Original Research

Comparative Evaluation of Root Coverage with Amniotic Membrane Under Macrosurgical and Microsurgical Approach: A Prospective Clinical Trial

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Abstract

Objectives: Gingival recession is a major concern as it causes unesthetic appearance during smiling, dentinal hypersensitivity, and root caries. Several surgical procedures have been undertaken to cover these exposed root surfaces, with the most predictable and effective being coronally advanced flap (CAF) with subepithelial connective tissue graft. Because amniotic membrane (AM) contains embryonic stem cells, it can be utilized as a possible autograft/periodontal-guided tissue regeneration substitute. Magnification improves visibility and causes less tissue trauma during surgery. Therefore, the goal of this study was to evaluate the efficacy of root coverage with AM utilizing a conventional macrosurgical technique (MaT) versus microsurgical technique (MiT) employing loupes. **Materials and Methods:** This randomized clinical trial included 24 patients, 12 of whom were treated using MaT and 12 utilizing MiT with 4x magnification loupes. Clinical parameters such as amount of root coverage in terms of vertical gingival recession (VGR), horizontal gingival recession (HGR), increase in width of keratinized gingiva (WKG), clinical attachment loss, and patient satisfaction analysis for the evaluation of discomfort, dentinal hypersensitivity, and esthetics were recorded at baseline and 3 and 6 months after surgery. **Results:** Both the groups demonstrated improvement in all clinical parameters. However, the test group showed a significant reduction in VGR and HGR with a mean difference of 0.95 mm (P = 0.007) and 2.167 mm (P = 0.002) at 6 months, respectively. There was no significant difference in the mean WKG and hypersensitivity scores between the two groups. **Conclusion:** Both treatment approaches, i.e., MaT and MiT with the use of AM, were effective in improving the clinical parameters and the amount of root coverage. However, the test group showed a better reduction in discomfort and hypersensitivity postoperatively with enhanced esthetic outcomes. **Clinical Relevance:** Magnification-assisted root coverage attained predictable outcome.

Keywords: *Clinical attachment loss, dentinal hypersensitivity, embryonic stem cells, gingival recession, periodontal guided tissue regeneration, surgical procedure*

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Introduction

Smile is considered an important determinant to the person's attractiveness, which requires a blend of facial and dental components. Gingival recession which is a sequel of periodontal disease manifestations is the

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displacement of the soft tissue margin apical to the cementoenamel junction (CEJ).[1] It presents to be one of the most common esthetic and functional problems of the periodontium, especially in the anterior teeth, and premolars not only pose esthetic problems as they are visible during smiling affecting social well-being of an individual but also leads to dentinal hypersensitivity, which is a distressing problem. On the other hand, for a clinician, esthetics and function are not only challenges associated, but the successful coverage of the root is of crucial importance. Among all the root coverage procedures, coronally advanced flap (CAF) gives predictable and promising results, especially in areas of single recessions. Many studies were conducted using CAF in combination with soft tissue grafts, barrier membranes (BM) (GTR), enamel matrix derivative, acellular dermal matrix, platelet-rich plasma, and living tissue-engineered human fibroblast-derived dermal substitute from human placental tissues. Among all the soft tissue grafts, although subepithelial connective tissue graft is considered to be the gold standard technique,[2] amniotic membrane (AM) which is an allograft is being used widely because of its advantage of avoiding the second surgical site along with its easy availability, ability to maintain the structural and anatomical configuration of regenerated tissues, enhancement of healing through reduction of postoperative scarring, and subsequent loss of function and providing a rich source of stem cells.

Although conventional traditional methods produce desirable results, modern dentistry has moved toward ensuring procedures to be carried out with minimal discomfort and maximal safety. New technologies, instruments, and surgical techniques are really necessary to attain best results and to satisfy the patient's expectations.[3] In that context, microsurgical technique (MiT) along with the microsurgical instruments enables the clinician to perform the clinical procedures better by reducing patient discomfort, superior approximation of wounds, more rapid healing, improved cosmetic results, and greater patient acceptance because of less invasiveness. Not only does MiT enhance patient comfort levels but also play a great role in enhancing the comfort levels of the clinician because of proper positioning of the operator, thereby reducing the risk of musculoskeletal disorders such as wrist, hand, shoulder, neck pain, and lower back pain.

Materials and Methods

Ethical aspects and study design

This was a randomized clinical comparative study conducted at Vishnu Dental College, India, conducted from February 2016 to November 2018. The study protocol was approved by the Institutional Ethical Committee and also registered under the Clinical Trials Registry of India (CTRI) with CTRI/2018/04/013134. All the clinical procedures were executed in full accordance with the Declaration of Helsinki and the Good Clinical Practice Guidelines. Every patient was provided with written informed consent before participation. CONSORT guidelines were followed [Figure 1].

Screening procedure

Patients visiting the Postgraduate Department of Periodontics, Vishnu Dental College, who were diagnosed with Class I and Class II gingival recessions were included in the study. Preliminary examination including medical and dental history was done for the patient's eligibility to include in the study.

Inclusion criteria

- Patient-related criteria: Age range of 18–45 years and absence of any systemic condition that would interfere with healing
- Tooth-related criteria: Miller's Class I or II recession (>2 mm in depth at buccal aspect of teeth).

Exclusion criteria

- Patient-related criteria: Poor oral hygiene, smokers, and pregnant patients
- Tooth-related criteria: Recession defects associated with caries, deep abrasions or restorations, active gingival and periodontal disease, excessive root prominence, teeth with occlusal interference, and mobility.

All the patients underwent baseline periodontal examination which included the clinical parameters such as plaque index (PI) (Silness and Loe, 1964),

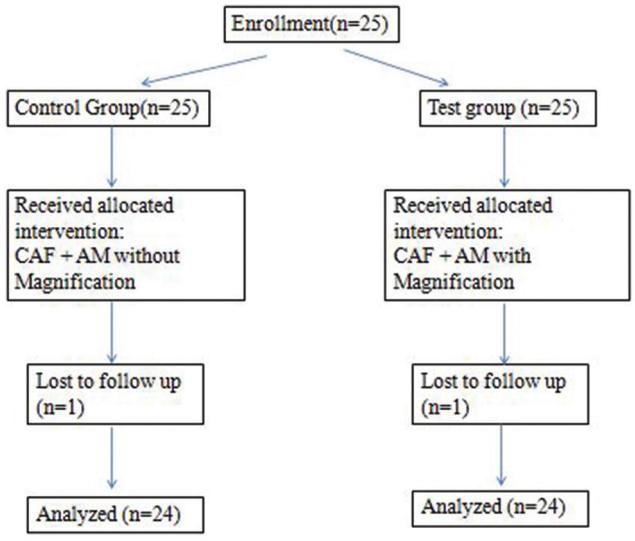

Figure 1: Consort flowchart

gingival index (GI) (Loe and Silness, 1963), probing depth (PD), relative clinical attachment level (CAL), horizontal component of the gingival recession (HGR), vertical component of the gingival recession (VGR), width of keratinized tissue (WKT), patient satisfaction analysis (PSA) for the assessment of discomfort, dentinal hypersensitivity, and esthetics.[4]

The assessment of all the parameters was carried out with the UNC-15 periodontal probe and the measurements were recorded at baseline and 3 and 6 months after surgery. Patient satisfaction regarding comfort, esthetic appearance, and hypersensitivity were recorded after 24 hours, 3 months, and 6 months postoperatively using VAS scale. Discomfort was graded in VAS score from 0 to 10 (0 - no discomfort and 10 - unbearable discomfort). To evaluate patient's esthetics, patients were asked to give a score between 0 and 10 (0 - poor esthetics and 10 - excellent esthetics) depending on the color, appearance, and form of the selected site. Hypersensitivity was recorded by blowing a blast of air from the air syringe held at 90° angle, 2–3 mm from the tooth, and the scores were recorded in a scale of 0–10 (0 - no pain and 10 - unbearable pain.)

All the subjects received initial treatment which consisted of scaling, root planing, and oral hygiene instructions. The full-mouth periodontal condition was ensured to be normal at least 1 week before the planned surgery. Upper and lower impressions were made and models were fabricated. The casts were used to prepare the occlusal stent, which served as the fixed reference point for recording the parameters initially and during the follow-up period.

Each patient was considered as a single experimental area consisting of a single gingival recession in the upper anteriors, premolars, or molars. When patients have bilateral recessions, the experimental site was selected by tossing a coin, and subsequently, CAF with AM under magnification loupe of ×4 was performed on one site [Figure 2] and CAF with AM without magnification [Figure 3] was performed on the other site. All the abovementioned parameters were recorded at 3 and 6 months postoperatively.

Surgical protocol

The surgical procedure was performed under local infiltration with 2% lignocaine containing adrenaline at a concentration of 1:200,000. After obtaining adequate anesthesia, two horizontal incisions at the level of CEJ were given on the either side of the tooth not extending to marginal gingiva of the adjacent tooth. This was followed by an intercrevicular incision. Vertical releasing incisions beginning from the end of horizontal incision were extended beyond the mucogingival junction and a full-thickness flap was elevated till the tooth root was exposed. At the base of the flap, a nick in periosteum was given, so that the flap can be passively positioned coronally over the defect without tension. The exposed root surfaces were thoroughly planed with curettes. Tin foil was cut into template, and AM (Tissue Bank, TATA Memorial Hospital, Mumbai, India) was cut into the size of the template which was placed on the planed root surface of the tooth. Flap was advanced coronally 1 mm coronal to the CEJ and stabilized with single sling suture using 5-0 prolene (Trulene™) suture. The vertical incisions were then sutured with two direct interrupted sutures on either side. The surgical site was covered with tin foil of suitable site and a noneugenol periodontal dressing (Coe-Pak™) was placed [Figures 2c-f and 3c-f].

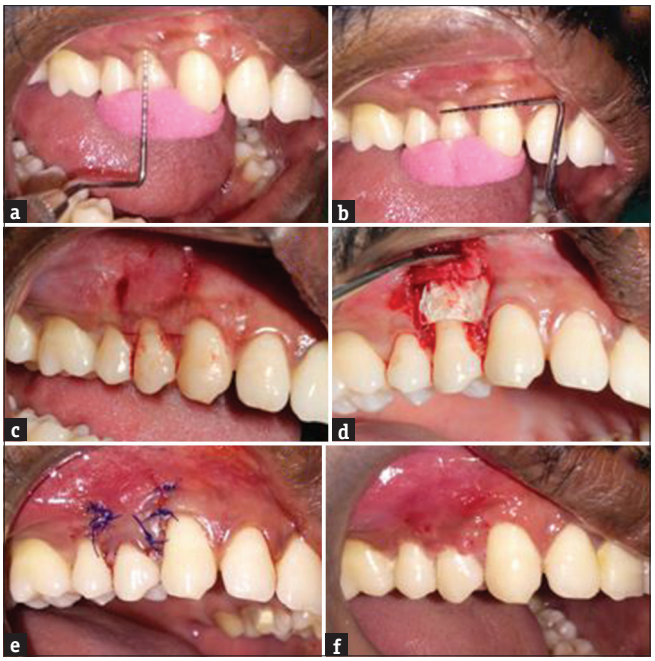

Figure 2: Test group. (a and b) Millers Class I gingival recession with respect to 14; (c) horizontal incisions given followed by crevicular and vertical incisions; (d) full-thickness mucoperiosteal flap elevated and amniotic membrane placed; (e) flap coronally advanced and stabilized using 5-0 Prolene suture; (f) suture removal done

Postoperatively analgesics (combination of aceclofenac 100 mg and paracetamol 325 mg twice daily for 3 days) were prescribed. The patients were refrained from tooth brushing at the surgical site and were instructed to rinse mouth with 0.2% chlorhexidine gluconate mouthwash daily for 6 weeks and were asked to report immediately if there is any displacement of periodontal dressing within a week or any untoward bleeding from the surgical area. After 10 days, checkup was done and the periodontal dressing was removed and the surgical site was thoroughly irrigated with saline. At 3 and 6 months postoperatively, assessment of the clinical parameters was done.

Statistical analysis

Descriptive statistics were expressed as mean ± standard deviation. All the collected data were subjected to statistical analysis using SPSS (20.0 ver. Armonk, New York, USA). Intergroup comparison of the study groups with means of all the parameters was done by unpaired *t*-test. Intragroup comparison of all the clinical parameters was done by ANOVA test. Chi-square test is done for root coverage based on location and hypersensitivity. $P < 0.05$ would be considered statistically significant for all the analysis.

Results

A total of 24 participants were included in the study protocol and were assessed for the statistical analysis. They were divided into two groups: control and test group of each 12 participants.

Demographic variables

The study groups comprised 20 males and 4 females ranging from 22 years to 41 years, wherein the control group comprised 9 males and 3 females and the test group comprised 11 males and 1 female patient.

Periodontal variables

The mean PI and GI scores were not statistically significant between the test and the control groups at baseline, 3 months, and 6 months postoperatively. However, at 6 months, there was a statistically significant improvement ($P = 0.001$) in PI scores (0.312 ± 0.130) in the test group compared to the control group [Tables 1 and 2].

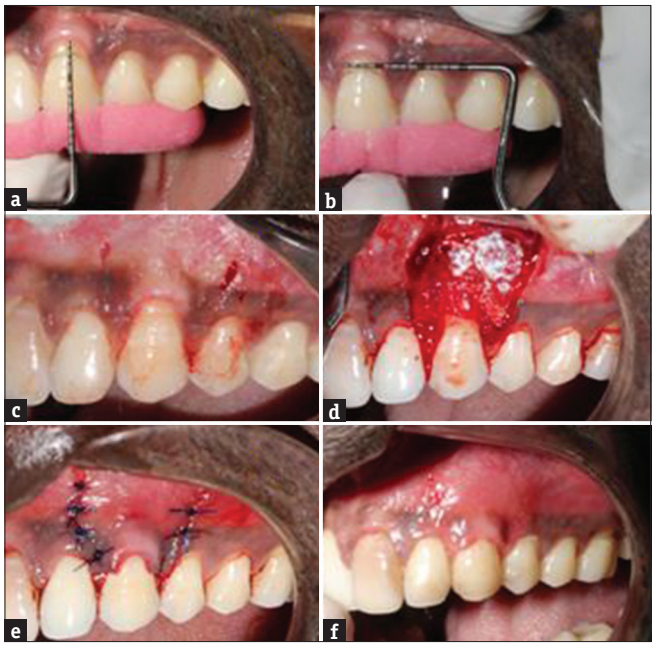

Figure 3: Control group. (a and b) Millers Class I gingival recession with respect to 23; (c) horizontal incisions given followed by crevicular and vertical incisions; (d) full-thickness mucoperiosteal flap elevated and amniotic membrane placed; (e) flap coronally advanced and stabilized using 5-0 Prolene suture; (f) suture removal done

There was no statistically significant difference between the test group and control group in PPD any time interval.

Intragroup comparison of mean CAL showed a significant improvement in both the groups from baseline to 3 months. However, only in the test group, there was a highly significant improvement ($P < 0.000$) with a mean reduction of 2.083 mm from baseline to 6 months. Intergroup comparison showed a considerable difference ($P = 0.030$) in CAL, with the test group showing better improvement (2.92 mm) as compared to the control group (3.83 mm) [Tables 1 and 2].

In both the groups, there was a significant improvement in VGR from baseline to 3 and 6 months. Intergroup comparison showed a considerably less ($P = -0.007$) VGR in the test group (0.54 mm) as compared to the control group (1.5 mm). Similarly, HGR also showed a better improvement in the test group at both 3 (0.015) and 6 (0.002) months postsurgery. There was no statistically significant difference in the mean width of keratinized tissue and hypersensitivity in 3 and 6 months' reevaluation between the test and the control groups [Tables 3 and 4, Figures 4 and 5].

Table 1: Intragroup comparison of periodontal parameters between baseline, 3 months, and 6 months

Variable	Control		Test	
	Mean difference	*P*	Mean difference	*P*
PI				
Baseline				
3 months	0.147	0.038*	0.07	0.332
6 months	0.232	0.001*	0.2	0.001*
3 months				
6 months	0.085	0.299	0.13	0.027*
GI				
Baseline				
3 months	0.121	0.014*	0.07	0.304
6 months	0.173	0.000*	0.161	0.005*
3 months				
6 months	0.051	0.426	0.09	0.147
PD (mm)				
Baseline				
3 months	0.083	0.874	0.417	0.097
6 months	0.083	0.874	0.50	0.039*
3 months				
6 months	0.000	-	0.083	0.904
RAL (mm)				
Baseline				
3 months	1.167	0.023*	2.167	0.000*
6 months	0.583	0.357	2.083	0.000*
3 months				
6 months	−0.583	0.357	−0.083	0.970

P<0.05 is considered statistically significant. PI=Plaque index, GI=Gingival index, PD=Probing depth, RAL=Relative attached level

It was observed from the obtained results that in both the groups, there was a decrease in the discomfort and hypersensitivity scores and improvement in the esthetic scores at 6 months postoperative evaluation. However, intergroup comparison did not show any difference between both the groups [Tables 3 and 4].

All of the teeth treated in the 24 patients had varying degrees of root coverage, with anterior teeth having the highest percentage of root coverage, with 55.6% reaching total root coverage, but none of the molar teeth had complete root coverage [Table 5].

Discussion

This is a randomized controlled clinical trial intended to compare the efficacy of conventional macrosurgical technique (MaT) with MiT using ×4 magnification loupes in the treatment of single gingival recessions using CAF with AM. The intragroup comparisons between the gingival and plaque scores remained at an acceptable level in both test and the control groups. These scores are contradictory to the results obtained by Jain *et al.*, wherein a study was conducted aiming to compare the effectiveness of platelet-rich fibrin (PRF) and AM in the treatment of gingival recession by CAF technique and the results obtained were not statistically significant at both 3 months and 6 months postoperatively.[5]

The mean probing depths in the control group remained constant from baseline to 6 months, whereas the mean probing depths in test group had shown a considerably

Table 2: Intergroup comparison of periodontal parameters at baseline, 3 months, and 6 months between the control group and test group

Variable	Group	Mean	Mean difference	*t*	*P*
PI					
Baseline	Control	0.613	0.100	1.543	0.137
	Study	0.512			
3 months	Control	0.467	0.023	0.491	0.628
	Study	0.443			
6 months	Control	0.38	0.068	1.609	0.122
	Study	0.312			
GI					
Baseline	Control	0.54	0.05	1.154	0.261
	Study	0.49			
3 months	Control	0.418	−0.002	−0.054	0.957
	Study	0.420			
6 months	Control	0.367	0.037	0.777	0.446
	Study	0.33			
PD (mm)					
Baseline	Control	2.25	−0.333	−1.431	0.167
	Study	2.58			
3 months	Control	2.17	0.000	-	-
	Study	2.17			
6 months	Control	2.17	0.083	0.596	0.557
	Study	2.08			
RAL (mm)					
Baseline	Control	4.42	−0.583	−1.465	0.157
	Study	5.01			
3 months	Control	3.25	0.42	1.131	0.27
	Study	2.83			
6 months	Control	3.83	0.917	2.321	0.030*
	Study	2.92			

P<0.05 is considered statistically significant. PI=Plaque index, GI=Gingival index, PD=Probing depth, RAL=Relative attached level

Table 3: Intragroup comparison of periodontal parameters between baseline, 3 months, and 6 months

Variable	Control		Test	
	Mean difference	*P*	Mean difference	*P*
VGR (mm)				
Baseline				
3 months	1.416	0.002*	1.916	0.000*
6 months	1.00	0.029*	1.958	0.000*
3 months				
6 months	−0.416	0.509	0.042	0.987
HGR (mm)				
Baseline				
3 months	1.750	0.021*	2.667	0.000*
6 months	1.333	0.094	2.667	0.000*
3 months				
6 months	−0.417	0.780	0.000	-
WKT (mm)				
Baseline				
3 months	0.291	0.642	−0.25	0.830
6 months	−0.291	0.642	−0.75	0.203
3 months				
6 months	−0.583	0.183	−0.5	0.482
Discomfort				
Baseline				
3 months	1.917	0.2	1.083	0.129
6 months	2.833	0.036*	1.333	0.05*
3 months				
6 months	0.917	0.681	0.250	0.890
Hypersensitivity				
Baseline				
3 months	0.50	0.853	0.583	0.209
6 months	0.75	0.702	0.50	0.312
3 months				
6 months	0.25	0.961	−0.083	0.967
Esthetic				
Baseline				
3 months	−0.583	0.753	−0.667	0.373
6 months	−1.00	0.441	−0.583	0.467
3 months				
6 months	−0.417	0.865	0.083	0.984

P<0.05 is considered statistically significant. VGR=Vertical gingival recession, HGR=Horizontal gingival recession, WKT=Width of keratinized tissue

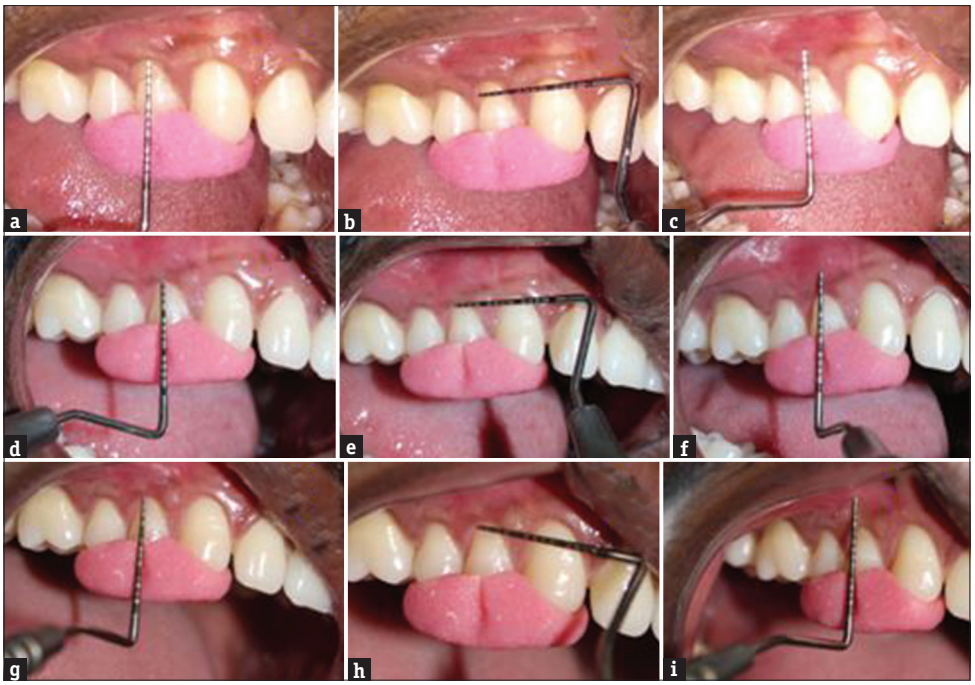

Figure 4: Test group. (a) Millers Class I gingival recession with respect to 14 with baseline VGR 2 mm; (b) baseline HGR 3 mm; (c) baseline WKT of 2 mm; (d) 0 mm HGR at 3 months reevaluation; (e) 0 mm HGR at 3 months reevaluation; (f) 4 mm WKT at 3 months reevaluation; (g) 1 mm VGR at 6 months reevaluation; (h) 2 mm HGR at 6 months reevaluation; (i) 4 mm WKT at 6 month reevaluation

Figure 5: Control group. (a) Millers Class I gingival recession with respect to 23 with baseline VGR 2 mm; (b) baseline HGR 4 mm; (c) baseline WKT of 2 mm; (d) 1 mm VGR at 3 months reevaluation; (e) 2 mm HGR at 3 months reevaluation; (f) 3 mm WKT at 3 months reevaluation; (g) 1 mm VGR at 6 months reevaluation; (h) 2 mm HGR at 6 months reevaluation; (i) 3 mm WKT at 6 months reevaluation

statistical improvement from baseline to 6 months. This is in agreement to the study conducted by Ghahroudi *et al*., which was a double-blinded randomized controlled clinical trial comparing the efficacy of amnion allograft connective tissue graft in covering denuded root surface in which a reduction in probing depth was evident at 6 months.[6]

On the other hand, the clinical attachment levels (CAL) have improved from baseline to 3 months with a mean difference of 1.16 mm in the control group and 0.50 mm in the test group, which is significant from baseline to 6 months. These results are in accordance with a study conducted by Latha *et al*., wherein an attempt for root coverage in Class I gingival recession defects was done

Table 4: Intergroup comparison of periodontal parameters at baseline, 3 months, and 6 months between control group (coronally advanced flap + amiotic membrane) and test group (coronally advanced flap + amiotic membrane +4x magnification)

Variable	Group	Mean	Mean difference	*t*	*P*
VGR (mm)					
Baseline	Control	2.5	0.000	-	-
	Study	2.5			
3 months	Control	1.08	0.5	1.787	0.08
	Study	0.58			
6 months	Control	1.5	0.95	2.972	0.007*
	Study	0.54			
HGR (mm)					
Baseline	Control	4.83	0.833	1.758	0.09
	Study	4			
3 months	Control	3.08	1.75	2.650	0.015*
	Study	1.33			
6 months	Control	3.5	2.167	3.606	0.002*
	Study	1.33			
WKT (mm)					
Baseline	Control	2.54	−0.12	−0.425	0.675
	Study	2.67			
3 months	Control	2.25	−0.67	−1.750	0.094
	Study	2.92			
6 months	Control	2.83	−0.58	−1.300	0.207
	Study	3.42			
Discomfort					
Baseline	Control	4.45	2.58	2.449	0.023
	Study	1.67			
3 months	Control	2.33	1.75	2.148	0.043
	Study	0.58			
6 months	Control	1.42	1.08	1.612	0.121
	Study	0.33			
Hypersensitivity					
Baseline	Control	2.00	1.08	1.264	0.219
	Study	0.92			
3 months	Control	1.50	1.16	1.583	0.128
	Study	0.33			
6 months	Control	1.25	0.83	1.909	0.069
	Study	0.42			
Esthetics					
Baseline	Control	6.67	−1.50	−1.947	0.064
	Study	8.17			
3 months	Control	7.25	−1.58	−2.477	0.021
	Study	8.83			
6 months	Control	7.67	−1.08	−1.857	0.077
	Study	8.75			

P<0.05 is considered statistically significant. VGR=Vertical gingival recession, HGR=Horizontal gingival recession, WKT=Width of keratinized tissue

using combining rotated papillary pedicle graft and CAF, under microsurgical approach in which the mean CAL showed improvements from 4.07 ± 0.80 mm at baseline to 1.77 ± 0.82 mm at 3 months and 1.47 ± 0.52 mm at the end of 12 months.[7]

Table 5: Root coverage based on tooth location

Tooth number	Root coverage (%)		Total (%)	χ^2
	Full coverage	Partial coverage		
Anterior	5 (55.6)	4 (44.4)	9 (100)	6.329
Premolar	2 (28.6)	5 (71.4)	7 (100)	
Molar	0 (0)	8 (100)	8 (100)	

When the recession depth or VGR was taken into consideration, there is a significant improvement in both the test and control groups, which is in accordance with a study conducted by Latha *et al*., in which root coverage in Class I gingival recession defects was done using combining rotated papillary pedicle graft and CAF, under a microsurgical approach.[7]

Similarly, in terms of HGR, both the groups showed a significant improvement from baseline to 3 months, whereas the test group has shown a significant difference from baseline to 3 months and maintained the same up to 6 months of the study. These observations suggest that use of AM along with the CAF procedure under magnification has shown good results sustaining up to 6 months, which is in accordance with the study conducted by Latha *et al*., wherein a microsurgical approach for the treatment of Class I recessions was advocated and the results exhibited improvement at 3 months and slightly increased at the end of 6 months.[7] In a case series done using AM, the 6 months postoperative results showed a mean difference in recession depth of 2.81 mm and recession width of 3.65 mm.[8]

One of the most important factors for increase in the amount of recession may be a thin and delicate margin. Therefore, surgical procedures for root coverage should not only result in an increased width of keratinized tissue but also an increase in the tissue biotype. In the present study, there was an increase in the amount of keratinized gingiva in both the groups. AM not only helps in increasing the width of keratinized gingiva (WKG) but also improves the tissue biotype by the release of keratinocyte growth factor that promotes keratinization of epithelial cells and helps maintain the mucogingival junction in position.[9] Increase in the dimensions of keratinized tissue helps in maintaining the tissue at the position in long term.[10]

There was a decrease in the dentinal hypersensitivity from baseline to 6 months in the test and the control groups. These values are in accordance with the study conducted by Ramireddy *et al*., concluded that CAF showed an increased thickness of the

keratinized tissue and resulted in a decrease in dentinal hypersensitivity.[11] In fact, among the restricted group of studies that investigated dentinal hypersensitivity, it was demonstrated that CAF alone or with any graft provided a significant improvement in reducing the thermal and evaporative hypersensitivity.[12]

In this study, patients were analyzed for their satisfaction levels using patient's satisfaction analysis score consisting of discomfort score, hypersensitivity score, and esthetic score. The patient's response, acceptance of surgical treatment, and assessing the comfort levels of the patient to the treatment they have undergone were assessed. Both the groups have demonstrated a significant decrease in the discomfort by the end of 6 months. Considering the esthetics in this study, there is a gradual improvement of the scores between the baseline to 6 months in both the groups. This may be due to the excellent chromatic integration of the CAF with the adjacent tissue. This is in accordance with the study conducted by Huang *et al*., in which a double esthetic evaluation was performed by a periodontist who was blinded to the treatment.[12] The periodontist evaluated treatment outcomes at 6 months, and 15 out of 16 BM sites and 11 sites treated with CTG were found to have an excellent color match. Patient satisfaction regarding esthetics was analyzed by color match, overall satisfaction, and amount of root coverage, which seemed the same in both the treatments. However, greater overall satisfaction was expressed for BM sites compared with CTG sites.

Dentinal hypersensitivity score was also decreased from baseline to 6 months in both the test and the control groups, but it is not of statistical significance. These results are in accordance with a study conducted by Agarwal *et al*., wherein the gingival recessions were treated with CAF+AM and CAF+PRF, and the patient's hypersensitivity was analyzed. At the end of the study, there is a nonsignificant reduction in hypersensitivity values in all the groups.[4]

Intergroup comparisons between the plaque index, gingival index, and probing depth were reduced in both the test and control groups. This may be because the procedure that is performed in both the groups is the same (i.e., CAF+AM). The PI, GI, and PD reduction mainly depend on the constant reinforcement of oral hygiene maintenance, which was good in both the test and the control groups and is in accordance with the study conducted by Singh *et al*.[13]

The WKG has slightly increased in both the test and control groups from baseline to 6 months, and on the other hand, these results are contradictory to the results obtained in a study conducted by Singh *et al.,* wherein the efficacy of microsurgical and MaT approach in single recessions using modified CAF was compared.[13]

Between the test and the control groups, a mean recession depth reduction of 0.95 mm in VGR and mean HGR reduction of 2.167 mm was observed from baseline to 6 months of the study. These results are in accordance with the study conducted by Singh *et al.*, in which there was a significant reduction in the VGR and HGR in the magnification group when compared to the conventional macrosurgery.[13] Following CAF of single-recession defects, it was reported that the gingival margin sutured on the average of 1 mm coronal to the CEJ remained stable at 1 week but shifted apically from 2-4 weeks, uncovering the CEJ in 60% of the sites with an average shift of 1.5 ± 0.6mm.[13]

In the present study, out of 24 teeth, 9 anterior, 7 premolar, and 8 molar teeth were treated. At the end of the study, i. e., at 6 months, out of 9 anterior teeth, 4 teeth and 2 premolar teeth attained full root coverage, whereas the molar teeth attained partial coverage. As per the literature, the coverage of the tooth mainly depends on the baseline avascular exposed root surface area (AERSA). If the AERSA is less, the chances for the coverage of the recession are more. In anterior teeth, the AERSA is less when compared to the premolar and the molar teeth. Hence, the amount of the root coverage in anterior teeth can be attributed to the less AERSA when compared to the posterior teeth, which is in accordance with the study conducted by Ozcelik *et al*.[14]

Most importantly, PSA was considered between the test and the control groups. Findings revealed that there is considerably decreased discomfort in the test group when compared to the control group. This may be to the usage of microsurgical loupes and instruments in the study due to which there may be less trauma and better wound healing as a result of improved visual acuity in the test compared to the control group. In a landmark split-mouth study conducted by Burkhardt and Lang, the microsurgically treated sites revealed better vascularity compared to macrosurgically treated sites, and these results could be attributed to sharper and finer surgical blades, together with finer suture material used in the microsurgical approach, thereby resulting in reduced tissue damage and better wound healing.[15,16]

Considering the esthetic score, better results were observed in the test when compared to the control group at the end of the 3 months study period. It is also evident from the results that anterior teeth have more chances for root coverage compared to premolars and molars. On the whole, procedure done under magnification has

shown superior results because of the usage of third eye, i.e., the magnification along with finer instruments and microsurgical sutures which could have improved the treatment outcome. Because of the less tissue trauma, minimal tissue handling, and lesser discomfort involved in magnification, it also paved the way for greater patient acceptance. The observations of this study have further emphasized the importance of magnification in everyday periodontal practice. However, evaluation over a long period of time would throw more light into the long-term sustainability of the benefits of the procedure. The results of the current study indicate that AM can be successfully used in the treatment of gingival recession as a substitute to other grafts and GTR membranes.

Limitations

Large multicentric trials assessing the patient comfort and operator ease with longer follow-up would provide more accurate and conclusive data.

Conclusion

The clinically significant relative CAL gain, reduction in VGR and HGR, and increase in the WKG in both the groups represent that CAF with AM can be used as a successful treatment modality for root coverage. MiT showed better root coverage outcome and stable results at the end of study period along with better patient acceptance.

Clinical relevance

Principal findings: Microsurgery resulted in greater gain in VGR, HGR, and WKT.

Practical implications: Magnification-assisted root coverage is helpful in attaining more predictable clinical results.

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Conflicts of interest

There are no conflicts of interest.

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