European Journal of Dental and Oral Health
Vol 6 | Issue 1 | February 2025
ISSN 2684-4443

REVIEW

A Review of Platelet-Rich Fibrin Uses in Oral Surgery and Dental Implantology

Noor Mohammed Al-Noori[1,*], Maryam Ali[2], and Mays Yasir[2]

ABSTRACT

Platelet-rich fibrin is a healing biomaterial that can be used unaccompanied or in conjunction with bone grafts to promote hemostasis, bone development, and maturation. It has a tremendous likelihood for bone and soft tissue redevelopment and does not cause any inflammatory reactions. The platelet-rich Fibrin preparation protocol is very simple: Collection of blood in the glass tube and then directly centrifuging it without any additives, establishing fixed fibrin clots rich in platelet leucocytes and growth factors set in the fibrin. Platelet-rich fibrin advantages: it does not dissolve rapidly and is prepared at a low cost. Platelet-rich fibrin is used in almost all oral surgery and dental implant procedures because of its effect on the healing of both hard and soft tissue of the oral cavity.

Keywords: Dental implant, Oral surgery, Platelet-Rich Fibrin, PRF.

Submitted: January 06, 2025

Published: February 03, 2025

10.24018/ejdent.2025.6.1.363

[1] *M.Sc Oral and Maxillofacial Surgery, Department of Oral Surgery and Periodontology, College of Dentistry, Mustansiriyah University, Iraq.*
[2] *B.D.S. College of Dentistry, Mustansiriyah University, Iraq.*

* ***Corresponding Author:***
e-mail: nooralnoori@uomustansiriyah.edu.iq

1. Introduction

Active Surgical biological material that is used to control the inflammation process and rise of healing capacity is considered the biggest challenge in treatment and clinical research. Because healing is considered a complicated process, and this process is still complex for complete understanding; however, platelets have an essential role in healing and hemostasis of the wound [1].

Recently, platelet concentrates have acquired the approval of possibility as reformative materials. A diversity of protocols for platelet concentrates preparation was presented, one of them: Platelet-Rich Fibrin (PRF), which is an *autologous blood-derived* product that was primarily presented by Choukroun in 2001 to augment healing and encourage rapid recovery response after surgical treatment [2], [3].

PRF preparation protocol is very simple: a collection of blood in the glass tube and then directly centrifuged without any additives, which establishes fixed fibrin clot rich in platelets (platelets, leucocytes and growth factors set in the fibrin, while platelets are stimulated throughout the procedure) [3], [4]. Applied PRF advantages: doesn't dissolve rapidly and is prepared at low cost [5], [6].

PRF holds a large number of cytokines and growth factors Because of its fibrous structure and permits a constant slow release of them over a period of ten days [7].

Healing properly has always depended on the presence of blood and its components surrounding the wound. Therefore, it seems that forming a blood clot at surgical sites supports the human body's natural healing mechanisms [8].

2. Review

PRF is a healing biomaterial that can be used unaccompanied or in conjunction with bone grafts to promote hemostasis, bone development, and maturation. It has a tremendous likelihood of bone and soft tissue redevelopment and doesn't cause inflammatory reactions [9]. The first use of PRF was made by Choukroun in 2001. Particularly in oral and maxillofacial surgery [10]. It has many benefits over other blood derivatives and is made up of an autologous fibrin matrix [11].

2.1. Types of PRF

2.1.1. Pure (P-PRF)

These preparations contain a high-density fibrin network without leukocytes [12]. The preparation by centrifugation of blood at 2700 rpm for 12 minutes, with no usage of anticoagulant in a glass tube.

The advantages of P_PRF are that it does not disintegrate rapidly after use and the durable fibrin medium is gradually changed in a similar way to a natural blood clot and its low price and without the use of chemicals. Therefore, this method seems to be most suitable for widespread use in daily practice [13].

2.1.2. Leukocyte (L-PRF)

Products consist of leukocyte-containing preparations with a high-density fibrin complex [14]. The method is completely natural, based on the concept of one-step centrifugation of blood without anticoagulant [15]. A blood sample is centrifuged in glass or glass-lined plastic tubes without using of any anticoagulant, at 3000 rpm for 10 minutes immediately following collection [16].

2.1.3. Injectable (I-PRF)

I-PRF was created in 2014. The blood centrifuged in plastic centrifugation tubes at lower centrifugation speeds (about 700 rpm for three minutes) resulted in a flowable PRF called I-PRF. The primary constituent of I-PRF is fibronectin, an extracellular glycoprotein that stimulates cellular proliferation [17].

2.1.4. Titanium (T-PRF)

T–PRF prepared in titanium tube; created on a suggestion that titanium may be more effective than glass tube and better biocompatibility [6], [18].

2.2. Application in the Field of Oral Surgery

2.2.1. Third Molar Extraction

This may be related to potential postoperative decreasing of pain, trismus, discomfort, and edema; increasing soft tissue and bone healing [19].

2.2.2. Alveolar Ridge Preservation

To help to reduce discomfort, edema, and the risk of inflammation surrounding extracted teeth [20], PRF is used to assist their preservation. It can be applied both as a filling material on itself or in mixed with bone graft ingredients [21].

2.2.3. Endodontic Surgery

The main reason for failed periapical healing following principal endodontic treatment is the perseverance of microorganism and diseased tissue in the periapical tissue and because PRF is made up of a fibrin network that is tangled with platelets, leukocytes, cytokines, and stem cells, it has been suggested that PRF can be treated as a healing biomaterial [22].

2.2.4. Dressing Agent in Patient with Anticoagulant Medication

Following the completion of the atraumatic extraction, the PRF and dental dressing were placed into the extracted tooth socket in patients who have heart disease and are on warfarin [23].

2.2.5. Pre Prosthetic Surgery

Pre-prosthetic operations particularly vestibuloplasty techniques considered an important role in organizing the oral environment for a preferable denture stability [24]. PRF membrane can be employed for covering the unprotected part of conventional vestibuloplasty to reduce the shortcomings of this procedure. Therefore, no requisite for additional skin or mucosal graft harvesting and the epithelialization rate of the wound can be enhanced [9].

2.2.6. Treatment of Oral Antral Fistula

Oral cavity and maxillary sinus' pathological communication; which is situation caused by teeth extractions, infections, osteomyelitis, radiation treatment or trauma. Terminating this situation is essential to evade debris and saliva contamination that might result in bacterial infection, compromised healing and result in chronic sinusitis [25]. The preparation procedure of this biomaterial is humble and low price (we need only a centrifuge and glass test tube) with great soft tissue therapeutic ability, seems to be a precise promising choice in the management of oro-antral fistula [26].

2.2.7. Covering the Donor Site

PRF application on the donor site after palate grafting accelerates the epithelialization and the inflammation reactions like hyperemia, pain and edema are less by releasing growth factors in the wound environment [27].

As a membrane to treat dehiscence and fenestration defects, PRF has been used as a membrane to enhance and accelerate tissue healing [28].

2.2.8. Filling Space After Cyst Inculcation

Large cystic bone lesions should be treated carefully since they raise the risk of a pathological fracture. Using autologous PRF as a surgical supplement is a creative and cost-effective way to encourage bone healing capability, improve soft and hard tissue redevelopment and confidently prompt wound soothing [15].

2.2.9. Injectable (I-PRF) in Managing Temporomandibular Joint Pain

I-PRF demonstrated significant efficacy in reducing TMJ pain intensity and improving jaw function [29].

2.3. PRF as an Adjunct to Implant Dentistry

2.3.1. Positive Effect on Osseointegration and Stability

Osseointegration, and increase stability [30] which was demarcated as a direct structural and functional connection between ordered, living bone and the surface of a load-bearing implant. Eventually supposed to be as *functional ankylosis*.

PRF in the osteotomy encourages these methods, as *osseointegration* is established on these extremely complex relations between cells and their products of inflammation [31].

2.3.2. A Membrane for Coverage of Immediate Implants

Membrane was used to shield the implant location [32]. PRF providing worthy soft tissue coverage above the immediate implants and it improved stability [33].

2.3.3. Immediate Implant with Periapical Infection

These lesions frequently result in significant alveolar bone resorption [34]. PRF minimize the inflammatory reaction in the extraction socket, avoids interfering with bone regeneration, and hastens early bone healing, PRF was used with the bone substitute in this instance [35].

2.3.4. Treatment of Peri-Implant Defects

Effective implant management is influenced by numerous factors including peri-implantitis, and implant rejection [36]. Rise in keratinized mucosa and an improvement in clinical attachment levels, After PRF use, so PRF could be helpful in treating peri-implantitis abnormalities [31].

2.3.5. In Sinus Left Procedure

PRF easily manages replacement biomaterial during sinus elevation in order to shorten the healing period prior to loading; and substance with therapeutic qualities; also, PRF membranes offer a successful and simple way to cover an osteotomy or sinus membrane [37].

2.3.6. With Ridge Splitting

The narrowing of the alveolar ridge is a significant complication to the proper implantation of dental implants [38]. Ridge splitting is a useful treatment for horizontal alveolar ridge malformation. When implant implantation is done concurrently with anterior ridge splitting, PRF may provide a useful substitute material that promotes bone regeneration and tissue repair [39].

3. Conclusion

No matter how much we talk about PRF we cannot do justice to its importance, as it has entered into almost all oral surgery and dental implant procedures, regardless of its other uses. We can call it a miracle in all its types. It is a simple, inexpensive and uncomplicated preparation method. With its stem cells, white blood cells, platelets and cytokines, it provides the best way to heal bone and soft tissues.

Conflict of Interest

Authors declare that they do not have any conflict of interest.

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