an isolated 4.0 mm deep gingival recession (Cairo RT1) on tooth #21 (upper left central incisor) accompanied by localized hypersensitivity. To avoid exposing or compromising the donor site gingival margin, a modified incision design was executed: a V-shaped recipient bed was prepared around tooth #21, and a split-full-split thickness pedicle flap was raised from the adjacent donor tooth (#22) leaving a 2.0 mm collar of undisturbed marginal gingiva. The pedicle was rotated laterally, coronally positioned 1.0 mm coronal to the cemento-enamel junction (CEJ), and stabilized with 5-0 microsurgical sutures.

Results: At the 6-month follow-up, 100% complete root coverage (CRC) was achieved on tooth #21 with a healthy band of attached keratinized mucosa. Crucially, the donor site (#22) demonstrated zero gingival margin breakdown, no recession, and preserved marginal tissue contour.

Conclusion: Preserving a submarginal collar of gingiva at the donor site during lateral pedicle flap preparation effectively eliminates donor site gingival recession while achieving complete root coverage in maxillary anterior isolated defects.

INTRODUCTION

Gingival recession—defined as the apical displacement of the soft tissue margin relative to the cemento-enamel junction (CEJ)—represents a prevalent clinical entity in daily periodontal practice. Its occurrence in the maxillary anterior aesthetic zone poses significant challenges, frequently manifesting as heightened dentin hypersensitivity, increased susceptibility to root caries, difficulties in maintaining plaque control, and severe cosmetic dissatisfaction due to unesthetic root exposure and asymmetry of the gingival zenith. The etiology of localized recession in upper incisors is multifactorial, commonly arising from mechanical trauma such as aggressive horizontal toothbrushing, thin periodontal phenotypes, prominent root positioning within the labial cortical bone plate, or localized plaque-induced attachment loss.

Predictable root coverage and long-term soft-tissue stability require surgical modalities that not only restore lost marginal tissue but also establish an adequate band of attached keratinized mucosa. Over the decades, various periodontal plastic surgical procedures have been developed, ranging from free autogenous soft tissue grafts (such as subepithelial connective tissue grafts) to pedicle soft tissue flaps. Among pedicle procedures, the **laterally repositioned flap (LRF)**, originally conceptualized by Grupe and Warren in 1956, remains a foundational technique. The primary biological advantage of a pedicle flap lies in its retained intrinsic vascular base, which maintains continuous blood supply over the avascular root surface during the critical initial phases of wound healing.

Despite its high predictability in treating isolated deep recession defects, the conventional Grupe technique carries a significant clinical drawback: **iatrogenic gingival recession and alveolar bone loss at the donor tooth site**. Because the

original technique involved full-thickness elevation encompassing the donor tooth's marginal gingiva and interdental papilla, secondary tissue contraction and dehiscence frequently compromised the adjacent healthy tooth.

To overcome donor site morbidity while retaining the vascular advantages of a pedicle graft, **Grupe (1966)** introduced a critical refinement: the **submarginal incision design**. By placing a horizontal incision approximately 1.5 to 2.0 mm apical to the free gingival margin of the donor tooth, a continuous collar of undisturbed marginal tissue and supracrestal fibers is preserved. This submarginal modification maintains the structural integrity of the biological width, protects the marginal vascular plexus of the donor tooth, and eliminates the risk of donor site marginal breakdown

Case Presentation

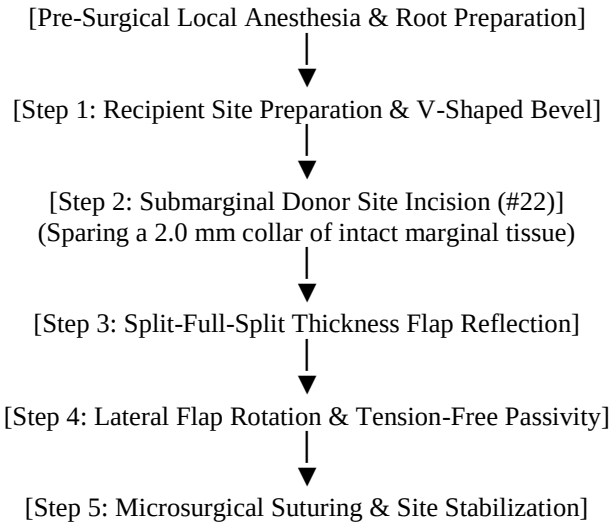
Patient Profile & Clinical Assessment

- **Patient:** 28-year-old systemically healthy male presenting with aesthetic dissatisfaction and localized cold sensitivity.
- **Clinical Site:** Maxillary left central incisor (#21) displaying an isolated 4.0 mm deep labial gingival recession with exposed root surface.
- **Periodontal Diagnostics:**
  - **Classification:** Cairo Class RT1 (Miller Class I) with intact interdental papillae and interproximal bone levels.
  - **Probing Pocket Depth (PPD):** 1.5 mm at tooth #21; $1.0 mm at adjacent donor tooth #22.
  - **Keratinized Tissue Width (KTW):** Minimal (1.0 mm) at tooth #21; adequate KTW (3.5 mm) and thick biotype at donor tooth #22.

PRE-OPERATIVE PARAMETERS		
Parameter	Recipient Site #21	Donor Site #22
Recession Depth (RD)	4.0 mm	0.0 mm
Keratinized Tissue (KTW)	1.0 mm	3.5 mm
Interproximal Bone Level	Intact	Intact

Surgical Protocol

The surgical procedure was performed under strict aseptic conditions. The step-by-step surgical sequence was executed as follows:



1. Pre-Surgical Preparation & Anesthesia

- **Local Anesthesia:** Infiltration anesthesia was administered at both the recipient site (#21) and the donor site (#22) using 2% Lignocaine with 1:100,000 Epinephrine. Care was taken to avoid over-distending the delicate mucogingival tissues at the donor site.
- **Root Decontamination & Biomaterial Conditioning:** The exposed root surface of tooth #21 was thoroughly planed using Gracey curettes (#1/2 and #5/6) to eliminate soft, infected cementum, reduce root convexity, and create a

smooth, biocompatible surface. Chemical root conditioning was performed using 24% EDTA gel applied for 2 minutes to remove the smear layer and uncover dentinal tubules, followed by copious irrigation with sterile saline.

2. Recipient Site Bed Preparation (#21)

- **V-Shaped Incision:** A V-shaped internal bevel incision was placed around the recession defect of tooth #21 to remove the pocket epithelium and create a clear, vascular receptive margin.
- **De-epithelialization:** The soft tissue margin surrounding the recession was de-epithelialized to expose underlying connective tissue vascular beds, ensuring rapid primary anastomotic connection with the incoming pedicle graft.

3. Submarginal Donor Site Flap Design (#22)

- **Sparing the Donor Marginal Gingiva:** To prevent post-surgical recession at donor tooth #22, a horizontal submarginal incision was placed 2.0 mm apical to the free gingival margin, extending from the mesial papilla of #22 to its distal line angle. This preserved an intact 2.0 mm band of marginal gingiva and interdental papilla intact on tooth #22.
- **Vertical Releasing Incision:** A vertical releasing incision was extended from the distal terminal end of the horizontal submarginal incision, passing through the mucogingival junction (MGJ) and into the alveolar mucosa. This allowed adequate rotational flexibility of the flap.

4. Flap Elevation (Split-Full-Split Thickness Approach)

- **Split-Thickness Submarginal Elevation:** A sharp dissection using a 15C scalpel blade was initiated at the submarginal incision line, elevating a split-thickness flap over the coronal 2-3 mm of the donor bed to retain periosteal covering over the donor bone.
- **Full-Thickness Central Elevation:** Mid-way down the donor radicular bone, flap elevation was converted to a full-thickness periosteal elevation using a periosteal elevator to maximize flap durability and preserve the deep intrinsic vasculature of the pedicle.
- **Apical Periosteal Release:** Beyond the MGJ, split-thickness dissection was resumed in the alveolar mucosa. A deep periosteal releasing incision was made at the base of the flap to relieve muscle tension, allowing the pedicle to be passively rotated laterally onto recipient tooth #21 without tension or elastic rebound.

5. Lateral Rotation, Positioning, and Suturing

- **Flap Placement:** The mobilized pedicle flap was rotated laterally across the interdental space to cover the exposed root of tooth #21, positioning the flap margin approximately 1.0 mm coronal to the cemento-enamel junction (CEJ).
- **Microsurgical Suturing:**
  - The pedicle was secured to the recipient bed using **5-0 PGA resorbable sling and interrupted sutures**.
  - The vertical releasing margin on the recipient side was sutured with simple interrupted microsurgical sutures to achieve precise edge-to-edge tissue approximation.
  - Light digital pressure was applied using a saline-soaked sterile gauze for 3 minutes to minimize blood clot thickness and facilitate initial fibrin layer adhesion.
- **Post-Surgical Management:** Periodontal dressing (Co-Pak) was omitted to prevent plaque accumulation and mechanical displacement of the delicate pedicle margin.

Post-Operative Care Protocol

1. **Systemic Medications:** Amoxicillin (500 mg thrice daily for 5 days) and Ibuprofen (400 mg thrice daily for 3 days) were prescribed.
2. **Chemical Plaque Control:** The patient was instructed to avoid mechanical brushing and flossing at the surgical site for 3 weeks, using 0.12% Chlorhexidine Gluconate mouthwash twice daily instead.
3. **Suture Removal:** Sutures were removed gently at 14 days post-surgery, demonstrating uneventful primary healing without flap necrosis or dehiscence.

RESULTS & FOLLOW-UP

The patient reported minimal postoperative discomfort. Suture removal was performed at 14 days post-surgery.

Parameter	Baseline	3 Months	6 Months
Recession Depth (#21)	4.0 mm	0.0 mm	0.0 mm
Root Coverage (%)	0%	100%	100%
KTW Gain (#21)	1.0 mm	3.0 mm	3.2 mm
Donor Site Marginal Recession (#22)	0.0 mm	0.0 mm	0.0 mm
Root Coverage Esthetic Score (RES)	N/A	9 / 10	10 / 10

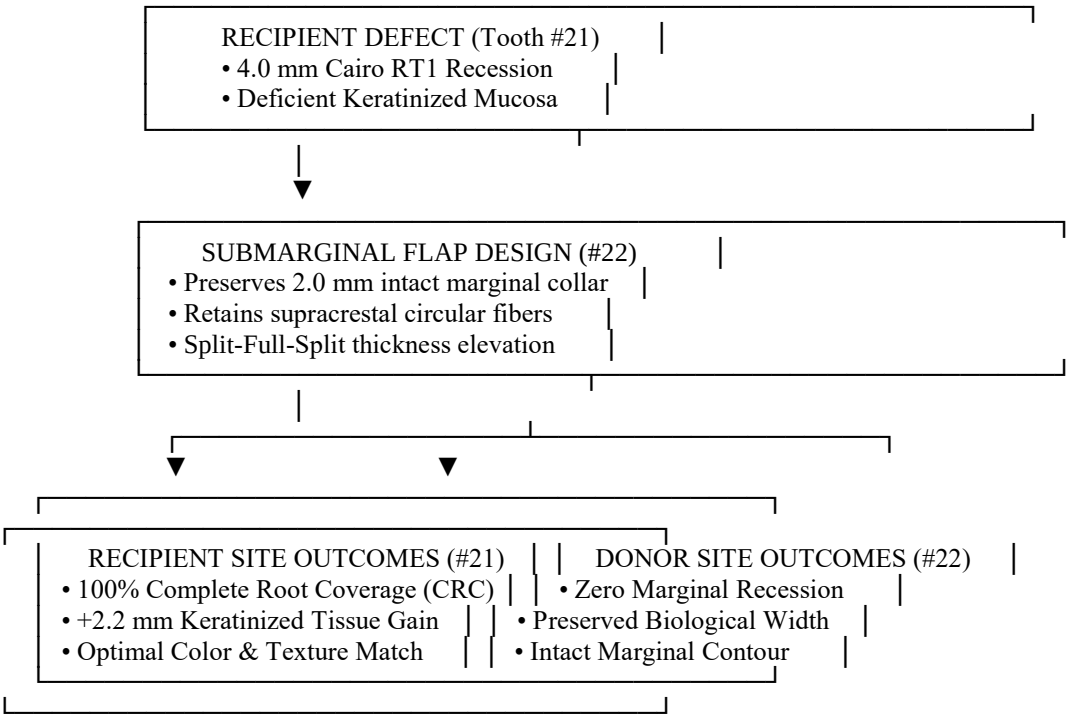
DISCUSSION

Root coverage in the maxillary anterior aesthetic zone demands predictable clinical protocols that fulfill both functional stability and stringent cosmetic expectations. Isolated gingival recession on a maxillary central incisor represents a particularly challenging scenario: the recipient site often suffers from a complete absence of attached keratinized tissue, exposing the root surface to continued mechanical abrasion, plaque retention, and dentin hypersensitivity. While the subepithelial connective tissue graft (SCTG) combined with a coronally advanced flap (CAF) is widely regarded as the historical gold standard for root coverage, it necessitates a secondary donor site (typically the hard palate), which increases patient morbidity, surgical time, and the risk of palatal bleeding complications.

The laterally repositioned flap (LRF), originally conceptualized by Grupe and Warren in 1956, offers a unique biomechanical advantage over autogenous free soft-tissue grafts. Because the pedicle graft remains attached at its base, its intrinsic plexus of blood vessels remains intact during lateral rotation. This uninterrupted continuous vascularization provides crucial nourishment over the avascular root surface during the initial 48 to 72 hours of wound healing, significantly reducing the risk of graft ischemia, partial necrosis, or flap failure.

Biomechanical Rationale of the Submarginal Incision

The primary factor that historically limited the routine adoption of the conventional Grupe lateral sliding flap was **donor site morbidity**. Conventional flap elevation required full-thickness dissection encompassing the free gingival margin and interdental papillae of the donor tooth. Subsequent tissue contraction and secondary intention healing over the un-covered donor radicular bone frequently resulted in iatrogenic gingival recession, root exposure, and marginal gingival breakdown on the adjacent healthy tooth.



By incorporating the **submarginal incision modification** described by Grupe in 1966, this clinical complication is effectively eliminated. Leaving an intact 2.0 mm collar of marginal tissue and supracrestal fibers on the donor tooth (#22) preserves the integrity of the biological width and sulcular epithelium. The intact marginal collar continues to receive vascular perfusion from the supracrestal gingival plexus and periodontal ligament fibers of tooth #22, completely safeguarding the donor site against gingival margin breakdown or secondary recession.

Vascularization & Flap Dissection Dynamics
The split-full-split thickness elevation technique executed in this case further optimizes healing at both sites:

1. **Split-Thickness at the Submarginal Margin:** Performing a delicate split-thickness dissection near the submarginal incision line leaves a underlying periosteal layer over the donor radicular bone, which facilitates rapid re-epithelialization and minimizes post-operative bone resorption at the donor bed.
2. **Full-Thickness Central Body:** Transitioning to full-thickness elevation along the central body of the pedicle preserves the deep periosteal vessels and increases the structural density of the graft, enhancing its resistance to mechanical breakdown over the recipient root.
3. **Apical Split-Thickness Periosteal Release:** Re-entering the split-thickness plane apical to the mucogingival junction allows deep muscle fiber release. This eliminates elastic rebound and guarantees passive, tension-free flap placement 1.0 mm coronal to the CEJ of tooth #21.

At the 6-month follow-up, this protocol yielded 100% Complete Root Coverage (CRC) on tooth #21 with a substantial increase in attached keratinized tissue width (+2.2 mm gain), while the donor site (#22) demonstrated pristine gingival architecture without any change in clinical attachment level or margin height.

CONCLUSION

The submarginal modified lateral pedicle flap is a highly effective, single-site surgical procedure for managing isolated gingival recession defects in the maxillary anterior region:

1. **Elimination of Donor Site Morbidity:** Preserving a continuous 2.0 mm collar of marginal gingiva at the donor site completely prevents iatrogenic donor recession, safeguarding the periodontal health and aesthetics of adjacent teeth.
2. **Vascular Predictability:** Leveraging the preserved intrinsic blood supply of a pedicle graft ensures predictable root coverage over avascular root surfaces without requiring a secondary palatal donor harvest or autogenous graft.
3. **Aesthetic & Structural Harmony:** The technique achieves complete root coverage (CRC), increases attached keratinized tissue width, and provides flawless color and texture integration with adjacent tissues in the aesthetic zone.

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