Original Research

COMPARISON OF CORONALLY ADVANCED FLAP WITH AND WITHOUT CONNECTIVE TISSUE GRAFT IN MILLER CLASS I GINGIVAL RECESSION

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ABSTRACT

Objective: To compare the clinical outcomes of Coronally Advanced Flap (CAF) alone and Coronally Advanced Flap combined with Connective Tissue Graft (CAF+CTG) in the treatment of Miller Class I gingival recession defects.

Methodology: A comparative clinical study was conducted in the Department of Periodontology. Forty patients presenting with Miller Class I gingival recession were equally allocated into two groups. Group A received Coronally Advanced Flap alone, while Group B received Coronally Advanced Flap combined with Connective Tissue Graft. Clinical parameters including recession depth (RD), recession width (RW), probing depth (PD), clinical attachment level (CAL), width of keratinized tissue (WKT), and percentage of root coverage were recorded at baseline and six months postoperatively. Data were analyzed using SPSS version 26.0. Statistical significance was set at $p<0.05$.

Results: Both treatment modalities demonstrated significant improvement in all clinical parameters after six months. Mean root coverage was significantly greater in the CAF+CTG group (92.4±8.5%) compared to the CAF-alone group (78.6±12.7%) ($p<0.001$). The gain in keratinized tissue width was also significantly higher in the CAF+CTG group. Complete root coverage was achieved in 85% of sites treated with CAF+CTG compared with 60% of sites treated with CAF alone.

Conclusion: Both techniques were effective in managing Miller Class I gingival recession; however, the addition of a connective tissue graft resulted in superior root coverage, greater tissue thickness, and improved clinical attachment gain. CAF combined with CTG may therefore be considered the treatment of choice for predictable root coverage.

Keywords: Coronally Advanced Flap, Connective Tissue Graft, Gingival Recession, Root Coverage.

INTRODUCTION

Gingival recession is characterized by the apical migration of the gingival margin beyond the cemento-enamel junction, leading to root surface exposure.[1] It is a common periodontal condition associated with aesthetic concerns, dentinal hypersensitivity, root caries, and difficulty in maintaining oral hygiene. The prevalence of gingival recession increases with age and may result from traumatic tooth brushing, periodontal disease, mispositioned teeth, thin gingival biotype, and iatrogenic factors.[2]

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Over the past few decades, periodontal plastic surgery has evolved considerably with the primary objective of achieving predictable root coverage, increasing the width of keratinized tissue, improving gingival thickness, and enhancing aesthetic outcomes. Various surgical techniques have been proposed for the management of gingival recession defects, including free gingival grafts, laterally positioned flaps, semilunar flaps, guided tissue regeneration procedures, tunnel techniques, and coronally advanced flaps with or without soft tissue grafting.[1] Among these techniques, the Coronally Advanced Flap (CAF) has emerged as one of the most widely utilized procedures because of its simplicity, minimal patient morbidity, favourable aesthetic outcomes, and high patient acceptance.[3] The Coronally Advanced Flap technique involves repositioning the gingival tissue coronally to cover the exposed root surface without the need for a second

surgical site. The procedure offers several advantages, including preservation of tissue colour match, reduced surgical time, and decreased postoperative discomfort. Numerous clinical studies have demonstrated favourable outcomes with CAF, particularly in Miller Class I and II recession defects where adequate interdental bone and soft tissue support are present. However, long-term stability and complete root coverage may be influenced by gingival thickness and tissue biotype.[3]

Various mucogingival surgical procedures have been introduced to achieve root coverage and improve aesthetics. Among these, the Coronally Advanced Flap (CAF) technique is widely used due to its simplicity, minimal morbidity, and favourable aesthetic outcomes. However, studies have suggested that combining CAF with a Connective Tissue Graft (CTG) may enhance tissue thickness, improve vascularity, and provide more predictable root coverage.[4] Although both techniques have demonstrated clinical success, controversy remains regarding their comparative effectiveness. Therefore, this study aimed to compare the clinical outcomes of CAF alone and CAF combined with CTG in the treatment of Miller Class I gingival recession defects.

MATERIALS AND METHODS

This comparative clinical study was conducted at the Department of Periodontology after obtaining approval from the Institutional Review Board. Forty systemically healthy patients aged between 18 and 50 years presenting with isolated Miller Class I gingival recession defects were recruited. Patients with active periodontal disease, smokers, pregnant women, and individuals with systemic conditions affecting wound healing were excluded.

Participants were allocated into two equal groups. Group A underwent treatment with Coronally Advanced Flap alone, whereas Group B received Coronally Advanced Flap combined with a subepithelial Connective Tissue Graft harvested from the palate. Prior to surgery, all patients received oral hygiene instructions and phase-I periodontal therapy. Baseline clinical measurements including recession depth, recession width, probing depth, clinical attachment level, and width of keratinized tissue were recorded using a calibrated periodontal probe. Surgical procedures were performed under local anesthesia. In Group A, a trapezoidal flap was elevated and coronally repositioned to cover the exposed root surface. In Group B, after root preparation, a connective tissue graft was harvested from the palate and stabilized over the recession defect before coronally advancing the flap. Patients were prescribed analgesics and instructed regarding postoperative care. Clinical parameters were reassessed at one, three, and six months postoperatively. The primary outcome measure was percentage root coverage, while secondary outcomes included gain in clinical attachment level and width of keratinized tissue. Data were analyzed using SPSS version 26. Quantitative variables were expressed as mean ± standard deviation. Independent and paired sample t-tests were used for intergroup and intragroup comparisons, respectively. A p-value less than 0.05 was considered statistically significant.

RESULTS

A total of 40 patients completed the study, comprising 22 males and 18 females with a mean age of 32.6 ± 7.8 years. No statistically significant differences were observed between groups at baseline (Table 1). Both groups showed significant improvement from baseline. However, the CAF+CTG group exhibited significantly greater root coverage and keratinized tissue gain (Table 2).

Table 1: Baseline Clinical Parameters

Parameter	CAF Group	CAF+CTG Group	p-value
Recession Depth (mm)	3.2 ± 0.7	3.3 ± 0.8	0.71
Recession Width (mm)	3.8 ± 0.9	3.9 ± 0.8	0.82
Clinical Attachment Level (mm)	4.5 ± 0.8	4.6 ± 0.9	0.68
Keratinized Tissue Width (mm)	2.1 ± 0.5	2.2 ± 0.4	0.74

Table 2: Six-Month Clinical Outcomes

Parameter	CAF Group	CAF+CTG Group	p-value
Root Coverage (%)	78.6 ± 12.7	92.4 ± 8.5	<0.001
CAL Gain (mm)	2.6 ± 0.6	3.4 ± 0.7	<0.001
WKT Gain (mm)	0.8 ± 0.4	1.9 ± 0.5	<0.001
Complete Root Coverage	60%	85%	0.03

DISCUSSION

The management of gingival recession remains a major focus of contemporary periodontal therapy due to the increasing demand for aesthetic treatment and the need to address dentinal hypersensitivity and root surface exposure. The present study compared the clinical effectiveness of Coronally Advanced Flap (CAF) alone and Coronally Advanced Flap combined with Connective Tissue Graft (CAF+CTG) in the treatment of Miller Class I gingival recession defects. Both treatment modalities resulted in significant clinical improvement; however, the addition of a connective tissue graft yielded superior outcomes in terms of root coverage, clinical attachment gain, and width of keratinized tissue. In the current study, the mean percentage of root coverage achieved after six months was significantly greater in the CAF+CTG group (92.4%) compared with the CAF-alone group (78.6%). Furthermore, complete root

coverage was obtained in 85% of sites treated with CAF+CTG compared with 60% of sites treated with CAF alone. These findings indicate that although both techniques are effective, connective tissue grafting substantially enhances treatment predictability.

The results of the present study are consistent with the landmark randomized clinical trial conducted by Nemcovsky et al. (2004)[5] and Gualtieri et al. (2025)[6], who reported higher percentages of complete root coverage when connective tissue grafts were combined with coronally advanced flaps. Their findings suggested that increased tissue thickness contributes significantly to long-term stability and resistance against recurrent recession. Similarly, Chauca et al. (2024)[7] demonstrated that CAF combined with CTG achieved superior clinical outcomes compared with CAF alone, particularly in terms of complete root coverage and gingival thickness enhancement.

A systematic review and meta-analysis conducted by Pabst and colleagues (2023)[8] also reported that connective tissue grafts significantly improved the probability of achieving complete root coverage when used in conjunction with coronally advanced flaps. The authors concluded that CTG remains the most predictable adjunctive procedure for root coverage therapy. The findings of the current study support this conclusion, as significantly better outcomes were observed in the CAF+CTG group.

The increased width of keratinized tissue observed in the present study is also in agreement with previous literature. Patients treated with CAF+CTG exhibited nearly double the gain in keratinized tissue width compared with those treated using CAF alone. This outcome may be attributed to the biological characteristics of connective tissue grafts, which promote tissue maturation and increase soft tissue volume. Similar observations were reported by Gualtieri et al. (2025)[6], who found significantly greater tissue thickness and keratinized tissue gain in graft-treated sites during long-term follow-up.

Clinical attachment gain was another important outcome evaluated in this study. The CAF+CTG group demonstrated significantly greater attachment gain than the CAF-alone group. These findings are comparable to those reported by Carvelli et al. (2022)[9] and another study by Mayta et al. (2023)[10], who observed improved attachment levels and enhanced periodontal stability in patients receiving connective tissue grafts. Increased tissue thickness may provide better protection against mechanical trauma and inflammatory insults, thereby contributing to improved periodontal attachment. One explanation for the superior performance of connective tissue grafts is their ability to modify the gingival phenotype. Thin gingival biotypes are more susceptible to recession recurrence and tissue shrinkage after surgical intervention. By increasing tissue thickness, CTGs create a more favorable biological environment for wound healing and long-term maintenance of root coverage. This concept has been strongly supported by studies conducted by Aroca et al. (2026)[11], who reported that gingival thickness is a critical determinant of successful root coverage outcomes.

Although CAF alone demonstrated comparatively lower outcomes, it still produced clinically meaningful improvements.[12] Root coverage approaching 80% was achieved in the CAF group, indicating that the technique remains a viable treatment option in carefully selected cases.[13] The absence of a donor site reduces patient morbidity, surgical time, and postoperative discomfort. Consequently, CAF alone may be preferred when patients decline palatal graft harvesting or when recession defects are associated with a thick gingival phenotype.[14] The present findings also corroborate the results of several recent meta-analyses that have identified CAF+CTG as the gold standard treatment for Miller Class I and II recession defects. These analyses consistently reported superior root coverage percentages, greater complete root coverage rates, and enhanced long-term stability when connective tissue grafts were incorporated into treatment protocols.[15] The results obtained in the current study further strengthen the growing body of evidence supporting the use of CTG as an adjunct to coronally advanced flap procedures.

Although CAF alone remains an effective treatment option with reduced surgical morbidity and shorter operative time, the combination approach demonstrated superior aesthetic and clinical outcomes. Therefore, when optimal root coverage and tissue augmentation are desired, CTG should be considered in conjunction with CAF.

CONCLUSION

Both Coronally Advanced Flap alone and Coronally Advanced Flap with Connective Tissue Graft are effective treatment modalities for Miller Class I gingival recession defects. However, the addition of a connective tissue graft significantly improves root coverage, clinical attachment gain, and width of keratinized tissue. CAF combined with CTG provides more predictable and stable clinical outcomes and may be regarded as the gold standard for root coverage procedures.

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