Original Article

Efficacy of Platelet-rich Fibrin in Interdental Papilla Reconstruction as Compared to Connective Tissue Using Microsurgical Approach

Dhanavendra Singh, Rajesh Jhingran, Vivek Kumar Bains, Rohit Madan, Ruchi Srivastava

Department of Periodontology, Saraswati Dental College, Lucknow, Uttar Pradesh, India

Abstract

Aim: This study aims to evaluate autologous platelet-rich fibrin (PRF) and autogenous connective tissue graft (CTG) in interdental papilla (IDP) reconstruction with buccal and palatal split-thickness flap (STF) using microsurgical technique. **Materials and Methods:** Forty Class I or Class II open gingival or cervical embrasure in maxillary anterior region in 14 patients were surgical treated for the reconstruction of IDP. For experimental Group I (STF with PRF, n = 20), surgical site was flushed with PRF fluid. PRF was then placed under the buccal flap and in the IDP region and squeezed. For experimental Group II (STF with CTG, n = 20) after the preparation of recipient site, CTG procured from palate was trimmed to the desired size and shape and placed at the site. Clinical parameters and patient satisfaction response recorded were plaque index, gingival index, probing pocket depth, clinical attachment level, height of IPD, and papilla index score (PIS). **Results:** STF surgery in combination with PRF or CTG, are an effective procedure to increase IDP-height with mean values of 3.10 mm (87.3%) and 3.45 mm (95.8%) for Group I (STF + PRF) and Group II (STF + CTG), respectively. In terms of complete fill (CF) achieved at 3 months, in the present study, the result showed that 90% CF was obtained in Group I (STF + PRF) and 95% in Group II (STF + CTG). The patient response and acceptance for surgical treatment modality in terms of patient postsurgical discomfort score and patient esthetic score was higher for Group II (STF + CTG) than Group I (STF + PRF). **Conclusion:** Based on single-centered 3 months' follow-up, it may be concluded that STF surgery in combination with PRF or CTG is an effective procedure to increase IDP-height; however, a long-term multicentric randomized clinical trial may be necessary to evaluate the clinical outcome for autologous PRF in comparison to CTG with STF.

Keywords: *Connective tissue graft, interdental papilla, platelet-rich fibrin*

Introduction

The absence of the papilla with opening of the black spaces result in "black triangles," that may be one of the major esthetic challenges in periodontal plastic surgery, and is related to the ability to reconstitute the lost interdental papilla (IDP) in the maxillary anterior segment. Various treatment modalities may be used in an attempt to achieve the reconstruction of IDP, including manipulating soft tissue, increasing of the hard tissue, and the restorative and orthodontic treatment.[1] The nonsurgical approaches modify the interproximal space and thereby inducing modifications in the soft tissues.[2] Many surgical treatment options are available for the reconstruction of IDP. The technique can be broadly classified as use pedicle graft with coronal displacement of the gingiva-papillary unit,[3] and subepithelial connective tissue grafting.[4-6] However, limited published studies have reported the use of platelet-rich fibrin (PRF) in papilla reconstruction. PRF is a form of second-generation platelet concentrate; a matrix of autologous fibrin, which is better than platelet-rich plasma by virtue of its properties, easier preparation, and cost-effectiveness. It promotes wound healing, wound sealing, and hemostasis. Their biologic property help to stabilize the flap, enhance neoangiogenesis, and reduces the necrosis and shrinkage of the flap and stabilization of the gingival flap in the highest covering position.[7]

Nowadays, microsurgery offers new possibilities to improve periodontal care in a variety of ways. Its benefits include improved cosmetics, rapid healing, minimum discomfort, and enhanced patient acceptance.[8] Hence, the present study was

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Address for correspondence:
Dr. Vivek Kumar Bains, Department of Periodontology, Saraswati Dental College, Lucknow, Uttar Pradesh, India.
E-mail: doc_vivek76@yahoo.co.in

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conducted to evaluate autologous PRF and autogenous connective tissue graft (CTG), considered as gold standard, in IDP reconstruction with buccal and palatal split-thickness flap (STF) using microsurgical technique.

Materials and Methods

This randomized controlled clinical study was conducted in the Department of Periodontology, Saraswati Dental College, Lucknow, India, from December 2015 to December 2017. The study protocol was conducted in accordance with the ethical principles described in the declaration of Helsinki 1998 revised 2008 after approval from IRDC (SDC/IRDC/2015/MDS-P/26) and IHEC (SDC/IHEC/2015/MDS-P/26).

All compliant patients received verbal information regarding the study protocol and written informed consent was obtained from each patient for participation in the study. Nonalcoholic, nonsmoker (self-reported) patients with no contributory medical history were recruited among those visiting the outpatient department of periodontology, based on the following inclusion and exclusion criteria.

Inclusion criteria

(1) Patients with both genders having age more than 18 years; (2) patient having at least one Nordland and Tarnow's[9] Class I or Class II open gingival or cervical embrasure in maxillary anterior region; (3) selected teeth must be free of restorations on the cervical (buccal or proximal) region; (4) radiographically, the distance between contact point (CP) to alveolar crest was ≤ to 6 mm^2 which was confirm during surgical procedure; (5) patient complaint of food lodgment or esthetic consciousness for open gingival embrasure; (6) patients having no mucogingival problem (shallow vestibule, aberrant frenemy attachment, or inadequate zone of attached gingiva) beside open gingival embrasure adjacent to operating site; (7) patient having minimal probing depth (≤2 mm) adjacent to the open embrasure; and (8) patients were in good health and no contraindication for periodontal plastic surgery.

Exclusion criteria

Pregnant women or nursing mother and patients using tobacco (smoke/smokeless); uncooperative patients; patients having any systemic problem or condition affecting soft tissue or alveolar bone; patients having gingival recession on the labial surface of the teeth adjacent to the open embrasure; teeth with interdental spacing, proclination, rotation, or alveolar bone loss; patients having any medication that may influence the surgical treatment.

Platelet-rich fibrin

Autologous PRF for the study was obtained from patient blood prior to surgery as suggested by Choukroun *et al.*[10,11] from a blood sample of 10 ml taken from the antecubital region of the forearm in a 10 ml sterilized dry glass test tube without anticoagulant, that immediately centrifuged using a tabletop centrifuge (REMI, Laboratories, India) at 3000 rpm for 12 min. The PRF clot obtained was squeezed with sterilized and moist gauge piece to form the PRF membrane [Figure 1]. The centrifuge machine was placed closed to the operatory and all efforts were made to minimize the time between the preparation of PRF and its placement in the defect so as to retain maximum regenerative potential.[11]

Connective tissue graft

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 and Weisgold.[12] The procured graft was stored in normal saline until it was placed at the recipient site. On donor site, partial-thickness flap was repositioned and secured in place by interrupted sutures using 4–0 black braided silk sutures to obtain primary closure [Figure 2].

Sample size determination

Studies advocating 1%–5% gain in papilla index score (PIS) in PRF treatment as compared to without PRF. Expecting at least 1.3% gain/loss (effect size) in PIS of either between CTG and PRF over 3 months (i.e., % mean change from baseline to 3 month) 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 required will be 20 in one group and total 40 for two groups.[13]

Study design

For the present clinical study, the selected sits were randomly assigned for two treatment modalities, as given in the flowchart [Figure 3]. Randomization was achieved by selecting the patient with the help of opaque, sealed envelopes, which ensured equal chances of selection. These identical sealed envelopes consist of one of the treatment modalities. Envelops for each treatment modality were equal in number to avoid heterogeneous sampling.

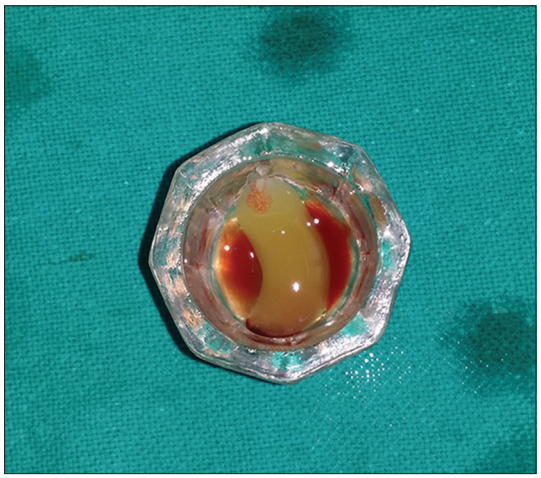

Figure 1: Platelet-rich fibrin procured

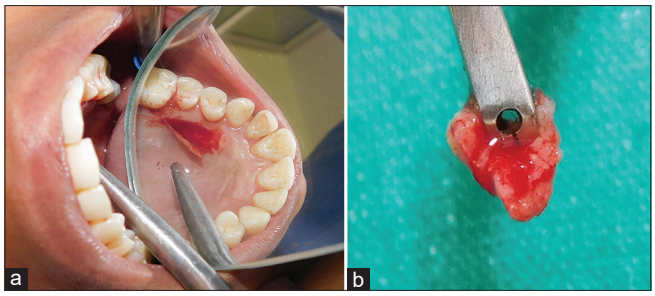

Figure 2: (a) Procurement of connective tissue graft from palate. (b) Connective tissue graft obtained

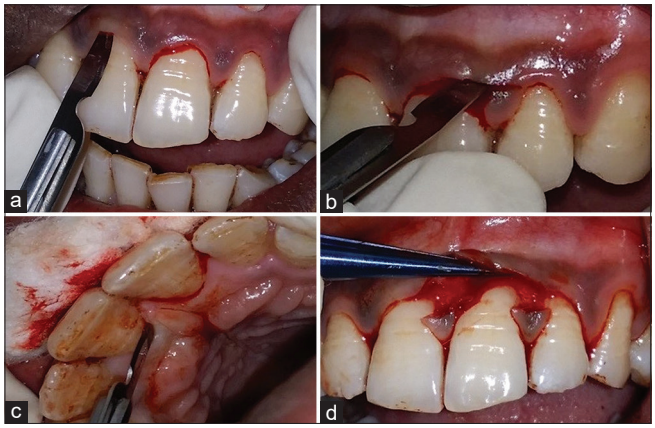

Figure 4: (a) Intrasulcular incision. (b) Horizontal incision at the level of cementoenamel junction. (c) Palatal incision. (d) Elevation of flap

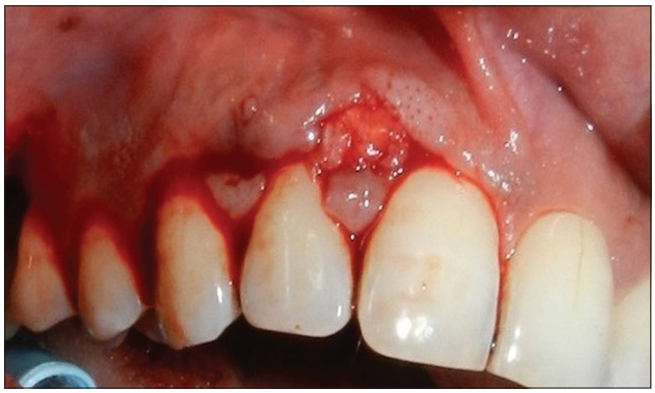

Figure 6: Placement of connective tissue graft at the recipient site

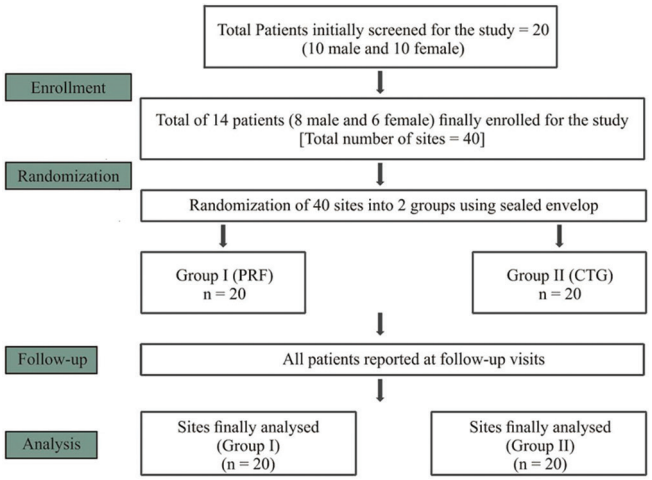

Figure 3: Flow chart showing study design

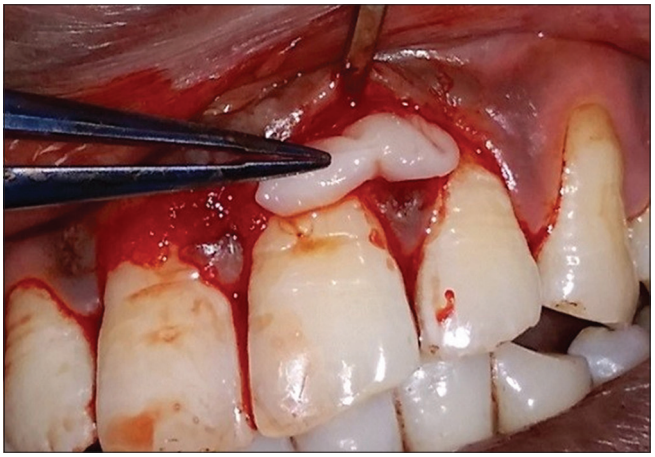

Figure 5: Placement of platelet-rich fibrin membrane at the recipient site with split-thickness flap

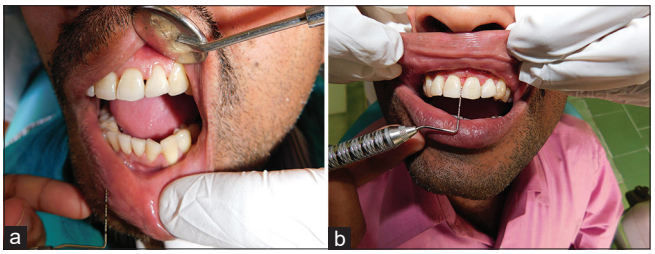

Figure 7: (a) Group I (split-thickness flap with platelet-rich fibrin) preoperative (baseline). (b) Group I (split-thickness flap with platelet-rich fibrin) 3 months' follow-up

Methodology

Initial therapy

All the selected patients were informed in detail about the study protocol and were asked to remain compliant and maintain meticulous plaque control measures. All patients enrolled in the study underwent phase-I therapy. Re-evaluation of phase I therapy was done up to 1 month.

Surgical procedure

Compliant patients with satisfactory oral hygiene maintenance were appointed for surgical therapy. Immediately prior to surgery, selected sites were randomly assigned to one of the two treatment modalities as detailed above. Preprocedural extraoral surface of the patient was swabbed with betadine (10% povidone-iodine). Oral antisepsis was accomplished using 10 ml of 0.2% chlorhexidine digluconate solution rinse. All surgical procedures were done using surgical operating microscope (three-dimensional medical system Co., U. S. A. with magnification of ×3.5, ×5.0). The operative site was anesthetized with lignocaine hydrochloride (HCL) with adrenaline (1:2,00,000) using block or infiltration technique.

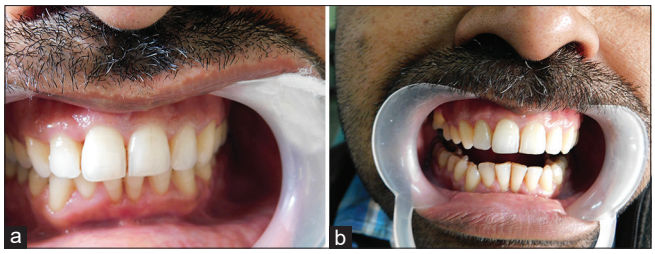

Figure 8: (a) Group II (split-thickness flap with connective tissue graft) baseline. (b) Group II (split-thickness flap with connective tissue graft) 3 months' follow-up

In case of experimental Group I (with PRF), the patient's blood sample was taken out for preparing PRF as explained above prior to the commencement of the surgical procedure [Figure 1].

Papilla reconstruction surgical procedure was performed according to Azzi *et al.*[14] An incision is made buccally across the IDP to be reconstructed at the level of the cementoenamel junction, leaving the existing papilla attached to the palatal flap using 15c blade. Intrasulcular incision was made around the necks of the adjacent teeth. An envelope-type STF is then elevated buccally and palatally using papilla elevator. The buccal portion of the flap is dissected well beyond the mucogingival line, leaving the periosteum and a thin layer of connective tissue on the bobe [Figure 4]. Care was taken to avoid any perforation in the flap that may compromise the blood supply. The palatal portion of the flap also raised in split-thickness manner that includes the IDP.

For experimental Group I (with PRF), surgical site was flushed with PRF fluid. PRF was then placed under the buccal flap and in the IDP region and squeezed [Figure 5]. For experimental Group II (with CTG) after the preparation of recipient site, CTG procured from palate was trimmed to the desired size and shape and placed at the site [Figure 6].

Both the experimental groups after placement of the PRF or CTG were placed at the recipient site the buccal and palatal flap were brought together and sutured using 6–0 prolene sutures. Interrupted sutures with composite button were placed.

The surgical site was covered with surgical periodontal dressing. The patient is instructed to rinse twice daily with 0.2% chlorhexidine gluconate solution and to avoid touching the dressing during oral hygiene procedures. Antibiotics was administered amoxicillin, 500 mg three times a day for 5 days and combination of diclofenac (50 mg) and paracetamol (325 mg) (Diclomol tablet) three times a day for 3 days.

Clinical parameters recorded

Clinical parameters and patient satisfaction response recorded were plaque index at selected teeth;[15] Gingival index at selected teeth;[16] probing pocket depth (recorded using UNC 15 probe on adjacent teeth); clinical attachment level (recorded using UNC 15 probe on adjacent teeth); height of IPD;[17] and papilla index score (PIS).[1]

Height of interdental papilla

It is the distance between the bone crest to the apical end of the CP (H). Loss of the papilla was determined by measuring the distance between the tip of the papilla to the apical end of the CP (H1). Then, the height of the IDP (H2) was determined by subtracting H1 from H.

Patient satisfaction analysis

Patient satisfactions regarding comfort, hypersensitivity, and esthetic appearance were analyzed subjectively based on visual analog scale (VAS) at baseline, 10 days, 3 months, and 6 months.

Patient postsurgical discomfort score

To evaluate patient comfort, the patient was asked for pain, edema, and other experiences regarding operating technique, instruments, and microscopic view to obtain patient comfort score. The perceived discomfort was graded using a VAS scale labeled at the two extremes with "unbearable discomfort" at the one extreme (score 10) and with "no discomfort" at the other extreme (score 0). At baseline, it was recorded within 24 h after treatment modality.[18]

Patient esthetic score

To evaluate esthetic appearance, patients were asked to give score between "score 10" for unpleasing appearance (poor esthetics) to "score 0" for pleasing appearance (excellent esthetics) to obtain patient esthetic score (PES) in respect to color, appearance, and form of the selected site.[11]

Patient follow-up

After 10 days of the surgery, the dressing and sutures were carefully removed without hampering the healing of soft tissue, and the surgical site was irrigated with normal saline. An inquiry regarding postsurgical procedures was made. Recall appointment of the patient was made after 1 month and 3 months months [Figures 7 and 8]. At each visit, oral hygiene instruction was reinforced. Supragingival scaling was done if required.

Statistical analysis

The results are presented in mean ± standard error of the mean (SE). Groups were compared by independent Student's *t*-test. Groups were also compared by repeated measures two factors (groups and periods) 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. Categorical (discrete) groups were compared by Chi-square (χ^2) test. A two-tailed (α = 2)

$P < 0.05$ was considered statistically significant. Analyses were performed on SPSS software, window version 17.0 (Chicago, Inc., USA).

Results

Demographic characteristics

The age of both Group I and II patients ranged from 18 to 40 years with mean (± SE) 28.29 ± 3.08 years and 30.57 ± 2.84 years, respectively, and median 27 years and 32 years, respectively. The mean age of Group I was slightly lower than Group II. Comparing the mean age of two groups, Student's *t*-test showed that similar age between the two groups (28.29 ± 3.08 vs. 30.57 ± 2.84, $t = 0.55$, $P = 0.595$), i.e., did not differ significantly. Further, in both Group I and Group II, there were 3 (42.9%) females and 4 (57.1%) males. Comparing the gender proportions (F/M) of two groups, χ^2 test showed similar gender proportions between the two groups ($\chi^2 = 0.00$, $P = 1.000$), i.e., also not differ significantly. Thus, patients of two groups were age- and gender-matched and thus comparable and may also not influence the study outcome measures.

Site distribution

In each group, surgical procedures were done on 20 sites; thus, there were 20 samples (sites) in each group, accounting total of 40 samples. In Group I, surgical site involved 1 in 7 (35%) cases, 2 in 7 (35.0%) cases, 3 in 3 (15%) cases, 4 in 1 (5%) case, 5 in 1 (5%) case, and 6 in 1 (5%) case whereas in Group II, it was 1 in 7 (35%) cases, 2 in 6 (30%) cases, 3 in 6 (30%) cases, 4 in 1 (5%) case, 5 in 0 (0%) case, and 6 in 0 (0%) case. Comparing the distribution of the site involved in two groups, χ^2 test showed a similar distribution of surgical procedure done (site involved) between the two groups ($\chi^2 = 3.08$, $P = 0.688$).

Complete filling of black triangle

In Group I, there were 2 (10%) cases without (no) complete fill (CF) black triangle and 18 (90%) cases with (yes) CF black triangle whereas in Group II, it was 1 (5%) and 19 (95%), respectively. Comparing the distribution of CF black triangle of two groups, χ^2 test showed a similar distribution of CF black triangle between the two groups ($\chi^2 = 0.36$, $P = 0.548$) though it was 5.0% higher in Group II than Group I.

Clinical parameters

STF surgery in combination with PRF or CTG, are effective procedure to increase IDP-height with mean values of 3.10 mm (87.3%) and 3.45 mm (95.8%) for Group I (STF + PRF) and Group II (STF + CTG), respectively [Tables 1 and 2].

Patient satisfaction

Patient response and acceptance for surgical treatment modality in terms of patient postsurgical discomfort

Table 1: For each group, mean values of plaque index, gingival index, probing pocket depth, clinical attachment level, H, H1, H2, and papilla index score at different tie interval

Period	PI			GI			PPD			CAL			H-distance			H1 distance			H2 distance			PIS	
	Group I	Group II	Mean difference	Group I	Group II	*P*	Group I	Group II	*P*	Group I	Group II	*P*	Group I	Group II	*P*	Group I	Group II	*P*	Group I	Group II	*P*	Group I	Group II
Baseline	1.34±0.02	1.31±0.02	0.03	1.28±0.01	1.27±0.02	0.402	1.70±0.11	1.65±0.11	0.683	1.70±0.11	1.65±0.11	0.683	5.00±0.26	4.95±0.22	NA	3.55±0.27	3.60±0.17	0.876	1.45±0.11	1.35±0.11	0.658	1.50±0.15	1.45±0.14
1 month	1.20±0.02	1.25±0.02	0.05	1.10±0.01	1.23±0.02	<0.001*	1.10±0.07	1.35±0.11	0.043	1.10±0.07	1.35±0.11	0.0438	5.00±0.26	4.95±0.22	0.05	0.45±0.28	1.90±0.18	<0.001*	4.55±0.18	3.05±0.15	<0.001*	2.80±0.14	2.20±0.12
3 months	1.02±0.03	1.09±0.03	0.08	1.01±0.01	1.11±0.02	<0.001*	0.95±0.05	0.95±0.05	1.000	0.95±0.05	0.95±0.05	1.000	5.00±0.26	4.95±0.22	0.05	0.45±0.28	0.15±0.15	0.351	4.55±0.21	4.80±0.16	0.270	2.80±0.14	2.95±0.05
Period	**Comparison (Group I vs. Group II)#**																						
	Mean difference	***P***																					
Baseline	0.03	0.437	0.01	0.402	0.05	0.683	0.05	0.683	0.05	0.683	0.05	0.781											
1 month	0.05	0.129	0.13	<0.001*	0.25	0.043	0.25	0.0438	0.25	0.0438	0.25	0.004*											
3 months	0.08	0.026	0.10	<0.001*	0.00	1.000	0.00	1.000	0.00	1.000	0.00	0.681											

#Newman-Keuls test. PI: Plaque index; GI: Gingival index; PPD: Probing pocket depth; CAL: Clinical attachment level; PIS: Papilla index score; NA: Not available; $P > 0.05$ Not significant; $P < 0.05$ Just significant; $P < 0.01$ Moderate significant; $P < 0.001$, Highly significant

Table 2: For each group, comparison of the difference in mean change in plaque index, gingival index, probing pocket depth, clinical attachment level, H, H1, H2, and papilla index score between the periods

Comparison	Group I		Group II	
	Mean difference	*P*	Mean difference	*P*
PI				
Baseline versus 1 month	0.14	<0.001*	0.06	0.029
Baseline versus 3 months	0.33	<0.001*	0.22	<0.001*
1 month versus 3 months	0.18	<0.001*	0.16	<0.001*
GI				
Baseline versus 1 month	0.19	<0.001*	0.04	0.006*
Baseline versus 3 months	0.28	<0.001*	0.16	<0.001*
1 month versus 3 months	0.09	<0.001*	0.12	<0.001*
PPD				
Baseline versus 1 month	0.60	<0.001*	0.30	0.007*
Baseline versus 3 months	0.75	<0.001*	0.70	<0.001*
1 month versus 3 months	0.15	0.348	0.40	0.001*
CAL				
Baseline versus 1 month	0.60	<0.001*	0.30	0.007*
Baseline versus 3 months	0.75	<0.001*	0.70	<0.001*
1 month versus 3 months	0.15	0.348	0.40	0.001*
H				
Baseline versus 1 month	0.00	NA	0.00	NA
Baseline versus 3 months	0.00	NA	0.00	NA
1 month versus 3 months	0.00	NA	0.00	NA
H1				
Baseline versus 1 month	3.10	<0.001*	1.70	<0.001*
Baseline versus 3 months	3.10	<0.001*	3.45	<0.001*
1 month versus 3 months	0.00	1.000	1.75	<0.001*
H2				
Baseline versus 1 month	3.10	<0.001*	1.70	<0.001*
Baseline versus 3 months	3.10	<0.001*	3.45	<0.001*
1 month versus 3 month	0.00	1.000	1.75	<0.001*
PIS				
Baseline versus 1 month	1.30	<0.001*	0.75	<0.001*
Baseline versus 3 months	1.30	<0.001*	1.50	<0.001*
1 month versus 3 months	0.00	1.000	0.75	<0.001*

PI: Plaque index; GI: Gingival index; PPD: Probing pocket depth; CAL: Clinical attachment level; PIS: Papilla index score; NA: Not available; $P > 0.05$ Not significant; $P < 0.05$ Just significant; $P < 0.01$ Moderate significant; $P < 0.001$, *Highly significant

score (PSDS) and PES was higher for Group II (STF + CTG) than Group I (STF + PRF) [Table 3].

Discussion

The current study was designed to evaluate autologous PRF and autogenous CTG in IDP reconstruction with buccal and palatal STF using microsurgical technique. Many case reports[19-24] revealed the use of PRF for papilla reconstruction. To the best of the author's knowledge, no randomized clinical study has reported a comparison of IDP reconstruction with the use of PRF and CTG microsurgically. For the present study, a total of 14 patients were finally enrolled for the study after screening. All 14 patients (6 females and 8 males) completed the study uneventfully, and also both the test groups (PRF and CTG) showed excellent healing after the surgery.[25]

In the entire course of the study, there was no apposition of alveolar crest, and no change was observed in the contact area. Hence, the mean change in position IDP resulted from mean gain of height of IDP. There was a significant ($P < 0.001$) increase in IDP-height at both 1 month and 3 months as compared to baseline in both groups. There was a significant early (1 month) increase in IDP-height in Group I that remain unchanged till 3 months, whereas in Group II, constant significant increase in IDP-height was observed. Up to 3 months, significant increase in intra-group IDP-height was observed in both the groups; however, the mean difference was higher for Group II (3.45 mm) as compare to Group I (3.10 mm), but the difference between two was nonsignificant. Shruthi *et al*.[26] compared two surgical techniques for the reconstruction of IDP and observed that the significant improvement in the papillary height in both Robert Azzi technique and Han and Takei technique. McGuire and Scheyer[17] reported that the significant mean percentage increase from baseline in IDP-height in the treatment of

Table 3: Patient postsurgical discomfort score and patient postsurgical discomfort score (mean±standard error, *n*=20) of two groups over the periods

Period	PSDS		PES-VAS		Comparison (Group I vs. Group II)			
					PSDS		PES-VAS	
	Group I	Group II	Group I	Group II	Mean difference	*P*	Mean difference	*P*
Baseline	1.10±0.07	1.05±0.14	5.65±0.17	5.70±0.16	0.05	0.791	0.05	0.861
Day 10	1.95±0.14	3.30±0.25	6.60±0.17	6.40±0.23	1.35	0.001*	0.20	0.292
1 month	0.40±0.11	0.55±0.11	8.70±0.29	7.10±0.23	0.15	0.426	1.6	0.022
3 months	0.10±0.07	0.15±0.08	8.75±0.26	8.95±0.34	0.05	0.791	0.2	0.079
Intra-group comparison	**Group I PSDS**		**Group II PSDS**		**Group I (PES)-VAS**		**Group II (PES)-VAS**	
	Mean difference	*P*	Mean difference	*P*	Mean difference	*P*	Mean difference	*P*
Baseline versus day 10	0.85	<0.001*	2.25	<0.001*	0.95	<0.001*	0.70	0.001*
Baseline versus 1 month	0.70	<0.001*	0.50	0.003*	3.05	<0.001*	1.4	<0.001*
Baseline versus 3 months	1.00	<0.001*	0.90	<0.001*	3.10	<0.001*	3.25	<0.001*
Day 10 versus 1 month	1.55	<0.001*	2.75	<0.001*	2.10	<0.001*	0.7	<0.001*
Day 10 versus 3 months	1.85	<0.001*	3.15	<0.001*	2.15	<0.001*	2.55	<0.001*
1 month versus 3 months	0.30	0.173	0.40	0.046*	0.05	0.682	1.85	<0.001*

PSDS: Patient postsurgical discomfort score; PES: Patient esthetic score; VAS: Visual analog scale. $P > 0.05$ Not significant; $P < 0.05$ Just significant; $P < 0.01$ Moderate significant; $P < 0.001$, *Highly significant

interdental papillary insufficiency by autologous fibroblast injections.

For the present study, papillary contour, i.e. papillary fill measurement was based on papillary index score (PIS) as detailed by Nemcovsky.[1] There was increase in PIS at both 1 month and 3 months as compared to baseline in both groups. There was a significant early (1 month) increase in PIS in Group I (1.3) that remain unchanged till 3 months, whereas in Group II (1.5), constant significant increase in PIS was observed. At the final evaluation, the net increase in PIS of Group II (2.95) was higher as compared to Group I (2.80). Concurrent to the present study, Nemcovsky[1] reported that IDP reconstruction with CTG was successful in 8 out of 10 procedures with the mean PIS change of 1.2. Arunachalam *et al*.[19] also reported IDP reconstruction with PRF with change in PIS from 0 to 3 in 3 months.

In the current study, CF of the gingival embrasure was observed in 95% of the cases in Group II and 90% of the cases of Group I, and the difference between the two groups was statistically nonsignificant. Arunachalam *et al*.[19] and Tomar *et al*.[22] reported complete papilla fill in the interproximal embrasure after reconstruction of IDP with PRF. They further quoted that the use of PRF in IDP reconstruction promotes wound healing and hemostasis. Sawai and Kohad[5] and Jaiswal *et al*.[27] also concluded from their clinical study that, CTG procedure is successful in IDP reconstruction.[28]

To evaluate patient response and acceptance for surgical treatment modality of IDP loss, patients were analyzed using PSDS and PSE based on VAS. Increased in VAS score (discomfort) in Group II may result from comparatively more invasive procedure (donor surgical site) during CTG procurement as compared to PRF preparation.[11,29]

Statistically significant ($P < 0.01$) increase in PES score at day 10 was observed in both the groups. At 1 month significant ($P < 0.01$), increase in PES (signifies more esthetic appearance) was perceived in Group I as compared to Group II that remained constant at 3 months. However, PES was found to be nonsignificantly higher in Group II (STF + CTG) as compared to Group I (STF + PRF) after 3 months, representing more esthetic appearance in Group II, after 3 months' postoperatively. In concurrent to the present study, Azzi *et al*.[14] and De Castro Pinto *et al*.[30] also reported that the use of CTG and subepithelial connective pedicle graft propitiated a satisfactory improvement in the esthetic appearance, respectively.

The current patient-centered study reported that the reconstructed IDP almost reaches its normal level (95% with CTG and 90% with PRF), solving the esthetic problem posed by its absence. This technique utilizes coronal repositioning of IDP with the positioning of graft material (PRF or CTG) apical to it, while palatal/lingual papilla remains in communion with the base like pedicle hence maintaining its vascularity. The blood supply to the grafted connective tissue is thus a key element of this technique. This is assured by the flap coverage of the connective tissue extension, in which only a small portion at the graft is left uncovered. The grafted tissue will receive a flow of plasma and an ingrowth of capillaries from the periosteum, the underlying connective tissue, and the overlying flaps.[14]

In the present study, PRF with STF offers a reliable solution as PRF has both mechanical adhesive and biologic functions like fibrin glue; it maintains the flap is stable position, enhances neoangiogenesis, and reduces the necrosis and shrinkage of covering position.

The PRF is easy to procure, in-expensive, and can be prepared in few minutes. PRF provides ideal healing properties. This fibrin matrix inclusive of its platelets, leucocytes, and cytokines allows remodeling of IDP to occur. PRF organized as a dense fibrin scaffold with the release of growth factors such as (transforming growth factor-beta), platelet-derived growth factor (PDGF)-AB, and vascular endothelial growth factor and glycoproteins (thrombospondin-1) during ≥7 days, is critical for the "take" of the grafted PRF.[31] Platelet cytokines, platelet growth factor PDGF-α, and insulin-like growth factor-1 are also gradually released, aiding the process of healing. The advantages for using PRF are the need for donor site is eliminated, making the technique less invasive, less postsurgical discomfort, promotes rapid soft-tissue healing with less edema compared to CTG.[23]

In terms of increase in volume, CTG with STF-treated sites obtained a better result as compared to PRF with STF for IDP reconstruction. CTG graft survival depends on a sufficient blood supply originating from the vascular recipient bed adjacent to the lost IDP and covering flap. The use of CTG for the resolution of the IDP loss and the increasing the IDP-height is based on its excellent biomimetic capacity, highlighting the induction potential of two fundamental characteristics.[32] CTG beneath the IDP reported adequate thickening of the existing gingiva and successful reconstruction of IDP.[4] Increase bulk and thickness of interdental gingiva can induce "creeping" papillary formation.[33]

To prevent the apical migration of gingiva-papillary unit, suspensory suture with composite buttons was given. Suspensory suture maintains the donor tissue under the papilla in a coronal direction until the overlying flap has matured and achieve its postsurgery position, thus preventing apical migration and displacement of graft.[34]

Limitations

The drawbacks of the study were low sample size, short-term follow-up with fair oral hygiene instead of meticulous plaque control among subjects, lack of histologic evaluation, lack of radiographic parameter assessment, and lack of model analysis.

Conclusion

Within the limitations of this randomized clinical trial for the IDP reconstruction, it can be concluded that split-thickness flap (STF) surgery in combination with PRF or CTG may be an effective procedure to increase IDP-height. Our results are based on single-centered 3 months follow-up; therefore, a long-term multicentric randomized clinical trial may be necessary to evaluate the clinical outcome for autologous PRF in comparison to CTG with STF.

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Conflicts of interest

There are no conflicts of interest.

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