

TREATMENT OF INTRABONY DEFECTS WITH HYDROXYAPATITE BONE GRAFT ALONG WITH PLATELET-RICH FIBRIN : A 6 MONTHS FOLLOW -UP CASE REPORT

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Abstract

Background: Chronic periodontitis is a multifactorial disease resulting in the inflammation and destruction of the supporting structure around the teeth. This leads to tooth mobility and subsequent loss of tooth. Although horizontal bone loss is most common, vertical bone loss is more amenable to regenerative periodontal therapy. Previously, various bone graft materials have been tried for management of osseous defects resulting from the disease process. However, the trend has now shifted towards application of endogenous regenerative therapy. The recent introduction of Choukroun's Platelet Rich Fibrin (PRF), has revolutionized the field of dentistry. PRF, a rich source of autologous growth factors and cytokines, is an upcoming therapeutic approach in the management of periodontal osseous defects.

Aim: To present clinical and radiographic results of a wide intrabony periodontal defect treated with hydroxyapatite bone graft along with platelet-rich fibrin (PRF).

Methodology: 10ml of patient's venous blood was collected and PRF obtained after centrifugation. The platelet concentrate obtained was used in combination with a bone graft in an intrabony defect in relation to tooth 37. Surgical therapy by means of open flap debridement and for the management of the osseous defect, placement of a combination of autologous PRF and hydroxyapatite bone graft was done.

Result: At the 6 month recall a reduction in the Probing pocket depth (PPD) from 11mm (Pre-operative) to 4 mm and clinical attachment level (CAL) from 12 mm (Pre-operative) to 6 mm (post-operative) at 6 month recall was observed respectively.

Conclusion: The combination therapy using platelet rich fibrin with hydroxyapatite bone graft is a rapid, effective and promising grafting modality for the management of infrabony osseous defects.

Key Words Infrabony defects, Platelet Rich fibrin, chronic periodontitis, and hydroxyapatite bone graft.

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INTRODUCTION

Periodontitis is an inflammatory disease characterized by destruction of alveolar bone, root cementum, periodontal ligament and gingiva as a response to insults affected by microbial accumulations on tooth surfaces¹. These responses result in a variety of intraosseous defects of various bony architectures. Periodontal therapy helps to protect and maintain the health of the dentition over a long span of time. It also helps to regenerate the supporting tissue which includes regeneration of cementum, periodontal ligament, and bone. It provides comfort, functionality and esthetically sound appearance². Periodontal surgical procedures have focused on the elimination of hard and soft tissue defects (i.e., probing depths and osseous defects) by facilitating formation of new attachment³. Conventional open flap debridement offers only limited potential towards recovering the lost periodontal structures⁴. Various grafting modalities have been used for periodontal tissue regeneration such as autogenous and allogenic bone grafts but none has been established as a gold standard in the treatment of intrabony defects, having their associated limitations⁵.

The hydroxyapatite crystals have been used extensively in the treatment of bone defects, ridge preservation and periodontal bone defects. However they had no regenerative effect on cementum and the periodontal ligament. Periodontal regeneration is the complete restoration of the lost tissues to their original architecture and function by recapitulating the crucial wound healing events associated with their development⁶. There has been tremendous interest in polypeptide growth factors (PGFs) in periodontal regeneration. Platelet-derived growth factor (PDGF) and transforming growth factor- β (TGF- β) have been shown to promote cell growth, differentiation, and periodontal regeneration⁷.

Platelet-rich fibrin (PRF) was first described by Choukroun et al. in 2004 in France. It has been referred to as the second generation platelet concentrate⁸. Carroll et al. 2005, in vitro study demonstrated that the viable platelets released six growth factors namely platelet-derived growth factor (PDGF), vascular endothelial growth factor, transforming growth factor (TGF), insulin-like growth factor, epidermal growth factor and basic fibroblast growth factor⁹. The preparation of PRF involves the collection of blood and centrifuging at 3000 rpm for about 10-12 minutes to obtain a gel like suspension of PRF.

Combining bone graft material with PRF concentrate can enhance bone regeneration. Platelet concentrate in adjunction with bone graft material makes it possible to amplify the graft volume without injuring the maturation quality in new bone¹⁰.

We present here a six month follow-up report of an intrabony defect, treated by means of combination

of hydroxyapatite bone graft along with autologous PRF, and assessed clinically and radiographically.

CASE REPORT

A 50-year-old male complaining of food lodgement and pain in the lower left mandibular second molar region reported to the Department of Periodontics, Haldia Institute of Dental Sciences And Research, Haldia, and West Bengal. On examination, the patient was systemically healthy and not taken any long-term anti-inflammatory medications or antibiotics. There was no history of dental trauma and no injurious habit was reported by the patient.

On intraoral examination, generalized bleeding on probing was elicited, but no swelling and/or pus exudation was noticed. The probing pocket depth (PPD) on the mesial aspect of the tooth 37 was 11 mm (Figure 1), clinical attachment level (CAL) was 12 mm, no mobility was detected in 37 and fremitus was found to be negative precluding the possibility of trauma from occlusion. An intraoral periapical radiograph revealed the presence of interdental angular bone loss mesial to tooth 37 (Figure 2)

A treatment plan was decided upon. It included a series of therapeutic procedures, following non-surgical periodontal therapy. PPD and CAL were measured after six weeks and they were still found to be 11 mm and 12 mm respectively.

Patient was recalled every week and a re-examination was done for 4 weeks. After non-surgical periodontal therapy a pocket still persisted after 4 weeks. Hence, a surgical periodontal therapy

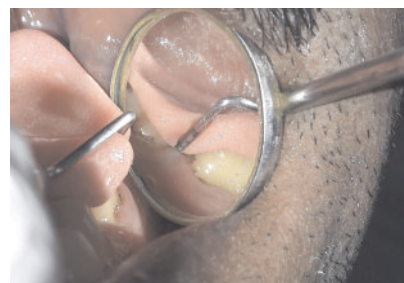


Figure 1: Preoperative clinical view (mesial to 37)

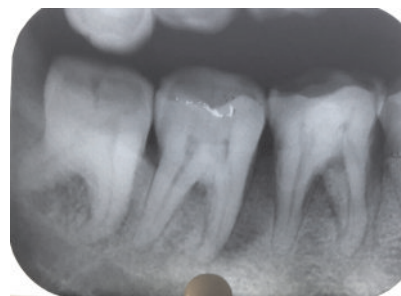


Figure 2: Preoperative radiographic view (mesial to 37)



Figure 3: collection of blood from antecubital vein

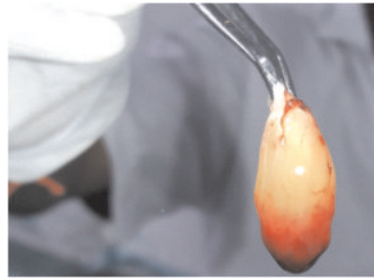


Figure 4: Prepared PRF



Figure 5: bone graft mixed with PRF

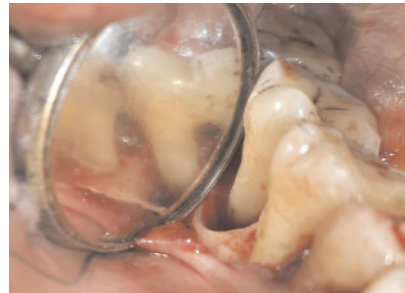


Figure 6: Full thickness flap elevated to expose the defect



Figure 7: Hydroxyapatite bone graft along with



Figure 8: Suture placed
Platelet-rich fibrin was filled
into the infrabony defect

was planned and advised for complete blood investigation. The blood report was found within normal limits.

PRF Preparation:

The PRF was prepared in accordance with the protocol developed by Choukroun et al. just prior to surgery; 10 ml intravenous blood was collected from antecubital vein in a sterile tube without an anticoagulant (Figure 3). Blood was centrifuged using a tabletop centrifuging machine for 10 min at 3,000 rpm (Figure 4). The resultant product consisted of three layers:

1. Topmost layer consisted of acellular platelet poor plasma (PPP).
2. PRF clot in the middle.
3. Red blood cells (RBCs) at the bottom.

PRF was easily separated from RBCs using a sterile tweezer just after removal of PPP and then transferred on to the sterile dappen dish. The PRF was then mixed with hydroxyapatite bone graft (Figure 5).

Surgical Procedure:

Intra-oral antiseptics was performed with 0.2% chlorhexidine di-gluconate rinse. Following administration of local anesthesia, buccal and lingual sulcular incisions were made and mucoperiosteal flaps were reflected. Meticulous debridement of the defect and root planning was carried out with the help of area specific curettes. The direct examination after debridement, confirmed the presence of three walled bony defect (Figure 6). Hydroxyapatite bone graft along with platelet-rich fibrin was filled into the infrabony defect (Figure 7). Also PRF membrane was used to cover the defect. The mucoperiosteal flap were repositioned and secured in place using 3-0 nonabsorbable black silk surgical suture (Figure 8). Simple interrupted sutures were placed.

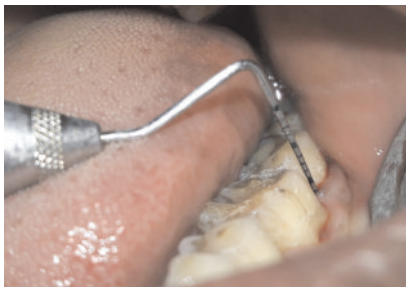


Figure 9: Postoperative photograph after 6 months



Figure 10: Postoperative radiograph after 6 months follow-up

Post-operative care:

Patient was given postoperative antibiotic and nonsteroidal anti inflammatory drug coverage along with 0.2% chlorhexidine mouth wash twice daily, for 1 week. Sutures were removed 1 week postoperatively. Surgical wound were cleaned with iodine and patients were instructed for gentle brushing with soft toothbrush. Patient was instructed for oral hygiene maintenance and examined weekly for 1 month and then 3 and 6 months.

RESULT

Re-examination at 6 months after the periodontal surgery revealed reduction in PPD (from 11 mm to 4 mm) and CAL (from 12 mm to 4 mm) with no sign of bleeding on probing (Figure 9). Radiographic re-evaluations were done at 3 months and 6 months post-operatively. The radiographic analysis of the defect revealed significant bone formation at the end of 3 months with additional crestal bone formation followed by almost complete bone fill by 6 months (Figure- 10).

DISCUSSION

The patient was treated with Hydroxyapatite Bone Graft along with platelet-rich fibrin in an attempt regeneration of bone in the intrabony defects in relation to mesial aspect of 37 in patients with chronic periodontitis. Result showed after six month follow up a significant reduction of periodontal pocket depth. There was a clinical attachment level gain as well as radiographic evidence of bone formation.

PRF is in the form of a platelet gel and can be used in conjunction with bone graft, which offers several advantages including promoting wound healing, bone growth and maturation, graft stabilization, wound sealing and hemostasis, and improving the handling properties of graft material. When platelets in a concentrated form are added to graft materials, a more predictable outcome

is derived. The growth factors present in PRF are PDGF and TGF- β . They help in the protein synthesis in osseous tissues, stimulates angiogenesis, and enhance woven bone formation, etc¹¹.

Simonpieri et al. (2009)¹² described the four advantages of the use of PRF during bone grafting. First, fibrin clot plays an important mechanical role in maintaining and protecting the graft and PRF fragments serve as biological connectors between bone particles. Second, fibrin network facilitates cellular migration, vascularization, and survival of the graft. Third, the growth factors (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 an important role in the regulation of inflammation and infectious within the intraosseous defects.

In another study, Pradeep AR et al. (2009)¹³ showed, using a split-mouth design, 18 subjects with 36 mandibular degree II furcation defects were randomly allotted and treated either with autologous PRF with open flap debridement (OFD) or open flap debridement (OFD) alone. All the clinical and radiographic parameters showed statistically significant improvement at the sites treated with PRF as compared with those with OFD.

Anuj Sharma et al. (2011)¹⁴ and Thorat et al. (2011)¹⁵ have done a study to explore the clinical and radiographic effectiveness of autologous PRF in the treatment of infrabony defects in patients with chronic periodontitis. There was greater pocket depth reduction, clinical attachment level (CAL) gain, and bone fill at the sites treated with PRF with conventional open-flap debridement compared to conventional open-flap debridement alone.

CONCLUSION

From the treatment results obtained in this case, a definite positive clinical impact of additional application of platelet-rich fibrin along with hydroxyapatite bone graft in the treatment of periodontal infrabony defect is defined by:

areduction in probing pocket depth, Gain in clinical attachment level, Significant radiographic bone fills and Improved patient comfort. However, long-term, multi center randomized, controlled clinical trials will be required.

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