CASE REPORT

Potential of Platelet Rich Fibrin in Regenerative Periodontal Therapy: Case Series

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ABSTRACT

Platelets can play a pivotal role in regeneration of peridontium as they harbor growth factors and cytokines which are the key factors involved in regeneration of bone and maturation of the soft tissue. Platelet-rich fibrin (PRF) is an autologous platelet concentrate which is prepared from patient's own blood. It is a fibrin-based biomaterial prepared from an anticoagulant-free blood harvest without any artificial biochemical modification that allows obtaining fibrin membranes enriched with platelets and growth factors. The purpose of this article is to describe two cases illustrating the use and potential role of the novel platelet concentrate PRF in periodontal regeneration.

KEYWORDS: Platelet Rich Fibrin, Periodontal Regeneration

INTRODUCTION

The goal of periodontal treatment is the maintenance of the natural dentition in a healthy state with proper functioning. Periodontitis can be described as an inflammatory disease characterized by destruction of supporting periodontal tissues as a response to insults induced by bacterial accumulations on surfaces of tooth.[1] These responses can lead to formation of different intraosseous defects of various morphotypes like one – wall, two-wall defect. The purpose of periodontal therapy is to completely eliminate the etiology & to stall the disease progression. The primary objective is to gain access to the diseased site. Regenerative periodontal therapy aims to predictably restore the tooth supporting periodontal tissues that have been lost due to periodontal disease.[2] Several modalities of periodontal regeneration such as bone grafts, guided tissue regeneration (GTR), or combination of both have been used.[3]

Growth factors have gained much attention to regulate various cell-stromal interactions involved in the regeneration of peridontium.[4] These are biologic mediators which regulate the proliferation, chemotaxis and differentiation of locally derived progenitor cells at the site of defect.[4]

Platelets possess regenerative potential as their alpha granules are rich sources of various vital growth factors.[5] Choukroun's platelet-rich fibrin (PRF), a second-generation platelet concentrate, can be defined as an autologous leukocyte and PRF biomaterial. PRF consists of an intimate assembly of cytokines, glycanic chains, and structural glycoproteins enmeshed within a slowly polymerized fibrin network.[6] The biologic activity of the fibrin molecule is enough, in itself, to account for the significant cicatricial capacity of the PRF, and the slow polymerization mode confers to the PRF membrane a particularly favorable physiologic architecture to support the healing process.[7] The leukocytes and key immune cytokines like IL 1β, IL 6, IL 4 and TNF α trapped in PRF give it the anti-infectious effect and lets PRF act as an immune regulation node.[8]

Bioglas (Perioglas) is a sterile bio-resorbable bone graft which has demonstrated positive results in management of intrabony defects. In the present case series, a combination approach was used for regeneration of perodontim with the use of platelet-rich fibrin PRF & Perioglas.

PREPARATION OF PRF

Preparation of PRF:PRF was first introduced in France by Choukroun et al in 2001. PRF was prepared in both the cases in accordance to the protocol given by Dohan & Choukroun.[6] Just prior to surgery, 10ml of intravenous blood (from the antecubital vein) was collected in a sterile tube without anticoagulant and centrifuged immediately at 2500 rpm for 10 min.

After centrifugation, three layers were formed which comprised of a red blood cell (RBC) base at the bottom, acellular plasma (platelet-poor plasma) as a supernatant and a PRF clot in the middle. (Fig 1). Sterile non toothed tweezers were used to extract the PRF clot from the tube, separated from the RBC base using sharp scissors, and were placed then in a sterile gauge piece and dappen dish.

How to cite this article:
Chhina S, Mishra S, Arora SA, Goel A, Kazimm J, Garg S. Potential of Platelet Rich Fibrin in Regenerative Periodontal Therapy: Case Series. Int J Oral Health Med Res 2016;2(5):132-135.

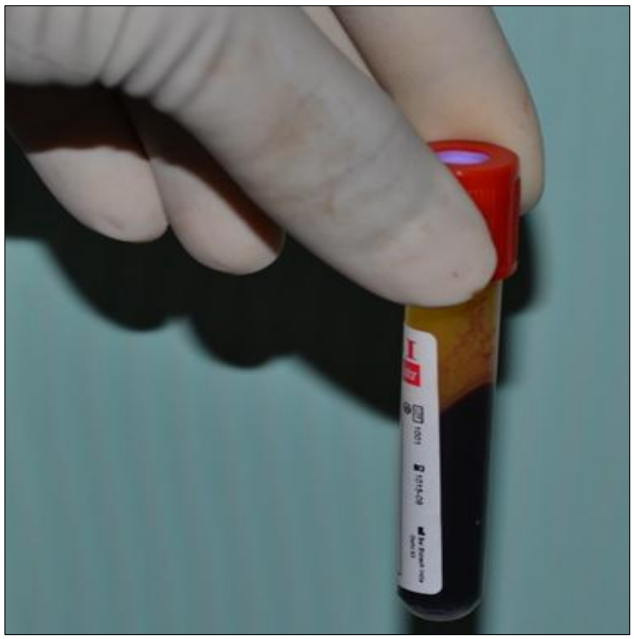

Figure 1 : Test tube showing centrifuged serum

This paper presents two cases that were diagnosed with intrabony defects & were treated by means of combination of autologous PRF with bovine derived demineralised bone matrix.

CASE REPORT

Case 1

A 29 year old male patient reported to the Department of Periodontics with the chief complaint of diry teeth and bleeding from gums since past 4 months. On further history taking and intraoral examination, generalized pockets were appreciated & radiographic evaluation revealed vertical bone defect in relation to tooth # 35,36.(Fig 2)

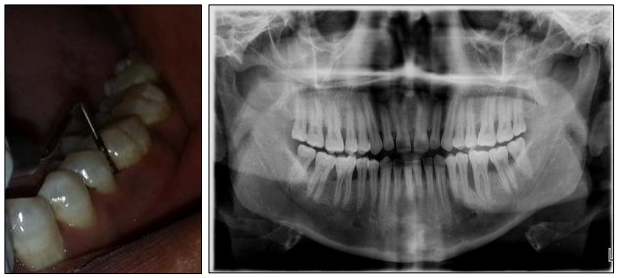

Figure 2 (a and b): Preoperative clinical picture and OPG

Open flap debridement & regenerative therapy was planned after re-evaluation of Phase I therapy. After giving local anaesthesia, labial & lingual sulcular incisions were made, and mucoperiosteal flaps were reflected. The patient's venous blood was collected, and PRF preparation was started. In the meantime, scrupulous defect debridement and root planing were done using Gracey's area specific curettes. PRF membrane was then mixed with bone graft (Perioglas) and was placed in the defect (Fig 3). The mucoperiosteal flap was repositioned & sutured back with interrupted 3-0 silk sutures. Periodontal dressing was placed over the surgical area (Fig 4). Post-operative instructions were given. Patient was evaluated after 24hours & 7 days postoperatively for healing.

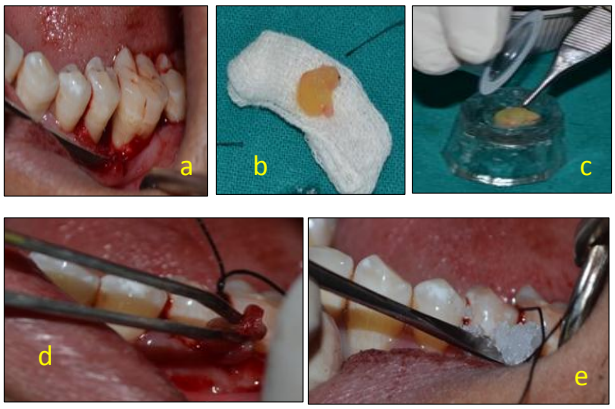

Figure 3 (a,b,c,d,e): Open flap debridement with placement of PRF membrane & bone graft

Figure 4 (a,b,c) : Suturing & Placement of Coe pack

Case 2

A 25 year old male patient complaining of dirty teeth reported to the Department of Periodontics. Intraoral examination revealed generalized bleeding on probing but no swelling or exudation. Periodontal pockets were recorded & vertical bone defect was present in relation to tooth # 16,17 (Fig 5).The probing pocket depth (PPD) on the mid-buccal aspect of the tooth #16 (first molar) was 6 mm, while the periodontal attachment level (PAL) was 5 mm, without tooth mobility.

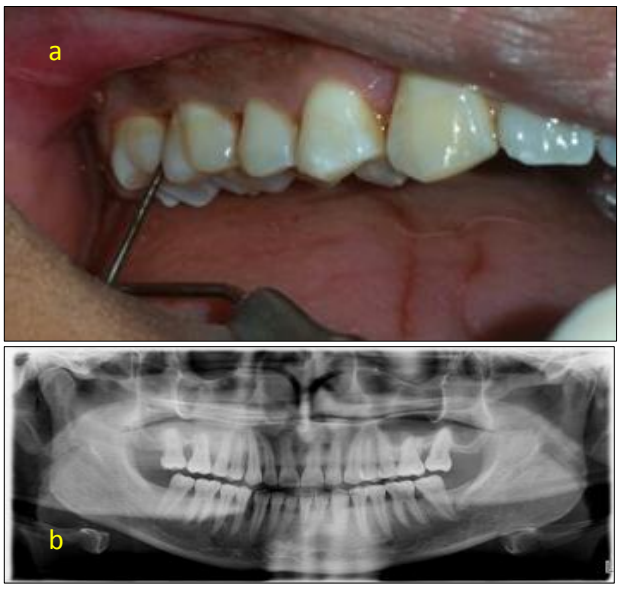

Figure 5 (a and b) : Preoperative view (Clinical & radiographic)

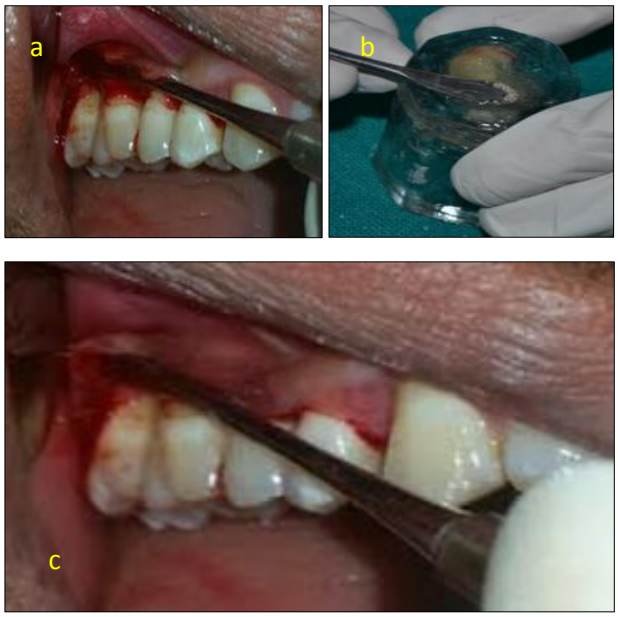

Figure 6(a,b,c) : Open flap debridement with placement of PRF membrane & bone graft

After a thorough Phase I therapy, open flap debridement & regenerative therapy with the help of PRF membrane & Perioglas was planned as the treatment modality and informed consent was obtained for the same.

After the induction of local anaesthesia, labial & lingual sulcular incisions were made, and mucoperiosteal flaps reflected. The patient's venous blood was collected, and the PRF was prepared. In the meantime, meticulous defect debridement and root planing was carried out using Gracey's area specific curettes. PRF membrane was mixed with bone graft (Perioglas) and it was placed into the defect (Figure 6). The mucoperiosteal flap repositioned & sutured using interrupted 3-0 silk sutures. Periodontal dressing was placed over the surgical area.(Fig 7)

Figure 7(a,b) : Suturing & placement of Coe Pack

DISCUSSION

The purpose of the periodontal therapy is to arrest and control the periodontal infection and inflammation and hence regenerate the lost periodontal structures. Newer approaches to periodontal therapy include regenerative procedures that aim to restore lost periodontal ligament, bone, cementum, and connective tissue. The present case series illustrates the placement of autologous PRF and Bioglass (alloplast) in the treatment of intrabony defects.

Platelets can play a pivotal role in regeneration of peridontium as they harbor growth factors and cytokines which are the key factors involved in regeneration of bone and maturation of the soft tissue. PRF was first developed in France by Choukroun et al. for specific use in oral and maxillofacial surgery. This technique requires neither anticoagulant nor bovine thrombin (nor any other gelling agent). It is nothing more than centrifuged blood without any addition[9]. Platelet rich fibrin concentrates 97 % of platelets and >50 % of leukocytes in a specific three dimensional distribution. It is a natural fibrin-based biomaterial prepared from an anticoagulant-free blood harvest without any artificial biochemical modification that allows obtaining fibrin membranes enriched with platelets and growth factors.

Gradual extended release of autologous growth factors such as PDGF and TGF β and better induction of osteoblastic differentiation and proliferation by PRF was shown in an experimental trial.[10]

One of the most widely used periodontal regenerative modality at present is the bone graft therapy. Unfortunately, the application of bone graft materials derived from the host or other living tissues may be limited because of their inherent limitations. Also, it is important to weigh the cost/benefit ratio because many of these biologic adjuncts have additional costs associated with their use. The inexpensive nature of PRF, less time consuming and less technique sensitive preparation protocol and favourable molecular properties, makes PRF an obvious choice for endogenous regenerative therapy.[1,11]

Perioglass is alloplast which mainly consists of Silica, & Oxides of Calcium, Phosphorus & Sodium which bonds to the bone through the development of a surface layer of hydroxyapatite. Bioactive glass is covered by a double layer of Silica gel & Calcium phosphate rich (apatite) layer, when exposed to tissue fluids. Calcium phosphate promotes adsorption & concentration of proteins used by osteoblasts to form a mineralized extracellular matrix[12,13].

In the present report, PRF afforded a great improvement in soft and hard tissue regeneration. Thus, the present case series supports the role of various growth factors present in the PRF in accelerating the soft and hard tissue healing. However, long term clinical trials are needed for its approval as one of the successful treatment modality.

CONCLUSION

PRF preparation is simple, easy, fast, and cost-free, without the use of any anticoagulant. It causes sustained release of growth factors. Therefore, this natural fibrin biomaterial has great potential for surgical wound healing. It has shown to be an effective regenerative material in the management of vertical bone defects. However, further studies and long term evaluations are necessary to assess the use of PRF as a treatment modality.

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Source of Support: Nil
Conflict of Interest: Nil