Case Report

Managing trauma-induced multiple gingival recessions associated with canine malposition using a modified tunneling technique and subepithelial connective tissue graft: A case report

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ABSTRACT

Introduction: Managing multiple gingival recessions in the aesthetic zone presents a clinical challenge, particularly in cases involving tooth malposition, extrusion, and irregular bone loss resulting from trauma. These factors complicate treatment selection. The Laterally Closed Tunnel (LCT) and Modified Coronally Advanced Tunnel (MCAT), both modified tunneling techniques, offer several advantages when combined with a Subepithelial Connective Tissue Graft (SCTG), including enhanced blood supply, improved graft nutrition, and reduced postoperative morbidity due to minimal vertical incisions and limited flap extension. This case report aims to demonstrate the effectiveness of this combined technique in treating multiple gingival recessions. **Case report:** A 20-year-old male patient presented with hypersensitivity and aesthetic concerns following accidental trauma. Clinical examination revealed Miller Class III/RT2 Cairo gingival recession on the buccal aspect of left maxillary canine and Miller Class I/RT1 Cairo gingival recession on the left maxillary first premolar, associated with canine malposition and extrusion, a recession depth of up to 7 mm, and inadequate keratinized tissue. The patient was treated using a combination of LCT and MCAT with SCTG. At the 3-month follow-up, substantial root coverage, increased soft tissue thickness, and improved gingival aesthetics were achieved, along with resolution of dentine hypersensitivity. **Conclusion:** The combination of LCT, MCAT, and SCTG techniques appears to be an effective treatment option for managing complex trauma-induced multiple gingival recessions associated with tooth malposition, providing favourable root coverage and improved soft tissue aesthetics

KEYWORDS

Trauma-induced, multiple gingival recessions, malpositioned tooth, modified tunneling technique, subepithelial connection tissue graft

INTRODUCTION

Gingival recession (GR) is defined as the apical displacement of the gingival margin relative to the cementoenamel junction. A worldwide prevalence ranging from 22% to 100% has been reported for gingival recession, which is associated with various dental problems that affect quality of life.[1] Meta-analysis results indicate that males are 1.52 times more likely to experience gingival recession than females.[2] Gingival recession may affect one or multiple teeth or surfaces, leading to attachment loss and root surface exposure. The condition is characterized by the degeneration of periodontal connective tissue. with concurrent loss of cementum and alveolar bone.[3]

Although gingival recession has a multifactorial etiology, traumatic occlusion may contribute to periodontal breakdown under certain clinical conditions. In the present case, gingival recession was associated with traumatic occlusion. Traumatic occlusion arises when occlusal forces exceed the supporting capacity of the periodontium, resulting in progressive damage of the periodontal tissues. This can lead to the formation of infrabony pockets, alveolar bone resorption, and gingival recession.[4] Exposed root surface due to gingival recession causes aesthetic problems, dentin hypersensitivity, and reduced ability to maintain oral hygiene.[5]

Management of multiple adjacent gingival recessions (MAGR) is more challenging and is largely influenced by key anatomical factors, including a thin gingival phenotype, underlying bone dehiscence, and high muscle or frenal attachment.[6] The predictability of root coverage varies across different recession classifications, with complete root coverage (CRC) being achievable in Miller Class I and II defects as well as in Cairo RT1 recessions.

In Miller Class III or Cairo RT2 defects, interdental hard and/or soft tissue loss or tooth malposition limits the possibility of achieving complete root coverage; therefore, only partial root coverage can generally be expected.[7] Soft tissue management in such cases is more complex, as wound healing can be influenced by several factors, including the width of the avascular surface, restricted blood supply, varying recession depths, and tooth malposition associated with trauma.[6]

The management of gingival recession should be guided by clinical findings, etiological factors, and the severity of the condition. As patients' aesthetic demands increase, surgical techniques that preserve papillary integrity have become increasingly essential.[8] Recently, in addition to achieving complete root coverage (CRC), surgical techniques that provide favorable aesthetic results without postoperative scarring have gained popularity. One such technique is the tunneling technique.[9]

Treatment of gingival recession with tunneling techniques is becoming increasingly favoured because it is more conservative and improves aesthetics outcomes by reducing the risk of post-operative scar formation.[3] Flap elevation without involving papillary tissue or requiring vertical incisions contributes to improved blood supply and accelerates the healing process.[9]

In recent years, the adaptation and advancement of tunneling-based procedures, particularly the Modified Coronally Advanced Tunnel (MCAT) and the Laterally Closed Tunnel (LCT), have provided clinicians with highly effective treatment options for the surgical management of gingival recession. These procedures exhibit strong reliability for root coverage, achieving success rates exceeding 90% in Cairo RT1 (Miller Class I and II) gingival recessions.[10,11]

According to findings from a recently published systematic review, the tunnel technique has demonstrated substantial effectiveness, achieving mean root coverage (MRC) values of 87.87 ± 16.45% in multiple recession cases and 82.75 ± 19.7% in single recession cases.[3] The combination of the tunneling technique with an autogenous SCTG provides an excellent esthetic treatment.[10] Among the adjunctive scaffolds or graft materials available, a connective tissue graft (CTG) is considered the gold standard. [12-14]

It seems that a CTG may act as a biological filler, improving the adaptation and the stability of the flap over the exposed root surfaces. Therefore, a high probability of achieving complete root coverage together with increased soft tissue thickness has previously been attributed to CTG-based approaches.[13] Several technical modifications, including flap design, incision design, and suturing technique, may also affect the success of this approach. [15, 16]

The novelty of this case lies in the achievement of root coverage exceeding the expected predictability for a Miller Class III recession using a combined modified tunneling approach with SCTG. The uniqueness of this case is reflected in the presence of trauma-induced multiple gingival recessions associated with a malpositioned tooth, conditions that usually limit the predictability of complete

root coverage. This case report aims to demonstrate the effectiveness of this combined technique in treating multiple gingival recessions.

Case Report

A 2—year-old male patient was referred to the Dental Hospital due to dentin sensitivity and aesthetic concerns, as his left maxillary canine had appeared increasingly elongated over the preceding 5 years. The dentin hypersensitivity was assessed using a visual analog scale (VAS) following air-blast stimulation, and the patient's VAS score was 7. The patient denied having any systemic diseases or a history of allergies and was not taking long-term medications.

The patient reported a traffic accident in the late 2019 that resulted in a fractured anterior tooth and nasal deformity. Following the accident, the patient reported mobility of the mandibular anterior teeth and a slight change in their position. After extraction of the fractured anterior tooth, the patient had the missing tooth replaced with a removable partial denture. However, after 4 months of wearing the prosthesis, the patient noticed gaps developing between the gingiva and teeth, and the teeth gradually appeared longer.

Extraoral examination revealed no facial or lip asymmetry. The patient presented with a convex facial profile. Intra oral examination showed that the recession depth of tooth 23 was 7 mm, measured from cementoenamel junction (CEJ) to the gingival margin, with a recession width of 4 mm at the level of the CEJ and inadequate keratinized gingiva. Tooth 23 presented with mesiopalatal torsiversion malposition. Radiographic examination showed bone resorption at the mesial and buccal of tooth 23; therefore, the gingival recession at tooth 23 was classified as Miller class III/RT2 Cairo. At tooth 24, the recession depth was 1,5 mm, with a recession width of 3 mm. No interdental bone destruction was observed; therefore, the gingival recession at tooth 24 was classified as Miller class 1/RT1 Cairo.

The local prognosis for tooth 23 was considered questionable due to approximately 50% attachment loss. In contrast, the prognosis for tooth 24 was considered good, as no alveolar bone loss was observed. The treatment plan included initial periodontal therapy to eliminate local etiological factors, followed by re-evaluation and subsequent periodontal surgery to manage the gingival recession. The patient provided written informed consent for the proposed treatment and publication of this case report.

Figure 1. Intraoral clinical examination. A. Initial clinical condition; B. Tooth 23 with a recession depth of 7 mm and a width of 4 mm; Tooth 24 with a recession depth of 1.5 mm, width 3 mm; C. Occlusal view of the maxillary arch; D. Occlusal view of the mandibular arch

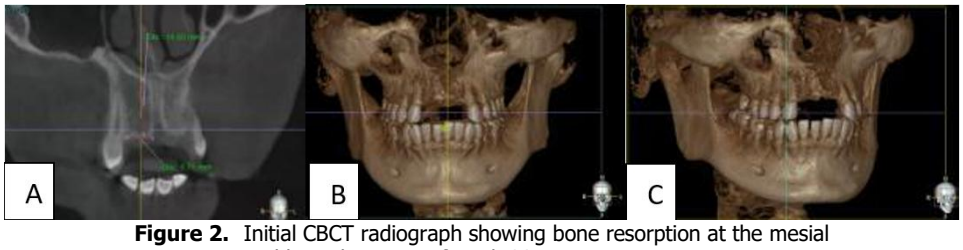

Figure 2. Initial CBCT radiograph showing bone resorption at the mesial and buccal aspects of tooth 23.

The treatment for this case was divided into several visits. At the first visit, initial periodontal therapy was performed, consisting of scaling and Dental Health Education (DHE) regarding the patient's condition, treatment options, and prognosis. The patient was also instructed to maintain good oral hygiene. No medication was prescribed on the first visit.

At the second visit, periodontal surgery for gingival recession was performed using the LCT technique combined with SCTG for tooth 23, and the MCAT technique for tooth 24. The procedure began with oral prophylaxis and aseptic preparation of the surgical area using povidone-iodine. Followed by infiltration anesthesia with Orabloc (45 Articaine HCL with Epinephrine) in the mucobuccal fold adjacent to teeth 23 and 24. Preparation of the recipient site included root planing of the exposed root surfaces using an ultrasonic scaler and Gracey curettes, followed by the application of 20% Ethylenediaminetetraacetic Acid (EDTA) to the exposed root surfaces for 2 minutes to remove the smear layer. The sites were subsequently irrigated with saline.

Next, the modified tunneling technique was performed, starting with an intrasulcular incision along the gingival margins of teeth 23 and 24 using a No. 15C blade without involving the interdental papillae. . A periosteal elevator (TITU 3&4 Tunneling set) was inserted into the layer between the periosteum and the alveolar bone, extending to the mucogingival junction. The flap was then carefully released until it could be moved laterally and coronally without tension, providing sufficient space for placement of the SCTG.

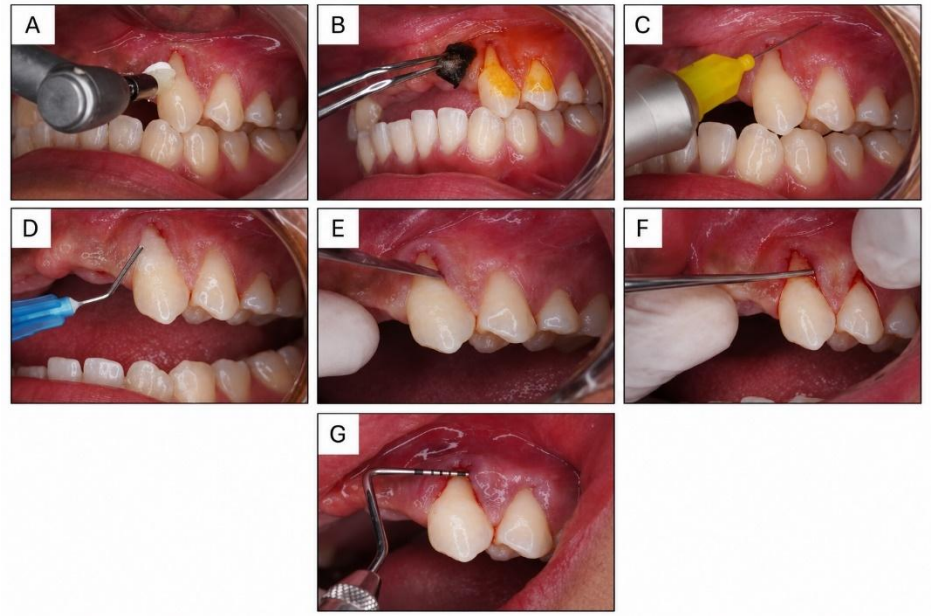

Figure 3. Procedure for preparing the recipient area. A. Prophylaxis with pumice; B. Aseptic with povidone-iodine; C. Infiltration anesthesia; D. Application of 20% EDTA; E. Sulcular incision; F. Release of the gingival attachment around teeth 23 and 24; G. Flap mobilization without tension.

After preparing the recipient area, the donor site on the palate was prepared. The graft size was measured first, and aluminum foil was used as a surgical

template. The donor site was prepared aseptically with povidone-iodine, followed by infiltration anesthesia. A subepithelial connective tissue graft (SCTG), approximately 1–1.5 mm thick, was harvested from the left palatal region between teeth 26 and 27 using a split thickness sharp dissection with trapdoor technique, consisting of one horizontal incision and two vertical incisions using a No. 15 blade. The SCTG was then contoured, removed from fatty tissue and wrapped with saline-moistened gauze. The donor area was covered with spongostan, sutured with simple interrupted sutures using nylon 5.0 and covered with ora-Aid.

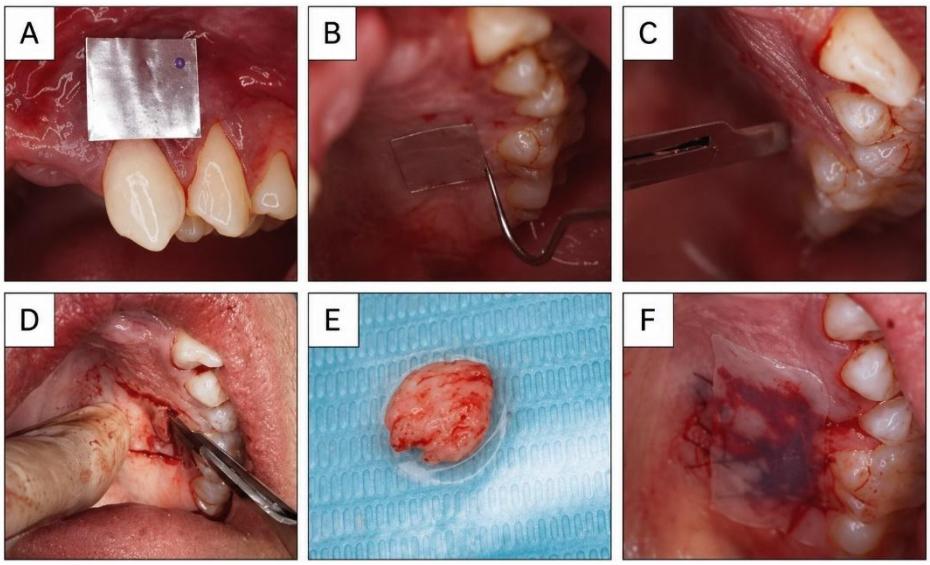

Figure 4. Graft harvesting procedure at the donor area. A. Alumunium foil as a surgical template; B. Marking according to the template; C. Incision with blade 15; D. SCTG harvesting using trapdoor technique; E. Subepithelial Connective Tissue Graft F. Suturing and application of Ora-Aid.

The next step was placement of the graft into the recipient area. Deepithelialization was performed at the distal and mesial gingival margins of tooth 23, which would be sutured together. The graft was carefully placed into the tunnel through the sulcus of tooth 23 and secured by suturing the mesial and distal regions with 6-0 resorbable sutures.

The flap on tooth 23 was brought together (unify the mesial and distal margins) to close the gaps creating Laterally closed tunnel and secured with simple interrupted sutures. For tooth 24, the flap was raised using a belt-suspender suture technique with additional composite resin on the incisal contact point of the tooth to achieve stability around the flap, while positioning the flap in coronal direction thereby achieving the Modified Coronally Advanced Tunnel technique.

A periodontal pack was applied postoperatively to protect the surgical site, stabilize the flap and grafted tissues, reduce mechanical irritation, and enhance patient comfort during the early healing phase. Postoperatively, the patient was prescribed amoxicillin 500 mg for 5 days to prevent postoperative infection, particularly considering the presence of two surgical sites; potassium diclofenac 50 mg for pain and anti-inflammation; and a 0.12% chlorhexidine gluconate mouth rinse to be used twice daily for 7 days.

The patient was instructed to avoid toothbrushing at the surgical sites for the first 10-14 days to prevent mechanical trauma and accidental dislodgement of the periodontal pack or displacement of the flap during the early healing phase. During this period, plaque control was maintained using a 0.12% chlorhexidine gluconate mouth rinse, and the patient was advised to avoid hot, hard, or spicy foods and beverages.

Following initial soft tissue healing, gentle toothbrushing was resumed using a soft-bristle toothbrush with the Charter's technique. This technique involves

positioning the bristles at a 45-degree angle toward the occlusal surface and gently directing them interproximally to facilitate plaque removal while minimizing trauma to the healing gingival tissues. The patient was advised to apply light pressure and avoid horizontal brushing movements at the treated sites

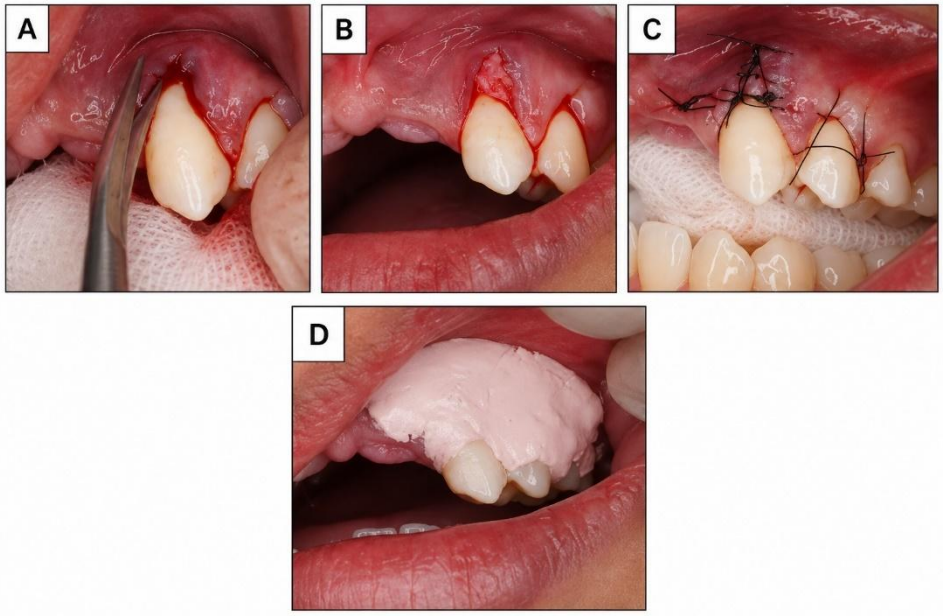

Figure 5. Graft placement procedure into the recipient area. A. De-epithelialization with microscissor; B. Inserting the graft into the recession area 23; C. Suturing belt-suspenders dan simple interrupted; D. Periodontal pack application.

The third visit was conducted 7 days postoperatively to evaluate the healing. The surgical area remined erythematous, but the patient reported no pain. The Ora-Aid dressing at the palatal site had detached, and granulation tissue had begun to form.

At the fourth visit, conducted 10 days postoperatively, the sutures were removed, and saline irrigation was performed. The operative areas remained slightly erythematous, indicating mild inflammation; , however, the patient reported no pain or discomfort . An increase in the width and thickness of the keratinized gingiva was observed at tooth 23.

At the fifth visit, 1 month postoperatively, an increase in gingival dimensions was clinically evident. The width of keratinized gingiva at tooth 24 increased from 5 mm preoperatively to 6.5 mm postoperatively, while at tooth 23 it increased from 0 mm preoperatively to 5 mm postoperatively. Gingival thickness increased from 0 mm to 2 mm, as assessed clinically. A slight enlargement of the gingival tissue was observed and was attributed to the incorporation and maturation of the subepithelial connective tissue graft, resulting in a relatively bulky gingval appearance .

The gingival tissue had begun to exhibit a coral-pink appearance; however, mild marginal erythema persisted around tooth 23. The erythematous area in the cervical region of tooth 23 was suspected to be associated with traumatic occlusion, potentially related to extrusion of teeth 31 and 32 following the previous trauma. Consequently, occlusal adjustment was performed during this visit. Dentin hypersensitivity associated with gingival recession was evaluated using a VAS following air blast stimulation. The VAS score decreased from 7 preoperatively to 0 in the 1-month follow-up, indicating a significant reduction in hypersensitivity.

At the sixth visit, 3 months postoperatively, the gingiva appeared coral pink, and the palatal site had healed. No gingival recession relapse was observed. Root coverage of tooth 23 was 80%, with 6 mm of the initial 7 mm recession cevered leaving 1 mm of residual recession. Tooth 24 achieved 100%/ complete root coverage. The donor site had begun to regain its tissue thickness. The patient

reported no dentin hypersensitivity and expressed satisfaction with the treatment outcome.

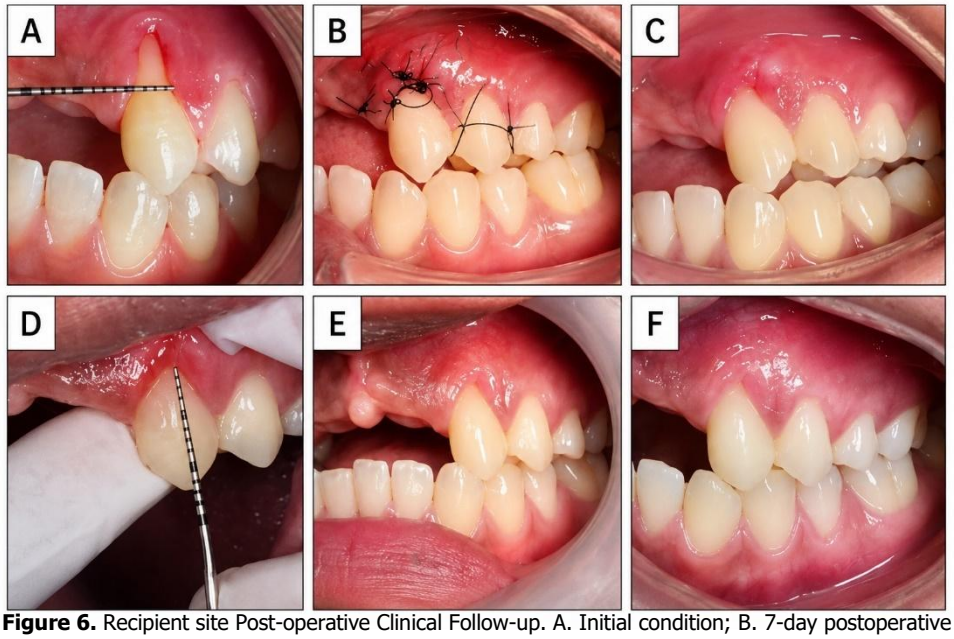

Figure 6. Recipient site Post-operative Clinical Follow-up. A. Initial condition; B. 7-day postoperative evaluation; C. 10-day postoperative evaluation; D. 1-month postoperative evaluation; E. 2-month postoperative evaluation; F. 3-month postoperative evaluation.

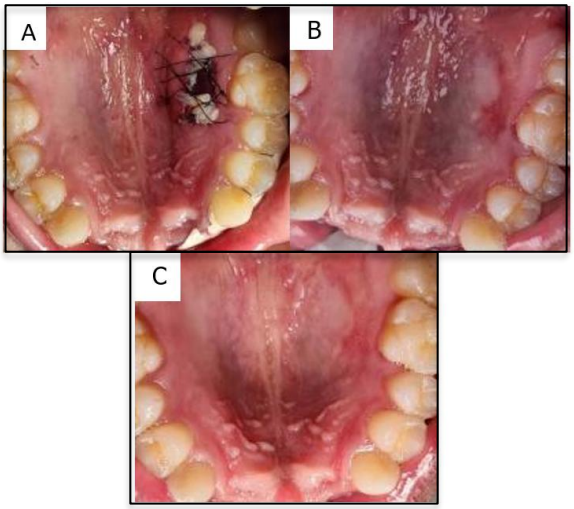

Figure 7. Postoperative clinical follow-up of the donor site; A. 7-day postoperative evaluation; B. 1-month post-operative evaluation; C. 3-month postoperative evaluation.

DISCUSSION

The combination of modified tunnelling technique (MCAT and LCT) with subepithelial connective tissue graft (SCGT) was chosen in this case, considering the inadequate width of keratinized gingiva and thin gingival phenotype at the recession sites (Figure 1). The tunnel approach is considered a predictable treatment option for managing multiple adjacent gingival recessions in the maxillary region, where achieving predictable root coverage is often challenging because of anatomical limitations and high esthetic demands.[8] Previous studies have reported satisfactory root coverage results with this technique.

The clinical outcomes observed in this case are consistent with these previously reported findings. As illustrated in the postoperative follow-up images (Figure 6), this technique preserves adequate vascular supply and nutrition to the graft, ensures proper adaptation to the recipient site, enhances aesthetic

outcomes, and increases the thickness of the keratinized gingiva.[8] This approach consists of creating a partial-thickness "envelope" that allow flap elevation and insertion of a CTG without detachment of the papillary tissues or the use of vertical releasing incisions. [17,18] These features may contribute to faster healing and less postoperative morbidity.[18,19] This principle was reflected in the progressive increase in the width and thickness of the keratinized tissue observed at teeth 23 and 24 during the 1- and 3-month postoperative follow-ups.

The subepithelial connective tissue graft is used in a bilaminar technique designed to optimize supraperiosteal and gingival vascularization to the graft. It is positioned over the recession defect, receiving nutrition and revascularization from the recipient bed, interdental papillae, and the overlying flaps.[20]

In this case, the SCTG was harvested using a trapdoor technique (Figure 4). The trapdoor technique consists of one horizontal incision and two vertical incisions. The horizontal incision was made according to the required graft dimensions (8x10 mm) and positioned 2 mm apical to the gingival margin. At the end of the horizontal incision a vertical incision was made approximately 1 mm coronal to the intended graft dimensions. The primary flap was then elevated using partial-thickness approach.

The present case demonstrated successful harvesting of an adequately sized graft with satisfactory tissue quality, allowing sufficient graft thickness for root coverage procedures. These findings are consistent with previous reports indicating that the trapdoor technique using three incisions facilitates a good access for harvesting SCTG and is commonly recommended when a larger connective tissue graft is required .[21] A recession width of ≥ 3 mm is considered a wide recession, whereas a width of < 3 is considered narrow.[22] Factors such as high muscle tension and a shallow vestibule may play an important role in the treatment outcome.[8] The tooth location may significanlty affect the success of gingival recession treatment, as different anatomical characteristics associated with specific tooth positions may affect the predictability of root coverage outcomes.[23]

In this case, the recession widths at teeth 23 and 24 were 4 mm and 3 mm, respectively (Figure 1), classifying both as wide recessions. Additionally, tooth 23 presented with mesiopalatal torsiversion malposition and interproximal bone loss (Figure 2), which increased the complexity of this case. Previous studies have shown that wide recession defects, tooth malposition, and loss of interproximal periodontal support are associated with lower predictability of complete root coverage as they may limit flap adaptation and compromise the vascular supply necessary for optimal wound healing.[23]

According to the Miller and Cairo classifications, complete root coverage is generally not expected in Miller Class III or Cairo RT2 recessions due to compromised interproximal support.[4] Root coverage procedures for gingival recession are often performed for aesthetic purposes: however, treatment outcomes should not be evaluated solely based on the percentage of root coverage, but also on functional improvements, particularly the reduction of dentin hypersensitivity and functional aspect.[24]

Despite these unfavorable anatomical conditions, the present case achieved approximately 85.7% root coverage at tooth 23 and complete (100%) root coverage at tooth 24, as documented at the 3-month follow-up (Figure 6). Specifically, the recession depth at tooth 23 decreased from 7 mm to 1 mm, while the recession width decreased from 4 mm to 2 mm. The width of keratinized gingiva also increased substantially, from 0 mm to 5 mm.

These clinical outcomes are comparable to those reported in previous studies demonstrating favorable root coverage outcomes following the use of tunnel techniques combined with subepithelial connective tissue grafts. Zucchelli et al. demonstrated that the modified coronally advanced tunnel (MCAT) technique combined with SCTG achieved a mean root coverage ranging from approximately 87% to 94% in patients with multiple gingival recessions, with complete root

coverage being highly predictable in Cairo RT1 defects but less predictable in RT2 defects because of interproximal attachment loss

These outcomes exceeded the expected predictability of complete root coverage for Miller Class III/Cairo RT2 recessions. This was aggravated by irregular alveolar bone resorption and inadequate keratinized gingiva.[6] Complete root coverage (100%) was achieved at tooth 24.

Along with the morphological improvements, favorable functional outcomes were also observed. Dentinal hypersensitivity is another common finding in patients with gingival recession defects. Exposure of dentinal tubules results in hydrodynamic liquid flow that activates pain sensation.[25] Dentin hypersensitivity associated with gingival recession, assessed using a visual analog scale (VAS), decreased from a preoperative score of 7 to 0 at the 1-month follow-up and remained absent at the 3-month evaluation. This finding is consistent with previous reports indicating that successful root coverage and increased soft tissue thickness significantly reduce dentin hypersensitivity by protecting exposed root surfaces.[26] No post-operative complications were found. In this case, the patient expressed satisfaction with the treatment outcome, particularly because of the improvement in the aesthetic appearance of the gingival tissue and teeth.

In addition to the recession surgery technique, another factor that influences treatment success is the suturing technique. Suturing plays a pivotal role in the success of periodontal surgery by ensuring close adaptation of the operated tissues and stabilizes the wound during healing, therby facilitating early primary closure. Careful selection of suture type and placement within the surgical area is therefore essential.[27] In this case, a belt-and-suspenders suture was used, providing optimal coronal traction of the gingival–papillary complex while preserving soft tissue stability and vascularization.[28]

This technique, presented by Ronco and Dard, consists of modified anchored horizontal and vertical mattress sutures.[29] Proximal tooth contacts splinted with composite resin material before surgery could be an option for anchoring sutures.[30] This suture, by surrounding the teeth with fixed anchor points, can pull and fix the flap in the proper position. Furthermore, extra vertical traction can restore harmonious gingival anatomy and appearance in the CEJ area.[21]

The limitation of this case report lies in its single-patient design and relatively short follow-up period, which restrict the generalizability of the findings and preclude definitive conclusions regarding long-term stability and predictability of root coverage outcomes, particularly Miller Class III/Cairo RT 2 recessions.

CONCLUSION

The use of modified tunneling techniques, including the modified coronally advanced tunnel (MCAT) and laterally closed tunnel (LCT) combined with subepithelial connective tissue graft (SCTG), resulted in favorable root coverage, increased soft tissue thickness, and satisfactory esthetic outcomes in the management of multiple gingival recessions associated with tooth malposition. These findings suggest that this approach may represent an effective treatment option for complex gingival recession defects where conventional techniques may be challenging. Clinicians may consider this combined approach as an alternative treatment strategy for selected cases with similar clinical characteristics.

The clinical implication of this report is the potential role of minimally invasive periodontal plastic surgery techniques in the management of complex recession defects while addressing both functional and esthetic outcomes. Further studies with larger patient populations and longer follow-up periods are needed to establish the long-term predictability, stability and broader clinical applicability of this combined approach.

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Informed Consent Statement: Written informed consent was obtained from the patient for publication of this case report.
Data Avaibility Statement: The data supporting the findings of this case are available from the corresponding author' upon reasonable request.
Conflicts of Interest: The authors declare no conflict of interest.

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