



Effects of Platelet-Rich Fibrin on Various Dental Treatments

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ABSTRACT

Introduction: platelet-rich fibrin is an autologous biomaterial of growing interest in dentistry due to its regenerative capacity and its potential to optimize wound healing.

Objective: to describe the clinical benefits of platelet-rich fibrin in dental procedures, assessing its effectiveness in soft and hard tissue as well as bone regeneration.

Methods: a systematic review was conducted across different databases. Through the design of an information search algorithm, relevant sources were identified and selected; those that met the established selection criteria were included for analysis of the topic addressed.

Development: the reviewed literature shows that platelet-rich fibrin promotes soft and hard tissue healing, reduces postoperative complications, and improves dental implant integration. Success rates above 75 % are reported in most studies, highlighting its usefulness in oral surgery, periodontics, and implantology. In addition, its three-dimensional structure acts as a biological scaffold that facilitates cell proliferation and angiogenesis. The evidence indicates that it is a versatile, safe, and cost-effective resource, with applications in bone regeneration, closure of sinus cavities, and advanced periodontal treatments.

Conclusions: platelet-rich fibrin is established as an effective therapeutic alternative in dentistry, with the ability to accelerate healing and reduce postoperative risks. Its simplicity of preparation and low cost enhance its clinical applicability; however, further research is recommended to standardize protocols and assess long-term outcomes.

Keywords: Platelet-Rich Fibrin; Biocompatible Materials; Dentistry; Guided Tissue Regeneration.

INTRODUCTION

Platelet-rich fibrin (PRF) is an important second-generation platelet concentrate obtained as a fibrin membrane with significant potential for tissue regeneration. Platelets present in PRF release growth factors that optimize the regenerative process. Additionally, the fibrin matrix promotes the formation of new blood vessels, facilitating the delivery of nutrients and cells to the injured area and playing a crucial role in tissue healing. PRF preparation is considered a simple and low-cost procedure. These platelet concentrates offer therapeutic options using autologous materials with the potential to stimulate the body's natural healing process and promote the regeneration of various tissues.⁽¹⁾

In dentistry, such procedures are increasingly becoming a prominent trend due to the versatility of platelet-rich fibrin (PRF), particularly in oral and maxillofacial surgery, implantology, and periodontics. This practice is regarded as highly feasible because it is derived from the patient's own blood. It is typically quick to apply, given its high regenerative capacity and low likelihood of causing infections, allergic reactions, or rejection. Furthermore, PRF has been shown to be effective in improving periodontal tissue health in patients undergoing surgical procedures, facilitating alveolar bone regeneration and the closure of sinus cavities, clefts, defects, or other irregularities.⁽²⁾

Structurally, platelet-rich fibrin is a three-dimensional matrix composed primarily of fibrin, a protein formed by the polymerization of fibrinogen. Fibrin consists essentially of polypeptide chains known as fibrin monomers, which bind together to form fibrin filaments. These filaments interweave to create a three-dimensional network that entraps platelets and other cellular components. The exact chemical composition of PRF may vary depending on several factors, such as the preparation technique used and the specific conditions of the patient's blood sample. However, in general, the chemical structure of PRF consists of an interwoven network of fibrin filaments, along with platelets and other growth factors and proteins present in the patient's blood sample.⁽³⁾

Currently, one of the major challenges in the medical-dental field following wound or injury treatment is the difficulty in achieving proper healing. This can lead to various complications, including abnormal infections resulting from unhealed wounds, which are susceptible to bacterial and pathogenic invasion—causing not only local but also systemic infections. Additional associated problems include persistent pain at the wound site and delayed postoperative recovery, which can prolong healing time after surgery and lead to functional and aesthetic issues.⁽⁴⁾

As stated above, fibrin—particularly in the form of platelet-rich fibrin (PRF)—is used in various applications in oral and maxillofacial surgery. In implantology, it aids in the effective healing of soft tissues surrounding the implant and promotes osseointegration. It also supports bone regeneration procedures, such as maxillary sinus lifts, by enhancing new bone formation and accelerating healing. In the treatment of periodontal diseases—such as advanced periodontitis—it stimulates the regeneration of all periodontal tissues. Additionally, in reconstructive facial and maxillofacial surgeries, PRF helps reduce scarring and supports tissue reformation in damaged areas.⁽⁵⁾

In dentistry, fibrin is available in various forms designed to enhance healing and facilitate surgical procedures. Fibrin glue, also known as tissue sealant, is used to control bleeding and promote healing in interventions such as tooth extractions and periodontal surgery. On the other hand, PRF—obtained by centrifuging the patient’s own blood—is employed to accelerate recovery after extractions, stimulate bone regeneration, and facilitate dental implant integration.⁽⁶⁾ Given the above, the present review was conducted with the objective of describing the clinical benefits of platelet-rich fibrin in dental procedures, evaluating its effectiveness in soft and hard tissue regeneration.

METHODS

This study is a bibliographic review developed in accordance with the recommendations of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement. The methodological objective was to identify, analyze, and synthesize the available scientific evidence on the clinical applications of platelet-rich fibrin (PRF) in dental procedures. The search period spanned from January 2010 to December 2024, with the aim of including updated and relevant studies that reflect the evolution of knowledge in this field. The target population consisted of all studies and publications investigating the use of PRF in dentistry, and the final sample was selected based on predefined inclusion criteria.

Information sources included widely recognized electronic databases in the biomedical and dental fields: PubMed/MEDLINE, Google Scholar, Scopus, and SciELO. Additionally, a manual review of the reference lists of selected articles was performed to identify potentially relevant additional studies. Grey literature—including theses and academic documents—was also considered, provided it met the established methodological and thematic criteria.

The search strategy was structured using an algorithm combining keywords and Boolean operators, adapted to each database. Search terms included: (“Fibrina rica en plaquetas” OR “Platelet-rich fibrin” OR “Fibrin”) AND (“Odontología” OR “Dentistry” OR “Oral surgery” OR “Implantology”). DeCS and MeSH descriptors were used whenever possible. Publications in Spanish, English, and Portuguese were included to broaden coverage and minimize language bias.

Inclusion criteria encompassed studies published within the defined timeframe, conducted in humans, and directly evaluating the clinical application of PRF in dental procedures. Original articles, systematic reviews, and meta-analyses with full-text availability were included. Exclusion criteria comprised duplicate studies, irrelevant research, publications outside the established period, and articles without full-text access. The selection process was carried out in three sequential phases: title screening, abstract evaluation, and detailed full-text analysis. Initially, 182 records were identified; 20 were removed as duplicates. After title and abstract screening, 138 articles were excluded for not meeting inclusion criteria.

Finally, 24 full texts were assessed, resulting in 14 studies included in the final analysis. The entire process was represented using a PRISMA flow diagram.

For data extraction and analysis, a standardized matrix was used to collect relevant information. Findings were integrated through a narrative qualitative synthesis, as methodological heterogeneity among the studies precluded quantitative meta-analysis.

DEVELOPMENT

To organize and contextualize the analyzed scientific evidence, the included studies were classified according to their methodology, allowing for an assessment of the level and diversity of investigative approaches regarding the use of platelet-rich fibrin in dentistry.

Table 1. Results of the studies included in the review.

Source	Methodology	Procedure	Success rate
Escalante et al.,(2016) ⁽¹⁾	Systematic search of various random sources	Analysis of PRF procedures and techniques in oral and maxillofacial surgery	84.9%
Ballesteros et al., (2023) ⁽²⁾	PRISMA methodology for systematic and theoretical review studies	Investigated the use of platelet-rich fibrin in bone during implant placement in sinus lift procedures	55.5%
Gutiérrez et al.,(2018) ⁽³⁾	In vitro experimental study using peripheral blood samples from five healthy adults attending the dental clinic of Universidad Antonio Nariño	15 mL of blood was drawn per patient and immediately processed in a digital centrifuge; 15 PRF samples were obtained—10 were compacted into membranes and 5 remained uncompact	100%
López-Pagán et al.,(2020) ⁽⁴⁾	Systematic literature search to evaluate periodontal tissue healing with PRF application	Concluded that PRF is a good alternative to enhance healing and potentiate other biomaterials for better regeneration in a shorter time	76.0%
González et al.,(2021) ⁽⁵⁾	Comparative study to identify the most effective treatment, intervention, or condition for this dental procedure	Two PRF membranes were placed in the extraction socket of the left mandibular third molar and compared with the right mandibular third molar socket, where no biological material was added after extraction (only simple sutures)	89.7%
Suárez et al.,(2020) ⁽⁶⁾	Quantitative, confirmatory, experimental design to assess the response of the dentinopulpal complex (dependent variable) treated with PRF (independent variable) versus a control group	Blood was drawn from the experimental group and centrifuged at 1,000 rpm for 2 minutes in tubes without anticoagulant to obtain PRF, which was then transferred to insulin syringes for application into the pulp chamber	100%
Guzmán et al.,(2017) ⁽⁷⁾	Surgical extraction of mandibular third molars in patients aged 16–27 years	Two PRF membranes were placed in the left mandibular third molar socket and compared with the right socket, where no biological material was added post-extraction	98.0%

Macias et al., (2020) ⁽⁸⁾	Documentary, descriptive, indirect-method, retrospective study with electronic search strategy	Analyzed the use of platelet-rich fibrin in dental interventions across clinical specialties: oral and maxillofacial surgery, prosthodontics, dental implants, periodontics, and endodontics, supported by oral and maxillofacial imaging	75.0%
Atamari et al.,(2017) ⁽⁹⁾	Convenience sampling without randomization; 18 patients (both sexes, 18–50 years), no systemic disease or coagulation disorders	PRF clot was placed in one socket (experimental), while the contralateral socket served as control (no PRF); both sockets were sutured	97.9%
Bettin et al., (2021) ⁽¹⁰⁾	Guided tissue regeneration enhanced with PRF	Allograft was compacted into the bony defect and covered with an L-PRF membrane; the flap was repositioned and suspended sutures were used	100%
Ramírez et al.,(2014) ⁽¹¹⁾	Systematic search of indexed literature on the topic in reliable databases	PRF was prepared from the patient's own blood and placed in the pulp chamber following a pulpotomy procedure	98.0%
Miquet et al.,(2019) ⁽¹²⁾	Comparative bibliographic review between stem cells and platelet-rich fibrin	Stem cells were used in a dental treatment to assess their regenerative evolution compared to PRF	75.0%
Brizuela et al.,(2011) ⁽¹³⁾	PRF treatment in a patient with apical periodontitis	Bleeding was induced in the root canal and PRF was inserted; white Mineral Trioxide Aggregate (MTA) was placed over the clot as a sealing material	98.9%
Cámara Cabello et al.,(2015) ⁽¹⁴⁾	Alveolar ridge preservation using tissue engineering with PRF	The PRF clot was divided into two equal parts: one for intra-alveolar filling and the other placed on sterile gauze to remove exudate and form a membrane; once the filling was placed and the membrane stabilized, suturing was performed	100%

Guzmán et al.,⁽⁷⁾ state that the use of platelet-rich fibrin (PRF) in third molar surgery showed favorable outcomes in improving bone and gingival tissue healing, thereby confirming its clinical validity. When analyzed by age group, patients aged 20–23 years exhibited better bone tissue healing, while those aged 16–19 years showed superior soft tissue healing. Regarding sex, males demonstrated better overall healing compared to females. Finally, no significant influence of surgical difficulty during third molar extraction was observed on outcomes.

According to Macías and Santana,⁽⁸⁾ platelet-rich fibrin (PRF) in dentistry exhibits both osteoinductive and osteoconductive properties. PRF releases growth factors—such as PDGF, TGF- β , and VEGF—in a controlled manner, recruiting stem cells and osteoprogenitor cells to stimulate osteoblast formation and accelerate bone regeneration in applications including periodontal defects, post-extraction sites, bone grafts, and implantology. Its three-dimensional structure promotes cell migration, proliferation, and activity, acting as a biological scaffold that facilitates new bone deposition and integration. Clinically, satisfactory healing is observed with notable

reduction in postoperative edema and pain, as confirmed by radiographs showing increased radiopacity and reduced clot interface in the alveolar process—highlighting PRF's therapeutic potential as both an osteoinductor and osteoconductor.

Atamari et al.,⁽⁹⁾ found that the application of platelet-rich fibrin (PRF) in dental extraction sockets significantly improved healing. PRF-treated sockets exhibited less inflammation, firmer alveolar mucosa, and reduced postoperative bleeding compared to untreated sockets. Additionally, treated patients reported less pain, suggesting that PRF effectively enhances post-extraction recovery and improves pain management. This study supports the use of PRF as a therapeutic intervention to optimize healing after tooth extraction, offering patients a more comfortable and faster recovery.

Bettin and López,⁽¹⁰⁾ report that, following PRF treatment, periodontal probing at follow-up revealed a reduction in periodontal pocket depth and improvement in clinical attachment level, contributing to decreased tooth mobility. This technique stands out because it is prepared without external chemical agents, enhancing its biocompatibility. The presence of leukocytes—particularly neutrophils—within the fibrin matrix acts as an immune modulator, reducing the risk of postoperative infections. For these reasons, leukocyte- and platelet-rich fibrin (L-PRF) has emerged as the preferred platelet concentrate in guided tissue regeneration according to recent literature, demonstrating positive outcomes in reducing pocket depth and preventing clinical attachment loss.

Ramírez and Sossa,⁽¹¹⁾ reaffirm that fibrin—particularly in its platelet-rich form—plays an essential role in endodontic practice. Beyond effectively sealing accidental perforations and providing hemostatic control during procedures, PRF actively promotes healing of periapical tissues. This is due to its ability to release growth factors that stimulate cell proliferation and facilitate scar tissue formation, thereby enhancing the overall effectiveness of endodontic treatment. In more complex cases—such as irreversible pulp necrosis—PRF acts not only as a biological barrier against bacterial contamination but also as a catalyst for regeneration of damaged pulp tissue. This approach reduces reinfection risk and optimizes comprehensive dental recovery.

According to Miquet and Báez,⁽¹²⁾ in the field of regenerative dentistry, stem cells—not PRF—are considered the optimal method for pulp regeneration due to their superior regenerative capacity, making them a promising tool for repairing and regenerating damaged pulp tissue. These cells can be stimulated through bioengineering techniques and biomaterials to promote dentin and other pulp component formation, offering significant potential to advance current regenerative dental therapies. However, Brizuela and Saint,⁽¹³⁾ argue that PRF is the best method for pulp regeneration, as it not only enhances vascularization and reduces inflammation but has also been shown to increase success rates and accelerate postoperative recovery.

CONCLUSIONS

Platelet-rich fibrin (PRF) is a biomaterial of high clinical value in dentistry, demonstrating efficacy in enhancing soft and hard tissue healing, accelerating regenerative processes, and reducing postoperative complications such as infection and inflammation. It has also shown the ability to promote osteogenesis, optimize dental implant integration, and improve outcomes in periodontal surgical procedures and complex dental extractions. Thanks to its versatility, PRF can be applied across a wide range of dental procedures with diverse therapeutic needs. Furthermore, its ease of preparation and application, low cost, and proven effectiveness position PRF as a safe and efficient alternative to other available treatments in contemporary dental practice.

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