

Case Report

THE POTENTIAL USE OF PLATELET RICH FIBRIN VERSUS AN ALLOPLAST IN THE REGENERATION OF INTRABONY DEFECT AND FURCATION INVOLVEMENT- A CASE REPORT

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ABSTRACT

The complete and predictable restoration of periodontium following destruction due to trauma or infection remains the objective of periodontal therapy. Various bone replacement grafts have been tried and bioactive glass, an alloplast has shown promising regeneration. Also, the focus is now on a novel biomaterial- autologous Platelet rich fibrin, which contains signalling molecules. This article aims to report the effectiveness of PRF as a regenerative material in comparison to bioactive glass, an alloplast with proven osteogenic potential.

A 22 year old male patient with bilateral (36 and 46) intrabony and furcation defects received bioactive glass alloplast on one side (36) and autologous PRF on the other side (46). The 6 months follow up results showed significant improvement in clinical parameters and bone fill in both the sites. This is suggestive of the potential benefits of both the graft materials in periodontal regeneration.

INTRODUCTION

Oral health continues to be a major health problem worldwide, chronic periodontitis being one of the most prevalent oral diseases. The pathologic hallmark of periodontitis is the destruction of the supporting structures of the teeth involved. In the overall evolution of periodontal therapy, initial attention was focussed on arrest of disease and long term maintenance of dentition. The first goal of periodontal therapy is the complete healing of inflammatory condition and next is the regeneration of all lost structures (Lindhe *et al.*, 2008).

Periodontal regeneration is defined histologically as regeneration of the tooth's supporting tissues, including alveolar bone, periodontal ligament, and cementum over a previously diseased root surface (Hom-Lay Wang *et al.*, 2005). A wide array of graft materials have been applied and evaluated clinically, including autogenous bone grafts, allografts and alloplasts have been utilised, of which, osseous grafting and Guided tissue regeneration are most documented (Reynolds *et al.*, 2003)

There is a renewed search to enhance healing and increase the volume of regenerative bone. Thus, signalling molecules like growth factors capable of stimulating cellular events has received great attention with regard to periodontal regeneration (Sangeetha and Victor, 2011). The focus has now shifted to Platelet Rich Fibrin (PRF), an autologous healing biomaterial, incorporating leukocytes, platelets and a wide range of key healing proteins within the dense fibrin matrix (Toffler *et al.*, 2009). This article reports the effectiveness of PRF as a regenerative material in comparison to bioactive glass, an alloplast with proven osteogenic potential.

CASES

A 22 year old male patient reported to the Department of Periodontology with the complaint of pain and recurrent episodes of swelling of gums in the lower left and right back tooth teeth, with associated exudation, as well as bleeding on brushing. There was no relevant medical history. On examination, oral hygiene was found to be fair. The gingiva in the lower posterior tooth region was red, inflamed, soft and oedematous with loss of scalloping. There was generalised bleeding on probing and exudation. On probing, deep pockets measuring about 8mm were found in the lower right and left first molars with grade I mobility, grade II furcation involvement and periodontal abscesses.

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The patient was advised routine blood investigations, Orthopantomograph and intraoral periapical radiographs of the associated areas. The Orthopantomograph revealed bone loss in the upper anterior and lower posterior regions. Further, the intra oral periapical radiographs of 36 and 46 showed vertical bone loss and involvement of the furcation areas. The teeth involved were found to be vital. The case was diagnosed as localised aggressive periodontitis. The overall and individual prognosis of 36 and 46 was found to be fair.

The treatment plan consisted of abscess drainage in the region of 36 under antibiotic cover of Amoxicillin 500mg trice daily for 5 days. The patient was reviewed after a week and subjected to complete scaling, thorough root planning and occlusal correction. After three weeks, there was resolution of inflammation and the patient was scheduled for flap surgery. The procedure was explained to the patient and the consent was obtained for the same.

After administration of local anaesthetic, 2% lignocaine with 1: 80000 adrenalin, an intrasulcular incision was made using a No.15 blade and conventional full thickness mucoperiosteal flap was raised in the region of 36. The area was thoroughly degranulated and the roots were planed. The PRF was prepared following the protocol developed by Toffler *et al.*, (2009). Briefly, prior to surgery, 10 ml intravenous blood was collected by venipuncture at the antecubital fossa. This was transferred into 10 ml sterile tube without anticoagulant and immediately centrifuged at 3000 rpm (400g) for 10 minutes. Fibrin clot formed in between the acellular plasma on top and the red blood cells at the bottom was separated using sterile tweezers and scissors. A stable fibrin was obtained by squeezing plasma out of the PRF clot. The vertical defect and the furcation involved area of 36 received PRF. One month later the region of 46 was subjected to flap surgery. Bioactive glass, an alloplast was placed in the intrabony defect and furcation area of 46.

After both surgeries, interrupted sutures were placed using 4-0 silk sutures and periodontal dressing was given. The patient received postoperative instructions and was prescribed post operative antibiotics and analgesics which included amoxicillin 500mg every 6 hours for 7 days and aceclofenac 100 mg every 12 hours for 3 days. Then, 2 weeks postoperatively, the dressing and sutures were removed and saline irrigation was done. The patient was monitored at regular intervals and was under maintenance therapy. At the end of 6 months, intraoral periapical radiographs of the treated areas were taken.

On examination of 36 and 46, there was satisfactory healing and without any post-operative complications. There was significant reduction in probing depth. The radiographs taken at 6 month interval, showed areas of bone fill and new bony trabeculae in both the treated areas. However the area treated with PRF showed a slightly improved bone fill in comparison to the area treated with bioactive glass.

DISCUSSION

Reconstructive dental surgeons are constantly looking for quick healing process to maximize predictability as well as the volume of regenerated bone (Toffler *et al.*, 2009). With respect to the treatment of intra-bony defects, the results of metaanalysis support the following conclusion: bone grafts increase bone level, reduce bone loss, increase clinical attachment level, and reduce probing pocket depths when compared to open flap debridement procedures.³ The present case shows improved periodontal regeneration in the areas treated with bone graft materials i.e. PRF and alloplastic material.

In the present case, there was satisfactory and significant bone fill and improved clinical parameters in the tooth treated with bioglass. Clinical studies evaluating bioactive glass particles have reported significantly greater improvements in clinical parameters compared to open flap debridement alone ((Ong *et al.*, 1998 and Subbaiah and Thomas, 2011).

.Similar clinical results have also been reported after the use of bioactive glass when compared to DFDBA and ePTFE membranes.⁸ Bioglass bonds to bone and stimulates both osteoinduction and osteoconduction. This may be due to the bonding of bioactive glass to bone that is attributed to the formation of hydroxyl carbonate apatite layer on glass surface in contact with body fluid.



Figure 1: PRF prepared



Figure 2: 36- intrabony and furcation defect



Figure-3: 36- filled with PRF



Figure 4: 46- intrabony and furcation defect



Figure 5: 46- filled with bioactive glass



Figure 6: Pre-op OPG



Figure 7: Post -Op OPG

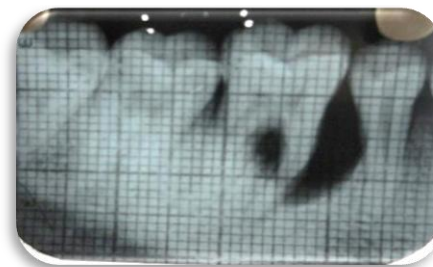


Figure 8: Pre Op- PRF

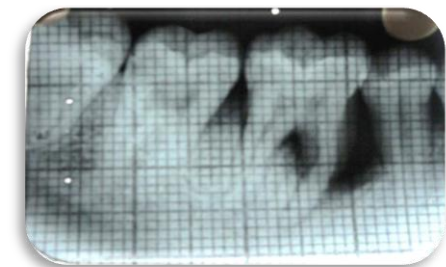


Figure 9: Post- Op PRF

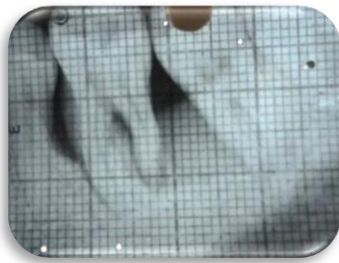


Figure 10: Pre -Op Bioactive glass

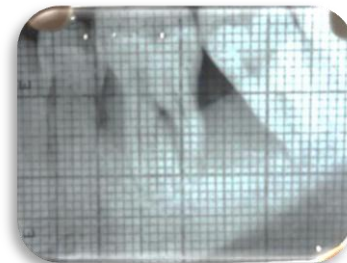


Figure 11: Post- Op Bioactive glass

Future studies in this area are certainly needed to better understand how these materials work histologically (Subbaiah and Thomas, 2011). The contralateral tooth treated with PRF also showed significant regeneration as evidenced by clinical and radiographic parameters. This is in accordance with the results of a randomised controlled clinical trial where autologous PRF was used in the treatment of 3-walled intrabony defects in chronic periodontitis (Tharot *et al.*, 2011). In a study, PRF was used as the sole grafting material and was found to be an effective modality of regenerative treatment for periodontal intrabony defects with regard to clinical and radiologic parameters (Chang *et al.*, 2011). Another study evaluated platelet-rich fibrin and bovine porous bone mineral in comparison to platelet-rich fibrin alone in the treatment of intrabony periodontal defects. Both were found to reduce pocket depth, improve clinical attachment levels and defects fill (Lekovic *et al.*, 2012).

Platelet-rich fibrin, first described and developed in France by Choukroun *et al.*, is a second generation platelet concentrate widely used to accelerate soft and hard tissue healing. Literature and clinical experience seem to indicate that PRF improves early wound closure, maturation of bone grafts, and the final aesthetic result of the peri-implant and periodontal soft tissues. Its advantages include ease of preparation, application, minimal expense, and lack of biochemical modification (Gupta and Porwal, 2011).

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 (Simonpieri *et al.*, 2009).

CONCLUSION

The clinical and radiographic results of the present case are suggestive that both bioactive glass alloplast and autologous PRF are efficacious in the treatment of a periodontal intrabony defect. However the presence of signalling molecules and ease of preparation makes PRF a clinically effective and cost effective regenerative material in the management of intrabony defects. Surgical re-entry or the use of histologic and advanced radiodiagnostic assessment can provide a greater insight to the actual regenerative process.

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