Original Article

Comparative Evaluation of Treatment of Localized Gingival Recessions with Coronally Advanced Flap Using Microsurgical and Conventional Techniques

Abstract

Background: Coverage of gingival recession is a very precision-oriented procedure. Employment of operating microscope has proved to be a boon in various surgical procedures and therefore can have positive benefits on the outcome of a procedure. **Aim:** The aim of this study is to find out whether the use of an operating microscope in the surgical treatment of Millers Class I and Class II gingival recession defects could improve the outcome in terms of root coverage and final tissue appearance compared to those done by the conventional technique. **Materials and Methods:** This clinical study was carried out on ten patients with the presence of bilateral isolated gingival recession classified as Miller's Class I or Class II recession defect. The split-mouth design was used where coronally advanced flap with the placement of platelet-rich fibrin was done in defects in test (microsurgical) and control (conventional) groups. Various clinical parameters were recorded at baseline and then postoperatively at 3-months and 6-month intervals. **Results:** The visual analog scale scores showed a statistically significant difference between scores while all other parameters had no statistically significant difference in intergroup comparison after 3 and 6 months. **Conclusion:** While microscope permitted less traumatic and minimally invasive procedure, both groups showed convincing improvement in clinical parameters.

Keywords: *Flap surgery, gingival recession, oral hygiene, periodontal microsurgery*

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Introduction

Gingival recession or marginal soft-tissue recession is the displacement of the gingival margin apical to cementoenamel junction. Although it seldom results in tooth loss, its sequel, such as root sensitivity, caries, abrasion, and esthetics have always been an area of major concern.[1] Moderate-to-severe chronic periodontitis results in attachment loss, periodontal pockets, and bone loss in concurrence with gingival recession resulting in decreased vestibular depth.[2] The treatment of periodontitis has more recently become increasingly focused on esthetic outcomes, extending beyond the tooth replacement and tooth color to include the soft tissues framing the dentition.[3]

Gingival recession can either be localized or generalized or it may be a feature of periodontitis as depicted in the definition of periodontitis which is "an inflammatory disease of the supporting tissues of the teeth caused by specific microorganisms or groups of specific microorganisms, resulting in progressive destruction of the periodontal ligament and alveolar bone with increased probing depth (PD) formation, recession, or both."[4] Several regenerative materials such as guided tissue regeneration (GTR) membranes,[5,6] enamel matrix proteins derivatives,[7] alloderm,[8] and living tissue-engineered human fibroblast-derived dermal substitute[9] have been combined with coronally advanced flap (CAF) in the treatment of gingival recession and have reported good clinical success. Although these regenerative materials are still used today, the introduction of autologous biomimetic agents like platelet concentrates have given a new dimension for the better clinical outcomes in periodontal therapy.[10,11] A recent innovation in dentistry is the use of second-generation platelet concentrate which is an autologous platelet-rich fibrin (PRF) gel with growth factors and cicatricial properties for root coverage procedures.[12] PRF production protocol attempts to accumulate the platelets and release cytokines in a fibrin

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clot. This clot contains a concentrated suspension of the growth factors found in platelets. These growth factors are involved in wound healing and are postulated as promoters of tissue regeneration.[13]

Various studies reported that the enhanced visual acuity provided using an operating microscope (i.e., magnification and improved illumination of the field) along with specifically designed microsurgical instruments allows a more accurate and atraumatic manipulation of the soft and hard tissues, improves the surgical access and avoids the unnecessary removal of tissues, optimizes the defect debridement and the root instrumentation, improves vascularization, and enhances the mobility of flaps, and hence, the possibility of obtaining better primary wound closure.[14-18] As new techniques and materials are developed, new surgical techniques are necessary to minimize the surgical trauma and overcome the limitations related to the manual ability and natural vision of the clinicians. The inclusion of an operating microscope for periodontal plastic surgery provides the better illumination and enhanced magnification to increase the precision of a surgeon's surgical skill. Hence, minimally invasive techniques were developed to minimize tissue trauma and allow primary wound closure.[19]

The aim of this study is to compare the use of an operating microscope and conventional periodontal surgery in the surgical treatment of Miller Class I and Class II gingival recession defects and whether any one method could improve the outcome in terms of root coverage and final-tissue appearance.

Materials and Methods

This comparative clinical study was carried out in the Department of Periodontics, Karnavati School of Dentistry, Gandhinagar, India. The study protocol was explained to each potential patient and written informed consent was obtained before the commencement of any treatment. This study was done under the ethical guidelines of the Institutional Research and Ethical Committee.

This was a split-mouth study which included a total of twenty sites (ten in each group), which were selected in total of ten patients of age ranging from 30 to 45 years, with the mean age of 37.62 years, who met the inclusion criteria of the study, were planned to be examined at baseline, and postsurgically at 3 months and at 6 months.

Inclusion criteria

The age group of 18–50 years from both sexes, the presence of bilateral isolated gingival recession classified as Miller's Class I or Class II recession defect, systemically healthy controls, ability to maintain good oral hygiene, patients willing to comply with all study-related procedures, and available for follow-up.

Exclusion criteria

Patients having the habit of smoking or chewing tobacco, nonvital teeth, malpositioned teeth, previous surgical attempt to correct gingival recession, pregnant or lactating women and cervical abrasion. Before surgery, test and control sides were decided by coin toss method. Each patient was divided into two groups as follows:

Group I (Test group): CAF under the microscope for obtaining root coverage in gingival recession defect with PRF placement.

Group II (Control group): CAF with the conventional technique for obtaining root coverage in gingival recession defect with PRF placement.

Each patient was given careful instructions on proper oral hygiene measures. A full-mouth supragingival and subgingival scaling and root planing procedure were performed. A periodontal evaluation was performed 1 month after Phase I therapy to confirm the suitability of the sites for this study. The selected sites were divided randomly into control and test groups [Figures 1a and 2a]. The control group sites were treated with CAF and PRF placement with the conventional technique, whereas in the test group sites, the same was done under the microscope.

The patients, who met all the inclusion criteria after the Phase I therapy, were recalled to record the preoperative clinical parameters.

Following clinical parameters were recorded at baseline and then postoperatively at 3 and 6-month intervals:

1. Plaque Index (Turesky–Gilmore–Glickman Modification of Quigley–Hein Plaque Index-1970)[20]
2. Modified Gingival Index (Lobene-1986)[21]
3. Recession depth (RD)
4. Recession width (RW)
5. Probing pocket depth
6. Clinical attachment level (CAL)
7. Width of keratinized gingiva (WKG)
8. Gingival/mucosal thickness
9. Visual analog scale (VAS).[22]

Following all the preclinical measurements, intraoral antisepsis was performed with 0.2% chlorhexidine digluconate rinse and an iodine solution was used to carry out extraoral antisepsis. After securing the local anesthesia, a horizontal incision was made at the level of the cementoenamel junction on both the sides of the tooth involved, without involving the marginal gingiva of the adjacent teeth. Incisions were given in such a way that they preserved the interdental papilla. Two vertical incisions, extending apically were given from the horizontal incisions, which were made slightly divergent to allow a broader base for better blood supply. Two horizontal incisions were connected by an intrasulcular incision [Figures 1b and 2b]. A full-thickness flap was raised from both horizontal incisions [Figures 1c and 2c]. Apical to the mucogingival junction, the flap was split, keeping the periosteum intact. The split-thickness flap was extended into the vestibule, until the flap was pulled coronally to completely cover the gingival recession, without any tension. The adjacent interdental papillae were deepithelialized to expose the connective tissue bed. The exposed roots were debrided with hand and ultrasonic instruments. No root biomodification was done.

On the test site, root coverage was done, under the microscope (Labomed, Prima DNT, Cal, USA) using × 4 to × 6 magnification, with PRF placement just apical to the cementoenamel junction [Figure 1d]. The flap was sutured coronally with silk sutures. Sling sutures were placed to secure the flap in coronal position, and interrupted sutures, for vertical incisions [Figure 1e]. The surgical area was protected and covered with a periodontal dressing. On the control site, root coverage procedure was done with conventional technique, with PRF placement just apical to the cementoenamel junction [Figure 2d]. The flap was sutured coronally with silk sutures [Figure 2e].

Suitable antibiotics and analgesics (500 mg amoxicillin, three times per day for 3 days, and 50 mg diclofenac sodium, three times per day for 3 days) were prescribed, along with chlorhexidine digluconate rinses (0.2%) twice daily for 2 weeks. Sutures and periodontal dressings were removed 14-day postoperatively, surgical wounds were gently cleansed with 0.2% of chlorhexidine digluconate, and patients were given instructions for gentle brushing with a soft toothbrush. Each patient was instructed for proper oral hygiene measures postoperatively and examined after 14 days, up to 1 month after surgery [Figures 1f and 2f], and again, at 3 and 6 months [Figures 1g and 2g]. At each visit, oral hygiene instructions were reinforced and the surgical sites were irrigated with normal saline.

Statistical analysis

The raw data for ten patients were entered into the computer database. Statistical software, SPSS version 22.0 (IBM Corp., Armonk, NY, USA) was used for statistical analysis. As the mean gingival RD follows a normal distribution (Kolmogorov–Smirnov test, $P > 0.05$), the unpaired t-test was used. Data were presented as the mean ± standard deviation (SD). The probability value from $P < 0.05$ to $P < 0.02$ was considered as statistically significant while from $P < 0.01$ to $P < 0.001$ was considered as statistically highly/strongly significant.

Results

Each patient was treated with a split-mouth design, that is, CAF alone on one site with PRF using the conventional technique and CAF with PRF under the microsurgical technique on the contralateral site. No undesirable effects were observed and both the therapies were tolerated well by the patients.

Baseline analysis showed no significant differences in RD $P = 0.586$, RW $P = 0.653$, PD $P = 0.728$, CAL $P = 0.468$, WKG $P = 0.209$, and thickness of keratinized gingiva (TKG) $P = 0.934$ between the two groups [Table 1].

Intergroup comparisons were also done to compare the result between test and control groups. The 3-month postoperative data comparisons showed no statistically

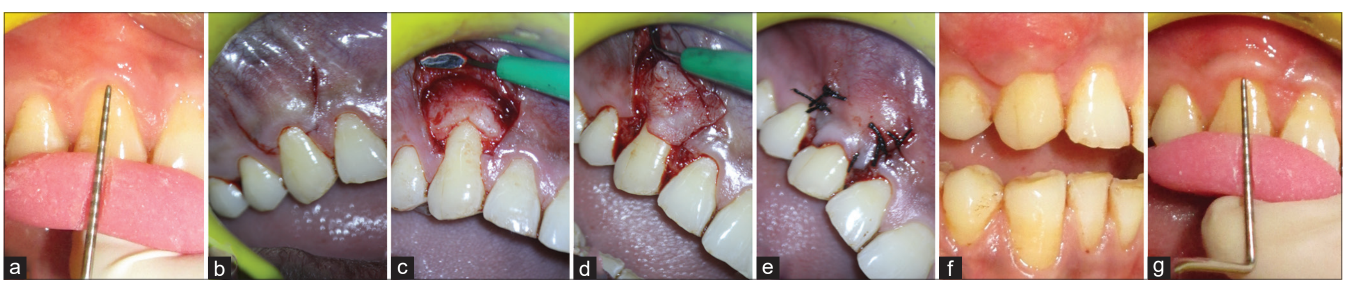

Figure 1: Preoperative recession depth measurement of test site (a), incision, flap reflection, PRF placement and suture placement done under microscope (b-e), initial healing at the time of suture removal (f), recession depth measurement at 6 months, well-formed gingival tissue coverage was seen at the test site (g)

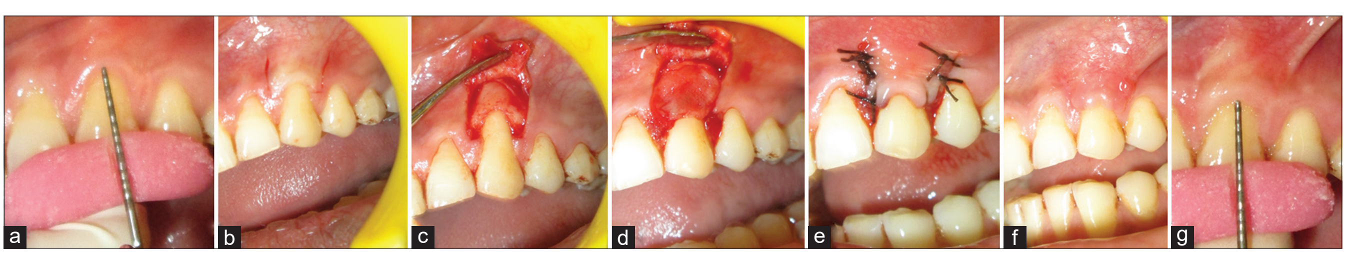

Figure 2: Preoperative recession depth measurement at control site (a), incision, flap reflection, PRF placement, and suture placement done in conventional manner without use of any magnification (b-e), initial healing at the time of suture removal (f), recession depth measurement at 6 months, adequate gingival tissue coverage was seen at the control site (g)

significant differences between the test and control group for RD, RW, PD, CAL, TKG, and WKG ($P > 0.05$) [Table 2].

While comparing the two group at 6 months, no statistically significant differences were found between the two groups for all the parameters, that is, RD, RW, PD, CAL, TKG, and WKG ($P > 0.05$) [Table 3].

There was a statistically significant difference in VAS score between the postoperative day 3rd and 7th in both test and control groups [Table 4].

Discussion

The CAF technique used in the present study for gingival recession defects was the flap design described by Tinti *et al.* in 1993.[23] CAF is the surgical technique of choice, when there is the presence of adequate keratinized gingiva apical to the recession defect. Optimum root coverage good color blending of the treated area, and recuperation of the original morphology of the soft-tissue margin can be accomplished quite predictably. The past studies of Pini Prato *et al*.[24] and Wennström and Zucchelli[25] concluded that the mean root coverage obtained from this technique varies from 60% to 100%. This procedure, however, does not increase the width of the keratinized gingiva nor does it provide much periodontal regeneration in gingival recession defects. To overcome this disadvantage of CAF, concept of GTR was introduced for recession treatment along with coronally repositioned flap.[26]

Jankovic *et al.*[27] in a 6-month randomized controlled trial found that PRF (PRF) membrane provided clinically acceptable results and enhanced wound healing when compared to connective tissue graft treated gingival recession sites. Similarly, Reddy *et al*.[28] also reported two cases where PRF membrane was used in addition to modified CAF technique and in that it showed enhanced root coverage with an increase in thickness of gingiva.[29] The cell composition of PRF indicates that this biomaterial is a blood-derived living tissue and must be handled with utmost care to keep its cellular content alive and stable. The three main platelet cytokines play a fundamental role in initial healing mechanisms owing to their capacity to stimulate cell migration and proliferation (particularly by platelet-derived growth factors [PDGFs]) and induce fibrin matrix remodeling as well as secretion of a cicatricial collagen matrix (particularly by transforming growth factor-beta [TGF-β]) With these fundamental considerations, PRF can be considered as a natural fibrin-based biomaterial suitable for development of a very fine blood meshwork and able to guide epithelial cell migration to its surface.[12]

In the present study, there were no statistically significant differences between the groups for the percentage of root coverage (PRC). At baseline, both test and control groups had similar findings and there was no statistical significance between test and control group at baseline. At 6 months, both test and control groups achieved adequate root coverage and RD also decreased from baseline. In both test and control groups, there was a statistically significant reduction in the RD at the end of 6 months. The mean percentage of root coverage obtained 6-month postoperatively was 87% ± 17.02% for the test group and 81% ± 20.52% for the control group. Andrade *et al*.[30]

Table 1: Mean values of baseline characteristics of test and control groups

At baseline	RD	RW	PD	CAL	WKG	TKG
Test	2.50±0.70	3.10±0.57	1.50±0.52	4.20±0.79	2.60±0.70	1.77±0.17
Control	2.10±0.87	2.8±0.63	1.40±0.51	3.40±0.70	2.60±0.51	1.79±0.16
P	0.568	0.653	0.728	0.468	0.209	0.934

Values are presented as mean±SD. RD: Recession depth; RW: Recession width; PD: Probing pocket depth; CAL: Clinical attachment level; WKG: Width of keratinized gingiva; TKG: Thickness of keratinized gingiva; SD: Standard deviation

Table 2: Comparison of mean values of test and control group at 3-months follow-up

At 3 months	RD	RW	PD	CAL	WKG	TKG
Test	0.50±0.70	0.70±0.63	1.20±0.42	1.70±0.82	3.60±0.70	2.02±0.19
Control	0.60±0.51	0.60±0.52	1.20±0.42	1.70±0.67	3.40±0.52	2.00±0.21
P	0.209	0.311	0.825	0.440	0.209	0.564

Values are presented as mean±SD. RD: Recession depth; RW: Recession width; PD: Probing pocket depth; CAL: Clinical attachment level; WKG: Width of keratinized gingiva; TKG: Thickness of keratinized gingiva; SD: Standard deviation

Table 3: Comparison of mean values of test and control group at 6-months follow-up

At 6 months	RD	RW	PD	CAL	WKG	TKG
Test	0.40±0.52	0.50±0.53	1.10±0.32	1.30±0.67	4.20±0.79	2.26±0.12
Control	0.50±0.53	0.40±0.52	1.10±0.32	1.20±0.42	3.90±0.74	2.16±0.14
P	0.742	0.728	0.883	0.228	0.809	0.811

Values are presented as mean±SD. RD: Recession depth; RW: Recession width; PD: Probing pocket depth; CAL: Clinical attachment level; WKG: Width of keratinized gingiva; TKG: Thickness of keratinized gingiva; SD: Standard deviation

Table 4: Comparison of visual analog scale score within the group at the various time interval

VAS	Mean±SD	*P*
Test		
3 days postoperative	0.80±0.42	<0.001*
7 days postoperative	0.20±0.42	
Control		
3 days postoperative	4.5±1.08	<0.001*
7 days postoperative	1.6±0.84	

*Highly significant. VAS: Visual analog scale; SD: Standard deviation

also compared the macro and microsurgery techniques for root coverage of teeth using a coronally positioned flap associated with enamel matrix derivative. They also had a similar observation; the percentage of root coverage was 92% and 83% for the test group and control group, respectively.

Both test and control groups achieved a significant reduction in RW which was statistically significant at 6 months for each group. However, the difference between the groups was not significant at 6 months. At 6 months, PD decreased to 1.1 ± 0.32 mm in the test group and 1.1 ± 0.32 mm in the control group. The macrosurgical and microsurgical techniques provided a statistically significant reduction in RD and RW, similar findings were also observed in a study by Latha *et al*.[31] and Francetti *et al*.[15] in which all parameters except probing pocket depth, significantly improved from baseline to 12 months.

There was an improvement in CAL of 2.9 ± 0.57 mm in the test group and 2.2 ± 0.79 mm in the control group at 6 months. There was statistically significant difference present between baseline and 6 months parameters in CAL in both test and control groups. The TKG increased to 2.26 ± 0.12 mm in the test group and 2.16 ± 0.14 mm in the control group at 6 months. The mean values were similar in both groups and but were not statistically significant.

Pandey and Mehta[32] did a similar comparative clinical study for the treatment of localized gingival recession using the free rotated papilla autograft combined with CAF by conventional (macrosurgery) and surgery under magnification (microsurgical) technique. Both (macro and microsurgery) groups showed significant clinical improvement in all the parameters (RD, RW, CAL, and WKT). However, by comparing both the groups, these parameters did not reach statistical significance which was similar to our findings. They concluded that surgery under magnification (microsurgery) may be clinically favorable than the conventional surgery in terms of less postoperative pain and discomfort experienced by patients at the microsurgical site, the findings of this study were similar to the observations made in the present study.

The VAS has been described as providing a convenient, easy, and rapidly administered measurement strategy that is useful in a wide variety of clinical and research settings to measure a number of subjective phenomena. These features appear to make the VAS an attractive measurement option for the clinical researcher concerned with maximizing the amount of data collected in relation to patient demand.[22]

In the present study, the mean VAS scores at 3-day postoperatively in the control and test group were 4.50 ± 1.08 and 0.80 ± 0.42, respectively. At 7th-day postoperative, the mean VAS scores in control and test groups were 1.6 ± 0.84 and 0.20 ± 0.42, respectively. The mean VAS scores were significantly higher in the control group at both the intervals showing that the pain perceived was more in the control group than the test group. These findings are also in accordance with the study by Francetti *et al*.[15] Tibbettes and Shanelec also found that microsurgery offers less postoperative pain, discomfort, and better healing because of finer sutures and instruments used in it.[33]

Compared to the conventional macrosurgical approach for the treatment of gingival recession, the microsurgical approach has been shown to offer the distinct advantage of increased vascularization of the grafts.[18] Despite the several benefits of microsurgical principles and techniques, limited adoption of microsurgery in periodontal surgical practice may owe to its inherent disadvantages. These may include restricted areas of vision, loss of depth of field and visual reference point, steep learning curve, and a relatively higher initial cost of microsurgical setup.[34] To meet out the above-mentioned challenges and make initial advantages attained during microsurgical approach into decisive advantages, new approaches would have to be adopted and prospective studies would be needed to see any major differences in long duration.

Conclusion

Both groups showed a convincing improvement of clinical parameters (RD, RW, probing pocket depth, relative attachment level, WKG, and TKG) in Miller's Class I and Class II gingival recession defects postoperatively. The percentage of root coverage obtained in both the groups was statistically similar and a microscope is a tool that permits less traumatic and minimally invasive surgery.

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Conflicts of interest

There are no conflicts of interest.

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