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Platelet-Rich Fibrin Versus Open-Flap Debridement Alone in Intrabony Defects

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ABSTRACT: Periodontal intrabony defects pose a challenge to periodontal reconstruction. PRF has been investigated as a biological adjunct to OFD to enhance treatment outcomes. Thus the aim of our study was to compare clinical and radiographic outcomes of OFD with PRF versus OFD alone in three-wall intrabony defects among 100 patients, with 50 receiving OFD plus PRF and 50 receiving OFD alone, evaluating one defect per patient. Probing pocket depth and clinical attachment level are assessed at baseline, three months, and six months; radiographic defect depth is assessed at baseline and six months.We have found that, at six-month mean probing pocket depth reduction was 3.70 mm with OFD plus PRF versus 2.60 mm with OFD alone. Mean clinical attachment gain was 3.40 versus 2.30 mm, respectively. Mean radiographic defect-depth reduction was 2.60 versus 1.50 mm, corresponding to reductions of 56.5% and 33.3% calculated from group means. Hence, statistical significance was not established. Thus, we have come to conclude that, the findings was in favor of adjunctive PRF, but clinical efficacy cannot be concluded without verified observations and appropriate statistical analysis.

1. INTRODUCTION

Periodontitis is a chronic inflammatory disease characterized by progressive destruction of the tooth-supporting tissues, including the periodontal ligament and alveolar bone. Its progression may produce intrabony defects associated with attachment loss and increased probing pocket depth (Miron et al., 2021). The management of these defects aims not only to control inflammation but also to restore lost periodontal support. Although open-flap debridement (OFD) provides surgical access for removal of subgingival deposits and granulation tissue, adjunctive regenerative approaches have been investigated to improve clinical attachment and radiographic defect resolution beyond that achieved with debridement alone. Accordingly, platelet concentrates have received increasing attention as biologically active adjuncts in periodontal reconstructive surgery (Silva et al., 2024).

PRF is an autologous, second-generation platelet concentrate obtained by centrifugation of blood without anticoagulants. It forms a fibrin matrix containing platelets and leukocytes, which can support wound healing through the release of growth factors and other biological mediators. This matrix provides a scaffold for cellular migration and may contribute to the healing environment within periodontal defects. Because PRF is prepared from the patient's own blood and can be placed directly into the surgically debrided defect, it offers a practical adjunct to conventional periodontal surgery (Dohan et al., 2006). Nevertheless, improvements in clinical and radiographic parameters should not be regarded as direct evidence of complete histological periodontal regeneration.

Previous investigations have reported promising outcomes with PRF-assisted treatment of intrabony defects (Silva et al., 2024). A randomized controlled clinical trial specifically involving three-wall intrabony defects reported greater probing depth reduction, attachment gain, and radiographic bone fill with OFD plus PRF than with OFD alone (Sharma and Pradeep., 2011). A subsequent systematic review and meta-analysis by Miron et al., including 27 randomized controlled trials across different PRF comparisons, also supported improved clinical and radiographic outcomes when PRF was added to OFD. However, variation in defect characteristics, PRF preparation protocols, treatment combinations, and follow-up periods limits the uniform interpretation of the available evidence (Miron et al., 2021). A more recent systematic review and network meta-analysis similarly identified substantial heterogeneity across the included studies (McGowan et al., 2025; Nourredine et al., 2026) . These limitations support further comparative evaluation using clearly defined defect morphology and standardized assessment procedures.

The present study is therefore designed to evaluate the additional clinical and radiographic benefit of PRF when used with OFD in three-wall intrabony defects. Restricting the investigation to a defined defect type is intended to reduce variation related to defect morphology and provide a focused assessment of the intervention. The aim of this study is to compare OFD combined with PRF versus OFD alone among 100 patients by assessing probing pocket depth reduction and clinical attachment gain at three and six months, together with radiographic intrabony defect-depth reduction at six months. The study seeks to determine whether adjunctive PRF offers measurable benefits over surgical debridement alone.

Research Questions

1. Does adjunctive PRF improve probing pocket depth reduction compared with OFD alone at three and six months?
2. Does OFD with PRF achieve greater clinical attachment gain than OFD alone at three and six months?
3. Does OFD with PRF produce greater radiographic defect-depth reduction than OFD alone at six months?

LITERATURE REVIEWS

Periodontal intrabony defects arise from the destruction of tooth-supporting tissues and represent an important challenge in periodontal treatment. OFD facilitates access for removal of subgingival deposits and inflamed tissue; however, adjunctive regenerative approaches have been investigated to improve clinical attachment and radiographic defect resolution beyond that achieved with debridement alone (Silva., 2024). Among these approaches, PRF has attracted attention as an autologous biomaterial that may enhance periodontal wound healing. A systematic review by Miron et al. supported improved clinical and radiographic outcomes when PRF was added to OFD, providing a rationale for evaluating this adjunct in intrabony defects (Miron et al., 2021). Moreover, PRF is a second-generation platelet concentrate prepared by centrifuging the patient's blood without anticoagulants. Its fibrin network contains platelets, leukocytes, and biological mediators that may support cellular migration, angiogenesis, and wound maturation. When placed within a debrided periodontal defect, PRF acts as a biological scaffold and may improve the local healing environment (Choukroun and Miron., 2017). Nevertheless, its clinical performance can vary with preparation protocols, defect morphology, and surgical technique. A study evaluated PRF-based approaches but identified substantial heterogeneity, emphasizing the need for standardized protocols and cautious interpretation of treatment comparisons (Acerra et al., 2025).

Another study showed that PRF produced greater probing pocket depth reduction, clinical attachment gain, and radiographic bone fill (Sharma and Pradeep., 2011). This trial is particularly relevant to investigations restricted to three-wall defects, although the findings should not be generalized automatically to less-contained defect configurations (Afrashtehfar et al., 2025). Ajwani et al. (2015) investigated 40 two- and three-wall intrabony defects in 20 patients using a split-mouth design, comparing OFD plus PRF with OFD alone over nine months. Both treatments produced improvements, but PRF-treated sites demonstrated significantly greater radiographic defect fill (Ajwani, et al., 2015). Although these findings support the potential adjunctive benefit of PRF, the small sample and mixed defect configurations limit broader conclusions. Together

with the systematic-review evidence, this study supports further comparative investigation using clearly defined defect morphology, standardized measurements, and consistent follow-up.

METHODOLOGY

A parallel-group comparative clinical study would include 100 patients with periodontitis, allocated to OFD with platelet-rich fibrin (PRF; n = 50) or OFD alone (n = 50), with three-wall intrabony defect evaluated per patient over six months. Inclusion criteria would comprise of systemically healthy adults aged ≥18 years, satisfactory plaque control following initial periodontal therapy, residual probing pocket depth ≥5 mm, and a radiographically identified intrabony defect ≥3 mm, with three-wall morphology confirmed during surgery while on the other hand, exclusion criteria would include smoking or tobacco use, pregnancy or lactation, systemic diseases or medications affecting periodontal healing, platelet or coagulation disorders, nonvital study teeth, furcation involvement, and previous regenerative surgery at the selected site. All participants would receive scaling and root planing and oral-hygiene instructions before reassessment. Surgery would involve flap elevation and thorough defect debridement, followed by placement of autologous PRF in the test group only, flap closure, and standardized postoperative care. PRF would be prepared immediately from venous blood collected without anticoagulant, using a prespecified protocol documenting tube type, centrifuge model, relative centrifugal force, and centrifugation duration, because published preparation protocols vary. Probing pocket depth and clinical attachment level would be recorded at baseline, 3 months & 6 months using a standardized periodontal probe and reproducible reference points, while standardized intraoral periapical radiographs would assess defect depth at baseline and 6 months. Continuous variables would be summarized as mean ± standard deviation and categorical variables as frequencies and percentages; longitudinal clinical outcomes would be analyzed using linear mixed-effects models incorporating treatment group, time, and their interaction, while six-month radiographic defect depth would be compared using analysis of covariance adjusted for baseline depth. Adjusted between-group differences would be reported with 95% confidence intervals, model assumptions would be assessed, and two-sided $p < 0.05$ would define statistical significance.

RESULTS

TABLE 1 : Baseline Demographics & Clinical Characteristics

CHARACTERISTIC	OFD+PRF	OFD ALONE
Age	39.6 ± 8.2	40.2 ± 7.8
Male	28 (56%)	27 (54%)
Female	22 (44%)	23 (46%)
Maxillary Study Site	23 (46%)	24 (48%)
Mandibular Study Sites	27 (54%)	26 (52%)
Probing Pocket Depth	7.20 ± 0.90	7.10 ± 0.85
Clinical Attachment Level	8.30 ± 1.10	8.20 ± 1.05
Radiographic Intrabony Defect Depth	4.60 ± 0.80	4.50 ± 0.75

Table 1 showed that, the baseline demographic and clinical characteristics were descriptively similar between the OFD + PRF and OFD-alone groups, each comprising 50 patients. The mean age was 39.6 ± 8.2 years in the OFD + PRF group and 40.2 ± 7.8 years in the OFD-alone group. Males represented 56% and 54% of the respective groups. Mandibular study sites were slightly more frequent than maxillary sites in both groups, accounting for 54% and 52%, respectively. Mean baseline probing pocket depth was 7.20 ± 0.90 mm in the OFD + PRF group and 7.10 ± 0.85 mm in the OFD-alone group, while clinical attachment level was 8.30 ± 1.10 mm and 8.20 ± 1.05 mm, respectively. Mean radiographic intrabony defect depth was also numerically close between groups (4.60 ± 0.80 mm versus 4.50 ± 0.75 mm).

TABLE 2: Probing Pocket Depth At Baseline & Follow-Up

ASSESSMENT	OFD+PRF	OFD ALONE	DIFFERENCE
Baseline	7.20 ± 0.90	7.10 ± 0.85	+0.10mm
3 Month	4.60 ± 0.75	5.30 ± 0.80	-0.70mm
6 Month	3.50 ± 0.65	4.50 ±0.75	-1.00mm
Mean Reduction from Baseline to 6 Months	3.70	2.60	+1.10mm

Table 2 showed that, the mean probing pocket depth decreased progressively in both groups over the six-month follow-up. In the OFD + PRF group, it decreased from 7.20 ± 0.90 mm at baseline to 4.60 ± 0.75 mm at three months and 3.50 ± 0.65 mm at six months. In the OFD-alone group, the corresponding values were 7.10 ± 0.85 mm, 5.30 ± 0.80 mm, and 4.50 ± 0.75 mm. Although baseline values were numerically similar, probing pocket depth was lower in the OFD + PRF group by 0.70 mm at three months and 1.00 mm at six months. The mean reduction from baseline to six months was 3.70 mm with OFD + PRF compared with 2.60 mm with OFD alone, representing an additional reduction of 1.10 mm in the PRF group. These values indicate a greater descriptive reduction with adjunctive PRF.

TABLE 3: Clinical Attachment Level & Attachmnet Gain

ASSESSMENT	**OFD+PRF**	**OFD ALONE**	**DIFFERENCE**
Baseline	8.30 ± 1.10	8.20 ± 1.05	+0.10mm
3 Month	5.90 ± 0.95	6.60 ± 1.00	-0.70mm
6 Month	4.90 ± 0.85	5.90 ±0.95	-1.00mm
Mean Attachment Gain from Baseline to 6 Months	3.40	2.30	+1.10mm

Table 3 showed that, the mean clinical attachment level decreased progressively in both groups over the six-month follow-up. In the OFD + PRF group, it decreased from 8.30 ± 1.10 mm at baseline to 5.90 ± 0.95 mm at three months and 4.90 ± 0.85 mm at six months. In the OFD-alone group, the corresponding values were 8.20 ± 1.05 mm, 6.60 ± 1.00 mm, and 5.90 ± 0.95 mm, respectively. Although baseline values were numerically similar, mean clinical attachment level was lower in the OFD + PRF group by 0.70 mm at three months and 1.00 mm at six months. Mean attachment gain from baseline to six months was 3.40 mm in the OFD + PRF group compared with 2.30 mm in the OFD-alone group, representing an additional gain of 1.10 mm with adjunctive PRF. Thus, the table shows greater descriptive attachment gain in the PRF group.

TABLE 4: Radiographic Intrabony Defect Depth & Defect Depth Reduction

RADIOGRAPHIC PARAMETER	**OFD+PRF**	**OFD ALONE**	**DIFFERENCE**
Baseline Defect Depth	4.60 ± 0.80	4.50 ± 0.75	+0.10mm
Defect Depth at 6 Month	2.00 ± 0.60	3.00 ± 0.65	-1.00mm
Mean Defect Depth Reduction	2.60	1.50	+1.10mm
PercentageReduction Calculated from Group Means	56.5%	33.3%	+23.2%

Table 4 showed that, the mean radiographic intrabony defect depth decreased in both groups over the six-month follow-up. In the OFD + PRF group, it decreased from 4.60 ± 0.80 mm at baseline to 2.00 ± 0.60 mm at six months, whereas in the OFD-alone group, it decreased from 4.50 ± 0.75 mm to 3.00 ± 0.65 mm. The mean defect-depth reduction was 2.60 mm with OFD + PRF compared with 1.50 mm with OFD alone, representing an additional reduction of 1.10 mm in the PRF group. Percentage reductions calculated from the group means were 56.5% and 33.3%, respectively, corresponding to a

difference of 23.2 percentage points, rather than 23.2%. Overall, the table shows greater descriptive radiographic defect-depth reduction with adjunctive PRF.

DISCUUSION

Our study results showed a greater clinical and radiographic improvements with OFD plus PRF than with OFD alone at six months. Mean probing pocket depth reduction was 3.70 versus 2.60 mm, and clinical attachment gain was 3.40 versus 2.30 mm, respectively, yielding an additional improvement of 1.10 mm for each outcome in the PRF group. These numerical trends agree with the systematic review, which supported additional probing depth reduction and attachment gain when PRF was added to OFD (Miron et al., 2021). However, the supplied values originated from simulated tables and cannot be presented as observed study findings without verification; moreover, statistical significance cannot be inferred without appropriate analyses.

Radiographically, the supplied tables indicate a mean defect-depth reduction of 2.60 mm with OFD plus PRF compared with 1.50 mm with OFD alone. Percentage reductions calculated from group means were 56.5% and 33.3%, respectively. This direction of improvement was in consistent with a study, where authors evaluated 40 two- and three-wall defects in 20 patients and reported significantly greater radiographic defect fill with adjunctive PRF at nine months (Ajwani et al., 2015). PRF's fibrin scaffold and associated growth-factor release provide a plausible explanation for enhanced wound healing, although this mechanism was not assessed in the supplied dataset. Differences in defect morphology, study design, radiographic landmarks, and follow-up duration also prevent direct numerical equivalence between studies.

In contrast to a general interpretation that PRF necessarily produces superior outcomes. A study found no statistically significant intergroup differences in probing depth reduction, attachment gain, or radiographic outcomes when comparing OFD plus PRF with OFD plus autogenous bone graft at six months (Mathur et al., 2015). Importantly, this was a comparison against another regenerative material but not OFD alone and therefore does not directly contradict a potential adjunctive benefit over debridement alone. It instead indicates that PRF's comparative performance depends on the treatment against which was evaluated (Khan, et al., 2026). Therefore, our study results was in favor of adjunctive PRF over OFD alone, but any claim of treatment superiority requires verified patient data, inferential statistical analysis, and longer-term assessment.

LIMITATIONS

Study limitations include the six-month follow-up, restriction to three-wall intrabony defects, and lack of histological evaluation. Inadequate reporting of examiner blinding and PRF preparation standardization may limit interpretability. Furthermore, the simulated results must be replaced with verified patient-level data before clinically valid conclusions can be drawn.

CONCLUSION

Adjunctive PRF may provide greater probing pocket depth reduction, clinical attachment gain, and radiographic intrabony defect-depth reduction than open-flap debridement alone at six months in three-wall intrabony defects. However, these simulated findings cannot establish clinical efficacy or statistical superiority. Definitive conclusions require verified patient-level data and appropriate statistical analysis. Longer-term follow-up is also needed to assess the stability of treatment outcomes.

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