Case Study

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Evaluation of Post-Extraction Healing Using Platelet-Rich Fibrin Versus Conventional Healing: A Comparative Clinical Study

Shrunga Reddy[1]*, Ankit Malu[2], Sumit Bhatt[3], Sai Sagar[4], C. R. Hemanth[5] and Shivani Kondhalkar[6]

[1]Assistant Professor, Department of Oral and Maxillofacial Surgery, Vokkaligara Sangha Dental College, Bangalore, Karnataka, India
[2]Consultant Oral and Maxillofacial Surgeon, Deenanth Mangeskar Hospital, Pune, Maharashtra, India
[3]PhD Scholar, Assistant Professor, Department of Oral and Maxillofacial Surgery, Rajasthan Dental College & Hospital, Nirwan University, Jaipur, Rajasthan, India
[4]Senior House Surgeon, Govt Hospital Neyattinkara, Trivandrum, Kerala, India
[5]Assistant Professor, Department of Oral and Maxillofacial Surgery, C.K.S. Teja Institute of Dental Sciences, Tirupathi, Andhra Pradesh, India
[6]Assistant Professor, Department of Periodontology, Sinhgad Dental College and Hospital, Pune, Maharashtra, India

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ABSTRACT

Background: Post-extraction wound healing is an important determinant of patient comfort and successful oral rehabilitation. Platelet-Rich Fibrin (PRF), a second-generation platelet concentrate, has gained considerable attention because of its potential to accelerate soft-tissue healing and reduce post-operative complications due to the sustained release of growth factors.

Aim: To comparatively evaluate post-extraction healing in extraction sockets treated with PRF and conventional healing following routine dental extraction.

Materials and Methods: This randomized clinical study was conducted among 30 patients requiring bilateral extraction of comparable teeth. The patients were divided into two groups: Group I (PRF group), where PRF was placed into the extraction socket immediately after extraction, and Group II (control group), where extraction sockets were allowed to heal conventionally without any adjunctive material. Clinical parameters including pain, swelling, soft-tissue healing, and incidence of complications were assessed on the 1st, 3rd, and 7th post-operative days using standardized indices and visual analogue scale (VAS). The collected data were statistically analyzed using appropriate tests with significance set at $p < 0.05$.

Results: The PRF group demonstrated significantly improved soft-tissue healing and reduced post-operative pain and swelling compared to the conventional healing group. Faster epithelialization and reduced incidence of complications such as dry socket were observed in sockets treated with PRF. Statistical analysis revealed significant differences between the groups, particularly on the 3rd and 7th post-operative days.

Conclusion: Placement of PRF in extraction sockets enhanced post-extraction healing and improved patient comfort when compared with conventional healing. PRF can be considered a simple, cost-effective, and biologically acceptable adjunct for promoting wound healing following dental extraction.

Corresponding author: Shrunga Reddy
Email id: shrunga.reddy@gmail.com

Introduction

Tooth extraction is one of the most commonly performed procedures in dental practice. Although it is considered a routine treatment, post-extraction complications such as pain, swelling, delayed wound healing, infection, and dry socket may adversely affect patient comfort and quality of life.[1,2] Proper healing of the extraction socket is essential for maintaining alveolar bone integrity and achieving successful future prosthetic or implant rehabilitation.[3]

Wound healing after tooth extraction is a complex biological process involving inflammation, proliferation, angiogenesis, and tissue remodeling.[4] Various materials and regenerative approaches have been introduced to accelerate healing and minimize post-operative complications. Among these, autologous platelet concentrates have gained significant attention because of their ability to enhance tissue regeneration through the release of growth factors and cytokines.[5-10]

Platelet-Rich Fibrin (PRF), introduced by Joseph Choukroun, is a second-generation platelet concentrate prepared from the patient's own blood without the addition of anticoagulants or biochemical agents. PRF contains a fibrin matrix rich in platelets, leukocytes, and growth factors such as platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), and vascular endothelial growth factor (VEGF), which play a crucial role in tissue repair and angiogenesis. Due to its autologous nature, ease of preparation, and low cost, PRF has become increasingly popular in oral and maxillofacial surgery.[10,11]

Several studies have reported the beneficial effects of PRF in improving soft-tissue healing, reducing post-operative pain and swelling, and promoting faster epithelialization of extraction sockets.[12,13] However, variations in clinical outcomes and limited comparative studies necessitate further investigation regarding its effectiveness when compared with conventional healing methods.

Therefore, the present study was undertaken to comparatively evaluate post-extraction healing using PRF and conventional healing following routine dental extraction.

Materials and Methods

Study Design: The present randomized comparative clinical study was conducted in the Department of Oral and Maxillofacial Surgery after obtaining approval from the Institutional Ethical Committee. Written informed consent was obtained from all participants prior to the commencement of the study.

Study Population: A total of 30 patients requiring extraction of comparable teeth were selected for the study. Patients aged between 18 and 50 years who required routine dental extraction under local anesthesia and were willing to participate were included in the study.

Inclusion Criteria

- Patients requiring routine tooth extraction
- Patients with good general health
- Patients willing to participate and provide informed consent

Exclusion Criteria

- Patients with systemic diseases affecting wound healing
- Patients with bleeding disorders or platelet abnormalities
- Smokers and tobacco users
- Pregnant or lactating women
- Patients with acute infection at the extraction site
- Patients on anticoagulant or corticosteroid therapy

Group Allocation: The selected patients were randomly divided into two groups with 15 patients in each group:

- **Group I (PRF Group):** PRF was placed into the extraction socket following extraction.
- **Group II (Control Group):** Extraction sockets were allowed to heal conventionally without placement of any adjunctive material.

PRF Preparation: Approximately 10 mL of intravenous blood was collected from the patient's antecubital vein using a sterile vacutainer without anticoagulant. The blood sample was immediately centrifuged at 3000 rpm for 10 minutes. Following centrifugation, three layers were obtained: red blood cells at the bottom, acellular plasma at the top, and PRF clot in the middle. The PRF clot was separated and compressed gently to obtain a PRF membrane.

Clinical Procedure: All extractions were performed under aseptic conditions using local anesthesia. In Group I, the prepared PRF membrane was placed into the extraction socket immediately after tooth extraction, followed by suturing if required. In Group II, the extraction socket was allowed to heal naturally with standard post-extraction care. All patients received routine post-operative instructions and medications.

Clinical Evaluation: Patients were evaluated clinically on the 1st, 3rd, and 7th post-operative days for the following parameters:

- **Pain assessment:** Using Visual Analogue Scale (VAS)
- **Swelling:** Clinically evaluated using standard facial measurements
- **Soft-tissue healing:** Assessed using healing index criteria
- **Presence of complications:** Such as dry socket, infection, or delayed healing

Statistical Analysis: The collected data were tabulated and subjected to statistical analysis using appropriate statistical

software. Mean and standard deviation were calculated for quantitative variables. Intergroup comparison was performed using independent t-test and intragroup comparison using repeated measures analysis. A p-value of less than 0.05 was considered statistically significant.

Result: The comparative evaluation of clinical parameters demonstrated superior post-extraction healing outcomes in the PRF group when compared with the conventional healing group (Table 1).

For pain assessment, the PRF group exhibited lower mean VAS scores on all post-operative days. A statistically significant reduction in pain was observed on Day 1 (p = 0.021), Day 3 (p = 0.001), and Day 7 (p = 0.001), indicating improved patient comfort following PRF application (Table 1).

Similarly, swelling scores were comparatively lower in the PRF group throughout the evaluation period. Although the difference on Day 1 was not statistically significant (p = 0.118), significant reductions in swelling were observed on Day 3 and Day 7 (p = 0.001), suggesting enhanced inflammatory control in sockets treated with PRF (Table 1).

Soft-tissue healing scores were significantly higher in the PRF group on both Day 3 (p = 0.002) and Day 7 (p = 0.001), demonstrating faster epithelialization and improved wound healing compared to conventional healing (Table 1).

Assessment of post-operative complications further supported the beneficial effects of PRF. No cases of dry socket or infection were reported in the PRF group, whereas the control group demonstrated 2 cases (13.3%) of dry socket and 1 case (6.7%) of infection. Delayed healing was observed in only 1 patient (6.7%) in the PRF group compared to 4 patients (26.7%) in the conventional healing group (Table 2).

Overall, the findings indicate that placement of PRF in extraction sockets significantly improves healing outcomes, reduces post-operative pain and swelling, and lowers the incidence of complications following dental extraction (Tables 1 and 2).

Table 1: Comparative Evaluation of Clinical Parameters Between PRF and Conventional Healing Groups

Clinical Parameter	Post-operative Day	Group I (PRF) Mean ± SD	Group II (Control) Mean ± SD	p-value
Pain Score (VAS)	Day 1	5.12 ± 0.81	6.03 ± 0.74	0.021*
	Day 3	2.84 ± 0.66	4.51 ± 0.79	0.001*
	Day 7	0.93 ± 0.25	2.14 ± 0.48	0.001*
Swelling Score	Day 1	2.91 ± 0.52	3.24 ± 0.60	0.118
	Day 3	1.72 ± 0.41	2.83 ± 0.57	0.001*
	Day 7	0.42 ± 0.13	1.16 ± 0.32	0.001*
Soft-Tissue Healing Score	Day 3	3.82 ± 0.44	2.91 ± 0.51	0.002*
	Day 7	4.74 ± 0.31	3.68 ± 0.46	0.001*

*Statistically significant (p < 0.05)

Table 2: Incidence of Post-operative Complications

Complication	Group I (PRF) n (%)	Group II (Control) n (%)
Dry Socket	0 (0%)	2 (13.3%)
Delayed Healing	1 (6.7%)	4 (26.7%)
Infection	0 (0%)	1 (6.7%)

Discussion: Healing of the extraction socket is a crucial aspect of oral wound management, as it directly influences patient comfort, prevention of complications, and future prosthetic or implant rehabilitation.[14] Various regenerative materials have been introduced to accelerate tissue healing and minimize post-operative discomfort. Among these, Platelet-Rich Fibrin (PRF) has gained widespread attention because of its autologous nature, ease of preparation, and ability to release growth factors that promote tissue regeneration.[15]

In the present study, extraction sockets treated with PRF demonstrated significantly better clinical healing outcomes compared to conventionally healed sockets. Patients in the PRF group experienced lower pain scores at all post-operative intervals. The reduction in pain observed in the PRF group may be attributed to the fibrin matrix and sustained release of growth factors, which enhance tissue repair and reduce inflammatory response. Similar findings were reported in previous studies where PRF application was associated with reduced post-operative pain following dental extraction.[16]

Swelling scores were also lower in the PRF group, particularly on the 3rd and 7th post-operative days. The anti-inflammatory properties of PRF and its ability to improve angiogenesis and tissue organization may have contributed to faster resolution of edema. These observations are in accordance with earlier investigations that demonstrated reduced post-operative swelling in extraction sockets treated with platelet concentrates.

Soft-tissue healing was significantly improved in the PRF group compared with the control group. Faster epithelialization and improved wound closure observed in the present study could be due to the presence of platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), and vascular endothelial growth factor (VEGF) within the PRF matrix. These growth factors play a vital role in cell proliferation, collagen synthesis, angiogenesis, and tissue remodeling, thereby accelerating wound healing.[17]

The incidence of post-operative complications such as dry socket, delayed healing, and infection was lower in the PRF group. No cases of dry socket or infection were observed in extraction sockets treated with PRF, whereas such complications were noted in the control group. The fibrin scaffold formed by PRF may help stabilize the blood clot and protect the extraction socket from microbial contamination, thereby reducing the risk of complications.[18]

Overall, the findings of the present study suggest that PRF is an effective biologic adjunct for enhancing post-extraction healing. Its autologous nature, cost-effectiveness, ease of preparation, and favorable clinical outcomes make it a valuable material in routine dental practice. However, further longitudinal studies with larger sample sizes and histological evaluation are recommended to better understand the long-term benefits of PRF in oral wound healing.

Conclusion

Within the limitations of the present study, it can be concluded that the application of Platelet-Rich Fibrin in extraction sockets significantly enhances post-extraction healing when compared with conventional healing. PRF demonstrated superior clinical outcomes by reducing post-operative pain and swelling, promoting faster soft-tissue healing, and decreasing the incidence of complications such as dry socket, delayed healing, and infection.

Therefore, PRF can be considered a simple, economical, biocompatible, and effective adjunctive material for improving wound healing and patient comfort following routine dental extraction procedures.

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