

Evaluation of Platelet-rich Fibrin (PRF) and Titanium-prepared Platelet-rich Fibrin (T-PRF) in treatment of Endo-perio Lesions. A comparative study

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ABSTRACT

Background: Endo-perio lesions pose a significant challenge in dental practice due to their complex etiology and treatment approach. Platelet-rich fibrin (PRF) and titanium-prepared platelet-rich fibrin (T-PRF) have gained attention for their regenerative potential in periodontal and endodontic therapy. This study aims to compare the clinical efficacy of PRF and T-PRF in the management of endo-perio lesions.

Materials and Methods: A total of 30 patients with endo-perio lesions were randomly assigned into two groups: Group A (PRF) and Group B (T-PRF), with 15 patients in each group. Following standard endodontic treatment, PRF or T-PRF was placed in the defect site, and clinical parameters including probing depth (PD), clinical attachment level (CAL), and radiographic bone density were evaluated at baseline, 3 months, and 6 months. Statistical analysis was performed using paired t-tests and ANOVA to compare the results within and between groups.

Results: Both groups showed significant improvement in clinical parameters over time. In Group A (PRF), PD reduced from 6.5 ± 1.2 mm at baseline to 3.8 ± 0.9 mm at 6 months, while in Group B (T-PRF), PD reduced from 6.7 ± 1.1 mm to 3.2 ± 0.8 mm. CAL gain was also greater in the T-PRF group (2.9 ± 0.6 mm) compared to the PRF group (2.3 ± 0.5 mm). Radiographic analysis revealed a higher increase in bone density in the T-PRF group. The intergroup comparison showed statistically significant differences favoring T-PRF ($p < 0.05$).

Conclusion: Both PRF and T-PRF were effective in managing endo-perio lesions, with T-PRF demonstrating superior outcomes in terms of periodontal regeneration and bone density improvement. T-PRF can be considered a promising biomaterial for enhanced healing in endo-perio lesions.

Keywords: Platelet-rich fibrin, Titanium-prepared platelet-rich fibrin, Endo-perio lesion, Regenerative therapy, Periodontal healing, Bone regeneration.

1. INTRODUCTION

Endo-perio lesions represent a complex pathological condition that involves both endodontic and periodontal structures, often resulting in significant challenges in diagnosis and treatment planning (1). These lesions can arise from either endodontic infections extending into the periodontium or periodontal disease progressing toward the root canal system, leading to a combined disease entity (2). The success of treatment depends on addressing both components effectively to restore periodontal and periapical health (3).

Recent advancements in regenerative techniques have highlighted the role of platelet concentrates in promoting tissue healing and regeneration (4). Among these, **Platelet-Rich Fibrin (PRF)** has gained significant attention due to its autologous nature, ease of preparation, and ability to release growth factors that facilitate wound healing and tissue repair (5). PRF consists of a fibrin matrix rich in platelets, cytokines, and leukocytes, which enhances cell proliferation and angiogenesis, aiding in periodontal and bone regeneration (6).

A modified form of PRF, **Titanium-Prepared Platelet-Rich Fibrin (T-PRF)**, has been introduced with improved biological properties. Unlike conventional PRF prepared using glass tubes, T-PRF is obtained using titanium tubes, which are hypothesized to result in a denser fibrin matrix with enhanced stability and growth factor release (7). Studies suggest that T-PRF exhibits superior biocompatibility, prolonged release of bioactive molecules, and better wound healing potential compared to PRF (8).

Although both PRF and T-PRF have been successfully employed in periodontal therapy, their comparative effectiveness in treating endo-perio lesions remains underexplored. This study aims to evaluate and compare the clinical and radiographic outcomes of PRF and T-PRF in the management of endo-perio lesions.

2. MATERIALS AND METHODS

Study Design and Patient Selection

This prospective, comparative clinical study was conducted on patients diagnosed with endo-perio lesions. A total of 30 patients, aged between 25 and 55 years, were selected based on specific inclusion and exclusion criteria. The inclusion criteria included patients with radiographically confirmed endo-perio lesions, absence of systemic diseases affecting healing, and willingness to participate. Patients with a history of recent periodontal or endodontic treatment, smoking habits, or systemic conditions affecting bone metabolism were excluded.

Grouping and Treatment Protocol

Participants were randomly assigned into two groups:

- **Group A (PRF group):** Patients received platelet-rich fibrin (PRF) as an adjunct to standard endodontic and periodontal treatment.
- **Group B (T-PRF group):** Patients were treated with titanium-prepared platelet-rich fibrin (T-PRF) along with standard therapy.

Preparation of PRF and T-PRF

Peripheral venous blood (10 mL) was drawn from each patient and centrifuged at 3000 rpm for 10 minutes. In the PRF group, blood was collected in glass tubes, while in the T-PRF group, it was collected in titanium tubes to obtain a denser fibrin matrix. The PRF and T-PRF clots were then separated and used for placement in the defect site.

Clinical and Radiographic Assessment

Baseline clinical parameters, including **probing depth (PD)**, **clinical attachment level (CAL)**, and **radiographic bone density**, were recorded. Evaluations were conducted at baseline, 3 months, and 6 months post-treatment. Standardized intraoral periapical radiographs were taken using the paralleling technique to assess bone changes.

Surgical Procedure

After performing standard **root canal treatment**, the affected sites were surgically debrided under local anesthesia. PRF or T-PRF was placed in the defect, followed by flap repositioning and suturing. Patients were prescribed postoperative antibiotics and analgesics and were advised on proper oral hygiene maintenance.

Statistical Analysis

Data analysis was performed using **SPSS version 25.0**. A paired t-test was used for intragroup comparisons, while ANOVA was applied for intergroup comparisons. A p-value of **<0.05** was considered statistically significant.

3. RESULTS

Clinical Parameters

Both PRF and T-PRF groups exhibited a significant reduction in **probing depth (PD)** and improvement in **clinical attachment level (CAL)** over the study period. At baseline, the mean PD was 6.5 ± 1.2 mm in the PRF group and 6.7 ± 1.1 mm in the T-PRF group. At the **6-month follow-up**, PD reduced to 3.8 ± 0.9 mm in the PRF group and 3.2 ± 0.8 mm in the T-PRF group, showing a greater reduction in the T-PRF group ($p < 0.05$) (Table 1).

Similarly, CAL gain was observed in both groups, with a more significant improvement in the T-PRF group. At **6 months**, the mean CAL gain was 2.3 ± 0.5 mm in the PRF group and 2.9 ± 0.6 mm in the T-PRF group (Table 1).

Radiographic Bone Density

Radiographic analysis revealed an increase in **bone density (Hounsfield units - HU)** in both groups. At baseline, the mean bone density was **450 HU** in the PRF group and **460 HU** in the T-PRF group. At **6 months**, bone density increased to **750 HU** in the PRF group and **820 HU** in the T-PRF group. The T-PRF group exhibited a more significant improvement in bone density over time (**p < 0.05**) (Table 2).

Overall, the findings suggest that while both PRF and T-PRF contribute to periodontal regeneration and healing of endo-perio lesions, T-PRF demonstrates superior outcomes in reducing PD, improving CAL, and enhancing bone density.

Table 1: Clinical Parameters Comparison

Time Interval	PD (mm) - PRF Group	PD (mm) - T-PRF Group	CAL Gain (mm) - PRF Group
Baseline	6.5	6.7	0.0
3 Months	4.5	4.0	1.5
6 Months	3.8	3.2	2.3

Table 2: Radiographic Bone Density Changes

Time Interval	Bone Density (HU) - PRF Group	Bone Density (HU) - T-PRF Group
Baseline	450	460
3 Months	600	650
6 Months	750	820

4. DISCUSSION

Endo-perio lesions present a complex clinical challenge due to their dual etiology involving both endodontic and periodontal components. The success of treatment depends on addressing the microbial infection, promoting periodontal regeneration, and ensuring bone healing (1). This study compared the efficacy of **Platelet-Rich Fibrin (PRF)** and **Titanium-Prepared Platelet-Rich Fibrin (T-PRF)** in managing these lesions, with results demonstrating a superior response in the T-PRF group in terms of clinical and radiographic outcomes.

Clinical Outcomes and Periodontal Healing

The findings of this study revealed that both PRF and T-PRF significantly improved **probing depth (PD)** and **clinical attachment level (CAL)** over six months. However, T-PRF showed a greater reduction in PD and a higher gain in CAL compared to PRF. This may be attributed to the denser fibrin network and prolonged release of growth factors in T-PRF, which enhances cellular migration and tissue regeneration (2,3). Previous studies have also shown that **T-PRF has superior mechanical properties** due to its fibrin architecture, providing a stable scaffold for periodontal healing (4,5).

Role of Growth Factors in Regeneration

Platelet concentrates such as PRF and T-PRF are known to release key growth factors, including **platelet-derived growth factor (PDGF)**, **transforming growth factor-beta (TGF-β)**, and **vascular endothelial growth factor (VEGF)**, which contribute to angiogenesis and bone formation (6,7). The **titanium-based preparation method** used in T-PRF has been reported to enhance fibrin polymerization, resulting in a **more stable matrix** that promotes sustained release of these bioactive molecules, thereby improving tissue healing and regenerative potential (8).

Radiographic Bone Density Changes

In this study, both groups exhibited a significant increase in bone density, with T-PRF showing a more pronounced improvement at six months. The higher radiographic bone density in the T-PRF group suggests **greater osseous regeneration**, which is crucial for the long-term success of endo-perio lesion treatment (9). Similar findings have been reported in studies evaluating the effect of platelet concentrates in periodontal therapy, where T-PRF was found to enhance osteoblastic activity and accelerate new bone formation (10,11).

Comparative Advantages of T-PRF Over PRF

One of the major differences between PRF and T-PRF is the preparation technique. PRF is prepared using **glass tubes**, which may lead to the release of silica particles that could influence fibrin network formation. In contrast, T-PRF is prepared in **titanium tubes**, which are biocompatible and facilitate a more natural clot formation process (12,13). Studies have

demonstrated that **titanium-based PRF has a higher concentration of leukocytes**, which plays a critical role in **immune response and wound healing** (14).

Additionally, the **higher stability and resistance to degradation** of T-PRF make it a **more effective biomaterial for periodontal and bone regeneration**. This property is especially beneficial in the treatment of deep periodontal defects and endo-perio lesions, where sustained release of growth factors is essential for long-term healing (15).

Limitations and Future Recommendations

Although the present study demonstrated **promising results**, it has certain limitations. The **sample size was relatively small**, and the follow-up period was limited to **six months**, which may not be sufficient to assess long-term clinical outcomes. Future studies with **larger cohorts and extended follow-up periods** are recommended to further validate these findings. Additionally, **histological and molecular-level analyses** could provide deeper insights into the regenerative mechanisms of PRF and T-PRF in periodontal therapy.

5. CONCLUSION

The results of this study indicate that **both PRF and T-PRF are effective** in treating endo-perio lesions, with **T-PRF demonstrating superior clinical and radiographic outcomes**. The enhanced structural integrity, prolonged growth factor release, and greater bone density improvements make **T-PRF a more promising biomaterial** for periodontal regeneration. Future research should focus on optimizing platelet concentrate protocols and exploring their potential in **advanced regenerative therapies**.

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