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PERIODONTAL REGENERATION USING PLATELET RICH FIBRIN (PRF): A CASE REPORT

Maj Raghavendra M H	Graded Specialist (Periodontics), 3 Corps Dental Unit, C/o 99 APO - 903503
Maj Devendra Srivastava	Graded Specialist (Periodontics), 21 Corps Dental Unit, C/o 56 APO - 903521
Col A K Shreehari	Associate professor (Periodontics), AFMC Pune.
Brig subrata Roy	Commandant, ADC (R&R) Delhi.

ABSTRACT Platelets can play a crucial role in periodontal regeneration as they are reservoirs of growth factors and cytokines tors for regeneration of the bone and maturation of the soft tissue. Platelet-rich plasma (PRP) and platelet-rich fibrin (PRF) are autologous platelet concentrates prepared from patient's own blood. Recent researches are being focused on the development of therapeutic alternatives which are easy to prepare, non-toxic or biocompatible to living tissues and economically cheap that might result in the local release of growth factors accelerating hard and soft tissue healing. PRF is a fibrin-based biomaterial prepared from an anticoagulant- free blood harvested without any artificial biochemical modification that allows obtaining fibrin membranes enriched with platelets and growth factors. Evidence from the literature suggests the potential role of PRF in periodontal regeneration and tissue engineering. The slow polymerization during centrifugation and fibrin-based structure makes PRF a better healing biomaterial than PRP and other fibrin adhesives. In this case we presenting different application of PRF in periodontal regeneration.

KEYWORDS : Platelet Rich Fibrin (PRF), Regeneration, Gingival bleeding.

INTRODUCTION:

Periodontal disease is defined as a complex, multifactorial disease characterized by the loss of connective tissue attachment with the destruction of periodontal tissues. The aim of periodontal therapy is to eliminate inflammatory process, prevent the progression of periodontal disease and also to regenerate the lost periodontal tissues. Periodontal regeneration is a complex multifactorial process involving biologic events like cell adhesion, migration, proliferation, and differentiation in an orchestrated sequence.[1] Periodontal regenerative procedures include soft tissue grafts, bone grafts, root biomodifications, guided tissue regeneration, and combinations of these procedures.[2] Numerous therapeutic modalities for restoring periodontal osseous defects have been investigated. For the last few decades, demineralized freeze-dried bone allograft (DFDBA) has been used alone and in combination with PRF in the treatment modalities for periodontal regeneration. The presence of bone morphogenetic proteins contained within DFDBA aids in mesenchymal cell migration, attachment, and osteogenesis. DFDBA has both osteoinductive and osteoc onductive activities.

Evidence shown that presence of growth factors and cytokines in platelets play key roles in inflammation and wound healing. [3] Platelet having growth factors and also secrete fibrin, fibronectin, and vitronectin, which act as a matrix for the connective tissue and as adhesion molecules for more efficient cell migration.[4] This has led to the idea of using platelets as therapeutic tools to improve tissue repair particularly in periodontal wound healing. Platelet-rich fibrin (PRF) described by choukroun et al is a second-generation platelet concentrate which contains platelets and growth factors in the form of fibrin membranes prepared from the patient's own blood free of any anticoagulant or other artificial biochemical modifications. The PRF clot forms a strong natural fibrin matrix, which concentrates almost all the platelets and growth factors of the blood harvest and shows a complex architecture as a healing matrix with unique mechanical properties which makes it distinct from other platelet concentrates.[5] When periodontal disease affects intrabony defect of a tooth, the prognosis considerably alters. The treatment of intrabony defect affected by periodontal disease is one of most difficult problem for general dentist and periodontist. Treatment will depend on the extent of the disease, the strategic importance of the affected tooth and degree of patient cooperation. The motivation of both the attending professional and of the patient are therefore of great importance. No ideal procedure for treating such lesion exists. The case presented below review the treatment modalities that are currently available.

CASE

A male patient of age 28 years reported to Dept of Dental Surgery with a chief complaint of food impaction in Right lower back tooth region and bleeding from the gums since 6 months. History revealed that the patient noticed food impaction from last 6 months and was associated with dull aching pain. The Patient was relatively asymptomatic 6 months back. He started using a toothpick to remove impacted food particles in between the teeth along with, associated with bleeding from gums on brushing. Patient medical history was not significant and noncontributory. Patient family history revealed noncontributory. General physical examination revealed no signs of systemic illness. Extraoral examination revealed no abnormality. On intra oral examination the patient had a fair oral hygiene. A total of 31 teeth and gingival examination revealed that the colour was pinkish red with rolled margin, loss of stippling and bleeding on probing. Consistency was soft and odematous. Intrabobony defect invovlment was detected in the lower right first molar (Fig 1). IOPA showed vertical bone loss in lower right first molar (Fig 2). Routine Haematological and urine parameters were within normal limits. Based on the history, clinical examination and radiological examination the patient diagnosed as a case of Generalized moderate chronic periodontitis with Localized severe chronic periodontitis wrt 46. A comprehensive treatment plan was formulated and patient was taken for phase I therapy and later for surgical therapy. It was decided to perform regenerative therapy in the area of intrabony defect wrt 46 using PRF with bone graft (DFDBA) & PRF used as a barrier membrane. Before surgery 10 ml of blood from patient the patient was taken and PRF gel extracted using centrifugation (Fig 3). The intrabony defect in the region of 46 was taken up for periodontal surgery. The patient was prepared for surgery and 2% lidocaine with adrenaline (1:80,000) was administered for Inferior alveolar nerve and lingual nerve blocks. Sulcular incision was placed extending from 45 to 47. The flap was then reflected. Granulation tissue was removed and intrabony defect exposed (Fig 4). The dimension of the defect were examined

and the length and depth of defect was found to be 11 mm. The PRF gel mixed with bone graft (DFDBA) graft material along with PRF membrane made used as a GTR membrane (Fig 5 & 6). Closure of the flap was done using 3-0 silk suture and periodontal pack was placed. Antibiotics and analgesics were prescribed. Patient was put on chemical plaque control using chlorhexidine mouth wash. Immediate post op radiograph revealed adequate bone substitute fill in the defect. The patient was recalled and after 1 week suture was removed. Gingival position after surgery was satisfactory. The Patient was revaluated after 1 & 3 months and periodontal parameters were compare to baseline. A significant gain in the attachment level and a reduction in the intrabony defect probing depth (Fig 7) was noted.

DISCUSSION

Periodontal disease is among the most prevalent diseases worldwide and is characterized by the presence of gingival inflammation, periodontal pocket formation, loss of periodontal attachment and loss of alveolar bone around the affected teeth.[6] The goal of periodontal therapy includes not only the arrest of periodontal disease progression, but also the regeneration of structures lost due to disease. Bone grafting is one of the most common forms of regenerative therapy and is usually essential for restoring periodontal supporting tissue. A wide range of bone grafting materials, including bone grafts and bone graft substitutes, have been applied and evaluated clinically, including autografts, allografts, xenografts, and alloplasts (synthetic/ semisynthetic materials).[7] DFDBA is widely used in periodontal therapy and has been demonstrated to be safe and capable of inducing new bone formation. In our case we used DFDBA. It is shown to be both osteoconductive and osteoinductive. Urist et al. showed through numerous animal experiments that DFDBA could stimulate the formation of new bone by osteoinduction. That is, the graft material induces host undifferentiated mesenchymal cells to differentiate into osteoblasts with subsequent formation of new bone. Moreover, DFDBA also provides a scaffold for osteoconduction. DFDBAs have repeatedly demonstrated significant improvements in soft and hard tissue clinical parameters for the treatment of intraosseous periodontal defects.[8]

Recently, the use of growth factors in periodontal regeneration has shown promising results. Growth factors are a class of natural biologic mediators that regulates key cellular events in tissue regeneration including cell proliferation, chemotaxis, differentiation, and matrix synthesis via binding to specific cell surface receptors. Platelet alpha (α) granules form an intracellular storage pool of growth factors including platelet-derived growth factor, transforming growth factor β (including β-1 and β-2-isomers), vascular endothelial growth factor, and epidermal growth factor and insulin-like growth factor-1.

PRF is a matrix of autologous fibrin, in which are embedded a large quantity of platelet and leukocyte cytokines during centrifugation. The intrinsic incorporation of cytokines within the fibrin mesh allows for their progressive release over time (7-11 days), as the network of fibrin disintegrates. The easily applied PRF membrane acts much like a fibrin bandage, serving as a matrix to accelerate the healing of wound edges. [9] It also provides a significant postoperative protection of the surgical site and seems to accelerate the integration and remodeling of the grafted biomaterial.

According to Simonpieri et al, the use of this platelet and immune concentrate during bone grafting offers the following 4 advantages: First, the fibrin clot plays an important mechanical role, with the PRF membrane maintaining and protecting the grafted biomaterials and PRF fragments serving as biological connectors between bone particles. Second, the integration of this fibrin network into the regenerative site facilitates cellular migration, particularly for endothelial cells necessary for the neo-angiogenesis, vascularization and survival of the graft. Third, the platelet cytokines (PDGF, TGF- β, IGF-1) are gradually released as the fibrin matrix is resorbed, thus creating a perpetual process of healing. Lastly, the presence of leukocytes and cytokines in the fibrin network can play a significant role in the self-regulation of inflammatory and infectious phenomena within the grafted material.[10]

CONCLUSION

The principle objective of all surgical procedure therapies is to preserve the dentition in a state of health and comfort throughout life. A combination of PRF with DFDBA demonstrated better results in probing pocket depth reduction and clinical attachment level gain alone in the treatment of periodontal intrabony defects. This result may be attributed to beneficial effects of PRF. PRF by Choukroun's technique is a simple and inexpensive technique for the successful regeneration of periodontal tissues. The main advantage is that PRF preparation utilizes the patient's own blood reducing or eliminating disease transmission through blood. In the future potential applications of PRF in the field of periodontal regeneration and tissue engineering and to extend its clinical applications.

CASE REPORT

Fig. 1 Intrabobony defect wrt lower right first molar (46).

Fig. 2 IOPA showed vertical bone loss wrt 46.

Fig. 3 PRF gel extracted after centrifugation.

Fig. 4 Flap reflected and intrabony defect exposed.

Fig. 5 PRF gel mixed with DFDBA graft material.

Fig. 6 PRF membrane used as a GTR membrane.

Fig. 7 Post op radiograph of 46 revealed bone fill.

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