

Assessment of root coverage following periosteal pedicle flap compared to CAF+SCTG: A Randomized Controlled Clinical Trial

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Authorship/ CONTRIBUTION LIST:

All the authors have substantial contribution in the work:

- A. R. Ar. and M. E. were involved in conception and design;
- M. E. performed the data analysis and interpretation;
- M. SD and M. E. performed manuscript drafting.
- All authors have read and approved the manuscript.

Abstract:

Objective: To evaluate the percentage of root coverage following periosteal pedicle flap inversion (PPF) compared to CAF with SCTG (CAF+SCTG) in the treatment gingival recession.

Materials and methods: Twenty gingival recession defects were randomly assigned to receive either CAF+SCTG (n=10) or PPF (n=10). Percentage of root coverage (%RC) was assessed at 3 and 6-months follow-up.

Results: Patients in the PPF group reported 66.85%±20.76% percentage of coverage (%RC) at 3 months, while at 6 months it increased to 85.74%±13.95%. In the control group, the percentage of root coverage at 3 months was 82.74%±17.34%, while at 6 months it increased to 92.78%±10.93%.

Conclusion and recommendation: Despite PPF could not show significant difference in root coverage outcome compared to SCTG at the 6-months follow up, further studies with longer follow-up time is required.

Keywords: recession type; Miller class II; Miller class III

Introduction:

Currently, coronally advanced flap with subepithelial connective tissue graft (CAF+SCTG) is considered to be the most predictable root coverage technique that

provides superior outcomes in terms of esthetics and complete root coverage with prolonged stability of the achieved results [1,2]. These superior outcomes could be attributed to the enhanced graft vascularity from both, the

underlying recipient bed vascularization and the covering flap [3].

However, graft harvesting from a second surgical site contributes to increased post-operative morbidity, prolonged surgical procedure in addition to the limited availability of graft tissue that could be insufficient to cover large surgical defects [4]. Consequently, several harvesting techniques from the palate, the most popular donor site of SCTGs, were presented seeking for reduced patient's pain/discomfort [5-7].

Besides, trials to find other donor sites were conducted including, graft harvesting from the tuberosity that has been reported to cause less Using the periosteum as a graft for root coverage procedures has been introduced by *Mahajan et al.* [14,15]; *Shetty* [16] and *Mahajan* [17]; they suggested that it can achieve the desired requirement of an autogenous graft that has its own blood supply, can be harvested from the same surgical site in sufficient amount, with possession of regenerative cells and fibrous content. However, periosteal pedicle flaps (PPFs) are still lacking evidence on using them for root coverage, due to the scarce randomized controlled clinical trials to compare them with SCTGs [17, 18].

METHODS

Settings. The protocol of the current randomized clinical trial received ethical approval and the study was performed in accordance with the Declaration of Helsinki and its amendments.

Participants. The current RCT included 20 patients with gingival recession defects of Miller classes I, II and III; root coverage surgical interventions were performed.

Participants included in the present study were not previously treated by other surgical root coverage procedures. Patients were included when having full mouth plaque score (FMPS) and full mouth bleeding score (FMBS) that did not exceed 20% and 5% respectively.

Exclusion criteria included patients having systemic disorders or taking medications that contraindicate surgical intervention, heavy smokers and cases with acute infection or inflammation in the surgical site.

pain and morbidity [8, 9]. It was reported that the higher fibrous content and decreased fatty and glandular tissue of the obtained graft compared to grafts harvested from the palate contributed to achievement of promising results [10].

In addition, connective tissue graft substitutes were introduced in an attempt to evade a second surgical site for graft harvesting and provide unlimited amount of graft tissue for large defects [11]. However, evidence for their ability to replace SCTGs with comparable outcomes remains scarce in literature and the need for an autogenous graft remains the gold standard to obtain predictable results [1, 12, 13].

Interventions. Detailed explanation of the study was provided to each eligible patient. Participants were then randomly allocated to either the test group (PPF) or the control group (CAF+SCTG). Random sequencing was generated.

Study steps. Professional periodontal treatment was performed to eligible patients. Oral hygiene instructions, patients' education and motivation were applied. Then, follow-up till inflammation subsided and patients could maintain their oral hygiene properly was performed.

Surgical procedures. a) For the PPF group: Local anesthesia administration, then split-thickness flap was reflected. Afterwards, the periosteum was bluntly dissected and inverted to cover the exposed root surface. Then, the PPF was secured at the level of the CEJ and the flap was then coronally advanced by sling sutures; b) The CAF procedure was carried out in the form of split-full-split thickness flap with trapezoidal design; whereas SCTG harvesting was by trap-door technique.

Postsurgical instructions and infection control. 600 mg ibuprofen tablet was prescribed before the surgery and repeated after 6 hours. Tooth brushing in the surgical area was stopped for 3 weeks. 0.12% Chlorhexidine mouth wash for 1 minute three times daily was also prescribed. Suture removal was after 14 days.

Outcome. Patients were followed up for a period of 6 months after the root coverage interventions for assessment of percentage of root coverage (%RC).

Statistical analysis. For comparing two groups mean of numerical quantitative variables, the independent samples t-test was applied.

RESULTS

In the test group, the percentage of root coverage at 3 months was $66.85\% \pm 20.76\%$, while at 6

months it increased to $85.74\% \pm 13.95\%$. In the control group, the percentage of root coverage at 3 months was $82.74\% \pm 17.34\%$, while at 6 months it increased to $92.78\% \pm 10.93\%$.

Mean and standard deviation (SD) for percentage of root coverage after 3 and 6 months in both groups are presented in table (1) and figure (1).

Table (1): Mean and standard deviation (SD) for percentage of root coverage in the two groups

	3 months		6 months	
	Mean	SD	Mean	SD
Test group [n=9]	66.85%	20.76%	85.74%	13.95%
Control group [n=9]	82.78%	17.34%	92.78%	10.93%

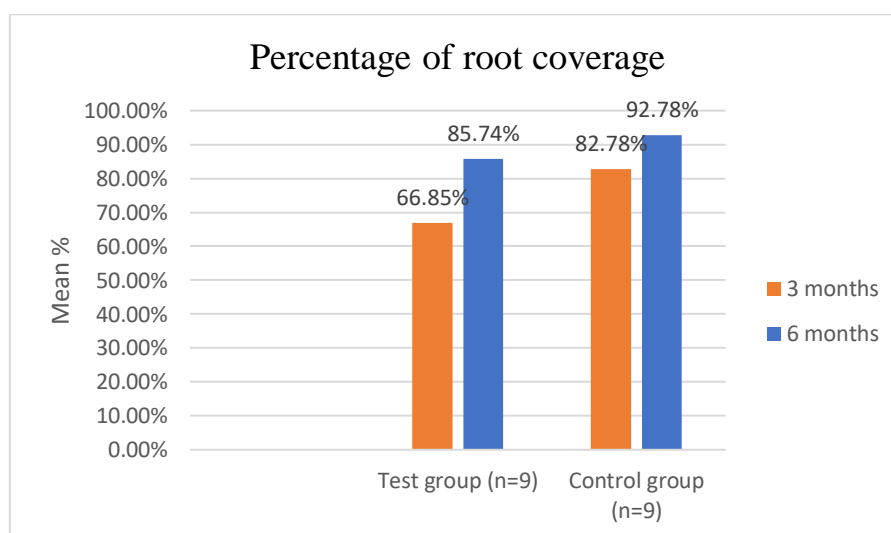


Fig. (1): Bar chart showing mean percentage of root coverage in the two groups

Discussion:

As described by *Zucchelli et al.* [19] and *Cao et al.* [20], gingival recession is a widespread clinical symptom that follows periodontal tissue damage, with subsequent apical migration of the gingival margin along the root surface, exposing CEJ and a substantial amount of the root of the affected tooth/teeth to the oral environment. Dentinal hypersensitivity, root surface caries and/or non-carious cervical lesions (NCCL), esthetic problem(s) and impaired oral hygiene practice are common well established sequelae [11].

By the evolution of the pink-and-white esthetics era, *Cao et al.* [20] stated that more stringent criteria regarding both the gingival and teeth forms, along with their harmony have progressed; and subsequently specialists' and patients' concerns for gingival recession problems have increased, rendering the treatment and correction of gingival recession defects essential parts of general oral treatment.

In consequence, numerous techniques and modifications for management of gingival recession defects have been presented in periodontal plastic literature [21-23]. However,

as many and variable the proposed techniques are, a recent systematic review conducted by *Bertl et al.* [2] reported the rarity of sufficient clinical trials to assess the root coverage stability among these techniques, particularly when using graft substitutes. Furthermore, the systematic review failed to reach a conclusion confirming or refuting a comparable long-term stability of the attained root coverage following graft substitutes application to that obtained by autologous grafts.

Besides, *Bertl et al.* [2] stated that even SCTG – that is considered the gold standard for gingival recession treatment – has well-reported shortcomings. For instance, they mentioned that although it provides stability and predictable clinical parameters, it fails to provide sufficient graft tissue for large defects; in addition to its well-reported postoperative pain particularly at the donor site. Therefore, the current study was held in an attempt to propose a novel technique using an autogenous soft tissue graft; namely periosteal pedicle flap (PPF).

The outcome of the present study was percentage of root coverage (%RC) as a clinical parameter. At 3-months follow up, 66.85%±20.76% was achieved by PPF and 82.74%±17.34% by SCTG group. After 6 months following the surgical procedures, 85.74% was achieved by PPF and 92.78% by SCTG. This was in accordance with several studies for SCTG that reported %RC >90% [24-26].

The aforementioned results highlighted that an apparent superiority was attributed to SCTG over PPF in the mean root coverage at 3 months postoperatively. However, the longer-term outcomes showed comparable results of both techniques at 6 months. Therefore, further studies are required with longer follow-up time to show the ability of PPF to accommodate closer %RC.

Conclusion:

PPF can be a promising alternative to SCTG for root coverage that can attain comparable root coverage outcomes but after longer follow-up time.

References:

- [1] Chambrone, L., Ortega, S. M. A., Sukekava, F., Rotundo, R., Kalemaj Z., Buti J. and Pini Prato, G. P. (2018). Root coverage procedures for treating localized and multiple recession-type defects. *Cochrane Database of Systematic Review*, 10.
- [2] Bertl, K., Spineli, L. M., Mohandis, K. and Stavropoulos, A. (2021). Root coverage stability: A systematic overview of controlled clinical trials with at least 5 years of follow-up. *Clin Exp Dent Res.*, 1–19.
- [3] Zucchelli, G., Mounssif, I., Mazzotti, C., Montebugnoli, L., Sangiorgi, M., Mele, M. and Stefanini, M. (2014). Does the dimension of the graft influence patient morbidity and root coverage outcomes? A randomized controlled clinical trial. *J Clin Periodontol*, 41(7): 708–716.
- [4] Imber, J. and Kasaj, A. (2021). Treatment of Gingival Recession: When and How? *Int Dent J*, 71(3): 178-187
- [5] Langer, B. and Langer, B. (1985). Subepithelial connective tissue graft technique for root coverage. *J Periodontol*, 56(12):715-720.
- [6] Hürzeler, M. B. and Weng. D. (1999). A single-incision technique to harvest subepithelial connective tissue grafts from the palate. *The International Journal of Periodontics & Restorative Dentistry*, 19:279–287.
- [7] Zuhr, O., Bäumer, D. and Hürzeler, M. (2014). The addition of soft tissue replacement grafts in plastic periodontal and implant surgery: critical elements in design and execution. *J Clin Periodontol*, 41 (15): S123–S142.
- [8] Amin, P. N, Bissada, N. F., Ricchetti, P. A., Silva, A. P. B. and Demko, C. A. (2018). Tuberosity versus palatal donor sites for soft tissue grafting: A split-mouth clinical study. *Quintessence International*, 49, 589–598.
- [9] Konflanz, W., Orth, C., Keller, C., Muniz, F., Haas, A. (2021). Influence of Donor Site and Harvesting Technique of Connective Tissue Graft on Root Coverage Outcomes of Single Gingival Recessions: Systematic Review and Meta-analyses. *J Int Academy Periodontol*, 23: 79-98.

- [10] Sanz, M. I., Rojo, E., Maldonado, E., Stroppa, G., Nart, J., Sanz, M. (2019). Structural and histological differences between connective tissue grafts harvested from the lateral palatal mucosa or from the tuberosity area. *Clinical Oral Investigations*, 23:957–964.
- [11] Stefanini, M., Marzadori, M., Aroca, S., Felice, P., Sangiorgi, M. and Zucchelli, G. (2018). Decision making in root-coverage procedures for the esthetic outcome. *Periodontology 2000*, 77(1):54–64.
- [12] Tonetti, M. S., Cortellini, P. and Pellegrini, G., (2018). Xenogenic collagen matrix or autologous connective tissue graft as adjunct to coronally advanced flaps for coverage of multiple adjacent gingival recession: randomized trial assessing non-inferiority in root coverage and superiority in oral health-related quality of life. *J Clin Periodontol*, 45:78-88.
- [13] Tonetti, M.S., Cortellini, P., Bonaccini, D., Deng, K., Cairo, F., Allegri, M., Conforti, G., Graziani, F., Guerrero, A., Halben, J., Malet, J., Rasperini, G. and Topoll, H. (2021). Autologous connective tissue graft or xenogenic collagen matrix with coronally advanced flaps for coverage of multiple adjacent gingival recession. 36-month follow-up of a randomized multicentre trial. *J Clin Periodontol*, 48: 962-969.
- [14] Mahajan, A. (2010). Mahajan's modification of Miller's classification for gingival recession. *Dental Hypotheses*, 1: 45-50
- [15] Mahajan, A. (2012). Periosteum: a highly underrated tool in dentistry. *Int J Dent*: 717816.
- [16] Shetty, N. (2014). Inverted periosteal technique – a solution to multiple teeth recession. *Dent Open J*, 1(1):10–13.
- [17] Mahajan, A. (2018). A review of periosteal pedicle graft technique for the management of gingival recession defects. *Adv Surg Res*, 2(1):10-14.
- [18] Singh N., Uppoor A. and Naik D.G. (2015). Bone's smart envelope - The periosteum: Unleashing its regenerative potential for periodontal reconstruction. *Int J Contemp Dent Clin Med Rev*, 2015.
- [19] Zucchelli, G., Sharma, P. and Mounssif, I. (2018). Esthetics in periodontics and implantology. *Periodontology 2000*, 77(1):7–18.
- [20] Cao, Q., Lu, R., Chen, J., Pan, H., Feng, H., Liu, B. and Wang, Y. (2021). Treatment of gingival recession with microinvasive surgical technology. *J Nanomaterials*.
- [21] Lindhe, J., Lang, N. and Karring, T. (2008). Mucogingival therapy. Periodontal plastic surgery. In: Ermes E, editor. *Clinical periodontology and implant dentistry. 5th edn. Oxford, Blackwell Munksgaard*: 995–1043.
- [22] Cortellini, P. and Pini Prato, G. (2012). Coronally advanced flap and combination therapy for root coverage. Clinical strategies based on scientific evidence and clinical experience. *Periodontology 2000*, 59: 158-184.
- [23] Zucchelli, G., and Mounssif, I. (2015). Periodontal plastic surgery. *Periodontology 2000*, 68(1), 333–368.
- [24] McGuire, M.K., Scheyer, E.T. and Schupbach, P. (2009), Growth Factor–Mediated Treatment of Recession Defects: A Randomized Controlled Trial and Histologic and Microcomputed Tomography Examination. *J Periodontol*, 80: 550-564.
- [25] McGuire, M. K., and Scheyer, E. T. (2010). Xenogeneic collagen matrix with coronally advanced flap compared to connective tissue with coronally advanced flap for the treatment of dehiscence-type recession defects. *J Periodontol*, 81(8), 1108-1117.
- [26] Jankovic, S., Aleksic, Z., Milinkovic, I. and Dimitrijevic, B. (2010). The coronally advanced flap in combination with platelet rich fibrin (PRF) and enamel matrix derivative in the treatment of gingival recession: a comparative study. *European Journal of Esthetic Dentistry*, 5: 260–73.