Original Article

Comparative Evaluation of Platelet-Rich Fibrin versus Connective Tissue Grafting in Treatment of Gingival Recession Using Pouch and Tunnel Technique: A Randomized Clinical Study

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Abstract

Aims: The aim of the study was to compare the clinical efficacy of platelet-rich fibrin (PRF) and connective tissue grafting in the treatment of gingival recession (GR) using pouch and tunnel (P and T) technique. **Materials and Methods:** A total of 40 Class I or Class II GR defects in 17 patients were randomized treated with *P* and T with PRF (Group I, $n = 20$) and *P* and T with CTG (Group II, $n = 20$). The parameters measured were plaque index (PI), gingival index (GI), probing pocket depth (PPD), clinical attachment level (CAL), horizontal gingival recession (HGR), vertical gingival recession (VGR), width of attached gingiva (WAG), width of keratinised gingiva (WKG), gingival thickness-mid buccal (GTMB), and gingival thickness interdental papilla (GTIP). Postsurgical discomfort level (PSDL), hypersensitivity score (HS), and patient esthetic score (PES) were recorded using visual analog scale (VAS). The PI, GI, PPD, CAL, HGR, VGR, WAG, WKG, GTMB, and GTIP were assessed at pretreatment (baseline) and 1-, 3-, and 6-month posttreatment. The PSDL, HS, and PES were assessed at baseline, day 10, 1, 3, and 6-month posttreatment. **Results:** P and T with PRF and CTG resulted in root coverage of 73.75% ± 7.80% and 70.83% ±8.26%, respectively. Patient response and acceptance for the surgical treatment modality showed less discomfort and better esthetics in Group I as compared to Group II. **Conclusions:** PRF treated sites were comparable to the gold standard CTG with better patient acceptance and a lesser invasive approach in terms of graft procurement.

Keywords: *Connective tissue grafting, gingival recession, periodontal plastic surgery, tunneling*

Introduction

The main objective of reconstructive periodontal therapy is the refurbishment of periodontal health, function, and esthetics that may need the correction of gingival recession (GR) in localized or generalized areas within the esthetic zone.[1] The pouch and tunnel (P and T) technique is a minimally invasive periodontal plastic surgical procedure which is considered a successful approach for attaining GR coverage as it improves esthetics by preserving papillae while sustaining vascularity at the operating site to support the grafts.[2] Aroca *et al.*[3] used the term modified coronally advanced tunnel, or coronally advanced modified tunnel to describe the tunneling approach with coronal advancement of the mucogingival complex. The microsurgical concept minimizes trauma, ensures better blood supply to the graft, enhances the wound healing, and creates an improved esthetic outcome.[1,4]

Among the use of soft tissue grafts, CTG appears to yield the most predictable outcomes for recession coverage on both the short-(6 months to 1 year) and long-term (up to 5 years) basis,[5] and hence is considered as the gold standard.[6] However, CTG necessitates a second surgical site and is associated with an increased risk of indisposition associated with garnering the autogenous graft from palate. Procurement of a sufficient amount of graft becomes a challenge in situations where the individual has a thin palatal tissue biotype. Further, the depth (shallow or deep) of the palatal vault is also one of the deciding factors for the amount of graft that can be procured. Subsequently, other biomaterials and grafts, such as acellular dermal matrices, enamel matrix derivatives, and autologous plasma, etc., are increasingly being sought.[7-10] Platelet-rich fibrin (PRF), a platelet

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concentrate, has emerged as a successful surgical adjuvant that stimulates soft-tissue healing and facilitates wound closure, thereby offering enhanced esthetic outcomes.[11,12]

To the best of our knowledge, only a few case reports but no randomized clinical study have been published in which GR was treated with P and T technique using PRF. Hence, the present study was the first study conducted to equate the clinical effectiveness of PRF or CTG with P and T for the GR defects management.

Materials and Methods

The present randomized clinical study was conducted in the Department of Periodontology. The study protocol was in agreement with the ethical principles described in the declaration of Helsinki 1998 revised 2008 after approval from the Institutional Research and Development Committee and Institutional Human Ethics Committee.

Sample size determination

Sample size was determined based on studies advocating 1% to 5% gain in root coverage (RC) in PRF treatment as compared to without PRF.[11] Expecting at least 1.3% gain/loss (effect size) in RC of either between CTG and PRF over 6 months of time (i.e. % mean change from baseline to 6 months) and considering 5% margin of error (Type I error: α =0.05), 80% power (Type II error: 1-β =0.80), and 1:1 ratio, the minimum sample size (recession sites) required was 20 in one group and total 40 for two groups.

Inclusion and exclusion criteria

For the present study, non-smoker, non-alcoholic (self-reported) patients without any contributory medical history were recruited amongst those visiting the outpatient Department of Periodontology. Patients of both genders with age more than 18 years, having at least two adjacent teeth in maxillary or mandibular anterior sextant with Miller's Class I or Class II labial GR defect, who were in good general health with no contraindications for periodontal surgery (American Society of Anesthesiologists-I). Selected teeth must be free of restorations on the cervical (buccal or proximal) regions.

Exclusion criteria include pregnant and lactating women; teeth exhibiting pathologic mobility, migration, mal-alignment, and alveolar bone loss; patients under active orthodontic therapy and those using drugs capable of modifying the results of periodontal therapy during the last 6 months.

Study design

For the present clinical study, patients were randomly assigned into either of the two treatment groups with the help of sealed envelopes. These randomly numbered, identical looking sealed opaque envelopes consisted of one of the two treatment modalities and ensured equal chances of selection. Equal number of envelopes for each treatment modalities were used to avoid heterogeneous sample size. The groups were as follows: Group I (P and T technique with PRF): GR was treated with P and T technique using PRF. Group II (P and T technique with CTG): GR was treated with P and T technique using CTG [Figure 1].

Initial therapy

All the selected patients were informed about their periodontal disease and were given detailed instruction for performing meticulous plaque control measures. All patients enrolled for the study underwent phase I therapy. Re-evaluation of phase I therapy was done after 1 month.

Procurement of platelet-rich fibrin and CTG

Autologous PRF was procured and prepared into membrane from patient's blood prior to surgery based on Choukroun's protocol,[10] using a tabletop centrifuge (REMI, Laboratories, India), as explained in previous studies.[10-13]

The connective tissue autograft for the present study was obtained from the palate using the Class III Type A incision design as described by Liu *et al*.[12] The procured graft was stored in normal saline until it was placed at the recipient site. On donor site, partial thickness flap was relocated and protected in place by interrupted sutures using 4-0 black braided silk sutures to obtain primary closure.

Preparation of acrylic stent

An acrylic stent was fabricated with cold cure resin on the cast models of the patients as described by Clark

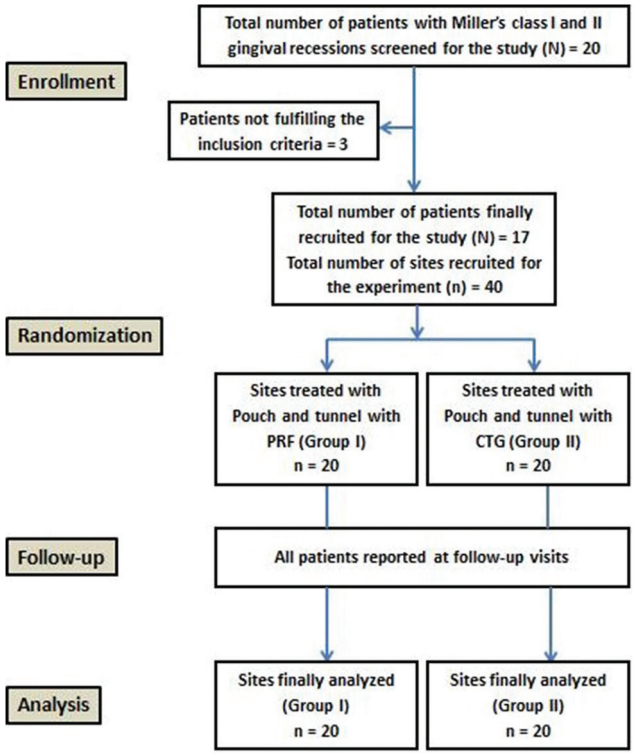

Figure 1: Flowchart of the study design

et al.[14] A slot/guiding groove carved on the stent at the mid-buccal (MB) area of the particular tooth to be treated. The apical margin of this guiding groove served as the fixed reference point (FRP) for measurements of the clinical parameters follow-up visits.

Clinical methodology

Patients who could maintain satisfactory oral hygiene during the maintenance phase after initial therapy were recalled for surgery, and written informed consent was obtained. Just before the surgery, the patient was made to rinse his/her mouth with 10 ml of 0.2% chlorhexidine gluconate solution. The extraoral mopping was done with betadine (10% povidone-iodine). The operative site was anesthetized (infiltration or block technique) using 2% lignocaine hydrochloride with adrenaline (1:200,000). In case of Group I (P and T with PRF), before giving incisions, patient's blood sample was drawn for the preparation of PRF.

The tunneling technique performed in the study was according to Salama *et al.*[1] utilizing the Microsurgical Tunneling Kit (Salama and Salama, Stoma USA Inc, Melville, NY). The tunnel was extended beyond the mucogingival junction so as to release the flap sufficiently. Flap was coronally mobilized until the marginal portion of the flap extend coronal to the cementoenamel junction (CEJ) of the tooth passively when rolled coronally using a blunt instrument [Figure 2a-f].

In sites of Group I (P and T with PRF), PRF was inserted into the tunnel and squeezed to form a membrane covering the defect, so that fluid obtained may confined to the treated site [Figure 3a and b]. In group II (P and T with CTG), after the preparation of recipient site, CTG harvested from the palate (as explained above) was extended to cover all the recession defects as proposed by Ribeiro *et al.*[15] and placed into the prepared tunnel, covering the exposed root areas [Figure 3c and d].

After the graft was placed into the tunnel, the mucogingival complex was positioned coronally to the mid-coronal point of the facial aspect of each tooth and secured with the help of coronally anchored sutures using composite resin. In Group II, the donor site was also sutured back in primary closure using 4-0 black silk sutures (Mersilk) to allow for healing by primary intention [Figure 3e and f].

Periodontal dressing (Coe-Pak, GC, America) was applied at the surgical site. Postsurgically, systemic antibiotics, and analgesics were prescribed for 5 days. Written postoperative were given to all the patients. Sutures were removed after 10 days postoperatively. During this time interval, patients were asked to refrain from toothbrushing on operated sites. 0.2% chlorhexidine mouthwash (Hexidine) was used twice a day for chemical plaque control.

After 10 days of the surgery, the Coe-Pak and sutures were carefully removed without hampering the healing of soft tissue, and the surgical site was irrigated with betadine and normal saline. Recall appointment of the patient was made after 10 days, 1 month, 3 months, and 6 months [Figures 4a-c and 5a-c]. Oral hygiene instructions were reinforced at each follow-up visit, and if required supragingival scaling was done.

Parameters recorded

Clinical parameters viz plaque index,[16] gingival index,[17] probing pocket depth (PPD), clinical attachment level (CAL), vertical gingival recession (VGR), horizontal component of GR at CEJ horizontal gingival recession (HGR), width of attached gingiva (WAG), and width of keratinized gingiva (WKG) were recorded on follow-up appointments [Figure 6a-d].[11] Gingival thickness (GT) was recorded using transgingival probing as mentioned by Vandana and Savitha at baseline, 1 month, 3 months, and 6-month posttreatment.[18] GT was measured with an endodontic No. 25 K-file at MB and interdental papilla.

Patient's satisfaction pertaining to his/her comfort, esthetic appearance, and hypersensitivity following the surgery was analyzed subjectively based on the visual analog scale (VAS) at baseline, 10 days, 1 month, 3 months, and 6 months.[19] The patient was asked about pain, edema, and other experiences following the surgery to obtain Postsurgical discomfort level (PSDL). The perceived discomfort was graded using the VAS, which bears the score of 0 at one end depicting "No discomfort" while a score of 10 at the other end represented "unbearable discomfort."[20] Hypersensitivity score (HS) was recorded as a score given by the patient on a scale from 0 to 10 where score of 0 indicated "no dental hypersensitivity," while a score of 10 exhibited "extreme hypersensitivity."[21] To assess the patient esthetic score (PES), the patient was asked to grade his/her satisfaction with respect to color, appearance, and form of the selected site, on a scale of 0–10, with score 0 indicating "poor esthetics" and score 10 representing "pleasing/excellent esthetics."[11,22]

Statistical analysis

Data were summarized as Mean ± standard error (SE) (SE of the mean). Groups were compared by independent Student's *t*-test. Groups were also compared by repeated measures two factor (groups and time intervals) analysis of variance and the significance of mean difference within (intra) and between (inter) the groups were done by Newman–Keuls *post hoc* test after ascertaining normality by Shapiro–Wilk's test and homogeneity of variance between groups by Levene's test. Analyses were performed on SPSS software version 17.0 (SPSS Inc., Chicago, IL, USA). The level of significance was set at 0.05 ($P < 0.05$ Significant [*]).

Results

For the present randomized clinical study, total of forty sites (in 17 patients) were recruited and randomized

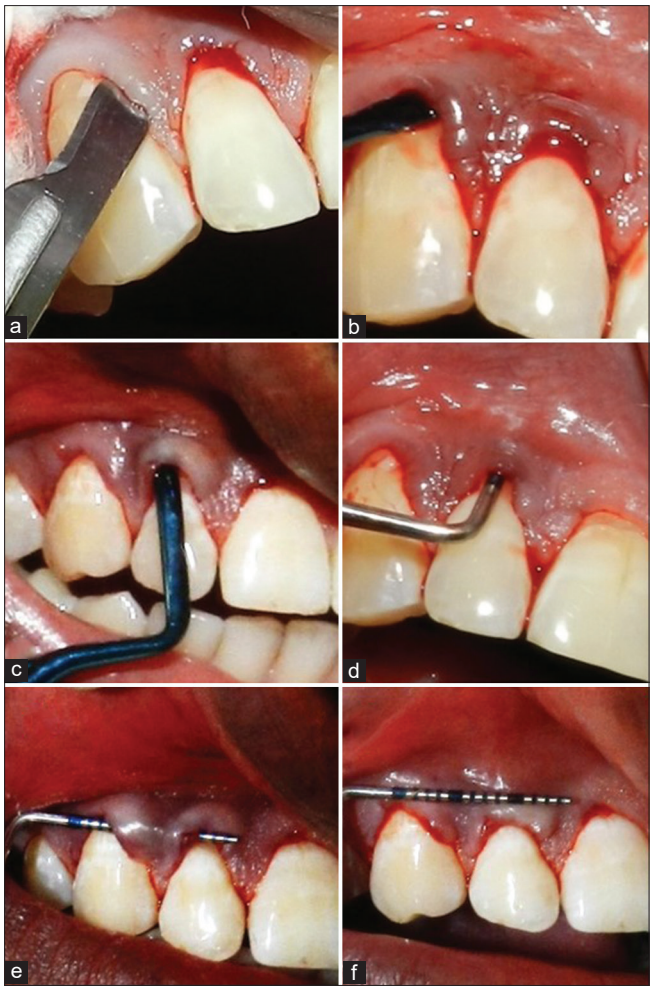

Figure 2: (a): Sulcular incisions were made on the labial surface of each tooth, sparing the interdental papillae. (b): Interdental papilla elevation using Microsurgical Tunneling Ki. (c): Flap elevation using Microsurgical Tunneling Kit. (d): Extension of tunnel beyond the mucogingival junction to relax the flap sufficiently. (e): Elevation of flap beyond mucogingival junction. (f): Coronal mobilization of the flap

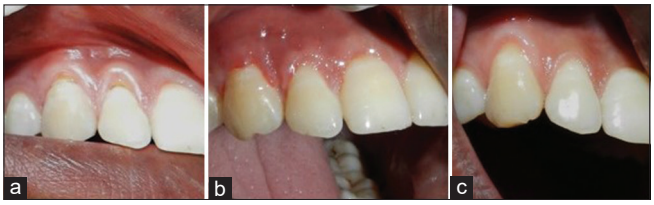

Figure 4: (a): Group I case at baseline. (b): Group I Follow-up at 3 month. (c): Group I follow-up at 6 months

into two groups: 20 sites (nine patients) were treated with PRF (Group I) and 20 sites (eight patients) with CTG (Group II). Table 1 shows demographics and distribution of surgical sites involved in the two groups. Patients of two groups were age and gender matched and thus comparable and may also not influence the study outcome measures. Comparing the distribution of tooth involved of two groups, Chi-square test showed a similar distribution of tooth involved between the two groups (χ^2 = 17.00, P = 0.150), i.e. did not differ significantly. Patients in Group I (P and T with PRF) and

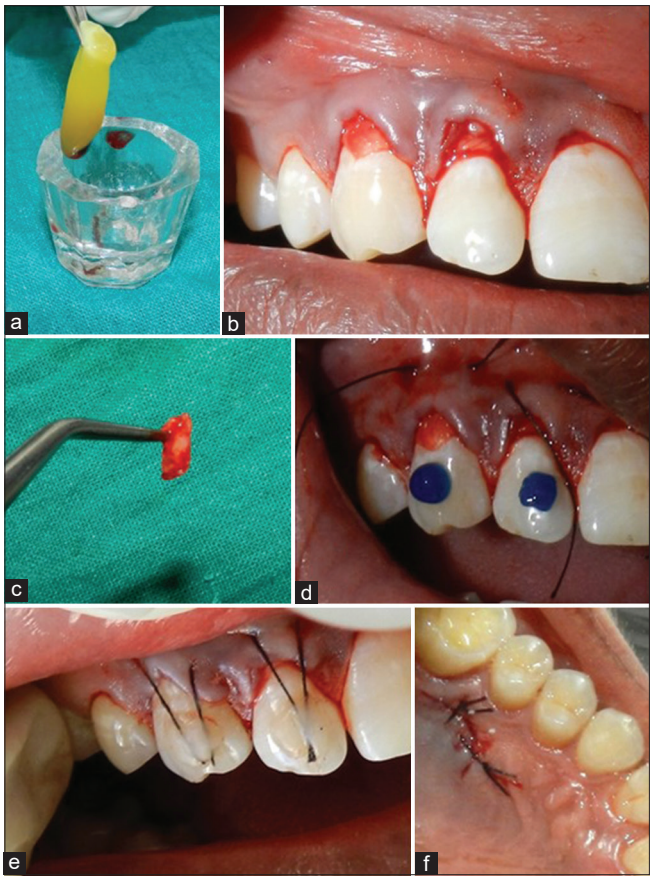

Figure 3: (a): Platelet rich fibrin procured from patients' blood. (b): Platelet rich fibrin was inserted into the tunnel. (c): Connective tissue procured. (d): Connective tissue graft in prepared tunnel. (e): Anchored sutures that were secured at the mid-coronal point of the facial aspect of each tooth with the help of composite resin. (f): The donor site was also sutured back in primary closure using 4-0 black silk sutures

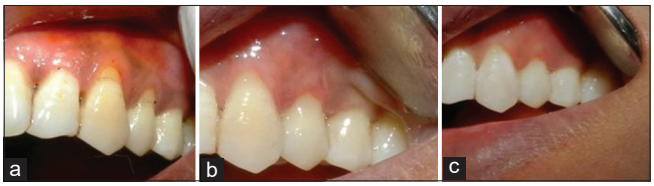

Figure 5: (a): Group II case at baseline. (b): Group II case follow-up at 3 months. (c): Group II case follow-up at 6 months

Group II (P and T with CTG) ranged from 20 to 47 years and 26–47 years. The mean age of Group I was slightly higher than Group II but did not differ significantly.

Table 2 shows the comparison of the difference in mean values of clinical parameters between the two groups at different time intervals from baseline to 6 months. In both groups, the mean gingival thickness-mid buccal (GTMB) increased significantly (P < 0.05 and P < 0.001) after treatment up to 3 months and remain unchanged till 6 months, while the mean gingival thickness interdental papilla (GTIP) increased significantly (P < 0.001) up to 1 month in Group I and up to 3 months in Group II, then remained stable till 6 months. In Group II, GTMB

increased significantly ($P < 0.001$) after 1 month till 6 months. At 1 month, the mean GTMB and GTIP were found significantly ($P < 0.01$) greater in Group I as compared to Group II. However, the overall increase in GTMB (i.e. mean change from baseline to 6 months) was found to be nonsignificantly greater in Group II while that in GTIP was nonsignificantly greater in Group I.

Table 3 showing the comparison of mean change in values of clinical parameters among the two groups from baseline to 6 months. In both groups, mean PPD decreased significantly ($P < 0.001$) while a significant ($P < 0.001$) gain in CAL was observed up to 3 months after treatment then remained stable till 6 months. The net decrease in PPD and gain in CAL (i.e. mean change from baseline to 6 months) was found to be nonsignificantly greater in Group I as compared to Group II.

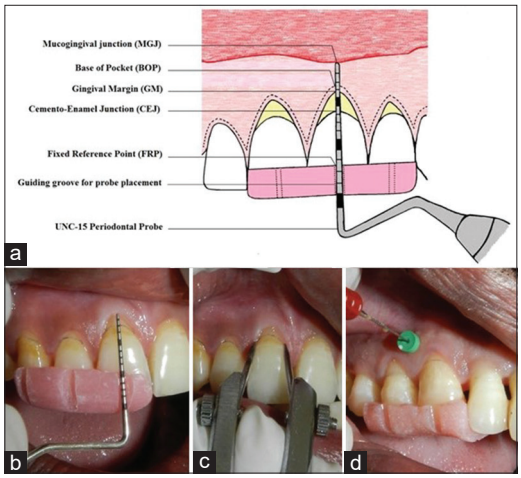

Figure 6: (a): Diagram showing landmarks for recording clinical parameters. (b): Gingival recession measurement using acrylic stent. (c): Measuring horizontal component of gingival recession. (d): Gingival thickness measurement

Table 4 postsurgical patient response score (Mean ± SE, $n = 20$) of two groups over the time intervals. Significant improvement ($P < 0.001$) in HGR was observed in both the groups at all postoperative time intervals. Early improvement (at 3 months) of HGR values was observed in Group I (P and T with PRF) that remained stable till final follow-up, whereas a linear improvement was observed from baseline to 6 months in Group II (P and T with CTG). In both groups, VGR decreased significantly ($P < 0.001$) after the treatment up to 3 months and remained stable till 6 months for both the groups. In both groups, VGR decreased significantly ($P < 0.001$) after the treatment up to 3 months and remained stable till 6 months. The improvement in VGR at 6 months from baseline in both the groups was equal i.e. 1.45 mm. After treatment, mean WAG and WKG increased significantly ($P < 0.001$) up to 3 months in both groups and remained stable till 6 months. The overall increase in mean WAG and mean WKG (i.e. mean change from baseline to 6 months) was found to be nonsignificantly greater in Group I as compared to Group II. In the present study, the gain in mean WKG was observed to be 1.45 mm for Group I and 1.35 mm for Group II at 6 months.

Table 5 showed the comparison of difference in mean patient response VAS scores between the time intervals in each group. There was net improvement in PSDL, and HS (i.e. mean change from baseline to 6 months) was found to be nonsignificantly greater in Group II as compared to Group I. However, improvement in PES was found to be nonsignificantly greater in Group I (2.90) as compared to Group II (2.45).

Table 1: Demographics and distribution of surgical sites involved in the two groups

Basic characteristics	Group I (n=9), n (%)	Group II (n=8), n (%)	t/χ^2	P
Age (years), mean±SE	34.11±3.63	32.75±2.33	0.31	0.763
Gender				
Female	1 (11.1)	3 (37.5)	1.64	0.200
Male	8 (88.9)	5 (62.5)		
Tooth number (site)	**Group I (n=20), n (%)**	**Group II (n=20), n (%)**	χ^2	P
11	2 (10.0)	0	17.00	0.150
12	4 (20.0)	0		
13	4 (20.0)	1 (5.0)		
14	0 (0.0)	1 (5.0)		
21	2 (10.0)	1 (5.0)		
22	2 (10.0)	1 (5.0)		
23	1 (5.0)	2 (10.0)		
24	0 (0.0)	1 (5.0)		
31	2 (10.0)	3 (15.0)		
32	2 (10.0)	2 (10.0)		
41	1 (5.0)	3 (15.0)		
42	0 (0.0)	4 (20.0)		
43	0 (0.0)	1 (5.0)		

*P<0.05 significant. SE: Standard error

Table 2: Comparison difference in mean values of clinical parameters between the two groups at different time intervals baseline to 6 months

Parameters	Period	Group I	Group II	Comparison (Group I vs. group II)	
				Mean difference	*P*
PI	Baseline	0.94±0.08	0.96±0.09	0.02	0.863
	1 month	0.61±0.05	0.69±0.08	0.07	0.434
	3 months	0.59±0.06	0.75±0.06	0.16	0.332
	6 months	0.75±0.07	0.90±0.04	0.14	0.136
GI	Baseline	0.88±0.07	0.86±0.06	0.03	0.734
	1 month	0.72±0.07	0.63±0.06	0.09	0.684
	3 months	0.55±0.05	0.72±0.05	0.17	0.143
	6 months	0.51±0.04	0.66±0.04	0.15	0.238
PPD	Baseline	1.75±0.14	1.60±0.11	0.15	0.234
	1 month	1.20±0.12	1.15±0.08	0.05	0.691
	3 months	0.95±0.05	0.95±0.05	0.00	1.000
	6 months	0.95±0.05	0.95±0.05	0.00	1.000
CAL	Baseline	3.85±0.25	3.90±0.22	0.05	0.881
	1 month	2.05±0.26	2.25±0.25	0.20	0.551
	3 months	1.65±0.20	1.85±0.25	0.20	0.932
	6 months	1.65±0.20	1.85±0.25	0.20	0.551
HGR	Baseline	2.90±0.28	2.75±0.18	0.15	0.682
	1 month	1.25±0.28	1.15±0.28	0.10	0.785
	3 months	0.80±0.22	0.85±0.28	0.05	0.990
	6 months	0.80±0.22	0.95±0.29	0.15	0.911
VGR	Baseline	2.10±0.24	2.30±0.21	0.20	0.533
	1 month	0.85±0.20	1.10±0.25	0.25	0.437
	3 months	0.65±0.20	0.85±0.25	0.20	0.923
	6 months	0.65±0.20	0.85±0.25	0.20	0.533
WAG	Baseline	2.10±0.32	2.05±0.36	0.05	0.920
	1 month	3.90±0.34	3.65±0.41	0.25	0.616
	3 months	4.30±0.26	4.00±0.40	0.30	0.929
	6 months	4.30±0.26	4.00±0.40	0.30	0.547
WKG	Baseline	3.85±0.31	3.65±0.38	0.20	0.684
	1 month	5.10±0.29	4.80±0.41	0.30	0.927
	3 months	5.30±0.26	5.00±0.40	0.30	0.972
	6 months	5.30±0.26	5.00±0.40	0.30	0.813
GTMB	Baseline	1.15±0.08	1.20±0.09	0.05	0.792
	1 month	2.15±0.15	1.45±0.11	0.70	0.003*
	3 months	2.10±0.16	2.25±0.14	0.15	0.857
	6 months	2.10±0.16	2.25±0.14	0.15	0.857
GTIP	Baseline	2.00±0.10	2.10±0.07	0.10	0.321
	1 month	2.95±0.05	2.20±0.09	0.75	<0.001*
	3 months	2.95±0.05	2.90±0.07	0.05	0.988
	6 months	2.95±0.05	2.90±0.07	0.05	0.873

*P<0.05 significant. PI: Plaque index; GI: Gingival index; PPD: Probing pocket depth; CAL: Clinical attachment loss; HGR: Horizontal gingival recession; VGR: Vertical gingival recession; WAG: Width of attached gingiva; WKG: Width of keratinized gingiva; GT: Gingival thickness; GTMB: GT – mid buccal; GTIP: GT – interdental papilla

Discussion

The present study was conducted with the primary objective to evaluate comparatively the regenerative potential of autologous PRF and autogenous CTG in the management of Miller's Class I and Class II GR defects using the P and T technique. The secondary objectives were to compare the patient satisfaction in terms of postsurgical discomfort, reduction in root sensitivity, and improved esthetics obtained by the P and T procedure for recession coverage in combination with PRF or CTG and to compare and evaluate the effective GT achieved from treatment by both graft materials. To the best of our knowledge, no data has been published reporting randomized controlled trial comparing PRF or CTG using P and T technique for the treatment of GR defects.

Significant improvement ($P < 0.001$) in GR was observed in both the groups at all postoperative time intervals.

Table 3: Comparison of mean change in values of clinical parameters amongst the two groups from baseline to 6 months

Parameters	Comparison	Group I		Group II	
		Mean difference	*P*	Mean difference	*P*
PI	Baseline versus 1 month	0.33	<0.001*	0.27	<0.001*
	Baseline versus 3 months	0.35	<0.001*	0.21	0.001*
	Baseline versus 6 months	0.19	0.001*	0.06	0.473
	1 month versus 3 months	0.02	0.671	0.07	0.211
	1 month versus 6 months	0.14	0.037*	0.21	0.001*
	3 months versus 6 months	0.16	0.017*	0.15	0.016*
GI	Baseline versus 1 month	0.17	0.008*	0.23	0.001*
	Baseline versus 3 months	0.34	<0.001*	0.14	0.030*
	Baseline versus 6 months	0.38	<0.001*	0.20	0.002*
	1 month versus 3 months	0.17	0.016*	0.09	0.257
	1 month versus 6 months	0.21	0.002*	0.03	0.646
	3 months versus 6 months	0.04	0.463	0.06	0.264
PPD	Baseline versus 1 month	0.55	<0.001*	0.45	<0.001*
	Baseline versus 3 months	0.80	<0.001*	0.65	<0.001*
	Baseline versus 6 months	0.80	<0.001*	0.65	<0.001*
	1 month versus 3 months	0.25	0.204	0.20	0.423
	1 month versus 6 months	0.25	0.142	0.20	0.087
	3 months versus 6 months	0.00	1.000	0.00	1.000
CAL	Baseline versus 1 month	1.80	<0.001*	1.65	<0.001*
	Baseline versus 3 months	2.20	<0.001*	2.05	<0.001*
	Baseline versus 6 months	2.20	<0.001*	2.05	<0.001*
	1 month versus 3 months	0.40	0.178	0.40	0.071
	1 month versus 6 months	0.40	0.123	0.40	0.123
	3 months versus 6 months	0.00	1.000	0.00	1.000
HGR	Baseline versus 1 month	1.65	<0.001*	1.60	<0.001*
	Baseline versus 3 months	2.10	<0.001*	1.90	<0.001*
	Baseline versus 6 months	2.10	<0.001*	1.80	<0.001*
	1 month versus 3 months	0.45	0.424	0.30	0.427
	1 month versus 6 months	0.45	0.338	0.20	0.407
	3 months versus 6 months	0.00	1.000	0.10	0.678
VGR	Baseline versus 1 month	1.25	<0.001*	1.20	<0.001*
	Baseline versus 3 months	1.45	<0.001*	1.45	<0.001*
	Baseline versus 6 months	1.45	<0.001*	1.45	<0.001*
	1 month versus 3 months	0.20	0.646	0.25	0.203
	1 month versus 6 months	0.20	0.518	0.25	0.320
	3 months versus 6 months	0.00	1.000	0.00	1.000
WAG	Baseline versus 1 month	1.80	<0.001*	1.60	<0.001*
	Baseline versus 3 months	2.20	<0.001*	1.95	<0.001*
	Baseline versus 6 months	2.20	<0.001*	1.95	<0.001*
	1 month versus 3 months	0.40	0.183	0.35	0.133
	1 month versus 6 months	0.40	0.126	0.35	0.219
	3 months versus 6 months	0.00	1.000	0.00	1.000
WKG	Baseline versus 1 month	1.25	<0.001*	1.15	<0.001*
	Baseline versus 3 months	1.45	<0.001*	1.35	<0.001*
	Baseline versus 6 months	1.45	<0.001*	1.35	<0.001*
	1 month versus 3 months	0.20	0.371	0.20	0.180
	1 month versus 6 months	0.20	0.180	0.20	0.371
	3 months versus 6 months	0.00	1.000	0.00	1.000

Contd...

Table3: Contnd....

Parameters	Comparison	Group I		Group II	
		Mean difference	*P*	Mean difference	*P*
GTMB	Baseline versus 1 month	1.00	<0.001*	0.25	0.019*
	Baseline versus 3 months	0.95	<0.001*	1.05	<0.001*
	Baseline versus 6 months	0.95	<0.001*	1.05	<0.001*
	1 month versus 3 months	0.05	0.634	0.80	<0.001*
	1 month versus 6 months	0.05	0.882	0.80	<0.001*
GTIP	Baseline versus 1 month	0.95	<0.001*	0.10	0.259
	Baseline versus 3 months	0.95	<0.001*	0.80	<0.001*
	Baseline versus 6 months	0.95	<0.001*	0.80	<0.001*
	1 month versus 3 months	0.00	1.000	0.70	<0.001*
	1 month versus 6 months	0.00	1.000	0.70	<0.001*
	3 months versus 6 months	0.00	1.000	0.00	1.000

*P<0.05 significant. PI: Plaque index; GI: Gingival index; PPD: Probing pocket depth; CAL: Clinical attachment loss; HGR: Horizontal gingival recession; VGR: Vertical gingival recession; WAG: Width of attached gingiva; WKG: Width of keratinized gingiva; GT: Gingival thickness; GTMB: GT – mid buccal; GTIP: GT – interdental papilla

Concurrent to the present study, Pazmiño *et al.*[23] also observed an improvement in GR in both PRF as well as CTG-treated sites with the P and T technique in a case report.

The mean % RC achieved in the present study did not differ significantly between the two groups (73.75% ±7.80% for P and T with PRF vs. 70.83 ± 8.26 for *P* and T with CTG). However, studies[3,10] reported a mean RC of 83% ±26% to 90% ±18% in sites treated with the tunneling technique using CTG. The difference in the results in the present study may be due to the incorporation of a greater number of mandibular sites (18 out of 40) in contrast to previous publications where most of the treated sites were maxillary. As it is difficult to suture the PRF due to inferior mechanical properties, PRF in the present study was pushed into the tunnel using blunt instruments. In the present study, complete root coverage (CRC) of 55% was achieved in both groups.

After treatment, mean WAG, WKG and GTMB increased significantly ($P < 0.001$) up to 3 months in both groups and remained stable till 6 months. Pazmiño *et al.*[23] reported that the tunneling technique with both CTG and PRF favored an increase in GT of keratinized tissue. Gingival biotype or thickness increase may have an advantageous effect on longstanding tissue stability and could even induce creeping attachment. However, connective tissue may be more prone to shrinkage if left exposed.[24]

The present study reported less patient discomfort with PRF as compared to CTG at day 10 and 1 month. It can be explained as PRF preparation is less invasive, does not require an additional donor site, and results in quick wound healing and early reduction of postsurgical edema.[12,23] Improvement in PSDL, PES, and HS (i. e., mean change from baseline to 6 months) was observed in both the groups. Pazmiño *et al.*[23] reported less postsurgical discomfort during first 45 days in patients treated with PRF than with those treated with CTG using the tunneling technique similar to the present study. Cheung and Griffin[20] also reported an increased PSDL score during the 1st week after surgery with CTG, which reduced significantly during the consecutive 3 weeks. Similarly, Agarwal *et al.*[22] also reported a mean decrease in patient discomfort and improvement in PES score in sites treated with PRF after 6 months of surgery. An absence of scar formation in PRF treated sites and an increase in the WKG could be responsible for better patient satisfaction in PRF treated sites as compared to CTG treated sites. Further, CTG created a bulky appearance that could result in less PES from patients.

P and *T* technique using microsurgical tunneling instruments provide better results due to the maintenance of adequate blood supply at the recipient site by avoiding vertical releasing incisions. Chairside availability of compatible table-top centrifuge enhances both biological and clinical outcomes of PRF. Further, PRF is autologous, simple to procure due to avoidance of donor site surgical procedures, cost-effective, nonimmunogenic biomaterial with excellent handling properties.[11,22]

Limitations

The drawbacks of the study were small sample size, short-term follow-up with good oral hygiene instead of meticulous plaque control among subjects, lack of histological evaluation and nonsuturing of CTG to the flap in order to simulate the PRF technique.

Conclusions

The P and T procedure in combination with PRF or CTG is an effective procedure to cover denuded roots with percentage RC of 73.75% ±7.80% in Group I (P and T with PRF) and 70.83% ±8.26% in Group II (P and T with CTG). CRC at 6 months was achieved in 55% of sites in both groups. Results achieved in PRF-treated sites are comparable to the gold standard CTG with better patient acceptance and a lesser invasive approach in terms of graft procurement. These results

Table 4: Postsurgical patient response score (mean±standard error, *n*=20) of two groups over the time-intervals

Time-interval	PSDL				HS				PES			
	Group I	Group II	Comparison (Group I vs. Group II)		Group I	Group II	Comparison (Group I vs. Group II)		Group I	Group II	Comparison (Group I vs. Group II)	
			Mean difference	*P*			Mean difference	*P*			Mean difference	*P*
Baseline	1.40±0.27	1.45±0.21	0.05	0.847	2.70±0.22	2.80±0.22	0.10	0.942	6.80±0.22	6.60±0.30	0.20	0.570
Day 10	2.95±0.17	5.45±0.15	2.5	<0.001*	2.40±0.30	2.70±0.28	0.30	0.588	8.05±0.27	6.95±0.29	1.10	0.003*
1 month	1.00±0.16	1.80±0.14	0.80	<0.001*	1.30±0.15	1.45±0.28	0.15	0.623	9.10±0.19	8.80±0.30	0.30	0.827
3 months	0.25±0.10	0.30±0.15	0.05	0.847	0.80±0.09	0.65±0.20	0.15	0.961	9.60±0.17	9.00±0.26	0.60	0.325
6 months	0.25±0.10	0.10±0.07	0.15	0.564	0.70±0.11	0.65±0.20	0.05	0.870	9.70±0.13	9.05±0.27	0.65	0.257

*P<0.05 significant. PSDL: Postsurgical discomfort level; HS: Hypersensitivity score; PES: Patient esthetic score

Table 5: Comparison of difference in mean patient response Visual Analog Scale scores between the time-intervals in each group

Comparison	PSDL				HS				PES			
	Group I		Group II		Group I		Group II		Group I		Group II	
	Mean difference	*P*	Mean difference	*P*	Mean difference	*P*	Mean difference	*P*	Mean difference	*P*	Mean difference	*P*
Baseline versus day 10	1.55	<0.001*	4.0	<0.001*	0.30	0.184	0.10	0.658	1.25	<0.001*	0.35	0.174
Baseline versus 1 month	0.40	0.066	0.35	0.124	1.40	<0.001*	1.35	<0.001*	2.30	<0.001*	2.20	<0.001*
Baseline versus 3 months	1.15	<0.001*	1.15	<0.001*	1.90	<0.001*	2.15	<0.001*	2.80	<0.001*	2.40	<0.001*
Baseline versus 6 months	1.15	<0.001*	1.35	<0.001*	2.00	<0.001*	2.15	<0.001*	2.90	<0.001*	2.45	<0.001*
Day 10versus 1 month	1.95	<0.001*	3.65	<0.001*	1.10	<0.001*	1.25	<0.001*	1.05	<0.001*	1.85	<0.001*
Day 10versus 3 months	2.70	<0.001*	5.15	<0.001*	1.60	<0.001*	2.05	<0.001*	1.55	<0.001*	2.05	<0.001*
Day 10 versus 6 months	2.70	<0.001*	5.35	<0.001*	1.70	<0.001*	2.05	<0.001*	1.65	<0.001*	2.10	<0.001*
1 month versus 3 months	0.75	<0.001*	1.50	<0.001*	0.50	0.027*	0.80	0.005*	0.50	0.011*	0.20	0.307
1 month versus 6 months	0.75	<0.001*	1.70	<0.001*	0.60	0.021*	0.80	0.004*	0.60	0.006*	0.25	0.409
3 months versus 6 months	0.00	1.000	0.20	0.680	0.10	0.658	0.00	1.000	0.10	0.610	0.05	0.799

*P<0.05 significant. PSDL: Postsurgical discomfort level; HS: Hypersensitivity score; PES: Patient esthetic score

are based on single-centered 6 month follow-up, therefore long-term multicenter randomized controlled clinical trials may be necessary to evaluate the clinical outcome for autologous PRF in comparison to CTG using P and T procedure.

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Conflicts of interest

There are no conflicts of interest.

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