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Short Communication

Platelet rich fibrin in dentistry

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ABSTRACT

A biomaterial called platelet rich fibrin (PRF) is formed from human blood and is a component of a platelet concentrate that is obtained by centrifuging it. It is frequently used in dentistry and medical for tissue regeneration as well as rehabilitation and healing following operations. The purpose of the current literature study was to assess how well PRF is used in dentistry, particularly while placing dental implants.

Keywords: Platelet rich fibrin; Augmentation; dental implant

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Introduction

In the 1970s, it was discovered that platelets carry growth factors that, among other things, induce cell differentiation, boost collagen synthesis, promote cell division, promote the formation of blood vessels, and attract other cells to the site of injury.[1,2]Platelet-rich plasma (PRP) and platelet-rich fibrin are the two types of platelet concentrates being used in oral surgery for in vivo tissue engineering applications (PRF). The growth factors present in platelets are concentrated in platelet concentrates, which are used locally as bioactive surgical additives to promote wound healing.[3]

Platelet-rich fibrin (PRF) membrane is an autogenous leukocyte and platelet-rich fibrin biomaterial that may be utilised as a membrane for root covering and is created from the patient's own blood. It was initially created in France by Choukroun et al. in 2001 to expedite soft and hard tissue healing following oral and maxillofacial surgery. It is a member of a new generation of platelet concentrates that may be made utilising streamlined processing techniques. The huge degranulation of active platelets during PRF centrifugation indicates a very substantial cytokine release, which has already been measured in numerous technological settings.[4]

In PRF, cytokines, platelets, and stem cells are contained in an autologous leukocyte-platelet-rich fibrin matrix that has a tetramolecular structure and functions as a biodegradable scaffold that encourages the growth of micro vascularization and can direct epithelial cell migration to its surface.[5] According to various researchers,[6,7] PRF is a biomaterial that promotes healing and has a high potential for regenerating bone and soft tissue without triggering inflammatory responses. It may be used alone or in conjunction with bone grafts to help with haemostasis, bone development, and maturation. In vitro investigations using this autologous matrix showed that it had a strong ability to promote cell attachment and to stimulate osteoblast proliferation and differentiation.[8]

This autologous biomaterial has several uses in plastic, ear, nose, and throat, oral, and maxillofacial surgery. For lateral sinus floor elevations, ridge augmentations, maxillary reconstructions, regeneration after cyst ablation, guided bone regeneration, and socket preservation during periodontal surgery, PRF membranes may be used in conjunction with graft materials to speed recovery. For the treatment of gingival recession in periodontal soft tissue regeneration, PRF membranes have been employed in combination with various root covering methods. After treating an isolated recession defect using a PRF membrane and a lateralized flap method, few studies reported full root coverage and good gingival tissue condition. However, according to Aroca et al., placing a PRF membrane under a modified coronally advanced flap (MCAF) resulted in greater gains in gingival/mucosal thickness at 6 months compared to MCAF alone, while providing poorer root coverage.[9]

Preparation of PRF

Blood is swiftly collected into test tubes without an anticoagulant in order to acquire the necessary amount of PRF, which is then centrifuged right away. A tabletop centrifuge can whirl blood for 3 to 8 minutes at 1300 revolutions per minute. The final product is composed of the following three layers: platelet-poor plasma in the top layer, a PRF clot in the centre, and red blood cells (RBC) in the bottom layer. The PRF is offered as a fibrin clot. Using a sterile tool resembling tweezers, the PRF clot may be extracted from the test tube. After lifting, a sterile pair of scissors can be used to carefully separate the RBC layer from the PRF clot.[10]

The mechanism through which platelet alpha granules, platelet-derived growth factor (PGDF), transforming growth factors (TGF), vascular endothelial growth factor (VEGF), and epidermal growth factor are released by PRF leads to platelet activation in response to tissue injury.[5] In reality, platelets and leukocyte cytokines play significant roles in the function of this biomaterial, but the fibrin matrix that supports them is most useful in defining the factors that constitute the true therapeutic potential of PRF. In a wound that is healing, cytokines are utilised right away and then eliminated. More so than any other platelet component, the balance between cytokines and the fibrin matrix that supports them is extremely important. [11]

Classification: PRP is categorized into four general groups:

1. ***Pure platelet rich plasma (P-PRP)*:** P-PRP products are formulations with a low-density fibrin network and no leukocytes. By using thrombin or calcium chloride, all the items in this class can be employed as liquid solutions or as activated gels. P-PRP can be injected to treat muscle and tendon injuries, or it can be applied to a skin incision or suture while it gels.
2. ***Leukocyte and platelet rich plasma (L-PRP)*:** L-PRP products are preparations with a high concentration of leukocytes and with a low-density fibrin network after activation. Similar to P-PRP, it may be injected at the site of damage, applied on a skin wound or suture while it gels, and utilised as a liquid solution or active gel. Leukocytes (neutrophils, monocytes, macrophages, and lymphocytes) may have either positive or negative effects on the wounded tissue, depending on their presence. Leukocytes encourage chemotaxis, cell proliferation, and differentiation while boosting the immune system's response to infections. Leukocytes also emit reactive oxygen species and inflammatory cytokines including interleukin-1 beta and tumour necrosis factor-alpha, which may have a negative impact on the tissues that have been treated.
3. ***Pure platelet rich fibrin (P-PRF)*:** P-PRFs are preparations with a high-density fibrin network and no leukocytes. Because of its unique properties, P-PRF products are only available in the form of a strongly active gel and cannot be injected. These products may be treated as solid materials for additional orthopaedic surgical applications because to their robust fibrin matrix, though. Additionally, they have been found to facilitate the repair of articular cartilage defects at the femoral condyles and can be utilised for hemostasis. Others have tried doing posterior spinal fusions using P-PRF combined with autologous bone marrow cells. He and colleagues used rat models to show that P-PRF had a larger and longer-lasting influence on the proliferation and differentiation of rat osteoblasts than PRP in vitro did on the release of autologous growth factors. The major disadvantage of this technique is it cost and complexity.[12]
4. ***Leukocyte and platelet rich fibrin (L-PRF*):** Preparations with leukocytes and a high-density fibrin network are called L-PRF products. These products, like the P-PRF, are only available in the form of a powerfully active gel and cannot be injected or utilised as conventional fibrin glues. However, they may be treated as solid material for various purposes because to a robust fibrin matrix. It has mostly been utilised in periodontics and dentistry to promote bone regrowth and wound healing.[13]

Conclusion

There are several potential clinical uses for the use of growth factors and PRP in the field of dentistry. PRP and other autologous blood products mostly work by releasing growth factors from activated platelet alpha granules. These growth factors have a crucial role in cellular functions such mitogenesis, chemotaxis, differentiation, and metabolism, all of which are crucial for the recovery and regeneration of musculoskeletal tissues following injury. For PRP and biologics to pinpoint areas of effectiveness, certain indications, and

formulations for which a therapeutic benefit exists in orthodontic surgery, further high-quality data is necessary.

Authors' contribution

Harini Sri K: Manuscript editing, Literature search, data collection

Harshini Nivetha E: Data Analysis, manuscript drafting

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Conflict of interest

The authors have nothing to disclose or any conflicts of interest.

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References

[1]. Ross R, Glomset J, Kariya B, Harker L. A platelet-dependent serum factor that stimulates the proliferation of arterial smooth muscle cells in vitro. Proceedings of the National Academy of Sciences. 1974 Apr;71(4):1207-10.

[2]. Kiran NK, Mukunda KS, Tilak Raj TN. Platelet concentrates: A promising innovation in dentistry. J Dent Sci Res. 2011 Feb;2(1):50-61..

[3]. Borie E, Oliví DG, Orsi IA, Garlet K, Weber B, Beltrán V, Fuentes R. Platelet-rich fibrin application in dentistry: a literature review. International journal of clinical and experimental medicine. 2015;8(5):7922.

[4]. Choukroun J, Diss A, Simonpieri A, Giard MO, Schoeffler C et al. Platelet rich fibrin (PRF): a second-generation platelet concentrate. Part IV: clinical effects on tissue healing. Oral Surg.Oral Med. Oral Pathol Oral Radiol.Endod. 2006;101(3):56-60.

[5]. Dohan DM, Choukroun J, Diss A, Dohan SL, Dohan AJ, Mouhyi J, Gogly B. Platelet-rich fibrin (PRF): a second-generation platelet concentrate. Part II: platelet-related biologic features. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2006 Mar 1;101(3):e45-50.

[6]. Saluja H, Dehane V, Mahindra U. Platelet-Rich fibrin: A second generation platelet concentrate and a new friend of oral and maxillofacial surgeons. Annals of maxillofacial surgery. 2011 Jan;1(1):53.

[7]. Kim TH, Kim SH, Sándor GK, Kim YD. Comparison of platelet-rich plasma (PRP), platelet-rich fibrin (PRF), and concentrated growth factor (CGF) in rabbit-skull defect healing. Archives of oral biology. 2014 May 1;59(5):550-8.

[8]. Ehrenfest DM, Diss A, Odin G, Doglioli P, Hippolyte MP, Charrier JB. In vitro effects of Choukroun's PRF (platelet-rich fibrin) on human gingival fibroblasts, dermal prekeratinocytes, preadipocytes, and maxillofacial osteoblasts in primary cultures. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2009 Sep 1;108(3):341-52..

[9]. Aroca S, Keglevich T, Barbieri B, Gera I, Etienne D. Clinical evaluation of a modified coronally advanced flap alone or in combination with a platelet rich fibrin membrane for the treatment of adjacent multiple gingival recessions: a 6 month study. J Periodontol. 2009;80(2):244-52.

[10]. Mufti, Sonam. Comparative evaluation of platelet rich fibrin with connective tissue grafts in the treatment of millers class I gingival recessions. Contemporary clinical dentistry. 2017;8(4):531-537.

[11]. Dohan DM. Platelet rich fibrin (PRF): a second-generation platelet concentrate. Part I: Technological concepts and evolution.Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod. 2006;101(3):37-44.

[12]. He L, Lin Y, Hu X, Zhang Y, Wu H. A comparative study of platelet-rich fibrin (PRF) and platelet-rich plasma (PRP) on the effect of proliferation and differentiation of rat osteoblasts in vitro. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2009 Nov 1;108(5):707-13..

[13]. Ehrenfest DM, Andia I, Zumstein MA, Zhang CQ, Pinto NR, Bielecki T. Classification of platelet concentrates (Platelet-Rich Plasma-PRP, Platelet-Rich Fibrin-PRF) for topical and infiltrative use in orthopedic and sports medicine: current consensus, clinical implications and perspectives. Muscles, ligaments and tendons journal. 2014 Jan;4(1):3.

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