PRF –FOUNTAIN OF YOUTH IN OUR BODY

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ABSTRACT

One of the promising innovations in the field of surgical dentistry is the use of platelet-rich fibrin (PRF), alone or as an additive with other biomaterials. It accelerates the healing mechanism of the tissue and reduces the inflammation.Platelet-rich fibrin (PRF) was first described by Choukroun et al. (2001). It has been referred to as a second-generation platelet concentrate, which has been shown to have several advantages over traditionally prepared platelet-rich plasma. PRF has a physiologic architecture that is very favourable to the healing process, obtained due to the slow polymerization process. This article describes the evolution of this novel platelet concentrate and various clinical application in dentistry

Keywords: Growth factors, platelets, platelet-rich plasma, wound healing, tissue engineering.

INTRODUCTION

In Greek mythology, Prometheus stole fire from Zeus and gave it to mankind. As punishment, Zeus had him chained to a rock where a great vulture tore at his liver every day. During the night, the liver grew whole again, only to have the vulture devour it again the next day.

Today, the regrowth of Prometheus' liver has become a symbol to medical researchers for the possible renewal of damaged human organs through the use of human stem cells. Developments in the field of tissue engineering have made the generation of artificial substitutes in several areas of medicine.

The term tissue engineering was originally coined to denote the construction in the laboratory of a device containing viable cells and biologic mediators (e.g., growth factors and adhesins) in a synthetic or biologic matrix, which could be implanted in patients to facilitate regeneration of particular tissues. In general, tissue engineering combines three key elements, namely scaffolds (collagen,bone mineral), signalling molecules (growth factors), and cells(osteoblasts and fibroblasts).Tissue engineering has been redefined presently as the relatively new highly promising ûeld of reconstructive biology.These principles of tissue engineering have found widespread application in severalbranches of dentistry such as periodontics, oral and maxillofacial surgery and oral implantology.[1]

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CONCENTRATED PLATELET-RICH PLASMA:BIOLOGICALADHESIVE OR CELLULAR THERAPY?

Because of the risk of transmission of hepatitis, many marketed ûbrin adhesives have been prohibited in the USA since 1978. Consequently, attempts at the development of autologous ûbrin adhesives increased, but with mitigated success. The use of platelet concentrates, based on the concept of cell therapy by growth factors, reopens technologic researchon the autologous ûbrin ad-

hesives. But do these surgical additives remain simple fibrin glue?

Platelets isolated from peripheral blood are an autologous source of growth factors. Platelet-rich plasma (PRP) is an easily accessible source of growth factors to support bone- and soft-tissue healing. It is derived by methods that concentrate autologous platelets and is added to surgical wounds or grafts and to other injuries in need of supported or accelerated healing.[2]

A blood clot is the center focus of initiating any soft-tissue healing and bone regeneration. In all natural wounds, a blood clot forms and starts the healing process. PRP is a simple strategy to concentrate platelets or enrich natural blood clot, which forms in normal surgical wounds, to initiate a more rapid and complete healing process. A natural blood clot contains 95% red blood cells, 5% platelets, less than 1% white blood cells, and numerous amounts of fibrin strands. A PRP blood clot contains 4% red blood cells, 95% platelets, and 1% white blood cells.

The use of PRP in place of recombinant growth factors has several advantages, in that growth factors obtained from platelets not only have their own specific action on tissues but also interact with other growth factors, resulting in the activation of gene expression and protein production.[3] Therefore, the properties of PRP are based on the production and release of multiple growth and differentiation factors upon platelet activation.

PLATELET-3RICH PLASMA: PREPARATION

The preparation and processing of PRP is quite similar in most of the platelet-concentrating systems although the anticoagulant used and the speed and duration of centrifugation may differ with different systems.

Venous blood is drawn into a tube containing an anticoagulant to avoid platelet activation and degranulation.

1. The first centrifugation is called "soft spin", which allows blood separation into three layers, namely bottom-most RBC layer (55% of total volume), topmost acellular plasma layer called PPP (40% of total volume), and an intermediate PRP layer (5% of total volume) called the "buffy coat".

2. Using a sterile syringe, the operator transfers PPP, PRP and some RBCs into another tube without an anticoagulant.

3. This tube will now undergo a second centrifugation, which is longer and faster than the first, called "hard spin". This allows the platelets (PRP) to settle at the bottom of the tube with a very few RBCs, which explains the red tinge of the final PRP preparation. The acellular plasma, PPP (80% of the volume), is found at the top.

4. Most of the PPP is removed with a syringe and discarded, and the remaining PRP is shaken well.

5. This PRP is then mixed with bovine thrombin and calcium chloride at the time of application. This results in gelling of the platelet concentrate. Calcium chloride nullifies the effect of the citrate anticoagulant used, and thrombin helps in activating the fibrinogen, which is converted to fibrin and cross-linked.

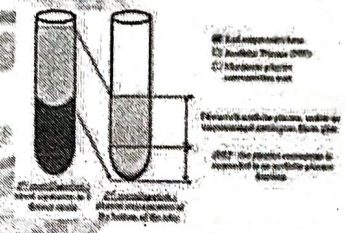

Fig. 1. Technologic concept of cPRP processing.

Potential Risks of Using PRP

The preparation of PRP involves the isolation of PRP after which gel formation is accelerated using calcium chloride and bovine thrombin. It has been discovered that the use of bovine thrombin may be associated with the development of antibodies to the factors V, XI and thrombin, resulting in the risk of life-threatening coagulopathies.[4] Bovine thrombin preparations have been shown to contain factor V, which could result in the stimulation of the immune system when challenged with a foreign protein.

PLATELET-RICH FIBRIN—A NATURAL FIBRIN MATRIX Technique

PRF was first developed in France by Choukroun et al for specific use in oral and maxillofacial surgery.[5] This technique requires neither anticoagulant nor bovine thrombin (nor any other gelling agent). It is nothing more

Gingival recession- Coronally advanced flap procedure, with subepithelial connective tissue, is the most predictive plastic procedure.[19] Recently, PRF has been used along with conventional order to improve the efficiency of the root coverage treatments and reduce the morbidity of the techniques.[20] According to Aroca *et al.*[21] use of PRF membrane showed an increase in the width of keratinized gingiva at the test sites at 6 months compared to the modified coronally advanced flap alone.

Perio-endo lesions- Perio-endo lesions develop by either periodontal lesion spreading apically with an already existing periapical lesion or an endodontic lesion combining with an existing periodontal lesion. The prognosis of a true combined perio-endo lesion is often poor or even hopeless. especially if it is chronic in nature. The prognosis of such affected tooth can be improved by increasing the bony support through bone grafting and guided tissue regeneration and the application of polypeptide growth factors to the surgical wound.[22]

CONCLUSION

Various experimental as well as clinical results favor the use of PRF alone or along with other biomaterials, without any conflicting findings. It shows promising outcome both in medical as well as dental fields with several advantages and many indications. However, some of the aspects of its uses, especially in dentistry, should be explored more with more clinical uses, especially after ablative surgery for the treatment of large oral cancers. In the current scenario, PRF seems to be a minimally invasive technique that comes with low risk factors and clinically satisfactory results.

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