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PRF-From self to self.

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Short Communication

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ABSTRACT

PRF, which belongs to a new second generation of platelet concentrates, with simplified processing, and not requiring biochemical blood handling, has several advantages over traditionally prepared PRP, which has been widely used for accelerating soft tissue and hard tissue healing. However, the preparation being strictly autologous, the amount of PRF obtained is limited. Choukroun's platelet-Rich Fibrin (PRF) incorporates leucocytes, platelets and a wide range of healing proteins within a dense fibrin matrix. It has a strong fibrin architecture and slow releasing growth factors and glycoproteins over several days. It is a natural bioactive membrane, which can enhance soft/hard tissue healing, at the same time, can also protect surgical sites,grafted materials from external aggressions. This article describes the evolution of this second generation platelet concentrate and its multipleuses in various surgical procedures.we have attempted to give an overview of PRF including its uses, advantages, its preparation & its microscopic structures.

INTRODUCTION

Periodontal diseases are among the most prevalent diseases worldwide. They are the major cause of tooth loss in adults [1]. The goal of periodontal therapy includes not only the arrest of periodontal disease progression, but also the regeneration of structures lost due to disease. One of the most important and, at present, unsolved problems in clinical periodontics is the predictable successful treatment of periodontitis affected furcations of multi-rooted teeth [2]. Since several therapeutic approaches that involve conservation, resection or regeneration are proposed, a proper diagnosis of these lesions is demanding. To overcome the prevailing healing limitations in furcation defects, the principles of tissue engineering were applied using a purified growth factor together with an osteo conductive scaffold to stimulate the patient's own cells toward a regenerative response. More recently, the use of growth factors and bone morphogenic proteins (BMPs) have shown promising results in the treatment of intra bony defects. The use of fibrin glue [1] or platelet concentrate [2,3] during periodontal surgical procedures is one of the current treatment concept used to accelerate woundhealing and tissue maturation [4]. Choukroun's platelet-rich fibrin (PRF) a 2nd generation platelet concentrate [5], was defined as an autologous leukocyteandplatelet-rich fibrin biomaterial [6,7,8]. PRF was developed in France by Choukrounet al [9]. In 2001. It is biocompatible, bioresorbable andplays an essential role in wound repair, notonly for hemostasis but also provides amatrix for migration of tissue-forming cellslike fibroblasts and endothelial cells, whichare involved in angiogenesis and that areresponsible for remodeling of the new tissue.In the normal wound-healing process,platelets are trapped within the fibrin matrixand are subsequently activated so thatgrowth factors like platelet-derived growthfactor (PDGF), transforming growth factor(TGF-b) and insulin-like growth factor I(IGF-I) are set free [10] ,which could stimulate the mitogenic responseof the periosteum during bone [11].The essence of platelet-rich fibrin (PRF)modified by Choukroun and colleagues [5] is a fibrin matrix inwhich the platelet cytokines and cells aretrapped and may be delivered after a certaintime [12].

Definition of PRF

PRF can be considered as an autologous healing biomaterial, incorporating in a matrix of autologous fibrin most leukocytes, platelets& growth factors harvested from a simple blood sample [5].

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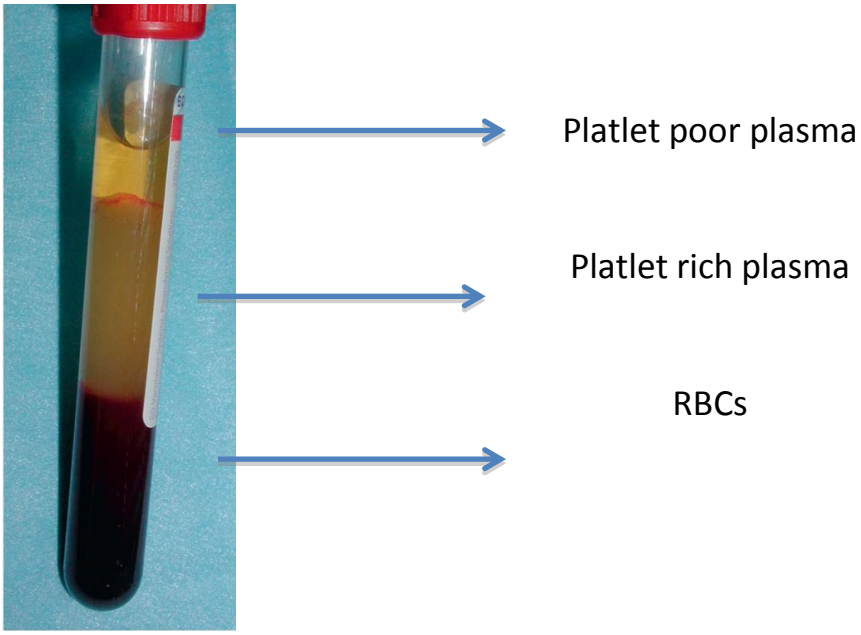
PRF preparation

A blood sample of 10 mL in test tubes without an anticoagulant is centrifuged using a tabletop centrifuge machine for 12 min at 2500 rpm or 10 min at 3000 rpm. The resultant product which is obtained after centrifugation could be seen in 3 distinct layers, a red blood cell (RBC)base at the bottom, a cellular plasma(platelet-poor plasma [PPP]) as a supernatant,and a PRF clot in the middle. It can be used directlyas a clot or after compression as a membrane (Fig. 1).

Figure 1



PRF: as seen microscopically (Figure 2)

The PRF clot can be described as composed of two main parts observable with the naked eye: a fibrin yellow portion, constituting the main body, and a red portion located at the end of the clot (full of RBCs). Between these two areas, a whitish layer called the ''buffy coat'' (similar to the whitish layer in PRP technologies) can be observed with the naked eye and concentrates cell corpuscules requiring identification. The PRF clot at a low magnification showed that the clot presented a concavity in its middle part.This is caused by matrix shrinkage due to fixation. In the red part of the PRF clot, RBCs are enmeshed in the fibrin network.RBC shapes are normal, but the fibrin-strand network appearimmature. At the junctionbetween the red and yellow parts of the PRF clot (the buffy coat area), the SEM examination showed leukocytesthat clearly appeared as spherical structureswith irregular surface (Figure 3) [13]. Platelet aggregates appeared very clearly along the fibrin strands.Beyond the buffy coat base, two distinguished different areas: the first area is composed of thick fibrin strands and a few scattered RBCs (probably from contamination during clot handling). The fibrin network appeared to be mature.The second area corresponded to the platelet veins. This area contained platelets and fibrin that formed large and dense clusters due to extensive aggregation and clotting. This aggregate formed a solid and thick mesh. Therefore, platelets seemed to be highly activated during the PRF-preparation protocol. At a low magnification, the PRFmembrane surface showed the print of the gauze threads. Fibrin is a physiologic glue; therefore, the compression of the fibrin clot into a membrane provided a very compact matrix. Inthe fibrin, one end of the membrane.is clearly organized in parallel strands that appeared very thick and dense. It is impossible to distinguish cellular elements trapped within this condensed network.

Figure 2

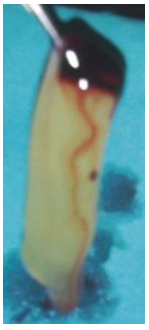


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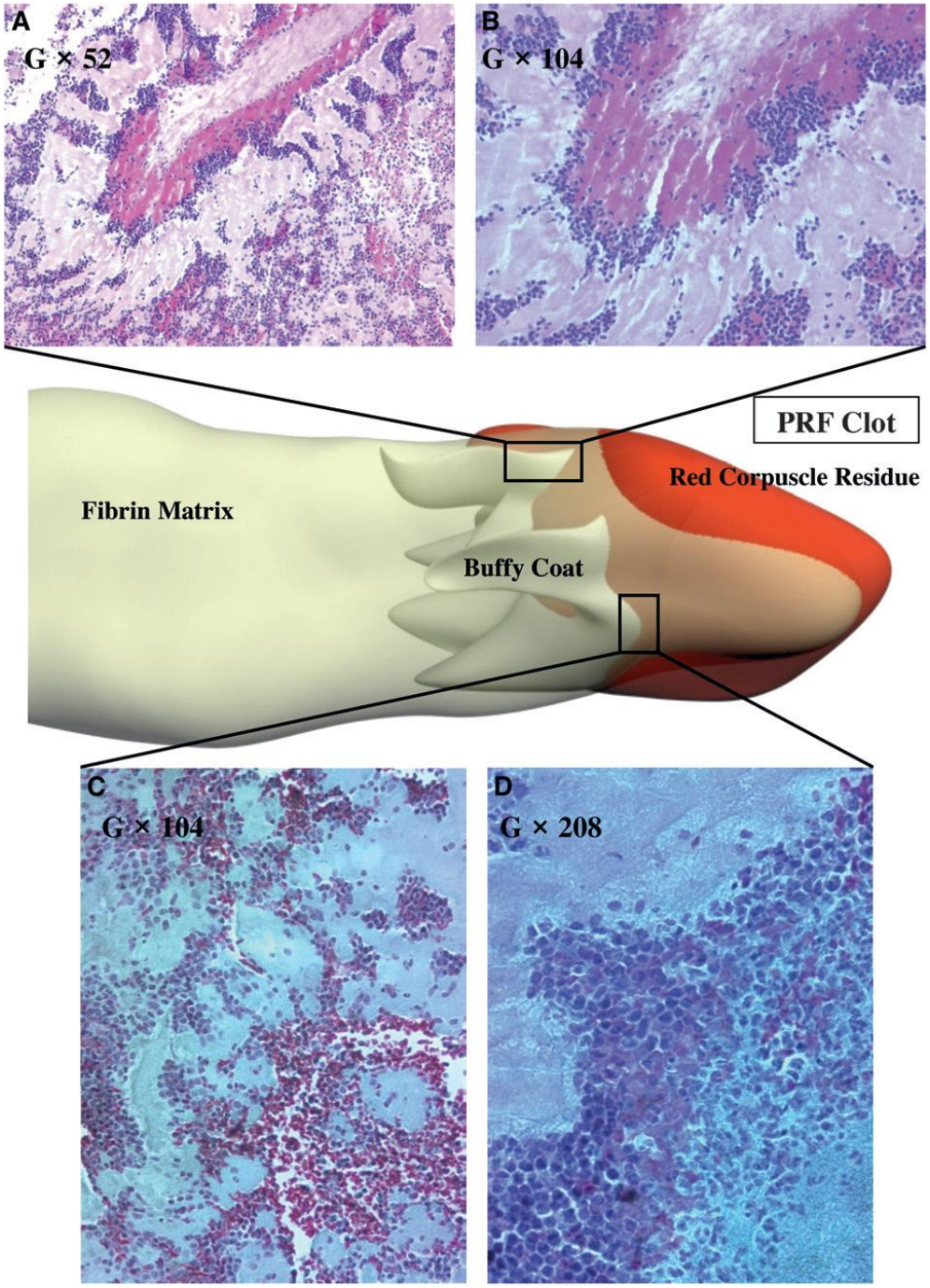
Figure 3



Saluja H, Dehane V, Mahindra U. Platelet-Rich fi brin: A second generation platelet concentrate and a new friend of oral and maxillofacial surgeons. Ann Maxillo fac Surg 2011;1:53-7.

Distribution of cells in PRF

The highest platelet/leukocyte density is found in the first millimeter of the yellow clot, just after the red clot. The platelet/ leukocyte distribution become increasingly scarce as they move away from the red clot, platelets or leukocytesbeyond the first half of the yellow clot is not seen.In the first 2 mm located beyond the yellow/red border,the platelet/leukocyte distribution is homogeneous throughout the clot width.

Uses of PRF

- For the treatment of 2 and 3 wall infrabony defects.
- Grade II and grade-III furcation involvements.

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- In the treatment of miller's class-I and class-II gingival recession.
- For the improvementof soft tissue healing [14,15,16]
- For bonegraft protection and remodeling
- Often mixed with graft materials.
- Socket preservation [17,18,19]
- It is also useful for Schneiderian membraneprotection
- As a sole osteoconductivefilling material during a sinus-lift
- In transfusion of PRP.
- In prosthodontics PRF can serve as a resorbable membrane that can be used in pre-prosthetic surgery as well as in implantology to cover bone augmentation sites [20].

Table 1: The advantages of Platelet-rich fibrin over Platelet-rich plasma and disadvantages of Platelet-rich fibrin

Advantages of PRF over PRP	Disadvantages of PRF
Ease of preparation/application	Amount available is low, because of autologous blood
No biochemical handling of blood required	Quick handling of blood is needed, immediately after collection
Simplified and cost effective process	
Use of bovine thrombin and anticoagulants not required. Thus, the use of vital fibrin as an autologous scaffold for periosteal cell or stem cell transplantation and consequently for bone tissue engineering is an obvious option	
Favorable healing due to slow polymerization	
More efficient cell migration and proliferation	
PRF has supportive effect on immune system	
PRF helps in haemostasis	
Contains large quantity of platelet and leukocyte cytokines	
Powerful healing potential on both soft & hard tissues.	

CONCLUSION

Thus, with this article we can conclude that the new and recent generation of platelet concentrate-PRF, would be a good friend to Periodontists in the near future. It has a list of its benefits, &intraoral applications. This material is already beingused widely in France, and considering its advantages, its popularity should increase here too. More clinical, histological and statistical studies are now required to understand the benefits of this new platelet concentrate better. However, it cannot be ignored that since it is obtained from an autologous blood sample, the quantity of PRF produced is low and only a limited volume can be used. This fact limits the systematic utilization of PRF, as in general surgery. Also though the potential applications of PRF are broad, however, an accurate working knowledge of the biomaterial, its biology, efficiency & limits are necessary to optimize its use in daily practice. Hence additional randomized clinical trials evaluating the use & performance of PRF are warranted.

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