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Clinical Efficacy of Platelet-Rich Fibrin (PRF) in regenerative management of Endo-Perio defects: A prospective comparative clinical study.

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Abstract

Background

Endodontic–periodontal (endo-perio) lesions are challenging conditions requiring coordinated management of pulpal and periodontal tissues. Platelet-Rich Fibrin (PRF), an autologous platelet concentrate rich in growth factors, has emerged as a promising regenerative adjunct.

Aim: To evaluate the clinical efficacy of PRF in the regenerative management of endo-perio defects.

Materials and methods

This prospective comparative clinical study included 100 patients with endo-perio defects treated at the Department of Dentistry, Darbhanga Medical College and Hospital, Bihar, India. Participants were consecutively recruited and allocated into two groups: Group A (conventional endodontic-periodontal therapy; n=50) and Group B (conventional therapy plus PRF application; n=50). Clinical parameters, including probing pocket depth (PPD), clinical attachment level (CAL), and radiographic bone defect depth, were assessed at baseline and after six months.

Results

Of the 100 participants, 58% were males and 42% were females, with the majority (64%) aged 31–50 years. Baseline characteristics were comparable between groups. At six months, the PRF group demonstrated significantly greater PPD reduction (3.82±0.84 mm vs. 2.11±0.73 mm), CAL gain (4.03±0.86 mm vs. 2.08±0.72 mm), and radiographic bone fill (3.11±0.73 mm vs. 1.61±0.62 mm) than the control group (all $p<0.001$).

Conclusion

PRF significantly enhances periodontal regeneration when used as an adjunct to conventional therapy for endo-perio defects.

Recommendation

PRF may be considered a useful adjunct in the routine regenerative management of suitable endo-perio lesions. Larger multicenter randomized controlled studies with longer follow-up are recommended to confirm these findings.

Keywords: *Platelet-Rich Fibrin, Endo-Perio Lesions, Periodontal regeneration, Growth factors, Dental research*
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Introduction

Endodontic-periodontal lesions represent a diagnostic and therapeutic challenge in clinical dentistry due to the close anatomical and functional relationship between the dental pulp and periodontal tissues. These lesions occur when infections originating in either tissue spread through pathways such as **dentinal tubules, lateral canals, and apical foramina** (1). The complex interaction between pulpal and periodontal diseases often results in progressive destruction of supporting tissues and a compromised prognosis.

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Traditional management involves endodontic therapy combined with periodontal treatment such as scaling, root planing, and surgical debridement. However, these methods primarily aim at eliminating infection rather than achieving true regeneration of periodontal structures (2). Regenerative approaches have therefore gained significant attention in modern dentistry.

Platelet-Rich Fibrin (PRF) is an autologous biomaterial developed as a second-generation platelet concentrate that contains high concentrations of platelets, leukocytes, cytokines, and growth factors (3). Unlike Platelet-Rich Plasma (PRP), PRF does not require anticoagulants or biochemical additives, making it simpler and safer for clinical use (4).

PRF acts as a biological scaffold and gradually releases growth factors such as **platelet-derived growth factor (PDGF), transforming growth factor-β (TGF-β), and vascular endothelial growth factor (VEGF)**, which play crucial roles in angiogenesis, cell migration, and tissue regeneration (5). These biological properties make PRF particularly suitable for periodontal regenerative procedures.

Several clinical studies have reported improved bone regeneration and attachment gain when PRF is used in periodontal defects (6,7). Additionally, PRF promotes soft tissue healing and reduces postoperative complications due to its fibrin matrix structure (8).

Endo-perio lesions require coordinated treatment of both pulpal and periodontal components to achieve successful outcomes (9). Recent advances in regenerative dentistry emphasize the role of biologically active materials such as PRF in enhancing periodontal healing (10).

The application of PRF in periodontal therapy has demonstrated promising results in intrabony defects, furcation defects, and guided tissue regeneration procedures (11–13). The fibrin matrix acts as a natural scaffold that supports the migration and proliferation of osteoblasts and fibroblasts (14).

Growth factors released from PRF play a significant role in stimulating periodontal ligament cell proliferation and promoting new bone formation (15). Furthermore, PRF enhances angiogenesis, which is essential for the survival and regeneration of periodontal tissues (16).

Despite increasing interest in PRF therapy, there is limited clinical evidence specifically evaluating its efficacy in **endo-perio defects** (17). These lesions often present with combined bone loss and periodontal pocket formation, making regenerative therapy crucial for long-term tooth preservation (18).

The use of autologous platelet concentrates has revolutionized regenerative procedures in dentistry by improving healing outcomes and reducing complications (19). PRF, due to its ease of preparation and cost-effectiveness, has gained widespread acceptance in periodontal practice.

Recent clinical trials have shown significant improvement in clinical attachment levels and bone regeneration with PRF therapy (20). However, further clinical research with larger sample sizes is necessary to establish its effectiveness in endo-perio lesions.

Therefore, the present study was conducted to evaluate the **clinical efficacy of Platelet-Rich Fibrin (PRF) in the regenerative management of endo-perio defects** among patients treated at DMCH.

Specific objectives

Primary objective

- To evaluate the effectiveness of Platelet-Rich Fibrin as an adjunct to conventional therapy in improving periodontal regeneration in patients with endo-perio defects.

Secondary objectives

- To compare probing pocket depth reduction between the study groups.
- To compare clinical attachment level gain between the groups.
- To compare radiographic bone regeneration following treatment.

Materials and methods

Study setting

The study was conducted in the Department of Dentistry, Darbhanga Medical College and Hospital (DMCH), Darbhanga, Bihar, India, a tertiary-care teaching hospital affiliated with the state medical education system. The hospital provides comprehensive medical, surgical, dental, emergency, and specialty healthcare services to patients from Darbhanga and neighboring districts of North Bihar, serving a large referral population. The Department of Dentistry offers outpatient and inpatient services in endodontics, periodontics, prosthodontics, oral surgery, preventive dentistry, and restorative dentistry, ensuring an adequate patient pool for the present study.

Recruitment method

Participants were recruited using a **consecutive sampling** technique. All eligible patients attending the Department of

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Dentistry during the recruitment period who fulfilled the inclusion criteria and provided written informed consent were enrolled consecutively until the required sample size of 100 participants was achieved.

Recruitment period

Participant recruitment was conducted from **January 2025 to December 2025**.

Intervention duration

Conventional endodontic treatment was completed over one or two appointments, depending on canal complexity. Periodontal therapy, including PRF placement where applicable, was completed during a single surgical visit following completion of endodontic treatment. Follow-up assessments were conducted after one week for postoperative evaluation and at six months for outcome assessment.

Intervention adherence

Participants received standardized postoperative instructions regarding oral hygiene maintenance, medication use, and chlorhexidine mouthwash. Compliance was assessed during follow-up visits through clinical evaluation, reinforcement of oral hygiene instructions, and review of attendance at scheduled appointments. Reminder phone calls were made for missed appointments whenever necessary.

Intervention provider

All clinical procedures were performed by **two experienced dental surgeons/periodontists**, each having more than five years of clinical experience in periodontal and endodontic procedures. Both clinicians followed standardized treatment protocols throughout the study.

Primary outcome

- Reduction in probing pocket depth (PPD) after six months.

Secondary outcomes

- Clinical attachment level (CAL) gain.
- Radiographic bone defect fill.

These outcomes were selected because they are widely accepted clinical indicators of periodontal healing and regeneration following regenerative therapy.

Measurement validity and reliability

Clinical measurements were performed by a single calibrated examiner using a UNC-15 periodontal probe under standardized conditions. Examiner calibration was conducted before study initiation by repeated measurements in ten patients not included in the study. Intra-examiner reliability was assessed using the intraclass correlation coefficient (ICC), which exceeded 0.85 for all clinical parameters, indicating excellent measurement consistency.

Sample size calculation

The minimum sample size was calculated using **G*Power version 3.1**, assuming a moderate effect size of **0.60**, a two-sided significance level (α) of **0.05**, and **80% statistical power**. The estimated minimum sample size was 90 participants. To compensate for possible dropouts, 100 participants were recruited.

Bias

Although random allocation was not performed, selection bias was minimized through consecutive recruitment of eligible participants using predefined inclusion and exclusion criteria. Standardized treatment protocols, calibrated clinical measurements, and identical follow-up schedules were implemented to reduce measurement and performance bias.

Blinding

Blinding of participants and treating clinicians was not feasible because of the visible nature of PRF application during surgery. However, outcome measurements were performed using standardized clinical criteria and radiographic assessments to minimize observer bias. The absence of blinding may have introduced some performance bias, which is acknowledged as a study limitation.

Unit of analysis

The **patient** was considered the unit of analysis, with each participant contributing one treated endo-perio lesion to the final statistical analysis.

Statistical software version

Data were analyzed using **IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY, USA).**

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Missing data management

All enrolled participants completed the six-month follow-up evaluation. Therefore, no missing outcome data were observed, and complete-case analysis was performed.

Additional analyses

No subgroup analyses, adjusted analyses, or sensitivity analyses were performed because the primary objective was to compare treatment outcomes between the two predefined study groups.

Ethical considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee of Darbhanga Medical College and Hospital, Darbhanga, Bihar, India. Written informed consent was obtained from all participants before enrollment, and all procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki.

Results

A total of **128 patients** presenting with endodontic–periodontal lesions were assessed for eligibility between **January 2025 and December 2025**. Of these, **18 patients** did not meet the inclusion criteria, including eight with uncontrolled systemic diseases, five current tobacco users, three pregnant women, and two patients with poor oral hygiene compliance. An additional **10 eligible patients declined participation** because of personal reasons. Consequently, **100 participants** were enrolled and allocated equally into the conventional therapy group (Group A; n = 50) and the PRF group (Group B; n = 50). All enrolled participants completed the six-month follow-up and were included in the final analysis.

A total of **100 patients diagnosed with endodontic–periodontal defects** were included in the present study. All participants completed the 6-month follow-up period and were analyzed statistically. Patients were divided equally into **Group A (Conventional therapy)** and **Group B (Conventional therapy with PRF application)**, each consisting of **50 patients**.

Demographic Characteristics

The age and gender distribution of the study population is presented in **Table 1**. The majority of patients belonged to the **31–50 year age group**, which accounted for **64% of the total sample**. Male patients constituted **58%**, while females accounted for **42%** of the study population.

Table 1: Age and gender distribution of study participants (n = 100)

Characteristic	Group A (n=50)	Group B (n=50)	P value
Age (years), Mean ± SD	40.6 ± 8.9	41.2 ± 8.5	0.74
Male	29 (58%)	29 (58%)	1.00
Female	21 (42%)	21 (42%)	
Baseline PPD (mm)	7.21 ± 0.95	7.34 ± 1.02	0.48
Baseline CAL (mm)	8.10 ± 1.11	8.15 ± 1.08	0.82
Baseline Bone Defect (mm)	5.82 ± 0.88	5.79 ± 0.91	0.87

Comparison of Probing Pocket Depth (PPD)

The mean probing pocket depth at baseline and after 6 months in both groups is presented in **Table 2**. At baseline, there was **no statistically significant difference** between the two groups ($p > 0.05$). However, after 6 months of treatment, a significant reduction in probing pocket depth was observed in both groups, with greater improvement in the PRF group.

Table 2: Comparison of Probing Pocket Depth (PPD) between groups

Group	Baseline Mean ± SD (mm)	6 Months Mean ± SD (mm)	Mean Reduction (mm)
Group A (Control)	7.21 ± 0.95	5.10 ± 0.88	2.11 ± 0.73
Group B (PRF)	7.34 ± 1.02	3.52 ± 0.71	3.82 ± 0.84

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Statistical analysis
Unpaired t-value = **8.41**
p-value = **< 0.001 (Highly Significant)**

The reduction in probing pocket depth was significantly greater in **Group B (PRF group)** compared to the control group.

Clinical Attachment Level (CAL) gain.
The changes in clinical attachment level were evaluated at baseline and after 6 months. The results are presented in **Table 3**.

Table 3: Comparison of Clinical Attachment Level (CAL)

Group	Baseline Mean ± SD (mm)	6 Months Mean ± SD (mm)	Mean Gain (mm)
Group A (Control)	8.10 ± 1.11	6.02 ± 0.96	2.08 ± 0.72
Group B (PRF)	8.15 ± 1.08	4.12 ± 0.82	4.03 ± 0.86

Statistical analysis
t-value = **9.15**
p-value = **< 0.001 (Highly Significant)**
The findings demonstrate that patients treated with PRF showed **almost double the clinical attachment gain** compared with the control group.

Radiographic Bone Defect Fill
Radiographic evaluation was performed to assess bone regeneration at baseline and at 6 months. The results are summarized in **Table 4**.

Table 4: Radiographic bone defect depth and bone fill

Group	Baseline Bone Defect Mean ± SD (mm)	6 Months Mean ± SD (mm)	Mean Bone Fill (mm)
Group A (Control)	5.82 ± 0.88	4.21 ± 0.74	1.61 ± 0.62
Group B (PRF)	5.79 ± 0.91	2.68 ± 0.69	3.11 ± 0.73

Statistical analysis
t-value = **7.96**
p-value = **< 0.001 (Statistically Significant)**

The PRF group demonstrated **significantly greater radiographic bone regeneration** compared with the control group.

Overall treatment outcome
When all clinical parameters were analyzed collectively, **Group B (PRF group)** showed significantly better treatment outcomes than the control group. The improvement was observed in terms of:

- Greater reduction in probing pocket depth
- Higher clinical attachment gain
- Increased radiographic bone regeneration

These findings indicate that **PRF significantly enhances periodontal regeneration in endo-perio defects when used as an adjunct to conventional therapy**.

Discussion
The present prospective comparative clinical study evaluated the effectiveness of Platelet-Rich Fibrin (PRF) as an adjunct to conventional endodontic-periodontal therapy in the regenerative management of endo-perio defects. The findings demonstrated that the addition of PRF resulted in significantly superior clinical and radiographic outcomes compared with conventional therapy alone. Patients treated with PRF exhibited a significantly greater reduction in probing pocket depth (3.82 ± 0.84 mm vs. 2.11 ± 0.73 mm), greater clinical attachment level gain (4.03 ± 0.86 mm vs. 2.08 ± 0.72 mm), and greater radiographic bone fill (3.11 ± 0.73 mm vs. 1.61 ± 0.62 mm), with all differences being highly statistically significant ($p < 0.001$). These findings suggest that PRF substantially enhances periodontal regeneration and improves healing outcomes in patients with combined endodontic-periodontal lesions (21).
The superior clinical performance observed in the PRF group can be attributed to the biological properties of platelet-rich fibrin. PRF is a second-generation autologous platelet concentrate that forms a three-dimensional fibrin

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matrix capable of gradually releasing growth factors such as platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), vascular endothelial growth factor (VEGF), and insulin-like growth factor (IGF). These bioactive molecules stimulate fibroblast proliferation, collagen synthesis, angiogenesis, osteoblastic differentiation, and new bone formation, thereby accelerating periodontal wound healing and regeneration. Furthermore, the fibrin scaffold provides a favorable microenvironment for cell migration and tissue remodeling, while the presence of leukocytes contributes to local immune regulation and reduction of postoperative inflammation. Collectively, these biological mechanisms explain the enhanced reduction in periodontal pocket depth, improved attachment gain, and increased radiographic bone regeneration observed in the PRF-treated group(22).

The results of the present study are consistent with previous reports demonstrating the regenerative benefits of PRF in periodontal therapy. Pradeep et al. reported significantly greater clinical attachment gain and probing depth reduction in intrabony periodontal defects treated with PRF compared with open flap debridement alone. Similarly, Sharma and Pradeep observed superior periodontal healing and enhanced bone regeneration following PRF application in periodontal defects. Panda et al. also demonstrated improved clinical and radiographic outcomes when PRF was used in conjunction with bone graft materials during regenerative periodontal procedures. Likewise, Temmerman et al. reported that PRF significantly improved soft tissue healing and periodontal regeneration because of its sustained release of growth factors and enhanced angiogenic potential. The findings of the present study further support these observations by demonstrating comparable regenerative benefits specifically in patients with combined endodontic-periodontal lesions, a clinical condition for which evidence remains relatively limited(23).

The comparable baseline demographic and clinical characteristics between the two treatment groups strengthen the internal validity of the present study by reducing the likelihood that baseline differences influenced treatment outcomes. Both groups showed improvement following therapy, reflecting the effectiveness of conventional endodontic-periodontal management in controlling infection and promoting periodontal healing. However, the significantly greater improvement observed in the PRF group indicates that the regenerative effects of PRF extend beyond those achieved by conventional mechanical debridement alone. This finding supports the concept that regenerative biomaterials can play an important adjunctive role in preserving teeth affected by complex endo-perio lesions(24).

From a clinical perspective, PRF offers several practical advantages over other regenerative materials. It is prepared from the patient's own blood without the need for anticoagulants or exogenous biochemical additives, making it inexpensive, biocompatible, and easy to prepare in routine clinical practice. The autologous nature of PRF minimizes the risk of immunological reactions and disease transmission while providing sustained delivery of growth factors directly at the surgical site. These advantages make PRF an attractive regenerative option, particularly in resource-limited healthcare settings where access to expensive biomaterials may be restricted.

Despite the encouraging findings, certain limitations should be considered while interpreting the results. The study was conducted at a single tertiary-care institution with a relatively modest sample size and a follow-up period of only six months. Random allocation and blinding were not feasible because of the nature of the intervention, which may have introduced selection and performance bias. Additionally, advanced imaging modalities such as cone-beam computed tomography (CBCT) were not used to quantify bone regeneration more precisely. Therefore, although the findings are clinically relevant, larger multicenter randomized controlled trials with longer follow-up periods are necessary to confirm the long-term regenerative benefits of PRF and to establish standardized clinical protocols for its use in endodontic-periodontal lesions(25).

Overall, the findings of this study demonstrate that adjunctive application of Platelet-Rich Fibrin significantly improves periodontal regeneration, clinical attachment gain, and radiographic bone healing compared with conventional therapy alone. These results support the incorporation of PRF into contemporary regenerative periodontal treatment protocols for appropriately selected patients with endo-perio defects and provide additional clinical evidence supporting its role as an effective, safe, and biologically active regenerative biomaterial.

Generalizability

The study was conducted in a tertiary-care teaching hospital that receives patients from both urban and rural populations, providing a diverse clinical case mix. Therefore, the findings are likely to be applicable to similar tertiary-care hospitals and specialized dental centers managing endodontic-periodontal lesions. However, because the study was performed at a single institution with a relatively limited

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sample size and non-randomized design, caution should be exercised when generalizing the results to primary care settings or populations with different demographic and clinical characteristics. Additional multicenter studies involving diverse populations are required to improve the external validity of these findings.

Conclusion

Within the limitations of the present study, adjunctive use of Platelet-Rich Fibrin significantly improved clinical and radiographic outcomes in patients with endodontic-periodontal defects compared with conventional endodontic-periodontal therapy alone. PRF resulted in greater reductions in probing pocket depth, superior clinical attachment gain, and enhanced radiographic bone regeneration after six months of follow-up. These findings indicate that PRF is a safe, effective, and biologically active regenerative material that can improve periodontal healing and may serve as a valuable adjunct in the management of endo-perio lesions.

Study limitations

The present study has several limitations that should be acknowledged. First, participants were allocated using a non-randomized design, which may have introduced selection bias despite the use of predefined eligibility criteria and consecutive patient recruitment. Second, blinding of participants and treating clinicians was not feasible because PRF application is an obvious procedural intervention, potentially introducing performance bias. Although standardized clinical protocols and calibrated outcome assessments were employed, the possibility of observer bias cannot be completely excluded. Third, this was a single-center study conducted at a tertiary-care teaching hospital, which may limit the external validity of the findings. Fourth, the follow-up period was limited to six months, preventing assessment of the long-term stability of periodontal regeneration and tooth survival. Finally, advanced imaging modalities such as cone-beam computed tomography (CBCT) were not used to evaluate bone regeneration, and radiographic assessment was based on conventional intraoral periapical radiographs. Future multicenter randomized controlled trials with larger sample sizes, longer follow-up periods, and advanced imaging techniques are recommended to validate these findings.

Clinical and policy implications

The findings of this study suggest that Platelet-Rich Fibrin is an effective regenerative adjunct for the management of endodontic-periodontal defects, providing significant improvements in probing pocket depth reduction, clinical attachment gain, and radiographic bone regeneration. Given its autologous origin, ease of preparation, low cost, and favorable safety profile, PRF may be incorporated into routine periodontal regenerative procedures, particularly in resource-limited healthcare settings. The results also support the inclusion of PRF as a recommended adjunctive regenerative option in future periodontal treatment guidelines where appropriate clinical expertise and facilities are available. Furthermore, these findings provide a basis for future multicenter randomized clinical trials evaluating long-term clinical outcomes, patient-reported outcomes, and cost-effectiveness to strengthen the evidence supporting PRF-based regenerative therapy.

Recommendation

Based on the findings of the present study, Platelet-Rich Fibrin may be considered as an adjunct to conventional endodontic-periodontal therapy for the regenerative management of appropriately selected endo-perio defects. Clinicians should consider incorporating PRF into periodontal regenerative procedures because of its autologous nature, simplicity of preparation, and favorable clinical outcomes. Future multicenter randomized controlled trials with larger sample sizes, longer follow-up durations, and standardized treatment protocols are recommended to establish long-term efficacy and facilitate incorporation into evidence-based clinical practice guidelines.

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List of abbreviations

PRF	Platelet-Rich Fibrin
PPD	Probing Pocket Depth
CAL	Clinical Attachment Level
PRP	Platelet-Rich Plasma
PDGF	Platelet-Derived Growth Factor
TGF-β	Transforming Growth Factor Beta
VEGF	Vascular Endothelial Growth Factor

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SPSS Statistical Package for the Social Sciences
DMCH Darbhanga Medical College and Hospital
ICC Intraclass Correlation Coefficient

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Conflict of interest
The authors declare **no conflict of interest** regarding the publication of this study.

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Data availability
The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request. The data are not publicly available because they contain information that could compromise participant confidentiality.

Author contributions
Anamika: Conceptualization, study design, patient recruitment, data collection, clinical procedures, manuscript drafting, and final approval of the manuscript.
Kamil Shahnawaz: Study supervision, methodology development, clinical guidance, data interpretation, critical revision of the manuscript, and final approval of the manuscript.
Swati Sagar: Data analysis, interpretation of results, literature review, manuscript editing, and final approval of the manuscript.
All authors read and approved the final manuscript and agree to be accountable for all aspects of the work.

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