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Dual combination-PRF and hydroxyapatite in the treatment of periapical lesions.

Divya shree[1],Keshava Prasad[2],Shashikala K[3] ,Murali Rao H[4]
[1]*Post graduate student(DAPM RV dental college and hospital,Bangalore,Karnataka)*
[2]*Professor (DAPM RV dental college and hospital,Bangalore,Karnataka)*
[3] *Professor & Vice Principal(DAPM RV dental college and hospital,Bangalore,Karnataka)*
[4] *Professor & HOD(DAPM RV dental college and hospital,Bangalore,Karnataka)*

Abstract-*PRF (Platelet rich fibrin)is referred to as second generation platelet concentrate,used in stimulation and acceleration of soft tissue and bone healing because of localand continuous delivery of growth factors and proteins, mimicking the needs of the physiological wound healingand reparative tissue processes.In this case report,a periapical endodontic surgery was performed on a 19 year old male patient with pus discharge in upper front teeth region and a large bony defect radiographically.Granulation tissue was enucleated and the periradicular bony defect was grafted using PRF and hydroxyapatite bone graft. Results of 8 months has been reportedwhich showed satisfactory healing of the periapical pathosis. On the basis of the results obtained in our case report, we hypothesizethat the use of PRF in combination with hydroxyapatite bone graft in the treatment of periapical inflammatory lesion fastens the healing process.*

Keywords: *PRF,Hydroxyapatitebone graft, Inflammatory periapical lesion,Regeneration*

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I. Introduction

Inflammatory periapical lesion is due to reaction of bone near the apex of tooth that develops after the pulpal necrosis or extensive periodontal disease[1].Most of the cases with periapical lesions heal adequately after nonsurgicalendodontic intervention[2]. Periapical surgery becomes the important therapyselection when the root canal treatment cannot be adequate enough for the elimination of apical lesion[3].Abramovitz et al have reported that treatment of 24.5% of the cases was impossible without surgicaltherapy[4].

The successful outcome of endodontic therapy depends on complete periapical repair and regeneration[5]. Better result is achieved by using growth factors, extracellular matrix and bonemorphogenetic proteins instead of routinely used synthetic bone grafts, because synthetic bone graftsinduce regeneration by osteoconduction whereas, biological modulators induce regeneration byosteoinduction[6].

HA bone grafts shows excellent boneconductive properties, which permits outgrowth of osteogenic cells from existing bone surfaces into theadjacent bone material.[7]Platelet-rich fibrin (PRF) is second-generation platelet concentrate as described by Choukroun et althat allows oneto obtain fibrin membranes enriched with platelets andgrowth factors, after starting from an anticoagulant-freeblood harvest[8]. PRF being both the healing and interpositional biomaterial, accelerates wound closure and mucosal healing due to fibrin bandage and growth factor release[1.]

This case report presents combination of prf with hydroxyapatite bone graftmaterial in management of a periapical inflammatory lesion in anterior maxilla.

II. Case Report

A 19 yearsold male patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of irregular pus dischargesince 4 months in the upper front teeth region.There was no previous history of pain or discomfort.The patient's medical statuswas noncontributory and he mentioned that he had no history of trauma to the related area. Patient was undergoing orthodontic treatment since 1 year. On intra oral examination, presence of sinus opening with pus discharge located in between maxillary left central and lateral incisor was seen. (fig. 1) WhenRadiographic examination is done, itshowed periapical radiolucency with a well-circumscribedsclerotic border around the right maxillary incisor,left maxillary central incisor, left maxillary lateral incisor and left maxillary canine.(fig. 2,3) The vitality tests showed the negative responsefor the teeth 11, 21, 22 and tooth 23showed delayed response.

FIG 1- Pus discharge through sinus opening

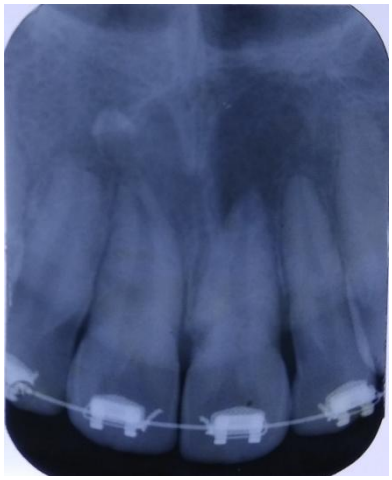

FIG 2 -Preoperative IOPAR

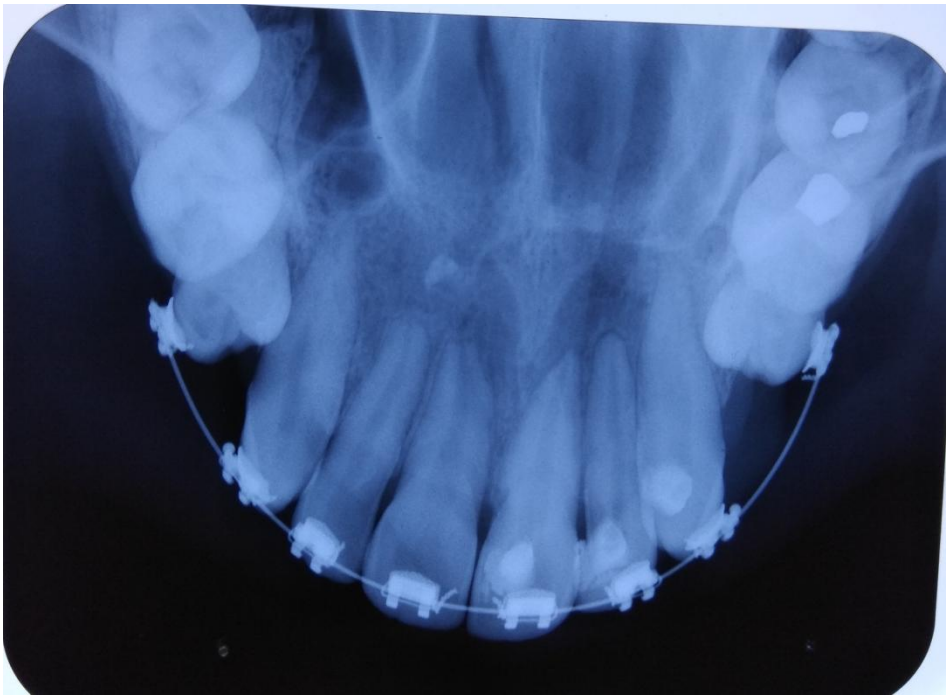

FIG 3-Preoperative occlusal radiograph

The root canal treatment was planned for 11, 21, 22, 23 . After isolation access opening wasdone, working length was determined radiographically (fig. 4). Cleaning and shaping was done using step back techniquetill an apical size of # 55 in relation to 11 , 21, and 23.Tooth 22 was prepared till an apical size of #55. 3%sodium hypochlorite solution was used to irrigate the canals during the canal preparation. Calcium hydroxide was used as the intracanal medicament in between the visits. Pus discharge stopped completely after two weeks .Root canals were obturated using gutta percha (Dentsply maillefer Ballaigues) and zinc oxide eugenol sealer by the lateral condensation technique(fig. 5).One month postobturation patient reported with intermittentpus discharge through sinus


FIG 4-working length radiograph


FIG 5-mastercone and obturation radiographs

Hence, a periapical endodontic surgery was planned. Under localanesthesia (1:200000 adrenaline, DJ Lab, India), a full thickness mucoperiosteal flap was reflected with vertical releasing incision starting from the distal of the tooth 12 to distal of the tooth 23 (fig. 6). A large periapical defectwas seen with complete loss of labial cortical plate (fig. 7).Tissue curettage was done at thedefect site followed by thorough irrigation using sterile saline solution (fig. 8). Using #702 tapered fissure bur (SS White burs), root end resection was performed in teeth 21. A 10ml sample of whole blood was drawnfrom the patient's right arm. The blood sample was transferred into a test tube without anticoagulant and centrifuged immediately at 3000rpm for 10 minutes to obtain the PRF (fig. 9). Commercially available HA bone graft crystals were placed and sprinkled over the PRF gel and together the mixture was placed into defect (fig. 10,11). Flap stabilization was done by suturing using 3-0 black silksuture material (Sutures India Pvt. Ltd, Karnataka, India) (fig. 12).Analgesics and antibiotics were prescribed andthe patient was advised to use chlorhexidine mouthwashfor a week. The sutures were removed after 7 days.

Clinical healing was uneventful. Patient was reviewed at 3 months,6 months and 8 months. After 1 month, healing sinus was noticed (fig. 13).After 3 months patient was asymptomatic (fig. 14). 6 months and 8months follow up radiograph shows complete bone formation (fig 15 and fig. 16).

Fig6-Flap reflection

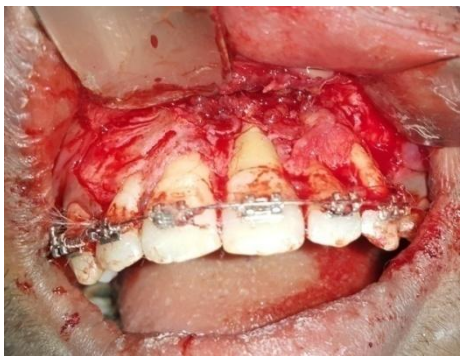

Fig7-exposure of lesion

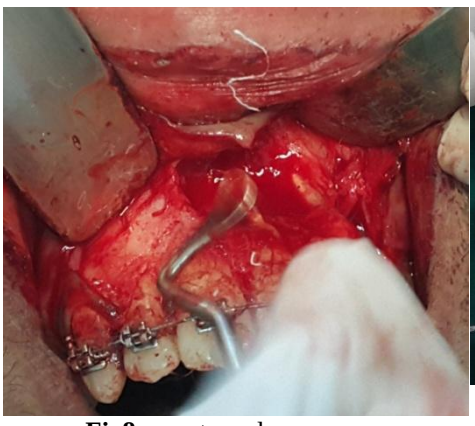

Fig8-curretage done

Fig9-fragmentation of prf

Fig 10-mixing of prf with bone graft

Fig 11-placement of combination In the defect

Fig12-suture placement

Fig 13- 1 month follow up

Fig 14-3 months follow up

Fig 15-6 months follow up

Fig 16- 8months follow up

III. Discussion

The success of an endodontic procedure depends uponcomplete healing of the lost periapical tissues. Most periradicular lesions heal uneventfully afterconventional endodontic treatment. However, some cases might require surgical intervention to remove thepathological tissue and to eliminate the source of irritation that could not be removed by orthograde root canal treatment[5.]

This case report demonstrates that the combination of PRFand hydroxyapatite in management of periapical lesion which showed satisfactory healing of periapical pathosis.

The ultimate outcome of the nature of wound healing after endodontic surgery can be repair or regeneration depending on the nature of the wound; the availability of progenitor cells; signaling molecules, adhesion molecules, extracellular matrix and associated noncollagenousprotein molecules[1].Since repairdoes not reconstitute the architecture and functions of the original tissueafter wound healing, regenerative approachesthat aim to restore the lost tissues (periodontal ligament, bone, cementum, and connective tissue) havebeen introduced[11.] Bone regeneration after surgical intervention takes place in a veryslow manner. Hence, to enhance these processes a number of bone substitutes are being tried out[5].

Hydroxyapatite crystals when used, act as a scaffold upon which new bone isdeposited, followed by a slow resorption of the graft[5].Synthetic bone graftsinduce regeneration by osteoconduction, whereas, these biological modulators induce regeneration byosteoinduction[6].Bone grafts alone without a blood clot or angiogenic factors are not likely to be capable ofpromoting periapical wound healing.[1]

PRF, in the form of a platelet gel,can be used in combination with bone grafts tooffer severaladvantages which include promoting wound healing, bone growth and maturation, graft stabilization, wound sealing, haemostasis and improving the handling properties of graft materials[12].PRF prepared using Choukroun's technique, is preparednaturally, without the addition of thrombin[13].PRF results from a natural and progressive polymerization occurring during centrifugation. The fibrin network thusformed presents a particularly homogeneous three dimensionalorganization, highly coherent than naturalfibrin clots[2].

PRF may play an important role in therevascularization of the graft by supporting angiogenesis[8].The PRF clot forms a strong natural fibrinmatrix, which concentrates almost all the platelets andleucocytes of the blood harvest,and creates a complexarchitecture as a healing matrix, that canprotect growth factors from proteolysis[8,13].PRF contains large number of growth factors like platelet derivedgrowth factor (PDGF), transforming growth factor β1 (TGF β1), insulin like growth factor (IGF), etc., exhibiting varied potent local properties such as cell migration, cell attachment, cell proliferation and celldifferentiation These growth factors are involved inwound healing and are promoters of tissue regeneration[1].

The progressive polymerization mode of coagulation in PRF helps in the improved incorporation of the circulating cytokines into the fibrin meshes (intrinsic cytokines) whichhelps in wound healing by moderating the inflammation[14].

Sculean et al concluded that the combination of barrier membrane and grafting materials results in histological evidence of periodontal regeneration, predominantly bone repair[1].Pradeep et al in their study concluded that combination of hydroxyapatite andPRF increases the regenerative effects in the treatment of human three wallintrabony defects[9].

The advantages of PRF over PRP are its simplified method of preparation and lack of biochemical handling of the blood. Calcium chloride and bovine thrombin accelerators are used in preparation of PRP,which is discovered to be associated with the development of antibodies to thefactors V, XI and thrombin, resulting in the risk of lifethreateningcoagulopathies[12].When compared to PRP,PRFdoes not dissolve quickly duringthe following hours after application .PRFresults to be slowly destroyed by remodeling due to the solid consistency of fibrin like anatural blood clot.In addition, theembedment of numerous growth factors in this matrixappeared logical and natural [13].

It requires around 1 year duration for complete healing to occur after the periapical surgery while with the use of PRF, healing is rapid and requires approximately 6 months for complete regeneration of bone[2].

. In this case report PRF in conjunction with hydroxyapatite crystals induced the rapid rate of bone formation and showed satisfactory healing of the periapical pathosis.

IV. Conclusion

PRF is a rich source of growth factors and itsapplication is an effective way to induce tissue repair and regeneration.In a clinical situation the use of bone substitutes like hydroxyapatite crystals in combination with PRF will definitely enhance periapical regeneration.

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