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RESEARCH ARTICLE

PLATELET RICH FIBRIN: REVIVAL WITH BARRICADES

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ABSTRACT

In dentistry the paradigm has shifted from repair to regeneration. This is possible using various regenerative procedures. Over the years, newer approaches in surgical regenerative procedures have evolved, Platelet Rich Fibrin (PRF) or second generation platelet concentrate is an autologous material containing all the constituents of a blood sample which are favorable to healing and immunity is one such approach. When compared to the use of Platelet Rich Plasma (PRP), PRF has advantages that; it is simplified, cost effective, promotes effective cell migration, cell proliferation etc. This case report highlights the role of Platelet Rich Fibrin, and benefits it offers to future of interdisciplinary approach in promoting guided tissue regeneration using membrane.

INTRODUCTION

Periapical lesions are seen as alocalized response around the apex of the toot has a result of periodontal disease following necrosis of pulp. In Sumi *et al.,* 1996 reported periapical surgery as one of the least understood and most meagerly performed procedure. Surgery aims to remove periapicalpathosis and further encourage wound healing that can be appreciated in the form of repair or regeneration. The success of surgical approach varies between 37 to 91% (Pinarrocha Diago *et al.,* 2008). Replicating complex tissues of oral cavity by utilizing complex natural scaffolds, thereby producing a homologized tissue-engineered organis a big task. Platelet-rich fibrin (PRF), a second generation platelet concentrate by Choukron *et al* from France in 2001 (Choukroun *et al.,* 2001),developed as an improvement over the earlier introduced platelet rich plasma (PRP) is perfect for this challenging task as it would serve as both healing and interpositional material. Various biomaterials like autografts, allograft, xenografts, composite grafts and alloplasthave been tried in periapical pathology but unfortunately they did not undergo healing followed by regeneration as the graft is wrapped with connective tissue (Bashutski and Wang, 2009). Use of barrier membranes over bone graft is required as it prevents the cells of undesired tissue to access the bone graft placed in the defect (Lin *et al.,* 2010; Nyman *et al*., 1982) first gave the concept of guided tissue regeneration.

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The technique requires neither anticoagulant nor bovine thrombin (nor any other gelling agent) (David and Dohan, 2006). It is nothing more than centrifuged blood without any addition. The success of this technique entirely depends on the speed of blood collection and transfer to the centrifuge. Indeed without anticoagulant, the blood samples starts to coagulate almost immediately upon contact with the tube glass, and it takes a minimum of a few minutes of centrifugation to concentrate fibrinogen in the middle and upper part of the tube. Quick handling is the only way to obtain a clinically usable PRF clot. Hence, the PRF protocol makes it possible to collect a fibrin clot charged with serum and platelets. PRF is a rich source of PDGF, TGF, and IGF, etc., application of PDGF increased bone regeneration in defects of skullcap using a bio-absorbable membrane in an in vivo study. TGF helps in deposition of bone matrix and further stimulated bio-synthesis of type I collagen. Increased proliferation of human osteoblasts have been demonstrated with a combination of PDGF, IGF-I, TGF, and epidermal growth factor (Palwinder Kaur *et al.,* 2011).

CASE REPORT

A 25-years-old male patient came to the Department of Periodontics and Implantology with a chief complaint of mobility and pain in the right upper front teeth region (teeth #12) on biting since 10-12 months (Figure 1). The patient had no medical contraindication to dental treatment. Past dental history revealed an incident of trauma to the upper front teeth

region 7-9 years ago. Clinical examination revealed grade II mobility irt to tooth #12.Thermal and Electric pulp vitality test were done.12 showed no response whereas 11 and 13 showed positive response. Upon radiographic examination, periapicalradiolucency was observed at the apical region of teeth #11, #12 and #13 (Figures 2).Calcification was seen in cervical and middle portion of teeth with faint appearance of canal in apical third. Periodontal ligament widening was seen around #12. Splinting was done. The root canal treatment was performed in #12 using step back technique till an apical size of # 55 respectively. 5.25% sodium hypochlorite solution (Novo Dental Product Pvt Ltd, India) was used as an irrigant during the canal preparation. Root canal was obturated using gutta percha (Dentsplymaillefer Ballaigues) and AH 26 (Dentsply DeTrey Gmb, H., Philadelphia, USA) by the lateral condensation technique [Figures 3].

As lesion was bigand patient wanted rapid healing so periapical endodontic surgery wasplanned with informed consent from patient. Splinting was done. Under local anesthesia (1:200000 adrenaline, DJ Lab, India), a full thickness mucoperiosteal flap was reflected by a Crevicular incision starting from the distal of the tooth#13 to distal of the tooth #21 with vertical releasing incisions. A large periapical defect was seen with complete loss of buccal cortical plate. Cavity was prepared at the site of defect. Tissue curettage was done followed by thorough irrigation using sterile saline solution. Using #702tapered fissure bur (SS White burs), root end resection was performed in teeth and GIC was used as the root end filling material (Figures 4). 20 mL of blood was drawn from the patient's antecubital vein and centrifuged (REMI centrifuge machine Model R-8c) for 10 minutes under 3000 revolutions to obtain the PRF (Figure 5).

Figure 1.

Figure 2.

Figure 3.

Figure 4.

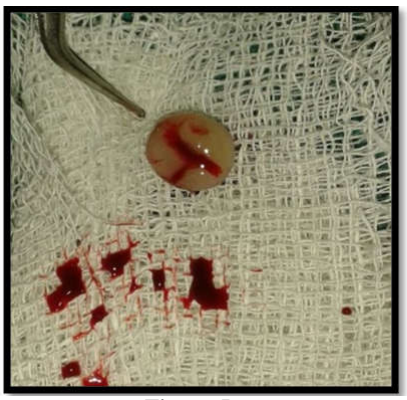

Figure 5.

Figure 6.

Figure 7.

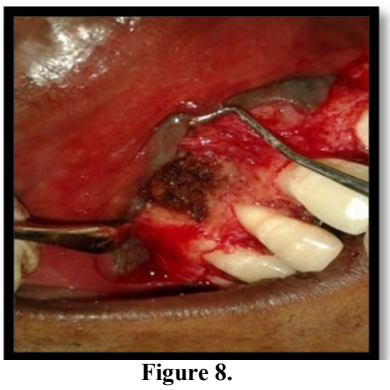

Figure 8.

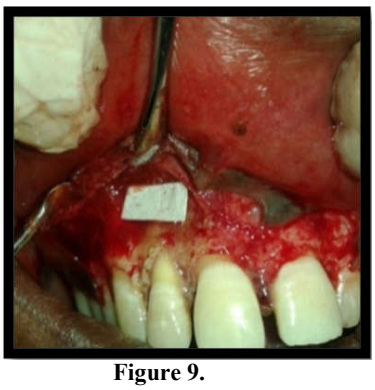

Figure 9.

Figure 10 .

Figure 10a.

Figure 11.

Figure 11a.

Commercially available Hydroxyapatite (HA) bone graft crystals (Biograft, H. A., IFGL Bioceramics Ltd., India) were sprinkled over the PRF gel and mixed together (Figure 6, 7). Tetracycline powder is added to the mixture of bone graft and PRF and was placed into the defect (Figure8). At last Periocol-GTR (Eucare Pharmaceuticals ltd., India) membrane was applied to cover the entire defect and to promote guided tissue regeneration (Figure 9). Flap stabilization was done followed by suturing using 3-0 black silk suture material (Sutures India Pvt. Ltd, Karnataka, India) and coe-pack was applied(Figure 10,10a).Patient was kept under the antibiotic (amoxycillin) coverage along with ketorol-DT Tab (Dr. Reddy's Lab, Andrapradesh, India) 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 (Figure 1e).Patient was reviewed at 3 months and 6 months (Figure 11,11a), during which there were no symptoms of pain, inflammation, or discomfort. These follow-up visits included routine intraoral examinations and professional plaque control.

DISCUSSION

The exact mechanism by which periapical lesions are formed is not clearly understood. An inflammatory reaction may be evoked due to egress of irritants from infected root canal into the periradicular tissue which can initiate the formation and perpetuation of periapical lesion. Depending upon the nature and quantity of irritants, duration of exposure the lesions may varies from simple periodontitis, granulomas, cysts or various fibro-osseous lesions. 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. The four critical factors that influence bone regeneration after the periapical surgery are primary wound closure, angiogenesis as a blood supply and source of undifferentiated mesenchymal cells, space maintenance, and stability of the wound (PASS principle) (Wang and Boyapati, 2006). PRF has been widely used to promote soft and hard tissue healing. (Toffler *et al.,* 2009; Dohan *et al*., 2006) proved that there are better results of PRF over PRP as there is slower release of growth factors and it was shown that the cells are able to migrate from fibrin scaffold. It has been reported that combination of HA with PRF resulted in greater pocket depth reduction, gain in clinical attachment and defect fill than PRF used alone (Pradeep *et al.,* 2012). For this reason, we chose HA, as that 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. (Sculean *et al.,* 2012) in their study concluded that the combination of barrier membrane and grafting materials may result in histological evidence of periodontal regeneration, predominantly bone repair. (Pradeep *et al.,* 2012) in their study concluded that when HA is combined with PRF,it increases the regenerative effects observed with PRF in the treatment of human three wall intrabony defects. 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 (Sunitha *et al.,* 2008).

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