

Role of Platelet Concentrates in Periodontics

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ABSTRACT

Platelet rich plasma and platelet rich fibrin are utilized in periodontal regeneration because of their advantages over other regenerating materials. These are autologous materials, cost effective as compared to other regenerative materials. However, more extensive use of PRF requires further investigation.

INTRODUCTION

Platelets contains growth factors that are released during degranulation of platelets. Growth factors enhance the healing in wound. Growth factors also stimulate cell migration and proliferation within the fibrin matrix. Based on healing potential of platelets, platelet rich concentrates are utilized in periodontal regeneration.

TYPES OF PLATELET CONCENTRATES

Platelet concentrates are of two types:

- First generation platelet concentrate: Platelet rich plasma (PRP), platelet derived growth factors (PDGF)
- Second generation platelet concentrate: Platelet-rich fibrin (PRF)

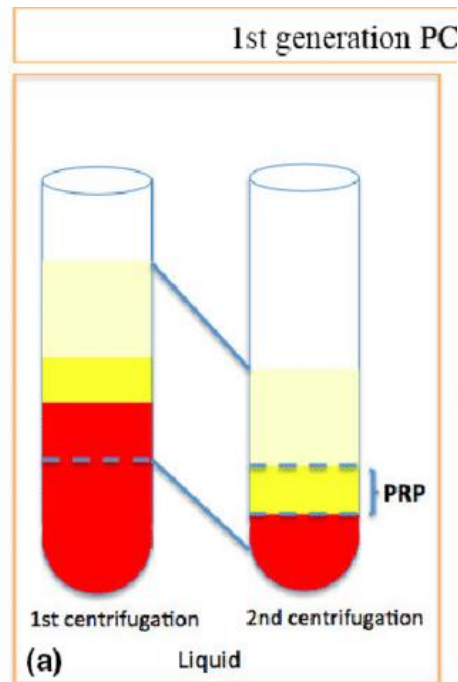
Depending on leucocyte and fibrin content four categories has been proposed¹:

- Pure platelet-rich plasma (P-PRP)
- Leucocyte- and platelet-rich plasma (L-PRP)
- Pure platelet- rich fibrin (P-PRF)
- Leucocyte and platelet-rich fibrin (L-PRF) such as Choukroun's PRF

PLATELET RICH PLASMA (PRP) — FIRST GENERATION PLATELET CONCENTRATE

Procedure for formation of PRP²:

Formation of PRP requires two centrifugation procedures. Autologous venous blood is taken with anticoagulant. The first centrifugation also known as "soft spin" separates blood in three layers. Red blood corpuscles (55% of total volume) forms at bottom of tube. Acellular plasma layer(40% of total volume) forms at the top of tube and is known as platelet-poor plasma (PPP). An intermediate layer (5% of total volume) known as "buffy coat." PPP, PRP, and some red blood corpuscles are aspirated with help of sterile syringe and transferred to another tube, without anticoagulant. This second tube will then undergo another centrifugation ("hard spin"). 3 distinct layers are obtained with intermediate layer of PRP. With a syringe, major part of acellular plasma is discarded. The unit is then gently shaken to obtain a ready-to-use PRP. At time of application, PRP is then mixed with bovine thrombin and calcium chloride. Polymerization of fibrinogen leads to fibrin matrix formation.



Uses of PRP:

In treatment of periodontal intrabony defects^{3,4,5}, furcation defects⁶ and ridge augmentation⁷.

Advantage of PRP:

- PRP increases the concentration of platelets by up to 338%⁸.
- Autologous preparations from patients own blood.
- Decreases the cost of the regeneration therapy⁹.

Disadvantages of PRP:

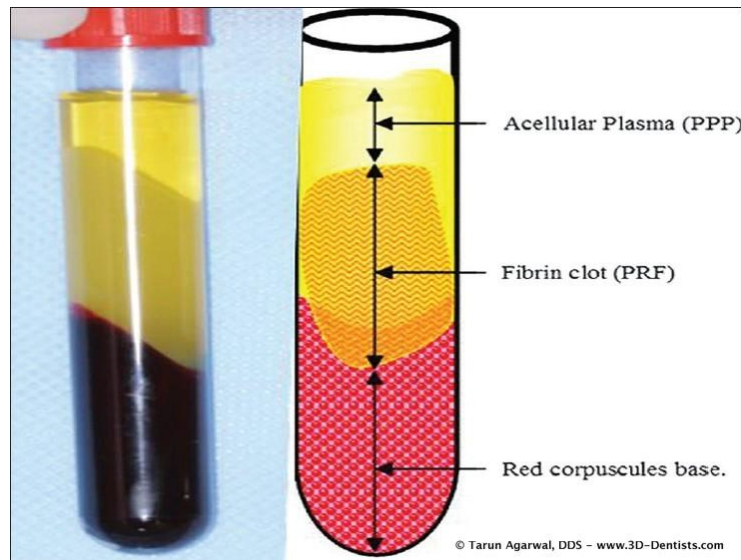
- Addition of bovine thrombin and calcium chloride influence the mechanical and biologic properties of the final fibrin matrix¹⁰.
- Rigid fibrin meshwork is not favourable for cellular migration and incorporation of cytokines^{2,10}.
- Release of cytokines in PRP is limited as compared to that of cytokines in PRF^{2,10}.

PLATELET-RICH FIBRIN—SECOND GENERATION PLATELET CONCENTRATE

Choukroun et al developed PRF in France¹¹.

Procedure for formation of PRF²:

A blood sample is taken without anticoagulant in 10-mL tubes which are immediately centrifuged at 3000 rpm (approximately 400g according to our calculations) for 10 minutes. Centrifugation leads to formation of fibrin clot in the middle of tube with acellular plasma at top and red blood cells at the bottom. Fibrin clot is extracted from the tube and fluid trapped in matrix is driven out.



Use of PRF:

In sinus-lift procedure¹², periodontal intrabony¹³ and furcation defects¹⁴, with a coronally displaced flap in multiple gingival recessions¹⁵.

Advantages of PRF over PRP:

- Formation of PRF requires neither anticoagulant nor bovine thrombin².
- Simple protocol is used for its formation².
- Fibrin obtained is physiologic^{2,10}.
- Flexible, elastic, and very strong PRF membrane allows cellular migration and incorporation of cytokines^{2,10}.
- Long term effect of PRF as compared to PRP^{2,10}.
- Release of relatively constant concentration of growth factors over a period of 7 days.
- Chair side preparation of PRF is quite easier and faster than PRP².
- Autologous preparations from patients own blood.
- Decreases the cost of the regeneration therapy⁹.

Disadvantages:

- Procedure is to be performed rapidly so that usable clot can be extracted from procedure².
- In case of delay in centrifugation, small blood clot is obtained².

Recent advances to improve efficacy of PRF:

- PRF membrane is considered novel therapeutic adjuvant in the management of periodontal soft and hard tissues¹⁶. However, possible health hazard may be present depending on the unavoidable contact with silica¹⁷. Tunali et al¹⁸ have developed a new, titanium-prepared PRF (T-PRF). Titanium tubes are more effective at activating platelets than the glass tubes¹⁸.
- Low speed centrifugation with increased time duration favors increase in growth factors release from PRF¹⁹.

CONCLUSION

Platelet rich concentrates have been utilised in regeneration of periodontium. Because of advantages of PRF over PRP, PRF has been used and various modifications have been made to improve properties. However, further studies are needed for substituting their use over other regenerative materials.

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