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## RESEARCH ARTICLE

### PRF- A WONDER WITHIN OUR OWN BLOOD A REVIEW

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#### ABSTRACT

PRF is an excellent autogenous biomaterial used in the field of dentistry in recent times, with predictable results. PRF is a second-generation platelet concentrate, which has several advantages over traditionally prepared PRP. PRF is now considered as an autogenous biomaterial, which has abundant growth factors and cytokines, entrapped in fibrin matrix, which creates an ideal environment for perfect wound healing and tissue regeneration. This article describes the properties, procurement and its various applications in the field of dentistry.

## INTRODUCTION

Modern science has recognized components in blood, as part of natural healing process and when it is added to wounded tissues or surgical sites, they have the potential to accelerate healing. In 1970's, fibrin glue was developed which is formed by polymerization of fibrinogen with thrombin and calcium and used with limited usage. Due to risk of disease transmission, PRP an autologous modification of fibrin glue was developed and used in success in various clinical applications. PRP delivers growth factors in high concentration to the site of bone defect or ridge augmentation. Due to high complexity in preparing PRP, a novel 2<sup>nd</sup> generation of platelet concentrate called PRF was developed which is an improvement over PRP.

### PRF and its preparation

Platelet rich fibrin is called as PRF. It was developed by Dr. Josephchoukroun *et al* in 2001 (France).

#### Preparation

1. Blood is drawn in 10 ml test tubes without anticoagulant and centrifuged immediately.
2. Blood is centrifuged for 10 - 12 minutes @ 2700 - 3000 rpm.

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The resultant product after centrifuging contains: (Fig 1)

1. Acellular platelet poor plasma – topmost layer.
2. PRF clot - in the middle layer. (Fig 2)
3. RBC's – at the bottom layer.

Because of absence of anticoagulant, the blood begins to coagulate as soon as it comes into contact with the glass surface of the test tube. Therefore for successful preparation of PRF speedy collection and immediate centrifugation is an absolute necessity. It is supposed that the junction of PRF to the RBC layer is rich in growth factors and therefore this region is preserved. PRF can also be obtained as membrane by squeezing the fluids in the fibrin clots (Choukroun *et al.*, 2006).

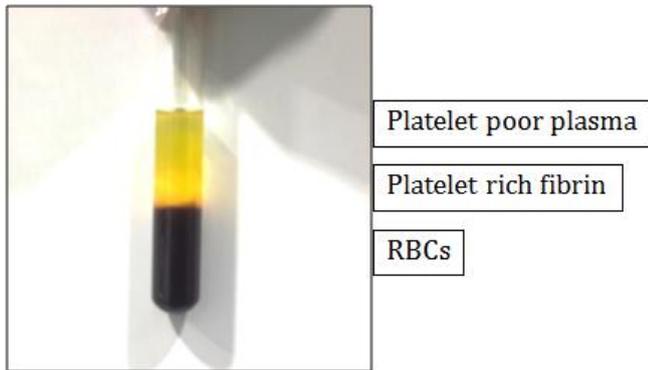
### What does it contain?

It consists of fibrin matrix polymerized in a tetramolecular structure with incorporation of platelets, leucocytes, cytokines and circulating stem cells. The intrinsic incorporation of cytokines within the fibrin mesh allows for their progressive release over time 7-10 days on the fibrin disintegrates (Kathuria *et al.*, 2011).

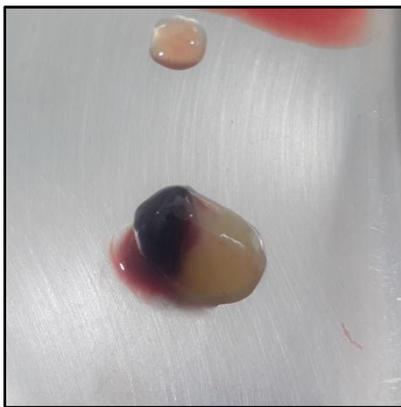
### How it functions (Corso *et al.*, 2010)

1. Maintains and protects the graftbiomaterials with PRF fragments serving as biological connectors between bone particles.

- Integration of this fibrin network into the regenerative site facilitates cellular migration, particularly endothelial cells necessary for neoangiogenesis, vascularization and survival of the graft.
- As the fibrin matrix gets resorbed PDGF, TGF and IGF-1 are released gradually, thus creating a perpetual process of healing
- Presence of leucocytes and cytokines play a significant role in the self regulation of inflammatory and infectious phenomenon within grafted material.



**Fig.1. After Centrifuging**



**Fig. 2. Platelet Rich Fibrin along with the top most layer of RBC's**

#### Uses

- It is used along with bone grafts as it offers several advantages like promoting wound healing, bone growth, maturation, graft stabilization and hemostasis (Sunitha *et al.*, 2008).
- PRF can be used as membranes (Sunitha *et al.*, 2008).
- Studies showed osteoblasts had more affinity to PRF than PRP, hence had more bone density.
- El-sharkawy H et al.*: The regenerative potential of PRF has been widely studied. It has been suggested that administration of growth factors may be combined with tissue regeneration techniques in repair of infrabony defects, furcations and cyst cavities (El-sharkawy *et al.*, 2006).

#### Advantages over PRP

- There is no process of adding anticoagulant and also there is no need to neutralize it (Gupta *et al.*, 2011).

- Bovine derived thrombin used in PRP is eliminated with use of PRF.
- Showed improved properties of PRF over PRP (Wiltfang *et al.*, 2005).

#### Major advantage

The conversion of fibrinogen into fibrin takes place slowly (with thrombin present in blood sample itself). Hence a physiologic architecture that is very favorable to healing process is obtained due to this slow polymerization process (Corso *et al.*, 2010).

#### Current applications in dentistry

##### Periodontics

- Used in combination with hydroxy apatite graft and GTR for treatment of infrabony defects (Malathi and Muthukumarasamy A. Beri, 2013).
- Used along with bone graft in endo-perio lesion (Shivashankar *et al.*, 2013).
- Used in root coverage procedures where PRF is placed between the graft and defect. Studies have shown increase in volume of the gingiva after grafting procedure (Ari *et al.*, 2010).
- Chang *et al* reported that PRF promotes the expression of phosphorylated extracellular signal regulated protein kinase (P-ERK) and stimulates proliferation of osteoprogenitors, which causes proliferation of osteoblasts (Chandran and Shivadasn, 2013 and Naik *et al.*, 2010).

##### Endodontics

- Used as scaffolding material in an infected immature tooth, which in turn causes pulpal regeneration and revitalization (Shivashankar *et al.*, 2012).
- It is used alongwith bone grafts to fill bony defects after periapical surgery
- Haug *et al* reported that PRF causes proliferation of dental pulp cells and increases the protein expression of dental pulp cells to differentiate into odontoblast like cells. (OPG and ACp are considered to be the marker of odontoblastic differentiation – seen in his study) (Meha Agarwal and Vineet Agarwal, 2013)

##### Oral Surgery

- Used as filling material in extraction sockets. It causes a stable clot for neovascularization and accelerated tissue regeneration (Ari *et al.*, 2010).
- Studies have shown that it can be used as a sole filling material during sinus lift and implant procedures (Meha Agarwal and Vineet Agarwal, 2013).
- PRF increases the cohesion between graft materials as fibrin act as physiological glue between the wounded tissues ((Meha Agarwal and Vineet Agarwal, 2013) *et al.*, 2010).
- Overall it increases the integration of the graft material since PRF is an optimized clot (Meha Agarwal and Vineet Agarwal, 2013).

5. As a membrane for Guided Bone Regeneration (GBR), the PRF dense matrix architecture covers, protects and stabilizes bone graft material and the operative site (Meha Agarwal and Vineet Agarwal, 2013)

## Conclusion

Ideal ratios of PRF preparation are still being investigated, more clinical researches are needed to assess long-term effectiveness of this combined treatment as an adjunct to endodontic therapy in the treatment of combined defects. The use of PRF as an adjunct in wound healing and periodontal regeneration has shown promising results. More clinical studies are needed to assess the clinical efficacy of and creditability of PRF on long-term basis.

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