University Journal of Dental Sciences

PULP REBIRTH USING PRF GEL REVASCULARIZATION: A BOON TO IMMATURE NECROSED YOUNG PERMANENT TEETH

Clinic Paper

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ABSTRACT: Revascularization is an alternative treatment for immature necrotic teeth, with a biological basis. Unlike techniques of an artificial apical barrier, it allows the continuation of root development and recovery of pulp vitality. The purpose of this case report is to describe successful revascularization procedure in 8 years old boy with immature non-vital permanent central incisor. After passive instrumentation of root canal wall and medication with triple antibiotic paste, bleeding was induced with subsequent clot formation followed by PRF gel insertion and placement of an MTA plug. Coronal sealing was performed with composite resin. Clinical and radiographic control revealed that the tooth was asymptomatic and the root apex closure had appeared with the successful revitalization of the non-vital pulp tissue. Thus, this case adds to support the revascularization approach of non-vital young permanent teeth.

Keywords:
Pulp revascularizarion, Young Permanent teeth, Open apex, Non-vital, Platelet-rich fibrin gel.

Conflict of interest: Nil
No conflicts of interest : Nil

INTRODUCTION: Pulp necrosis in immature young permanent teeth is challenging clinically due to open root apex with incomplete root development. The traditional techniques to manage such teeth, include apexification with calcium hydroxide (Ca[OH]2) or Mineral trioxide aggregate (MTA).[1] With such techniques, successful root-end closure is induced, but the tendency for root fracture is increased due to lack of continued root development both in terms of length and wall thickness.[2,3] An alternative to these methods, regenerative endodontic strategies has been advocated to promote root development with the successful revitalization of the dead pulp tissue. This case report presents revitalization along with root apex closure in an eight years old boy with non-vital permanent central incisor using PRF (platelet-rich fibrin gel) as scaffold along with blood clot.

CASE REPORT: An 8-year-old boy reported with the chief complaint of fractured upper front tooth associated with occasional spontaneous pain for the past six months. The patient gave a history of fall from stairs nine months back and had not sought treatment for the same until now.

On Clinical Examination, the upper left central incisor tooth presented with complicated crown fracture and was non tender to percussion with no abnormal mobility [Figure 1].

Figure : Preoperative Clinical Image showing fractured tooth 21.

The tooth did not respond to cold test or an electric pulp test. Radiographic examination revealed an incomplete root formation with open apex with no signs of periapical changes [Figure 2].

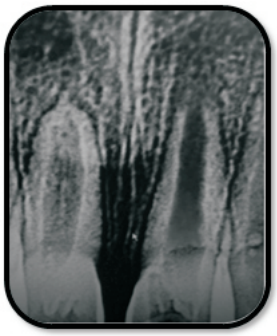

Figure : Preoperative Radiographic Image of tooth 21 showing wide open apex.

Different treatment approaches with their Pros and Cons to treat such teeth were explained to the parents including Periapical surgery, calcium hydroxide apexification, MTA apical barrier apexification and Pulp Revascularization technique.

They agreed for attempting pulp revascularization and informed consent was obtained fot the same.

Banchs and Trope[4] technique was followed for pulp revascularization. Rubber dam isolation was done and Access Cavity was prepared, the canal was not instrumented, copious disinfection was done with 10ml of 5.25% sodium hypochlorite followed by normal saline, the canal was then dried with paper points and was filled with triple antibiotic paste (metronidazole, ciprofloxacin, minocycline in a ratio of 1:1:1 in propylene glycol). The access cavity was sealed with temporary cement for 21 days.

After 21 days the patient was asymptomatic when recalled so after administration of local anaesthesia (2% lignocaine) without any vasoconstrictor, the triple antibiotic paste was removed followed by irrigation with 5.25% sodium hypochlorite and saline, bleeding was then induced into the canal using sterile 15 K file coated with EDTA (ethyelene diamine tetraacetic acid) a calcium chelating agent added to facilitate periapical bleeding beyond the root apex [Figure 3].

Figure : Induction of Bleeding in the Root Canal of tooth 21 for the formation of Blood Clot Scaffold during Revascularization of tooth.

After 15-20 minutes blood clot was formed till cementoenamel junction, then platelet-rich fibrin gel freshly prepared from patients blood was inserted into the canal and placed over the blood clot to form a supportive scaffold. [Figure 4]

Figure : PRF gel preparation by Centrifugation followed by its insertion over the blood clot scaffold.

White MTA (Mineral Trioxide Aggregrate) was then mixed in distill water and placed over the gel scaffold (2-3mm). A moist cotton pellet was placed over MTA plug and access was sealed with temporary cement.

After three days, temporary filling and cotton pellet were removed and MTA setting was checked, and the tooth was restored with composite resin to get a 3-dimensional tight hermetic seal. The patient was followed clinically and radiographically after 3 months, 6 months, 12 months, 18 months. Pulp re-vitality was also checked at every appointment [Figure 5,6,7,8]. The tooth showed no abnormal mobility, radiographically normal peri-radicular tissues with continued root length development, and root wall thickening was seen. After 18 months of follow up the tooth, 21 did respond to cold test and Electric Pulp Testing thereby showing successful revitalization of necrosed pulp tissue with complete closure of open root apex.

RADIOGRAPHIC EVALUATION:

Figure 5: Follow-up after 3 months irt tooth 21 showing Open Apex with tight hermetic seal of MTA and Composite resin.

Figure 6: After 12 months follow up tooth 21 showing Partial Root Apex Closure with lateral root wall thicking and root length enlonagtion.

Figure 7: After 18 months, Root length Elongation was seen with full Root Apex Closure irt tooth 21 with absence of any periapical changes.

Figure 8: Post-Operative Clinical Image after 18 months. Tooth 21 responded positively to cold testing and Electric pulp test showing successful revitalization of necrosed pulp.

DISCUSSION: Pulp revascularization is the reintroduction of vascularity in the root canal system. The stem cells from apical papilla have received special attention in the field of pulp revascularization.[4,5] The purpose of scaffolds is to provide a three-dimensional structure for stem cells to proliferate and differentiate into the desired cells.[6]The patient blood clot has got cytokines and growth factors in low concentration while PRF gel also is known as Choukroun's PRF is obtained by centrifuging the drawn blood from a patient without adding anticoagulant. Thus soon when blood comes in contact with the glass surface of test tube coagulation starts.[6,7] PRF has a rich source of growth factors like Platelet derived growth factors, transforming growth factors, insulin growth factors, (PDGF,TGF,IGF) and cytokines.[7] Among different scaffold tried PRF is found to be most suitable biological scaffold.[8]In this case scaffold for ingrowth of tissue was induced by bleeding and allowing the formation of clot over the CEJ. To induce bleeding a sharp bent was given in the K file dipped in calcium chelators like ethylenediaminetetraacetic acid (EDTA) and Local Anaesthesia was given without vasoconstrictor. PRF Gel (Platelet Rich Fibrin) was placed over the blood clot. Disinfection of the root canal space with an intracanal medicament also plays an essential role in apical closure. In the present case, copious irrigation was done using 5.25% sodium hypochlorite along with 0.2% chlorhexidine to prevent the invasion of bacteria into the pulpal space.Differentirrigants used successfully are providoneidodine, saline, 3% hydrogen peroxide.[5] Triple antibiotic paste and calcium hydroxide have been used with good results. However, calcium hydroxide due to its high pH can lead to tissue necrosis, thereby interfering with cell differentiation[7]. As described by Hoshino et al. [9] triple antibiotic paste is most effective for disinfection, in present case tooth discolouration is caused due to the presence of minocycline which can be replaced with cefachlor and is equally effective for disinfection. A bacteria tight seal in our case was obtained with MTA over the clot and PRF gel and sealing the access with composite resin. Often, a blood clot is not strong enough to hold MTA resulting in the collapse of MTA. A technique of placing collagen matrix, co plug[10] above the blood clot serves as a solid absorbable matrix against which MTA can be packed.

Histologically, Torabinejad[10] reported regeneration of pulp-like tissue in one of their cases where they used PRP as a scaffold. Examination of the tissue removed from the canal revealed the presence of vital pulp like connective tissue.

In the present case report, clinical success was identified with lack of symptoms like pain, swelling, absence of tenderness to percussion, and mobility and radiographically successful apical closure was seen at the end of 12 months with the revitalization of pulp tissue at the end of 18 months. Banchs

and Trope[4] alsoreported positive vitality response in their case at the end of 2 yearsof follow up period.

CONCLUSION: In the current case, both clinical and radiographic evidence showed successful pulp revascularization treatment of an immature permanent tooth. However, more studies are needed to understand the use of PRF gel as scaffold along with blood clot comparing different protocols.

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