

Case Report

Management of Periapical Lesion with Hydroxyapatite and Platelet Rich Fibrin(PRF) – A Case Report

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Abstract: Periapical surgery aims to remove periapical pathology to achieve complete wound healing and regeneration of bone and periodontal tissue. Platelet rich fibrin (PRF) is a wonderful tissue engineering product and has gained much popularity due to its promising results in wound healing by bone induction. The features of this product are an attribute of platelet cells, which, after cellular interactions, release growth factors. This case report illustrates the use of PRF and hydroxyapatite in bony regeneration after periapical curettage in maxillary anterior region.

Keywords: Bone regeneration, Hydroxyapatite, Platelet rich fibrin, wound healing

INTRODUCTION

The success of endodontic therapy depends on complete periapical repair and regeneration. In majority of cases, teeth with periapical lesions heal satisfactorily after nonsurgical endodontic intervention. However, there are cases with persisting symptoms and infection that require periradicular surgery in order to remove the pathological tissue, eliminate the source of irritation and to promote healing.

Successful treatment for periapical lesion depends on removal of pathological tissue along with the causative microorganisms. In cases where conventional root canal therapy fails to eliminate the lesion, surgery is the last alternative. Periapical surgery includes removal of diseased periapical tissue, provision of proper seal between root canal system and the periradicular tissues and sometimes application of different graft material to enhance new bone formation at the defective site.

Bone regeneration after the periapical surgery depends upon four critical factors such as primary wound closure, angiogenesis as a blood supply and source of undifferentiated mesenchymal cells, space maintenance, and stability of the wound (PASS principle) [1]. Bone regeneration after surgical intervention takes place in a very slow manner. Hence, to enhance these processes a number of bone substitutes are being tried out. Bone grafting is the most common form of regeneration therapy. A variety of materials are available for bone regeneration, which are highly

osteoconductive or osteoinductive like, freeze dried bone graft, bioactive glass, emdogain, proximal tibial replacement (PTR) polymer, mineral trioxide aggregate (MTA), tricalcium phosphate, and octacalcium phosphate [2, 3].

Enhancement of the regenerative process of human body by utilizing the patient's own blood is a unique concept in dentistry. Post-surgically, blood clots initiate the healing and regeneration of hard and soft tissues. Platelet rich fibrin (PRF) is coming up as a biological revolution in dental field. PRF usage for wound healing was first introduced in France by Choukroun *et al* in 2001. Using platelet-rich fibrin is a way to accelerate and enhance the body's natural wound-healing mechanisms. Platelets primarily are involved in wound healing through clot formation and the release of growth factors initiate and support wound healing. Growth factors are the biologically active substances that are involved in tissue-repair mechanism such as chemotaxis, cell proliferation, angiogenesis, extra-cellular matrix deposition, and remodelling. An easy, cost-effective way to obtain high concentrations of growth factors for tissue healing and regeneration is autologous platelet storage via PRF [4].

Platelet rich fibrin can be a great adjunct to many periodontal and oral surgical procedures such as bone grafts for alveolar defects, for implants placement and maxillofacial reconstructions. This paper presents a case where periapical curettage was performed for endodontically treated anterior teeth, in which bone

graft and platelet rich fibrin were placed in the surgical site to promote healing.

CASE REPORT

A 28-years-old male patient with a chief complaint of pain and swelling in the upper right front teeth region was reported to the Department of Conservative Dentistry and Endodontics, with a history of trauma 5 years back. On intraoral examination, palatal swelling was observed in relation to maxillary right and left incisor area. A periapical and occlusal radiographs revealed presence of large periapical lesion involving root apices of teeth 11, 21 and 22 (Fig. 1). Since, the patient had no systemic complications, it was decided to perform periapical curettage after completion of root canal treatment for teeth # 12, 11, 21.

After access openings, root canals were cleaned and shaped using step back technique and 3% sodium hypochlorite irrigation. Calcium hydroxide was used as the intracanal medicament, later the root canals were obturated using guttapercha and AH plus sealer by the lateral condensation technique. Before planning for the surgical procedure, patient's platelet count (3.5 lac/mm^3), Haemoglobin (11.5 gm/dl), Bleeding time (2.5 min) and Clotting time (4.5 min) were assessed and found to be within normal limits.

Under local anesthesia a full thickness mucoperiosteal flap was reflected by the sulcular incision on palatal aspect, starting from the distal aspect of the tooth # 12 to distal of the tooth #21 (figure 2a). A large periapical defect was seen with complete loss of cortical bone on the palatal aspect. Apical curettage was done at the defect site followed by thorough irrigation with sterile saline solution.

PRF Preparation

Just prior to surgery, 8 ml intravenous blood (by venipuncturing of the antecubital vein) was

collected from the patient and immediately centrifuged in centrifugation machine at 3,000 rpm for 10 minutes. It results in formation of a structured fibrin clot in the middle of the tube, just between the red corpuscles at the bottom and acellular plasma (Platelet-poor plasma) at the top. PRF was easily separated from red corpuscles base using a sterile tweezers and scissors and then transferred onto a sterile dappen dish.

Commercially available hydroxyapatite bone graft crystals (Biograft HA, IFGL Bioceramics Ltd., India) were sprinkled over the PRF gel and together the mixture was placed into the defect site (figure 2d). Flap stabilization was done followed by suturing using 3-0 black silk suture material (figure 2e), and post-operative instructions were given. Patient was kept under the antibiotic coverage along with 0.2% chlorhexidine gluconate mouth rinses for a period of 5 days. Suture removal was done after 5 days. Patient was reviewed after 3 months (figure 3c) and 6 months (figure 3d) during which there were no symptoms of pain, inflammation, or discomfort. Six month recall radiograph revealed a dense radiopacity, intact lamina dura and trabeculae in regular fashion at periapical area of # 11, 12 and 21.

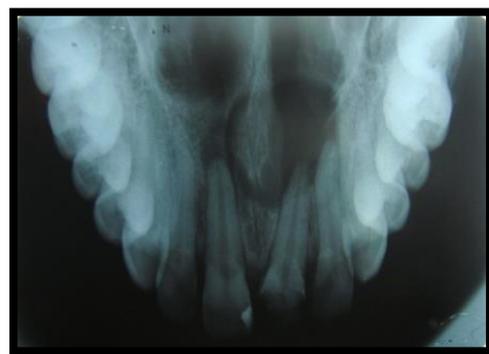


Fig. 1: Preoperative radiograph

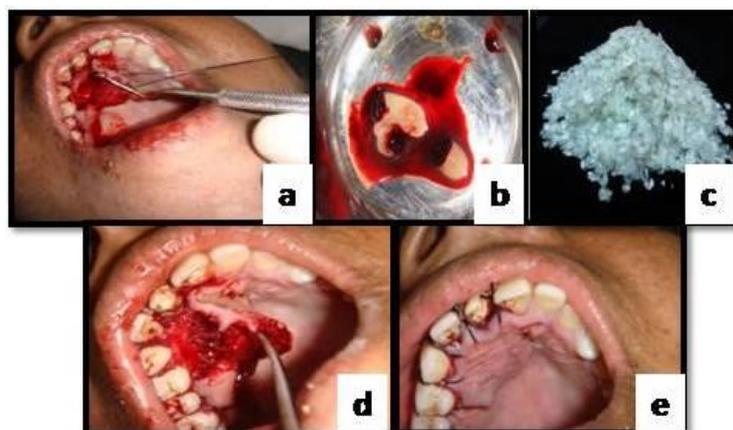


Fig. 2: (a) Flap elevation, (b) Platelet rich fibrin (PRF), (c) Biograft HA crystals, (d) Combination of PRF and hydroxyapatite crystals placed over the defect, (e) Postoperative clinical picture after suturing.



Fig. 3: (a) lesion after root canals obturation. (b) Immediate postoperative radiograph after PRF and hydroxyapatite mixture placement, (c) 3months followup, (d) 6 months followup

DISCUSSION

The exact mechanism by which periapical lesions are formed is not clearly understood. An inflammatory reaction may be evoked due to the ingress of irritants from infected root canal into the periradicular tissue which can initiate the formation and perpetuation of periapical lesion. Nonsurgical root canal therapy often fails to remove the lesion and then surgery is the last option by which lesion is removed followed by placement of suitable graft material.

Hydroxyapatite has shown positive results with respect to periodontal regeneration in periapical defects. It has been reported that combination of HA and PRF resulted in greater pocket depth reduction, better clinical attachment and defect fill than PRF used alone [5]. For this reason we choose HA, as it could enhance the effects of PRF by maintaining the space for tissue regeneration to occur, as well as by exerting an osteoconductive effect in the bony defect area. Bone grafts alone without a blood clot or angiogenic factors are unlikely to be capable of promoting large periapical lesion healing.

The present case report evaluated the clinical efficacy of PRF in the treatment of large periapical lesion. PRF is a matrix of autologous fibrin, which is embedded with a large quantity of platelets 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 main component of PRF is high concentration of growth factors present in the platelets which are required for wound healing[4].

Amongst the various growth factors that PRF contains, platelet derived growth factor (PDGF), Transforming growth factor b (TGF b-1 & b-2), and insulin like growth factor (IGF), epidermal growth factor, vascular endothelial factor, and fibroblast growth factors are believed to play a major role in bone metabolism and potential regulation of cell proliferation. PDGF is an activator of collagenase which promotes the strength of healed tissue. TGF-B

activates fibroblasts to form procollagen which deposits collagen within the wound. PRF facilitates healing by controlling the local inflammatory response.

In the present case report the combination of PRF and HA has shown promising result. Initially at one month recall the lesion showed periapical radiodensity when compared to preoperative radiograph. At 3 month and 6 month recall, the lesion was gradually replaced by the newly formed bone structure. This was mainly due to the osteoconductive action of hydroxyapatite crystals which permits the outgrowth of osteogenic cells from the existing bone surface into the adjacent bone material. Thus, the lesion merged with the surrounding structure with new bone regeneration.

CONCLUSION

On the basis of the results obtained in this case report, the use of PRF in conjunction with HA crystals might have accelerated the bone formation, resolving the defect. However, histological studies are required to examine the nature of newly formed tissue in the defect and long term, controlled clinical trials are required to know the effect of this combination over bone regeneration.

REFERENCES

1. Boyapati L, Wang HL; The role of stress in periodontal disease and wound healing. *Periodontol.*, 2007;44(1):195-210.
2. Kim SG, Kim WK, Park JC, Kim HJ; A comparative study of osseointegration of avana implants in a demineralized freeze – dried bone alone or with Platelet – Rich Plasma. *J Oral Max Fac Surg.*, 2002;60(9):1018-1025.
3. Lekovic V, Camargo PM, Weinlaender M, Vasilic N, Kenny EB; Comparison of Platelet rich plasma, bovine porous bone mineral and guided tissue regeneration versus platelet rich plasma and bovine porous bone mineral in the treatment of intrabony defects - a reentry study. *J Periodontol.*, 2002;73(2):198-205.
4. Marx RE, Carlson ER, Eichstaedt RM, Schimmele SR, Strauss JE, Georgeff KR; Platelet-rich plasma:

growth factor enhancement for bone grafts. *Oral Surg Oral Med Oral Pathol Oral RadiolEndod.*, 1998;85(6): 638-646.

5. Prdeep AR, Bajaj P, Rao NS, Agarwal E, Naik SB; Platelet- rich fibrin combined with a porous hydroxyapatite graft for the treatment of three-wall bony defects in chronic periodontitis: A randomized controlled clinical trial. *J Periodontol.*, 2012;83(7):1499-507.