



Combination of Platelet Rich Fibrin with Hydroxyapatite in Treating a Large Periapical lesion-Case Report of Young Patient

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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Case Study

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ABSTRACT

The primary goal of any dental treatment is the maintenance of the natural dentition in health and for optimum function, and esthetics. Successful treatment for periapical lesion depends on removal of lesion along with causative microorganisms. In cases where conventional root canal therapy fails to eliminate the lesion surgery is the last alternative. Peri-apical surgery aims to eliminate the pathology and thus aims to achieve complete wound healing. There have been many attempts to devise a wonder material which can achieve healing and regeneration and platelet rich fibrin is one such material. Platelet rich fibrin (PRF) is a wonderful tissue engineering product and has gained much popularity due to its promising results in wound healing bone induction. The platelets release growth factors which lead to rapid healing and regeneration. Along with the addition of hydroxyapatite this combination can achieve regeneration and repair in no time. This case report illustrates the use of this combination in a 16- year- old male for better and faster healing.

Keywords: Platelet rich fibrin; endo-osseus; lesion; young patient; heal.

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1. INTRODUCTION

Various pathological etiologies result in dysfunction of the oral tissues and creation of bony defects, thus affecting the quality of life in these patients. The main focus is to reconstruct and regenerate the damaged tissue to achieve optimum health, function and comfort to the patient. Only repair is not an ideal outcome of any surgical procedure. We need to have repair along with regeneration for the desired result of health and function. Enhancement of the regenerative process of the human body by utilizing the patient's own blood is a unique concept in dentistry [1]. 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 the dental field. Wound healing as such is a staged process which involves the activity of leukocytes and platelets. For this process to work efficiently, the platelets play a vital role. The growth factors present in platelets are important to guide the regenerating cells to the area of healing. Platelet rich fibrin (PRF) is one such material that holds on to these growth factors enmeshed in the fibrin network resulting in their sustained release over a period of time that can accelerate the wound healing process. The world of medicine was acquainted with the regenerative potential of platelets in 1974 [2]. Using platelet concentrates is a way to accelerate and enhance the body's natural wound healing mechanisms. PRF is a second-generation platelet concentrate widely used to accelerate soft and hard tissue healing and is a strictly autologous fibrin matrix containing a large quantity of platelet and leukocyte cytokines. Platelets primarily are involved in wound healing through clot formation and the release of growth factors that initiate and support wound healing [3]. PRF was first introduced in France by Choukroun et al. [4] in 2001. The PRF production protocol attempts to accumulate platelets and released cytokines in a fibrin clot. The use of PRF has been restricted to hospital settings. This was mainly due to the cost of separating the platelets from the blood and the large amount of blood needed (one unit) to produce suitable quantity of platelets. New technology permits us to safely harvest and produce a sufficient quantity of platelets from only 8-10 ml of blood drawn from patients in dental office. Surgical sites enhanced with PRF have been shown to heal at rates two to three times that of normal surgical sites. Porous hydroxyapatite has been used to fill the intra bony periodontal defect, which has resulted in

clinically acceptable responses [5]. It has been shown that porous HA bone grafts have excellent bone conductive properties, which permit outgrowth of osteogenic cells from existing bone surfaces into the adjacent bone material [6]. Since there are no organic components contained in HA, this bone graft material does not induce any allergic reaction and is clinically very well tolerated. This case report describes the healing of a peri-apical defect which was treated using combination of PRF and HA followed over a period of 2 years. Post-operative healing was checked by clinical & radiographical parameter.

2. CASE REPORT

A 16-years-old Indian male complaining of occasional pain in the upper right anterior region reported to the dental clinic. On intraoral examination, upper right central and lateral incisors were slightly discolored but there was no mobility, no swelling and no pus exudation (Fig. 1). The gingiva seemed apparently healthy with scalloped margins, consistency was firm and resilient, stippling was present with no bleeding on probing or exudation from the gingival sulcus. There was no swelling in relation to the teeth involved at the time of examination, although the patient did mention of swelling some time back which had completely healed when the patient had taken medications as prescribed by a medical practitioner. There was history of dental trauma which occurred while playing two years ago and no other self-injurious habit was reported by the patient. An intra-oral periapical radiograph was taken using the standardized bisecting angle techniques, which revealed presence of a large peri-apical defect in relation to 11, 12, 13 and 14 (Fig. 2). The radiolucency appeared to be in relation to 11, 12, 13, 14 and 21 with root resorption in 11. The patient was healthy and no other medical complication was reported. The patient was sent for medical examination before the surgical procedure and was declared fit to undergo oral surgical procedures. Then it was decided to do root canal treatment in 21, 11, 12, 13 and 14 and remove the lesion surgically as the lesion would not heal with conventional root canal therapy only. The treatment plan was surgical removal of the lesion and filling the cystic cavity with PRF and hydroxyapatite as the lesion was large and faster healing would take place when surgical endodontics were performed. Before planning for the surgical procedure, patient's platelet count hemoglobin, bleeding time and clotting time were

assessed and found to be within normal limits. Informed consent from the patient and the parents was taken and they readily agreed to the procedure. Root canal therapy of teeth 21, 11, 12, 13 and 14 was done in conventional step-back method using k files and obturated with guttapercha and AH Plus sealer (Dentsply, Canada) utilizing lateral condensation method. Tooth 11 went for root resection, as the root resorption was seen in this tooth, which was followed by retrograde root canal filling and sealing it with amalgam. There are many other modern retrograde filling materials like MTA, Glass ionomer cements, calcium phosphates, bone cements but we decided to use amalgam in this case as it is cost effective (due to the patient being financially disadvantaged) and amalgam has been the most extensively used materials for the past seven decades as root end filling material. Access cavity was filled up by glass ionomer cement in all the root canal treated teeth. As the peri-apical lesion was big, it was decided to go for endodontic surgery along with placement of PRF in combination with HA (Biograft-HA; IFGL Bioceramics Ltd, Kolkata, India) for better results. Following administration of local anaesthesia, buccal sulcular incisions were made and full thickness mucoperiosteal flaps were reflected (Fig. 3). The loss of labial cortical plate was evident in relation to right central and lateral incisors (Fig 4). The cystic lining was enucleated and the bony defect cleaned profusely with normal saline. 10 milliliter of blood was drawn from the patient's antecubital vein and centrifuged in a centrifugation machine (REMI, R-8C Laboratory Centrifuge, Mumbai,

India) for 10 min under 3000 revolutions per minute to obtain the PRF. Commercially available HA bone graft crystals were sprinkled over the PRF gel after mincing of the PRF gel membrane in a sterile dappen dish and the mixture was placed into defect site (Fig. 5). Flap was repositioned in place followed by suturing using 3-0 black silk suture material (Fig. 6). Patient was kept under the antibiotic coverage along with analgesic and 0.2% chlorhexidine gluconate solution as mouth rinse for a period of 5 days. Suture removal was done 1 week later and the healing was uneventful. Patient was recalled after 1 month, 3 months, 6 months and 1 year. The patient reported to be healthy and the



Fig. 1. Pre-Operative - Upper right central and lateral incisors were slightly discolored but there was no mobility, no swelling and no pus exudation

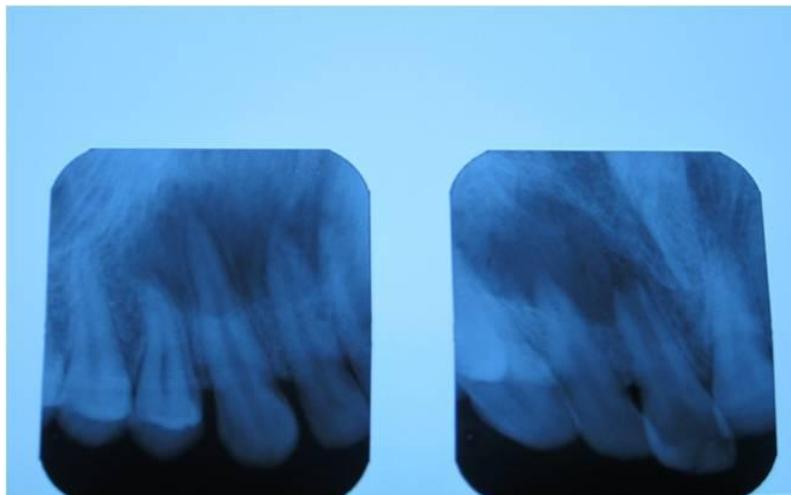


Fig. 2. Intra-oral peri-apical radiograph showing the lesion which involves the peri-apical regions of right central incisor, lateral incisor, canine and first premolar of maxilla

teeth asymptomatic both clinically and radiographically (Figs. 7,8). Radio-graphically the peri-apical lesion had healed satisfactorily (Fig. 8). The root canal treated teeth were set for crowns at a later date. The patient is under follow up for a period of 2 years now without any symptoms at all. The healing which was achieved with surgical intervention by placement of PRF and HA was faster than doing routine endodontic procedures. Doing only root canal treatment and waiting for the lesion to heal would have led to longer healing period and the defect would not have healed sufficiently. If the surgery had been performed alone without utilization of PRF and HA, it would not have given the desired healing in the same time frame as it did with utilization of these materials. PRF, as we know is a storehouse of growth factors and this along with HA gives excellent results in healing. To our knowledge, this is one of the first attempts to utilize the combination of PRF and HA in a young patient and getting the desired results so early. Many cases have attempted use of PRF in older subjects and good results were obtained.



Fig. 3. Flap raised-Full thickness mucoperiosteal is raised extending from right central incisor to right second premolar in maxilla

3. DISCUSSION

Conventional root canal therapy sometimes may not give us the desired results. Then we have to take into account other surgical and regenerative procedures at our disposal to get the desired results. One such material which has been available for some time now and offers better results is PRF. PRF is a matrix of autologous fibrin, in which are embedded a large quantity of platelet and leukocyte cytokines during centrifugation [7]. The intrinsic incorporation of cytokines within the fibrin mesh allows for their

progressive release over time (7-11days), as the network of fibrin disintegrates [8]. The main component of PRF is high concentration of growth factor present in the platelets which are required for wound healing [9]. The PRF acts much like a fibrin bandage, serving as a matrix to accelerate the healing of wound. PRF is in the form of a platelet gel and can be used in conjunction with bone grafts, 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 materials [10]. The present case report evaluated the clinical efficacy of PRF along with HA in the treatment of intrabony defect. There are few cases where they have utilized PRF along with HA to achieve significantly good results.



Fig. 4. Bone defect-A bony defect is seen in relation to right central incisor, lateral incisor and canine



Fig. 5. Mixing of PRF with HA bone crystals



Fig. 6. Sutures placed



Fig. 7. Healing-Proper healing as seen in intra-oral peri-apical radiograph



Fig. 8. (Post Operative follow up)

Shivashankar et al. [11] described a case report highlighting the combined use of graft material (PRF and hydroxyapatite [HA]) and barrier membrane in the treatment of large periapical lesion. The authors hypothesized that the use of PRF in conjunction with HA crystals accelerates the resorption of the graft crystals and induces

rapid rate of bone formation. Jayalakshmi et al. [12] used PRF in combination with beta tricalcium phosphate (β -TCP) bone graft in the treatment of periapical cyst. The authors reported progressive, significant, and predictable clinical and radiographic bone regeneration/healing with the use of PRF. The authors have stated that the combined use of PRF and β -TCP for bone augmentation in treatment of periapical defects is a potential treatment alternative for faster healing than using biomaterials alone. In our case we have used HA in the form of DFDBA (Decalcified freeze dried bone allograft) which has a better osteogenic potential than the cases reported earlier and so the healing and regeneration becomes faster with this combination. The periapical lesion in our case was larger than other cases utilizing this combination but we got somewhat faster healing than other cases reported. The main shortcoming of PRF is its preparation and storage. The clinical benefit of PRF depends on time interval between speed of handling between blood collection and centrifugation as PRF is prepared without any addition of anticoagulants. Another main disadvantage of PRF is its storage after preparation. The storage time for this material is much less as it shrinks fast. That is why fresh preparation of this material is required for it to be beneficial. The utilization of amalgam as root end filling material is debatable here but the report of allergy and toxicity was not seen in our case [13].

5. CONCLUSION

It can be suggested with our case that PRF in combination with HA is efficacious clinically and radiographically in the treatment of intrabony defect. PRF is an autologous preparation and found to be clinically effective and economically viable than any other available regenerative materials. HA has high osteogenic potential to cause faster healing. Thus the combination used in this case presents a new avenue to be looked at in the near future. Still the growth factors, ideal ratios of the components and exact mechanisms, are being investigated, and more clinical research with long-term results is needed. PRF with its beneficial results and outcomes can surely make regenerative dentistry more exciting and worthwhile. This case is one of the first cases to utilize this combination in a young adult for curing such a huge peri-apical lesion in such a short space of time, namely 4 months, and one that has been followed up for two years to find that the combination of PRF and HA works well in healing of such lesions. A few more cases

have to be investigated and followed up to utilize the combination more often.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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