



## RESEARCH ARTICLE

# REGENERATION OF IMMATURE NECROTIC TOOTH USING SECOND GENERATION PLATELET CONCENTRATE

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### ABSTRACT

**Introduction:** Regenerative endodontics in immature necrotic teeth helps in root elongation and dentinal wall thickening. This case reports the use of Platelet rich Fibrin as a scaffold for regeneration in such tooth.

**Methods:** An 11 year old boy with the history of trauma was diagnosed with the pulpal necrosis, open apex and symptomatic apical periodontitis in tooth #21. Access preparation and minimal instrumentation was done to remove necrotic debris under copious irrigation with 2.5% sodium hypochlorite. Triple antibiotic paste was packed in the canal for four weeks. The intracanal medicament was removed and Platelet rich fibrin (PRF) prepared utilizing Choukroun's method was pushed to the apical region of root canal. Access cavity was sealed with GIC coronally and tooth was permanently restored with composite.

**Results:** Clinical examination at 6 and 12 months revealed no sensitivity to percussion and palpation in tooth #21. Radiographic examination showed resolution of periapical rarefaction, further root development and apical closure of the tooth #21.

**Conclusion:** On the basis of successful outcome of the present case it can be stated that PRF clot may serve as a scaffold for regeneration in necrotic immature teeth.

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## INTRODUCTION

The nonsurgical endodontic treatment offers questionable prognosis and unreliability for management of immature necrotic teeth (Cvek, 1992; Trabert *et al.*, 1978). The thin dentinal walls and open apices pose challenge to instrumentation and obturation in such teeth (Kerezoudis *et al.*, 1999). Frank AL in 1966 advocated the use of long term calcium hydroxide dressing to form an apical barrier (Frank, 1966) but Cvek M 1992 showed that the tooth fracture is the major reason of tooth loss following calcium hydroxide apexification as it reduces the root strength due to denaturation of collagen (Andreason *et al.*, 2002; Andreason *et al.*, 2006). Moreover apical barrier formed by it is porous in nature (Steiner *et al.*, 1968) Torabinejad in 2000 pursued the single step MTA apexification (Shabahang and Torabinejad, 2000) but it still was challenge to clinicians as there is no further root development and thin dentinal walls remain susceptible to fracture (Ballesio *et al.*, 2006) Hargreaves *et al* in 2008 reported that tissue engineering can be applied to apical region

of such teeth to promote the root growth and dentinal wall thickening. It requires correct spatial orientation of stem cells, scaffolds and growth molecules. The signaling molecules from the remnant hertwig's epithelial root sheath cells may stimulate the surrounding stem cells in the presence of a scaffold to form odontoblast like cells if environment is sterile (Hargreave *et al.*, 2008; Langer and Vacanti, 1993). These odontoblasts like cells help in further root elongation and maturation. This case reports the use of PRF as a scaffold with concentrated growth factors for regeneration in immature necrotic teeth.

### Case report

An 11 year-old boy reported to the department of conservative dentistry and endodontics with the chief complaint of pain in the left maxillary central incisor. The patient gave the history of road mishap two years ago. The medical history was noncontributory. The extraoral examination showed no significant changes. The intra-oral examination showed absence of any other soft tissue abnormalities. Clinical examination revealed slight discoloration and mild swelling on the buccal aspect with respect to tooth #21. It was sensitive to percussion and palpation tests.

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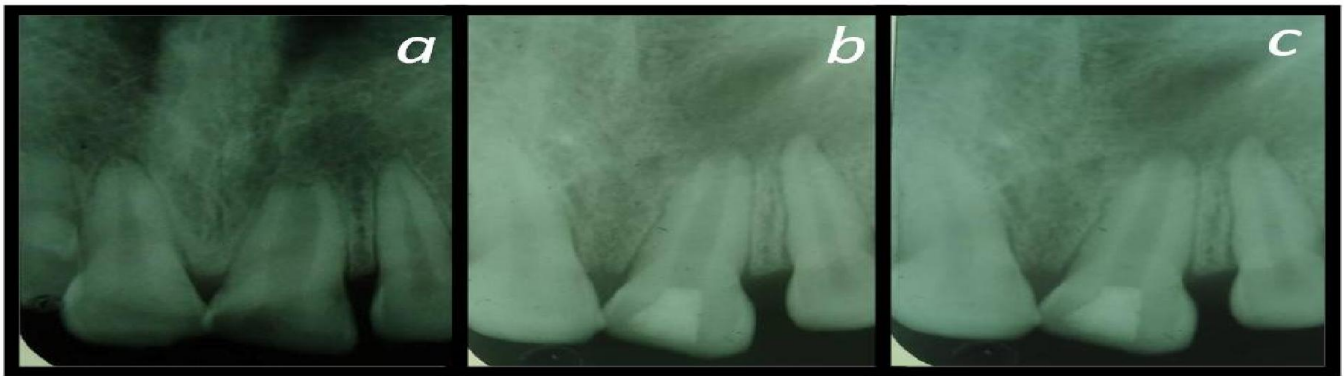


Fig 1c. Postoperative intraoral periapical radiograph at 12 months

It did not respond to 1, 1, 1, 2-tetrafluoroethane (Endo-Ice; Hygenic Corp., Akron, OH, USA) and electric pulp test (Analytic Technology, Redmond, WA, USA). The adjacent teeth were asymptomatic and responded positively to pulp testing. The periodontal examination of all teeth showed probing depths within normal limits. An intraoral radiograph (XCP, Dentsply) showed an immature root associated with periapical pathology in tooth #21 (Fig. 1a) On the basis of clinical and radiographic findings, the diagnosis of necrotic pulp with symptomatic apical periodontitis was made. Various treatment options were explained to the parents. They agreed for regenerative endodontic procedures with the aid of PRF.

Under rubber dam isolation, access preparation was done in tooth #21 after obtaining the local anesthesia. Minimal instrumentation was done and the canal was continuously irrigated with 2.5% NaOCl for 15 minutes. Equal proportions of ciprofloxacin (Bayer, Leverkusen, Germany), metronidazole (Shionogi and Co, Ltd, Osaka, Japan), and minocycline (Aurobindo, Andhra Pradesh, India) were ground and mixed with distilled water to a thick paste consistency. Canal was dried and the antibiotic mixture was packed in the canal using large endodontic pluggers. The access cavity was sealed with Cavit (ESPE, Chergy Pontoise, France). Patient was kept on follow up period of four weeks and anti-inflammatory medications were prescribed for three days. Tooth #21 showed no sensitivity to percussion and palpation, absence of pain and swelling during follow up. A 5 ml of whole blood was collected from the median cubital vein of the patient and was subjected to centrifugation at 2400 rpm for 12 minutes for the preparation of PRF clot. Temporary restoration was removed and the triple antibiotic mixture was washed out with saline and 2.5% sodium hypochlorite. Canal was dried and the fibrin membrane was pushed with Buchanan Hand Plugger Size #2 (Orange, CA Sybron Endo) 1mm beyond the confines of working length and coronally to the level of cemento-enamel junction. A 1 layer of GIC was applied directly over PRF clot. Tooth was permanently restored with composite (Esthet. X HD, Dentsply, UK). The patient was kept on follow up for 6 and 12 months (Fig 1b, 1c). Clinical examination on follow ups showed tooth #21 was asymptomatic. Radiographic examination was done using XCP (Dentsply) for standardization at 6 and 12 months (Fig. 1b, 1c) which showed resolution of the periapical lesion, further root development and continued apical closure in tooth #21.

## DISCUSSION

Tissue engineering in the apical region of immature necrotic teeth leads to the apexogenesis and maturogenesis (Weisleder and Benitez, 2003). The thickened and convergent dentinal walls add to the overall resistance of the tooth to fracture and increase the longevity of the tooth. This regenerative process is accomplished after complete disinfection of the root canal and placement of a matrix in the canal for tissue in-growth. Minimal instrumentation and copious irrigation was done with 2.5% NaOCl and to achieve further disinfection, a 1:1:1 mixture of ciprofloxacin, Metronidazole and minocyclin was used as an intracanal medicament for four weeks. This triple antibiotic paste has proven to be effective in killing the polymicrobial endodontic flora in necrotic and infected root canals (Hoshino *et al.*, 1996) Appropriate scaffolding is necessary to give correct spatial location to stem cells and to regulate its differentiation, proliferation and metabolism by different growth factors. Platelet derived growth factor (PDGF-AB), transforming growth factor  $\beta$  (TGF- $\beta$ ), insulin-like growth factors derived from platelet concentrates have been evaluated for their ability to guide the stem cells to differentiate into odontoblasts like cells (Harrison and Cramer, 1993). Choukroun's platelet-rich fibrin (PRF) is a second generation platelet concentrate and is a source of such growth micromolecules in a concentrated form. It gives the good outcome as a scaffold opposed to synthetic polymer and collagen gels in terms of cost, inflammation, immune response and toxicity levels (Ahmed *et al.*, 2008) The clinical application platelet rich fibrin has proven to be vital in the other fields of dentistry like implant dentistry, periodontal surgeries (Soffer *et al.*, 2003) sinus lift procedures (Choi *et al.*, 2006) and medical fields like ear, nose, throat (ENT) surgeries, plastic and orthopaedic surgeries. The successful clinical outcome of using PRF in the present case was measured in terms of increased root length, dentinal thickness and apical closure. This case report shows that PRF has ideal properties to be used for regenerative endodontic procedures.

## Conclusion

On the basis of short term results of present case report, it is reported that PRF is an ideal scaffold for regeneration of tissue in necrotic immature teeth as it is natural, easy to handle and non immunogenic.

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"The authors deny any conflicts of interest"

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