



Subject Area : Bagalkot, Karnataka

EVALUATION OF THE EFFICACY OF PLATELETS CONCENTRATES, INJECTABLE-PLATELET-RICH-FIBRIN(I-PRF) AND CONCENTRATED-PLATELET-RICH-FIBRIN(C-PRF) ADJUNCT TO SCALING AND ROOT PLANING

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ARTICLE INFO	ABSTRACT
Received 14 th May, 2025 Received in revised form 26 th May, 2025 Accepted 18 th June, 2026 Published online 28 th June, 2026	Background: Periodontitis is chronic inflammatory disease caused by pathogenic microorganisms leading to destruction of supporting structures of teeth. Conventional mechanical therapy scaling and root planing (SRP) may not completely eliminate subgingival pathogens. Local delivery using platelet concentrates have gained attention due to extensive release of growth factors. Injectable platelet rich fibrin(I-PRF) improves osteoblast proliferation, differentiation, and mineralization in tissue culture. Concentrated platelet rich fibrin (C-PRF)) has enhanced fibroblast migration, proliferation, and collagen I synthesis. This study evaluated clinical efficacy of Platelet concentrates as local delivery system in periodontitis patients. Objectives: Assessment of effect of SRP alone, I-PRF and C-PRF adjunct to SRP on clinical parameters at baseline and after 4weeks. Methods: Thirty patients (35–60 years) with Stage II or III, Grade B periodontitis were randomly assigned to three groups; Group A: SRP alone, Group B: SRP + I-PRF and Group C: SRP +C-PRF. Clinical parameters included were plaque index, sulcus bleeding index, probing pocket depth $\geq 5\text{mm}$ & clinical attachment level $\geq 4\text{mm}$ were recorded. Results: Significant reduction was seen in C-PRF compared I-PRF Conclusion: C-PRF showed better healing properties compared to I-PRF, adjunct to scaling and root planing,.
Key words:	
C-PRF , I-PRF,Periodontitis,platelet concentrates, Scaling and root planning.	
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INTRODUCTION

Periodontal diseases can result in the loss of supporting tooth tissues, contributing to the gradual breakdown of the periodontal ligament and alveolar bone, explaining the need for regenerative periodontal therapy. Scaling and root planing (SRP) is a conventional nonsurgical treatment for periodontal diseases¹. Sometimes SRP alone is not enough for the treatment of periodontitis in case of deep periodontal pockets, various adjunctive treatments have been investigated and proposed to supplement SRP. They help in improving clinical periodontal parameters such as probing depth reduction, gaining clinical attachment level and bone defect (BD) fill in periodontitis. Among this local drug delivery have been efficiently used for the treatment of periodontal diseases adjunct to scaling and root

planing². Platelet concentrates are introduced as local drug delivery in periodontitis. Platelet concentrates are usage has become popular these days. Platelet concentrates, constitute of autologous blood-derived growth factors, have been effectively utilized in regenerative medicine and dentistry for over twenty years.¹

Platelet-rich plasma (PRP) is a first-generation platelet concentrates, the preparation process is significant, often requires coagulation activators and anticoagulants. Although PRP promotes osteoblast proliferation and differentiation, its therapeutic effectiveness is unclear due to anticoagulant-induced cytotoxicity and decreased coagulation or healing³. Choukroun et al. in 2001 introduced platelet rich fibrin (PRF), a second-generation platelet concentrates. Platelet rich fibrin (PRF) causes platelet accumulation and cytokine release in fibrin clot, leading to slow and sustained release through the natural maturation and reorganization of the clot. Platelets with fibrin are commonly utilized to promote soft tissue wound healing and fight bacterial sepsis due to their leukocyte

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content. It contains of self-supporting matrix with the presence of several growth factors, cytokines and leukocytes that create an efficient network for cell migration with increased ability to promote angiogenesis and tissue ingrowth. The limitation of PRF is rapid breakdown of fibrin network¹.

Liquid platelet concentrates have become increasingly important in recent years. Choukroun and Ghanaati in 2018 created injectable platelet rich fibrin(I-PRF) by reducing rotations per minutes and time. This technique increases platelet, leukocyte, and growth factor concentrations. Wend et al.¹¹ (2017) found that low-speed centrifugation of I-PRF dramatically enhanced levels of Platelet Derived Growth Factor-BB (PDGF-BB), Transforming Growth Factor-beta1(TGF- β 1), Vascular Endothelial Growth factor (VEGF), and Epidermal Growth Factor (EGF). I-PRF has been used in dentistry domains such as periodontal and bone regeneration, orthodontic tooth movement, temporomandibular joint diseases, and endodontics. In-vitro studies have shown that I-PRF improves osteoblast proliferation, differentiation, and mineralization in tissue culture more than platelet rich plasma (PRP)⁴. Miron, et al. in 2020 introduced another liquid platelet concentrate i.e concentrated platelet rich fibrin (C-PRF)⁴, it follows L-PRF protocols, the buffy coat layer contained the majority of cells, whereas the upper 4 ml remained cell-free. Higher centrifugation techniques resulted in a tenfold rise in baseline concentrations, especially in the 0.3-0.5 mL buffy coat layer, which is directly above the RBC layer³. It shows 2–3-fold increase in Platelet Derived Growth Factor-AA (PDGF-AA), Transforming Growth Factor-beta (TGF- β), and Epidermal Growth Factor (EGF) release in C-PRF over 10 days, better enhancing fibroblast migration, proliferation, and collagen I synthesis compared to I-PRF. C-PRF was expected to produce more platelets and leukocytes, leading to increased growth factors and improved cellular activity⁴.

Several studies assessed the efficacy of I-PRF adjunct to scaling and root planning. Clinical study was done using C-PRF on tooth extraction socket. To the best of our knowledge, there are no literatures on comparative study between I-PRF and C-PRF in periodontitis subjects. Hence the aim of this study is to compare I-PRF and C-PRF as an adjunct to scaling and root planing in periodontitis subjects.

MATERIALS & METHODS

Type of study: It is an original study.

Study Design: A total of 30 patients with stage II, stage III and Grade B periodontitis were grouped as follows (according to world workshop 2017 classification of Periodontal and Peri-implant diseases and conditions) all the patients age was between 35-60 years were selected for this study from the outpatient section of Department of Periodontics, PMNM Dental College & Hospital, Navanagar, Bagalkot. It was made clear to patients that participation is voluntary. A duly signed written informed consent was obtained from patients.

Subjects were randomly divided 3 into groups:

GROUP A: 10 periodontitis patients were treated with scaling and root planing alone.

GROUP B: 10 periodontitis patients treated with I-PRF after scaling and root planing.

GROUP C: 10 periodontitis patients treated with C-PRF after scaling and root planing.

Each patient underwent full-mouth scaling and root planing (SRP) with ultrasonic instruments. Patients with ≥ 5 mm periodontal pocket received I-PRF & C-PRF local delivery in group B & C. Patients were recalled after 4 weeks for follow-up

Inclusion criteria-Include healthy male and female subjects, willingly given consent aged between 35-60 years, diagnosed with stage II/III grade B periodontitis, with pocket probing depth ≥ 5 mm & clinical attachment level ≥ 4 mm, & no history of periodontal therapy or use of antibiotics in the preceding 6 months were taken.

Exclusion criteria-includes with any known systemic disease or condition, pregnant and lactation women, any known allergy, and alcoholic patients, smokers or Immunocompromised patients should be excluded.

Keeping alpha error at 5%, at β error 20% power of the study at 80%, the sample size estimated was approximately 10 in each group.

Method of platelet concentrates preparation

I-PRF -. The I-PRF will be prepared according to the protocol developed by Miron and Choukron in 2017. 10 mL of intravenous blood will be collected from the participant using venipuncture of antecubital vein under sterile conditions, The collected blood is transferred into a plain sterile test tube without anticoagulant and immediately subjected to centrifugation at 70-g force at 700 rpm for 3 minutes. After centrifugation, the blood separates into two parts: the bottom layer consists of a red blood cell compartment, and the top layer is PRF plasma, which is still liquid consistency. The top PRF layer is aspirated into a 2ml syringe and injected into the periodontal pocket until it filled and overflowed⁵. (Figure 1)

C-PRF - 10 mL of blood will be collected in Plastic Polyethylene Terephthalate (PET) tubes and centrifuged at a 2,700 RPM for 12 min for C-PRF, at room temperature. 0.3–0.5 mL buffy coat layer, located directly above the red blood cell corpuscle⁴. (figure-2)

Method of application

The selected sites (periodontal pockets ≥ 5 mm) will be subjected to clinical examination. Both the platelet concentrates will be applied subgingivally using syringe with blunted needle with diameter of 0.65 mm (23G) placing at the base of pocket, and delivered. Both the platelet concentrates are applied at baseline after scaling and root planing. Patients will be given post treatment instructions which includes avoiding any use of mouth rinses and any form of interdental aids, to refrain from chewing hard sticky foods. (Figure 3) & (Figure 4)

Clinical examination to assess the periodontal condition:

Clinical examination was performed on all the subjects using Plaque Index (PI) (Silness & Loe 1964), sulcus bleeding index (Muhlemann & Son, 1971), Clinical attachment loss (CAL), Pocket probing depth (PPD).

Statistical analysis: The collected data was analysed using Chi-square test for association between two attributes, One way ANOVA or Kruskal Wallis ANOVA for comparison of

three groups followed by independent t or Mann-Whitney U test for comparison of pairs of two groups. Dependent t test or Wilcoxon matched pairs test for intra group comparison and descriptive statistics with frequency, percentage, mean SD etc. A significance was set at 5% level of significance ($p < 0.05$)

All the participants were clearly explained regarding the need and design of the study. A duly signed written informed consent was obtained from all the subjects willing to participate in the study.



Figure 5. Pocket probing depth before I-PRF of placement



Figure 6. Pocket probing depth after 4 weeks of placement I-PRF

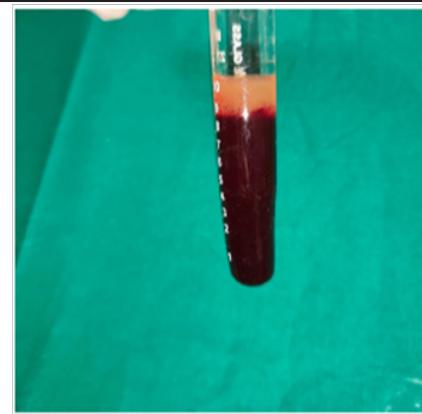


Figure.1. Collection of blood for I-PRF preparations, centrifugation process, after centrifugation separation of blood layers

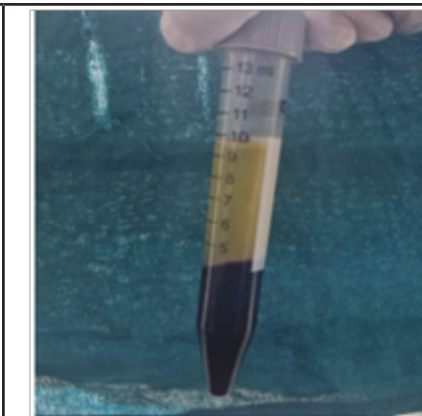


Figure 2. Collection of blood for C-PRF preparation, centrifugation process, after centrifugation separation of blood layers



Figure 3. I-PRF application in periodontal pocket



Figure 4. C-PRF application in periodontal pocket



Figure 7. Pocket probing depth before

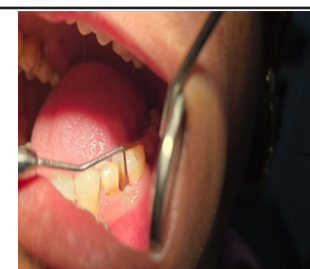


Figure 8. Pocket probing depth after 4 weeks of C-PRF group C-PRF placement

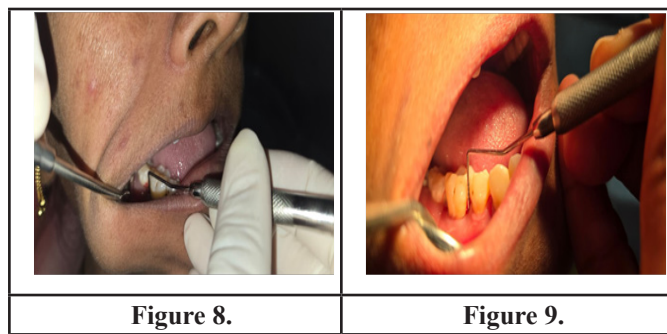


Figure 8.

Figure 9.

RESULTS

The results of our study showed statistically significant reduction in the clinical parameters in both group B & C compared to group A. But comparatively group C (figure 7&8) showed more reduction in clinical parameters, with gain in CAL followed by group B and A (figure 5&6). The comparison of PI score showed mean difference of '0.8' in group A, '0.6' in group B, '-0.1' in group C of from baseline to 4 weeks [Table 1]. BOP score showed mean difference of '1.1' in group A, '1.1' in group B, '0.9' in group C from baseline to 4 weeks [Table 2].

Table 1. Comparison of baseline and follow-up treatment time points with PI scores in three groups (A, B, C) by Wilcoxon matched pairs test

Group	Time points	Mean	SD	Mean Diff.	SD Diff.	Effect size	Z-value	p-value
Group A	Baseline	1.9	0.6					
	Follow-up	1.1	0.3	0.8	0.6	1.38	2.3664	0.0180*
Group B	Baseline	1.7	0.6					
	Follow-up	1.1	0.3	0.6	0.6	1.02	2.3664	0.0180*
Group C	Baseline	1.1	0.1					
	Follow-up	1.1	0.4	-0.1	0.3	-0.53	0.4472	0.6547

*p<0.05

Table 2. Comparison of baseline and follow-up treatment time points with BOP scores in three groups A, B, C) by Wilcoxon matched pairs test

Group	Time points	Mean	SD	Mean Diff.	SD Diff.	Effect size	Z-value	p-value
Group A	Baseline	2.5	0.8					
	Follow-up	1.5	0.7	1.1	0.6	1.24	2.6656	0.0077*
Group B	Baseline	2.1	0.3					
	Follow-up	1.0	0.0	1.1	0.3	3.11	2.8031	0.0051*
Group C	Baseline	1.9	0.4					
	Follow-up	1.0	0.0	0.9	0.4	2.25	2.3664	0.0180*

*p<0.05

Table 3. Comparison of baseline and follow-up treatment time points with PPD scores in three groups (A, B, C) by paired t test

Group	Time points	Mean	SD	Mean Diff.	SD Diff.	Effect size	t-value	p-value
Group A	Baseline	5.7	0.7					
	Follow-up	4.4	1.1	1.3	0.8	1.74	5.0576	0.0007*
Group B	Baseline	7.6	1.5					
	Follow-up	5.3	1.0	2.4	0.8	1.64	9.1885	0.0001*
Group C	Baseline	6.8	0.7					
	Follow-up	3.8	1.4	2.9	1.0	4.15	8.1816	0.0001*

*p<0.05

Table 1. Comparison of baseline and follow-up treatment time points with PI scores in three groups (A, B, C) by Wilcoxon matched pairs test

Group	Time points	Mean	SD	Mean Diff.	SD Diff.	Effect size	t-value	p-value
Group A	Baseline	4.3	0.4					
	Follow-up	3.6	0.7	0.7	0.8	1.67	2.9794	0.0155*
Group B	Baseline	6.4	1.7					
	Follow-up	4.3	1.0	2.0	1.2	1.18	5.4166	0.0004*
Group C	Baseline	5.8	0.8					
	Follow-up	2.4	0.5	3.4	0.7	4.48	7.0000	0.0001*

*p<0.05

PPD score showed mean difference of '1.3' in group A, '2.4' in group B & '2.9' in group C from baseline to 4 weeks. CAL score showed mean difference of '0.7' in group A, '2.0' in group B & '3.4' in group C from baseline to 4 weeks. No adverse reactions were observed during the study period for any of the interventions and none of the participants reported any discomfort with the treatment protocol.

DISCUSSION

The concept of controlled release of drug i.e local drug delivery (LDD) was initially proposed by Goodson et al. in 1979. Local drug delivery treatment approach restricts the drug to its target site, which leads to higher drug concentrations, and prevents the majority of issues related to systemic therapy (such as drug toxicity and interactions and the formation of resistant bacteria).⁸

Injectable platelet rich fibrin (I-PRF) exists as a liquid for a brief period of time before transitioning into a fibrin gel, facilitating improved cellular recruitment and prolonged release of growth factors. The integration of I-PRF into periodontal pocket has demonstrated notable enhancements in fibroblast and osteoblast activity, type I collagen gene expression, and the proliferation of periodontal ligament cells⁹, but according to Miron, et al. in 2020, C-PRF has increased wound healing property compared I-PRF. This randomized clinical trial, compared the effects of SRP alone and, SRP combined with I-PRF and SRP combined with C-PRF were evaluated. The results demonstrated that both treatment modalities produced statistically significant improvements in all evaluated clinical parameters four weeks after therapy initiation. At baseline, no significant differences in PPD and CAL were observed between the three groups.³ All participants received oral hygiene instructions and were encouraged to maintain regular home care, which may have contributed to the improvement in clinical parameters observed in all groups during the study period. Over the years, conventional periodontal therapy (SRP) has been augmented with various adjunctive approaches, most commonly through the systemic or local administration of antibiotics and antiseptics. Given the potential risks associated with their use, antibiotics and antiseptics should be prescribed only in specific cases and under optimal conditions.

Our research focuses on adjunctive regenerative approaches for the treatment of chronic periodontitis. a liquid, injectable form of platelet-rich fibrin (I-PRF) was introduced by Choukroun in 2006, which is extensively used in periodontitis now-a-days. In this study, we explored, for the first time in-vivo application of C-PRF adjunct nonsurgical treatment modality for chronic periodontitis. Its liquid consistency offers a distinct advantage for direct application into periodontal pockets. The process is enabled due to the fact that after a short period of time, approximately 15 minutes, C-PRF is formed into a matrix scaffold. The scaffold has been shown to directly enhance the migration and proliferation of human gingival fibroblasts, stimulate the release of additional growth factors, promote periodontal ligament cell growth, and increase osteoblast differentiation. By preventing the apical migration of junctional epithelium onto root surfaces and limiting its interference between the root and surrounding soft tissues¹. Dohan et al⁶. reported that PRF exhibits immunological and antibacterial properties through leukocyte degranulation and

contains cytokines capable of inducing angiogenesis as well as modulating pro- and anti-inflammatory responses. The resulting reduction in microbial load contributes to diminished inflammation, which in turn leads to decreases in PPD, GML, and BOP values. Another study done by, Sarah al-rihaymee et al⁷. Evaluated for platelet-rich fibrin as an adjunct to scaling and root planning, there was a significant reduction in clinical parameter like PPD with gain in CAL at 1- and 3-month follow-up visits. In vitro study done by Fujioka-Kobayashi M³ showed C-PRF exhibited an up to a threefold increase in growth factor release compared to standard i-PRF. This significantly promoted higher gingival fibroblast migration, proliferation, collagen I synthesis, and gene expression.

Vichudachattrathikul⁴ reported I-PRF and C-PRF promoted greater mineralization and differentiation than PRP. These liquid platelet concentrates positively impact on human osteoblast proliferation differentiation, and making them acceptable for clinical utilization requiring bone regeneration.

From the above observations, the use of I-PRF and C-PRF as a local delivery system resulted in a significant reduction in all the clinical parameters like PI, BOP, PPD with gain in the CAL compared to control group with p-value <0.05. but C-PRF showed significantly better results compared to I-PRF. Thus, within the limits of this study, it can be concluded that C-PRF could be considered a potential local delivery system in periodontal pocket therapy.

Conclusion: Despite the limited sample size, the present study demonstrated that local application of C-PRF in conjunction with SRP, compared to I-PRF, significantly improved periodontal clinical parameters in the treatment of chronic periodontitis. Further studies with long term follow up can be done C-PRF.

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Conflicts of interest: There are no conflicts of interest

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