Applications of Platelet-Rich Fibrin in Oral and Maxillofacial Surgery

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Introduction

Platelet-rich fibrin (PRF) is an autologous platelet concentrate product that is prepared from a patient's blood. The product is rich in platelets, anti-inflammatory cytokines, and other growth factors[12] that promote the healing of wounds (see Figure 1).

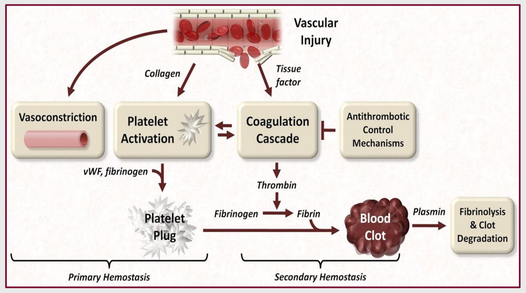

Fig 1. Illustrates the major steps of hemostasis and the role of platelets within the process.[12]

These characteristics have made PRF ideal for use in oral and maxillofacial surgery (OMS) as a therapeutic treatment. The main aim of this study is to examine the applications, efficacy, and benefits of PRF treatment in OMS. Specifically, this study will explore the outcomes of PRF on postoperative discomfort, inflammation, hard and soft tissue healing, and dental implant osseointegration.

Methods

For this literature review, a range of databases was used such as Google Search, PubMed, Web of Science, National Library of Medicine, and ScienceDirect. The search strategy used was a combination of terms such as "Platelet-rich fibrin (PRF)", "PRF in post-operative healing", "PRF in oral and maxillofacial surgery", "PRF in regenerative dentistry", and "PRF and oral pathology". Studies selected were published between January 1, 2017, and February 2022. Only English-language articles were considered for this research. A total of nine clinical studies and one systematic reviews were collected and analyzed.

	Inclusion	Exclusion
Time Period	Literature published between 2017-2023	Literature published prior to 2017
Language	English	Non-English
PRF types	Leukocyte PRF (L-PRF) Titanium PRF (T-PRF) Advanced PRF (A-PRF) Injectable PRF (I-PRF)	All other platelet concetrates
PRF Applications	Oral and Maxillofacial surgeries	All other types of surgeries
Article Type	Journal Articles, Systematic Reviews, Peer-reviewed Articles, Clinical studies	All other Articles
Article Criteria	PRF use or non-use in Oral and Maxillofacial surgeries	PRF use in all other types of surgeries

Results

Study	Article Type	Participants (n=)	Clinical Application	Type of PRF	Results
Karagah et al. (2022)	Clinical Study	10	Maxillary sinus augmentation and immediate implant	L-PRF	The mean **implant stability and osseointegration** quotient was higher at 2 ($p= 0.002$), 4, and 6 months ($p= 0.001$) as compared to control
Valladao Jr. et al (2020)	Clinical Study	18	Bone grafting of alveolar bony defects and implant placement	I-PRF and L-PRF	**Increase in bone thickness** ($p < 0.001$) and **height** ($p < 0.005$) after treatment
Ali et al. (2022)	Clinical Study	60	Implant placement	Not specified	Higher **implant stability and osseointegration** ($p< 0.05$) at 1 week and 1 month. No significant difference ($p > 0.05$) was found at baseline and 3 months as compared to control.
Patra et al. (2022)	Clinical Study	26	Gingival grafting with collagen membrane	I-PRF	**Decreased gingival recession depth** in the test group at 3 months ($p= 0.008$) and 6 months ($p= 0.04$). **Decreased recession width** in the test group at 3 months ($p= 0.008$) and 6 months ($p= 0.001$). **Increased keratinized tissue** width in the test group at 1, 3, and 6 months with P values of 0.04, 0.004, and 0.003, respectively. The test group had **increased root coverage** at 1, 3, and 6 months (91.6%, 81.6%, and 67%), as compared to the control group.
Trybek et al. (2021)	Clinical Study	90	Mandibular third molar extractions	L-PRF	The test group felt **pain with lesser intensity** 6 hours, 1 day, and 3 days post-operatively ($p<0.05$), and experiences **less severe trismus** on postoperative days 1, 2, and 7 ($p<0.05$).
Shruthi et al. (2022)	Clinical Study	44	Mandibular third molar extractions	Not specified	**Decreased severity of postoperative symptoms such as pain, swelling, and trismus** compared to the control group ($p= 0.001$)
Gupta et al. (2020)	Clinical Study	20	Mandibular third molar extractions	A-PRF	**Less pain, swelling, trismus, and increased soft tissue healing** on 3rd postoperative day in test group compared to control (p values 0.008, 0.031, 0.0001, 0.05). **Fewer analgesics intake** in test group ($p= 0.004$). **Increased bone regeneration** 1, 3, and 6 months postoperatively ($p< 0.05$)
Bao et al. (2020)	Systematic Review	10 trials, 307 patients	Mandibular third molar extractions	L-PRF and A-PRF	L-PRF **promoted soft tissue healing** ($p = .0004$) in test group.
Mallapa et al. (2022)	Clinical Study	28	Bone grafting of alveolar bony defects	A-PRF and I-PRF	**Higher bone and connective tissue regeneration** when compared to the control ($p\leq 0.05$) at the end of 6 months.
Starzynska et al. (2021)	Clinical Study	100	Mandibular third molar extractions	A-PRF	**Decreased pain, trismus, analgesic intake, and edema** on the 3rd and 7th post-operative day ($p<0.05$)

Table 2. Ten studies including a total of 703 participants that studied the applications, efficacy, and benefits of PRF in dental procedures.[9]

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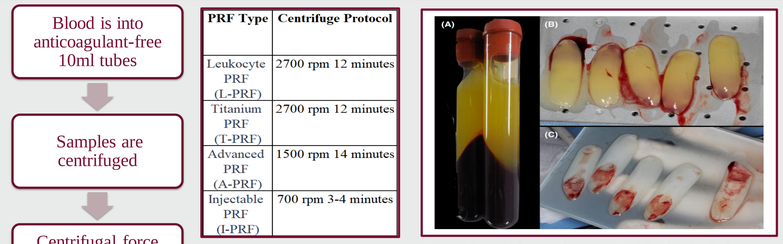
PRF Preparation



PRF Type	Centrifuge Protocol
Leukocyte PRF (L-PRF)	2700 rpm 12 minutes
Titanium PRF (T-PRF)	2700 rpm 12 minutes
Advanced PRF (A-PRF)	1500 rpm 14 minutes
Injectable PRF (I-PRF)	700 rpm 3-4 minutes

Table 3. Summarizes the centrifuge protocol for each PRF type.[8]

Fig 2. Clinical photos of prepared PRF tube, PRF clots, and flattened PRF membranes.[13]

Fig 3. Components of PRF are illustrated.[1]

Fig 4. Clinical photos of prepared PRF.[9]

Conclusion & Future Directions

Based on the current literature and clinical studies, PRF is a versatile and useful therapeutic treatment in many fields of dentistry, especially oral and maxillofacial surgery. PRF is extremely effective in reducing and resolving post-operative pain and other symptoms and can accelerate soft and hard tissue regeneration.

Future directions:

- The clinical community must standardize PRF treatment processes
- More reproducible clinical studies must be conducted on PRF's benefit in bone and soft tissue regeneration.

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