

Comparative evaluation of gingival recession coverage by coronally advanced flap versus semilunar coronally repositioned flap- A clinical study

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Abstract

Background: The objective of the study was to compare the clinical outcomes of the semilunar coronally repositioned flap and coronally advanced flap (CAF) procedure in the treatment of Miller's class I gingival recession defects in maxillary teeth.

Material And Methods: 4 patients, with Miller's class I gingival recession defects were selected and randomly divided into two Groups 1 / Sites 1: - CAF, Group 2/ Site 2: - SCRF Clinical parameters plaque index, gingival index, width of keratinized gingiva, clinical attachment loss, recession width, recession height and percentage of root coverage were recorded at baseline, 1 month and 3 months.

Results: In both intergroup and intragroup comparison of recession height was statistically non-significant ($p > 0.05$) with comparative less mean recession height in group 1 in 3 months. In terms of recession width, the intergroup comparison showed statistically non-significant among 2 groups but in intra group comparison it was statically significant ($p \leq 0.05$) with comparative more recession width in group 1 at 3 months.

Conclusion: CAF is predictable in treatment of gingival recession. It provides consistently better result than SCRF for the treatment of Miller's class 1 gingival recession defect.

Keywords: Coronally Advanced Flap, Gingival Recession, Root Coverage, Semilunar Flap

Introduction

Gingival recession (GR) is defined as the location of gingival margin apical to the cemento–enamel junction (AAP 2001)¹. Many patients seek treatment because of concerns with unacceptable aesthetic appearance, root hypersensitivity or fear of early loss of the affected teeth as well as difficulty in achieving optimal plaque control. Gingival Recession is often complicated by root caries, chemical erosion and mechanical abrasion on the exposed root surface and cervical enamel or a combination of the above¹.

Marginal tissue recession is a common feature in populations with high standards of oral hygiene as well as in populations with poor oral hygiene. The predominant cause for localized gingival recessions in populations maintaining high standards of oral hygiene is tooth brushing trauma. Other causes of gingival recession include, labially/buccally positioned teeth, frenal and muscle attachments that encroach on marginal gingiva and orthodontic tooth movement through a thin buccal osseous plate.²

Several surgical approaches have been used with an aim to obtain complete root coverage (CRC) and to improve aesthetics, but also to increase the thickness of soft tissue covering the recession to enable the long-term stability. Complete root coverage is considered the true goal of treatment because only complete coverage assures recovery from the hypersensitivity and aesthetics defects associated with recession areas. These include numbers of surgical techniques such as Coronally or laterally positioned pedicle graft, epithelized free tissue grafts, subepithelial connective tissue grafts, guided tissue regeneration (GTR) as novel approaches to achieve improvement in recession depth, clinical attachment level and width of keratinized tissue.

Coronally advanced flap (CAF) was coined by **Pini Prato et al. in 1999**. Coronally advanced flap (CAF) is one of the most widely used surgical techniques indicated for the treatment of Miller's class I and class II gingival recession defects⁴. Among the surgical procedures used for root coverage, it results in optimum root coverage, good color blending with respect to adjacent soft tissues, and good recovery of original soft tissue morphology.

The Coronally advanced flap (CAF) procedure does not involve a palatal donor site, and therefore it is a safe and predictable approach. In patients with high aesthetic expectations, the CAF is the first choice when there is adequate keratinized tissue apical to the root exposure. With this technique, the soft tissue used to cover the root exposure is similar in color, texture, and thickness to that actually present at the buccal aspect of the tooth with the recession defect³. This technique can be used alone or in combination with soft tissue grafts, barrier membrane, enamel matrix derivative (EMD), acellular dermal matrix (ADM), platelet rich plasma (PRP) and living tissue engineered human fibroblast derived dermal substitute (HF-DDS).

Semilunar coronally repositioned flap (SCRFF) is another simple minimally invasive technique for coronal advancement of gingival margin. The technique was introduced by **Tarnow in 1986**. The technique involves a semilunar incision made parallel to the free gingival margin of the facial tissue and coronally positioning this tissue over denuded roots. Tarnow reported the semilunar coronally repositioned flap technique as a procedure indicated for the treatment of gingival recession in areas with minimal labial probing depth (PD) and adequate band of keratinized gingiva⁴. This technique has the advantages over coronally positioned flap, in that no disturbance of the adjacent papillae, no shortening of the vestibule, and no tension on the flap. Besides these advantages, no sutures are needed. Case reports have shown a high success rate for this procedure and two controlled clinical trials with a 6 month follow up confirmed the predictability of this technique to treat Miller class 1 gingival recession defects.

This technique is very simple and predictably provides 2- 3mm of root coverage. It can be performed on several adjoining teeth, but even though the incision may be continuous, extreme care should be exercised not to dissect the blood supply. Tarnow technique is successful for the maxilla particularly in covering root left exposed by the gingival margin.

So far, very few studies have been reported comparing the two simple techniques; Coronally advanced flap and Semilunar coronally repositioned flap. Hence in the present study an attempt was made to compare and evaluate the clinical outcomes of the Semilunar coronally repositioned flap and Coronally advanced flap (CAF) procedure in the treatment of Miller's class I gingival recession defects in maxillary teeth⁴.

Materials and Methods

Study population

This was a pilot study done in the Department of Periodontology and Implantology, National Dental College and Hospital Derabassi Punjab. Ethical approval was taken from the institutional review board committee and written consent from each of the patient. A total 4 patients with Miller class 1 gingival recession defects in maxillary anterior were enrolled in the study and were randomly assigned to receive treatment with either Coronally advanced flap technique or Semilunar coronally repositioned flap were randomly treated as follows:

Group 1/ Site 1: 4 gingival recession sites were treated with coronally advanced flap

Group 2/Site 2: 4 gingival recession sites were treated with semilunar coronally repositioned flap.

Inclusion Criteria

- 1) Patient of both sexes between the age group of 20-45 years.
- 2) Patients who will be diagnosed with Miller's class I gingival recession defects.
- 3) Adequate zone of attached gingiva.
- 4) Sulcus probing depth 0-3mm.
- 5) Absence of bleeding on probing.
- 6) Tooth should be vital.
- 7) Absence of dental caries in the area to be treated.
- 8) Patient with no contraindication for periodontal surgery.
- 9) No use of medication known to interfere with periodontal health.

Exclusion Criteria

- 1) Miller's class II, III and IV gingival recession defects.
- 2) Thin gingival biotype.
- 3) Contraindication for periodontal surgery.
- 4) Patient on medication known to interfere with periodontal tissue health and healing in the proceeding 6 months.
- 5) Smokers, subjects with immunosuppressive systemic diseases, poor oral hygiene, high frenal attachment, occlusal interfere, malaligned teeth, cervical abrasion, caries and restoration.

Assessment of Clinical Parameter

Baseline plaque and gingival index score were recorded according to Sillness & Loe and Loe and Silness, respectively. Clinical parameters were assessed at the mid-facial surface of teeth using CEJ as the reference point. All measurements were recorded using a UNC 15 (University of North Carolina) periodontal probe at baseline, 1 month and 3 months. Measurements were recorded to the nearest millimetre. Recession Height (RH) was measured as the distance from CEJ to gingival margin (GM). Width of keratinized tissue (WKT) was measured from distance between the most apical point of

the gingival margin to muco gingival junction (MGJ), Recession Width (RW) was measured from the greatest mesiodistal dimension of the gingival recession defects. The calculation of root coverage percentage was assessed as preoperative recession height – post operative recession height \times 100%

Surgical Procedure

After taking proper case history and clinical examination, initial case preparation included hand scaling and root planning, oral hygiene instructions with Modified Stillman's brushing technique and repeated scaling and root planning after 1 week was performed. Four cases were selected which were divided into two groups Group I (Coronally advanced flap) and Group II (Semilunar Coronally repositioned flap).

Group1/Site1- Coronally advanced flap (CAF)

The CAF was designed performing two vertical releasing incisions at both the mesial and distal aspects of the recession to be treated, in such a way that both the proximal papillae was included as part of the flap. Papillae were never bisected. Beveled divergent vertical incisions was performed in the attached gingiva, initiating at the CEJ level on the mesial and distal line angles of the tooth, avoiding the formation of butt joints between the flap and adjacent tissues, and was continued several millimetres apically into the alveolar mucosa.

The vertical incisions were joined by an intra-sulcular incision (**Figure 1 B**). In the interproximal area, the papillae were split in a mesio-distal dimension, resulting in a flat surface of connective tissue for contact between the flap tissues and the retained portion of the papillae after re-positioning and suturing of the flap. A combined mucoperiosteal–mucosal trapezoidal flap was elevated such that the first 3–4 mm coronal aspect of the alveolar bone was exposed, while the remaining buccal bone was still covered by the periosteum and gingival connective tissue. A complementary horizontal incision was performed on the apical aspect of the flap, by means of a partial-thickness dissection, releasing the flap from the attached periosteum and muscle fibres (**Figure 1 C**). This allowed the elongation and free coronal positioning of the flap. The flap was, then, positioned at least 1 mm coronal to the CEJ and maintained in place by means of individual 5.0 monofilament sutures (**Figure 1 D**). A surgical dressing (CoePak™) was changed after 7 days and removed after 14 days.

Group 2/ Site 2-Semilunar coronally repositioned flap (SCRF)

A semilunar incision was carried out following the outline of the gingival margin. This incision was ending into the papilla on each inter-proximal area of the tooth to be treated, but not all the way to the tip of the papilla. At least 2 mm of gingiva was preserved on each side of the flap in order to preserve the blood supply. The semilunar incision was curved apically to an extent to guarantee that the apical part of the flap rests on bone after the coronal advancement to cover the root (**Figure 2 C**). An intra-sulcular incision was performed mid-facially. Then, a split-thickness dissection was performed from the initial incision coronally until connecting to the intra-sulcular incision (**Figure 2 D**). The mid-facial tissue was completely released, coronally positioned to the CEJ and held in place against the tooth with a moist gauze pad placed with light pressure, perpendicular to the flap, for 5 min. No sutures were placed. A surgical dressing was changed after 7 days and removed after 14 days (**Figure 2 E**).

Post-Surgical Care

For both groups, post-operative instructions were given. On first post-operative day, the patients were advised to take soft diet, avoid hot food or beverages, avoid any mechanical trauma to the site, avoid drinking from a straw, not to touch the

area or rinse vigorously. Patients were put on antibiotic, analgesic, anti-inflammatory drugs for five days. Then patients were recalled after 7 days for removal of periodontal pack and sutures was removed after 14 days. All the patients were periodically recalled and assessing the clinical parameter during the follow-up visit at 1 month and 3 months.

Results

Statistical Analysis

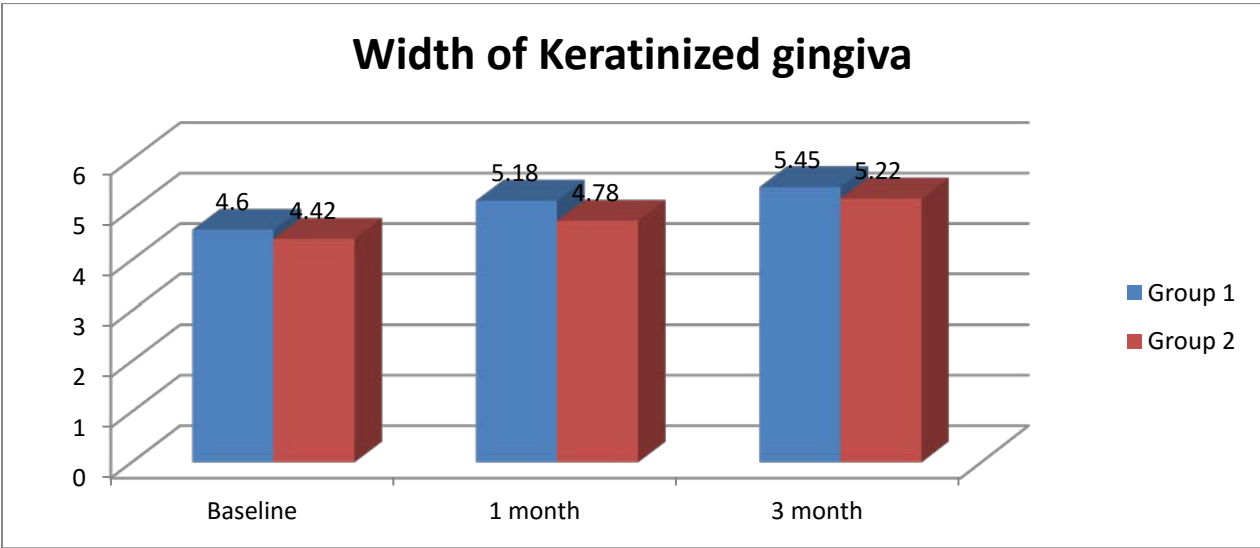
Descriptive statistical analysis was expressed as mean ± standard deviation (SD) for each group. Inter and intra variations in various clinical parameters over a period of 3 months were analysis using ANOVA (test of significance with Bonferroni correction) and Independent t test. In the above test p value less than or equal to 0.05 ($p \leq 0.05$) was taken to be statistically significant. All analysis were performed using Software version IBM SPSS version 20.

Table 1: Comparison of all clinical parameters at various time intervals at Site 1 and Site 2

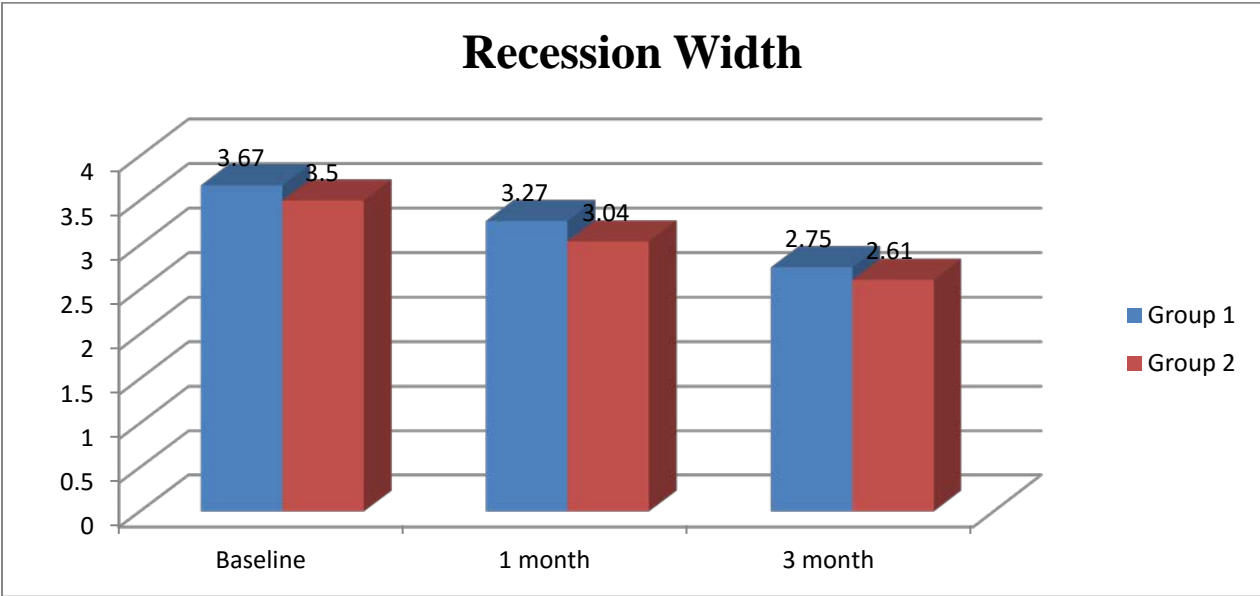
	Width of Keratinized Tissue		Recession Width		Recession Height		Gingival Index		Plaque Index	
	Site 1/ Group 1	Site 2/ Group 2	Site 1/ Group 1	Site 2/ Group 2	Site 1/ Group 1	Site 2/ Group 2	Site 1/ Group 1	Site 2/ Group 2	Site 1/ Group 1	Site 2/ Group 2
Baseline	4.60 ±0.39	4.42 ±0.17	3.67± 0.43	3.50 ±0.34	1.81± 0.32	1.86 ±0.19	2.42 ±0.15	2.37 ±0.23	2.35 ±0.17	2.52 ±0.23
1 month	5.18± 0.47	4.78 ±0.26	3.27± 0.43	3.04 ±0.26	1.63 ±0.32	1.79 ±0.19	1.87 ±0.25	2.17 ±0.23	1.85 ±0.17	2.02 ±0.23
3 months	5.45± 0.37	5.22 ±0.15	2.75 ±0.44	2.61 ±0.29	1.37± 0.33	1.62 ±0.19	1.21 ±0.02	1.55 ±0.10	1.15 ±0.10	1.55 ±0.10
P value	0.047*	0.001*	0.045*	0.633*	0.213**	0.280**	0.000*	0.001*	0.000*	0.000*

*p value < 0.05 (statistically significant).

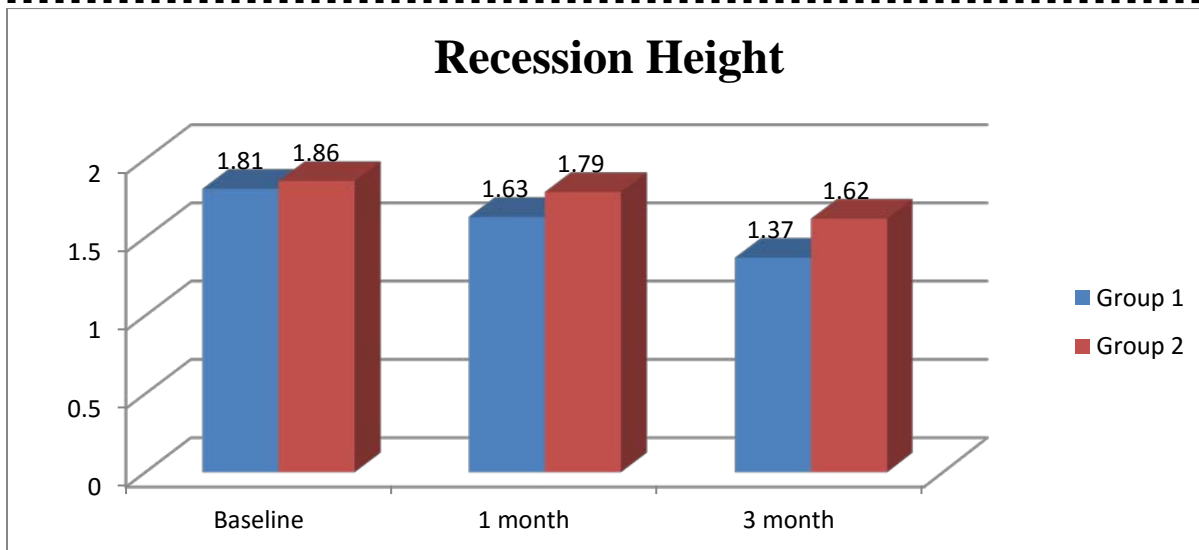
**P value > 0.05 (non-statistically significant)



Graph 1 : Comparison of mean Width of Keratinized Gingiva at various time interval at Group 1 and group 2



Graph 2 : Comparison of mean Recession Width at various time interval at Group 1 and Group 2



Graph 3: Comparison of mean Recession Height at various time interval at Group 1 and Group 2

Table 1 showed all the clinical parameter was compared in 2 study group. Intra group comparison between the pre and post-surgical measurements at different time intervals of CAF Group 1 show statistically significant in term of mean width of keratinized tissue and recession width from baseline to 3 months. While it was non-significant in term of mean recession width.

The results showed in table no.1, graph no.1 that the inter group comparison of mean width of keratinized gingiva was statistically non-significant among the two groups ($p > 0.05$) at baseline, 1 month and 3 months. The intra-group comparison in Group 1/Site 1 showed statistically significant difference from baseline to 1 months and 3 months ($p < 0.05$), Also, in Group 2/Site 2 intragroup comparison the results are statistically significant ($p < 0.05$) with comparatively more mean width of keratinized gingiva in Group 1 /Site 1 at 3 months.

For the clinical parameter of recession width (RW), the result showed in Table no 1 and Graph no 2 that the inter group comparison of mean recession height was statistically non-significant among the two groups ($p > 0.05$) at baseline, 1 month and 3 months. The intra-group comparison in Group 1/ Site 1 showed statistically significant difference from baseline to 1 months and 3 months ($p < 0.05$), Also, in Group 2/ Site 2 intragroup comparison the results are statistically significant ($p < 0.05$) with comparatively more mean recession width in Group 1/Site 1 at 3 months.

In terms of recession height (RH), the results showed that in Table no 1 and Graph no 3 the inter group comparison of recession height was statistically non-significant among the two groups ($p > 0.05$) at baseline, 1 month and 3 months. The intra-group comparison in Group 1/ Site 1 showed statistically significant difference from baseline to 1 months and 3 months ($p > 0.05$), Also, in Group 2/ Site 2 intragroup comparison the results are statistically significant ($p > 0.05$) with comparatively less mean recession height in Group 1/ Site 1 at 3 months.

Discussion

Root coverage procedure is a common requirement in patients who have an aesthetic concern or root sensitivity in patient with high standard of oral hygiene. Aesthetics is the main indication for root coverage surgical procedures. However, this awareness is often limited to those patients with pronounced gingival display and their focus infrequently goes beyond the facial aspect of the anterior dentition.

In addition to aesthetic concerns of the patient, an unfavourable consequence of gingival recession is the exposure of root surfaces to a potentially cariogenic supragingival microbiota. Common mucogingival conditions are recession, absence or reduction of keratinized tissue, and probing depths extending beyond the MGJ

The patient exposes only the most coronal portion of the recession while smiling which is considered as one of the main aesthetic problem. While planning and designing for any root coverage procedure, the clinicians must address many aspects of clinical problems such as patients' attitude, correction of etiological factors, root preparation, discomfort and healing of donor site wound, vestibular depth and anatomic contour of the recipient sites.

Since the middle of the 20th century, different techniques have been developed to cover the denuded roots. One of the root coverage procedure successfully used for long years due to the minimal amounts of keratinized gingiva is the coronally advanced flap procedure. Hence, the aim of every root coverage procedure is to achieve all these requisites besides restoring the gingival health.

The present study was done to compare and evaluate the clinical outcome of Coronally Advanced Flap and Semilunar Coronally Repositioned Flap in the treatment of Miller's Class I gingival recession defects in the maxillary arch. The present data indicate that there is a decrease in both recession width and recession height, and increase in width of keratinized tissue at the sites treated with both coronally advanced flap and semilunar coronally repositioned flap were reported at the end of the study. However, significant superior result was observed with CAF design than the once obtained by SCRF. These results are consistent with previous studies⁵.

A total of 4 Patients enrolled in the study and maintained a fairly good oral hygiene as observed by mean plaque index score at various time periods of observation in both group 1 and 2. The plaque score plays an important role in determining the oral hygiene status of the patient both pre and postoperatively. It also influences the treatment outcome e.g.; maintenance of poor oral hygiene may result in treatment failure. Hence, in our study, only those patients were considered for periodontal surgery who showed good oral hygiene maintenance after the Phase-I therapy. The gingival status also found to be healthy at both groups as revealed by mean gingival index at various time periods of observation. In inter group comparison of mean plaque index and gingival index were found to be statistically non-significant among the 2 groups whereas in intra group comparison the mean plaque index and gingival index were found to be statistically significant ($p < 0.05$)

The recession height (RH) and recession width (RW) are the two important clinical parameters in the study of gingival recession treatment. Reduction in the mean RW and RH will result into root coverage and restoration of aesthetics. In the present study, On intergroup comparison, the mean recession height (RH) and recession width (RW) were found to be non-significantly in both the groups from baseline to 3 months postoperatively whereas on intra group comparison, the mean recession width were statistically significant in both the treatment group. The results were in accordance with the study by **Moka R L et al (2014)** and **Nassar CA (2014)**. The coronal advancement of flap by 2mm beyond the CEJ, followed by stabilization of the flap in the same position by interdental sutures, in CAF, significantly influences the reduction in recession height as compared to SCRF, that involves no sutures after coronal advancement of the flap.

In our study there was statistically significant increase ($p < 0.05$) in Width of Keratinized Tissue (WKT) in both the groups from baseline to three months. The results obtained are in accordance with the previous studies conducted by **Santana et**

al. (2010), Sandro Bittencourt et al. (2006), Erico Del Peloso Riebeiro et al. The statistically significant increase in the keratinized tissue, in SCRF group which was superior to that attained by CAF group, may be attributed to different healing patterns. In the SCRF the granulation tissue that fills the semilunar area will generally turn into same type of tissue that was present before the repositioning of the tissue.⁴ According to Ainamo et al. (2004), the increase in the width of keratinized tissue is due to the tendency of the coronally displaced mucogingival line, to regain its original, “genetically determined” position, after the soft tissue margin attains stability at the level of the cemento enamel junction⁶.

This study confirms the gain of WKT in CAF group was in agreement with the previous studies conducted by Pini Prato et al. (1999) Some other studies conducted by Giovanpaolo Pini Prato et al. (1999), reported a decrease in WKT due to reduction of blood supply to the marginal gingival tissues. There was no statistically significant difference between the groups at baseline, one months and three months.

Although significant improvement were achieved in all clinically parameter among both groups but the limitation of this study was small sample size and short time period (three months follow-up), may affect the reproducibility of results. Also, the technique used in the study were not compared with other root coverage procedures such as Free Gingival Grafts, Connective Tissue Grafts, Enamel Matrix Proteins (EMP), Alloderm, GTR techniques. Moreover, mandibular teeth were not selected in the inclusion criteria only and this study was performed on maxillary anterior teeth.

To consider the Long-term study period with all the above-mentioned techniques in the future further studies are required. It is the simple clinical procedure compared to expensive, technique sensitive procedures like Alloderm, EMP, can be used in the future as the best feasible solution for gingival recession.

Conclusion

Both flap designs were effective in obtaining and maintaining a coronal displacement of the GM, however the CAF flap design resulted in clinical improvements significantly superior to the ones obtained by the SLCRF for percentage of RC, frequency of complete RC and gain in CAL.

It is concluded that RC is significantly better with CAF compared with the original SLCRF technique in the treatment of shallow maxillary Miller class I gingival recession defects performed under standard clinical situations without surgical magnification.

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Clinical Photographs

Group I/ Site I- Coronally Advanced Flap Technique



Figure 1 A: Preoperative view



Figure 1 B: Intrasulcular incision with two vertical relaxing incision



Figure 1 C: displacement of flap in apical direction



Figure 1 D: Stabilization of coronally advanced flap using 5.0 monofilament suture



Figure 1 E : 3 months post- operative

Group II/ site II- semilunar coronally repositioned flap technique



Figure 2 A: Pre operative view



Figure 2 B: Measurement of recession depth with UNC-15 probe



Figure 2 C: Semilunar incision given



Figure 2 D: Partially Thickness Flap raised



Figure 2 E: Periodontal pack given



Figure 2 F: 3months post-operative view