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## Endodontic management of open apex in a tooth using platelet rich fibrin mediated regeneration

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### Abstract

Endodontic management of open apex includes conventional treatment method using calcium hydroxide for apexification or use of mineral trioxide aggregate plug. Use of calcium hydroxide for long time causes weakening of dentinal structure which may lead tooth to fracture in later stage. Mineral trioxide aggregate is advantageous as compared to increased number of appointments with calcium hydroxide. Recently, modified concept of regeneration has been suggested as the treatment plan of open apex tooth. Effective disinfection of root canal is of utmost importance for the regeneration of pulp dentin complex. This article presents a case report with endodontic regeneration using platelet rich fibrin for revitalization of immature non vital tooth.

**Keywords:** Open apex, regeneration, platelet rich fibrin

### Introduction

Immature teeth with open apices pose problems in the field of endodontics due to significant risk of complications including root fracture and accidental injection of fluids or filling materials beyond root apex. These immature apices present challenges to the clinician during complete cleaning and obturation of root canal. Hence, apexification of immature tooth is the treatment procedure before obturation of root canal system. Traditionally, apexification procedure involves increased timely use of calcium hydroxide but long term use of calcium hydroxide makes tooth more susceptible to fracture<sup>[1, 2]</sup>. However, later on use of mineral trioxide aggregate (MTA) in apexification has shown accelerated success outcome as compared to calcium hydroxide. Use of MTA also has not completely reduced the chances of root fracture<sup>[3]</sup>. However, regenerative endodontic procedure helps to provoke the new pulp dentin complex which will make the tooth structure quite favourable. Regeneration results in apical closure, thickening of lateral dentinal walls alongwith regeneration of pulp-dentin complex and helps maturogenesis in non-vital immature tooth. Stem cells, growth factor and scaffold are three important factors for success of regeneration<sup>[4]</sup>. The purpose of the case report is to use platelet rich fibrin (PRF) as scaffold for the regeneration in open apex case.

### Case report

11 year old girl came to the department of Conservative Dentistry and Endodontics with the chief complaint of broken and discoloured upper front tooth. Dental history reveals trauma to upper front tooth and medical history was non-significant. On intraoral examination, Ellis class IV fracture was detected w.r.t 11 and with no soft tissue abnormality (fig 1). Adjacent and opposite teeth were in normal status. Tooth 11 did not respond to cold test and electric pulp test. Periodontal probing depth of tooth 11 was normal. CBCT revealed an open apex with periapical radiolucency area measuring to 47 square mm in coronal plane (fig 2). Diagnosis was made as asymptomatic apical periodontitis with necrosed pulp. Treatment was planned to perform regenerative endodontic procedure using platelet rich fibrin. Treatment was explained to the patient and written informed consent was taken from the parent of the patient.

The methodology followed was based on the guidelines of the American Association of Endodontists and the European Society of Endodontology. Local anesthesia was administered using 2% lignocaine with 1:200000 adrenaline. Access cavity was prepared with rubber dam application on the tooth #11. Working length was determined and canal was thoroughly irrigated with 20 ml of 3% sodium hypochlorite (Prime Dental, India) followed by 20 ml of 17% EDTA (Desmear, Anabond, India)(fig 3) as per the methodology of American Association of Endodontists. Drying of canal was performed with paper points, calcium hydroxide (Ultracal, Ultradent, USA) was placed as an intracanal medicament and access cavity was sealed with Cavit (3M ESPE, Germany) (fig 4). Patient was scheduled for second appointment after 4 weeks and tooth was re-accessed. CBCT was done to observe the healing of periapical lesion. Removal of previously placed calcium hydroxide was performed from canal with same irrigation protocol. 10 ml of blood was taken intravenously from patient right antecubital vein and collected in test tube and centrifugation was done at 3000 rpm for 10 minutes in a tabletop centrifuge machine (Remi Laboratories, Mumbai). PRF was obtained having a jelly like consistency which was condensed into the canal below the level of cemento-enamel junction using hand pluggers so that it reaches the apical end (fig 5) (fig 6). Collagen membrane was placed over PRF and MTA (ProRoot MTA, Dentsply) was placed to thickness of 3mm followed by placement of moist cotton pellet (fig 7)(fig 8). Access cavity was sealed with temporary restoration. Radiograph was taken to confirm placement of MTA (fig 9). Patient was recalled 24 hrs later to replace the temporary restoration with glass ionomer restoration. Patient was under follow up for 6 months and 12 months. It was found that healing of periapical lesion was progressing and patient was asymptomatic at 6 months. Further, regression of periapical lesion to an area 6square mm along with apical closure was found on CBCT after 12 months follow up (fig 10). Fractured tooth was restored with composite restoration (fig 11). Cold test and electric pulp test response was found to be positive.

#### Discussion

Regenerative procedure in the field of endodontics was introduced by Ostby in 1961 [5]. This procedure helps in apexogenesis, apexification and also in vital pulp therapy. The procedure has an added advantage over standard apexification procedure by inducing further root development, increasing dentinal thickness with root length and formation of apical closure with the help of mesenchymal stem cells and scaffolds. Many scaffolds has been used like blood clot, platelet-rich plasma and PRF, collagen scaffolds, polyglycolic acid, polylactic glycolic acid. PRF has shown to be the most successful on basis of biocompatibility and growth factor release [6]. Inducing blood in the pulp canal was easy with minimum armamentarium but it was difficult to achieve the clot at the level of CEJ [7]. Furthermore, growth factor release by blood clot was also unpredictable. PRF a second generation platelet concentrate, found to have more advantageous as compared to PRP as PRF causes maintained release of growth factors such as platelet derived growth factor, transforming growth factor  $\beta$ 1 for atleast 1week and up to 28 days which are known to promote proliferation of mesenchymal stem cells to help regeneration of tissues [8]. Synthetic scaffolds are found to be toxic and more expensive. Hence, PRF was used in this case as a scaffold which could release growth factors for wound healing process. Sodium hypochlorite of 3% concentration was used as 5.25% concentration causes adverse effect to stem cells. Use of

calcium hydroxide was preferred over triple antibiotic paste as calcium hydroxide is beneficial for the proliferation, survival, and differentiation of stem cells at all concentration. Triple antibiotic paste also has harmful effect on stem cells in applied concentration [9]. Ideal concentration of triple antibiotic paste suited for use is 0.01-0.001mg/ml which is impossible to attain clinically. MTA has been packed over PRF such that to have a tight coronal seal and also helps in providing signalling molecules for growth of stem cells [10]. CBCT was performed at regular intervals to confirm the success of the treatment.



Fig 1: Ellis Class IV fracture w.r.t 11



Fig 2: Open apex with periapical radiolucency of area 47mm<sup>2</sup>



Fig 3: Working length determination



**Fig 4:** Calcium hydroxide placement



**Fig 7:** Collagen membrane placed over PRF



**Fig 5:** PRF from centrifugation



**Fig 8:** MTA placement



**Fig 6:** PRF placement in canal



**Fig 9:** Radiograph confirming placement of MTA at CEJ level



**Fig 10:** Regression of periapical lesion to an area 6mm<sup>2</sup> with apical closure



**Fig 11:** Fractured tooth restored with composite

### Conclusion

Regeneration of pulp dentin complex is the main aim of regenerative endodontics. Regeneration is only possible when proper treatment protocol is maintained. Total canal disinfection and use of scaffold plays a major factor in the success of treatment. However, with the advent of PRF and stem cells, this is going to be the future of endodontics.

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### References

1. Staffoli S, Plotino G, Torrijos BGN, *et al.* Regenerative endodontic procedure using contemporary endodontic materials. 2019;12:908.
2. Andreasen JO, Farik B, Munksgaard EC. Long term calcium hydroxide as root canal dressing may increase risk of root fracture. *Dent Traumatol.* 2002;18:134-137.
3. Bose R, Nummikoski P, Hargreaves KA. Retrospective evaluation of radiographic outcomes in immature teeth with necrotic root canal systems treated with regenerative endodontic procedure. *J Endod.* 2009;35:1343-9.
4. Hargreaves KM, Giesler T, Henry M, Wang Y. Regeneration potential of the young permanent tooth: What does the future hold? *J Endod.* 2008;34:51-6.
5. Ostby BN. The role of the blood clot in endodontic

therapy. An experimental histologic study. *Acta Odontol Scand.* 1961;19:324-53.

6. Narang I, Mittal N, Mishra N. A comparative evaluation of the blood clot, platelet-rich plasma, and platelet-rich fibrin in regeneration of necrotic immature permanent teeth: A clinical study. *Contemp Clin Dent.* 2015;6:63-8.
7. Nosrat A, Homayounfar N, Oloomi K. Drawbacks and unfavorable outcomes of regenerative endodontic treatments of necrotic immature teeth: A literature review and report of a case. *J Endod.* 2012;38:1428-34.
8. Doham DM, Choukroun J, Diss A, Dohan SL, Dohan AJ, Mouhyi J, *et al.* Platelet rich plasma: A second generation platelet concentrate. Part I: Technological concepts and evolution. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2006;101:37-44.
9. Ruparel NB, Teixeira FB, Ferraz CC, Diogenes A. Direct effect of intracanal medicaments on survival of stem cells of the apical papilla. *J Endod.* 2012;38:1372-5.
10. Torabinejad M, Paririokh M. Mineral trioxide aggregate. A comprehensive literature review-Part II: Leakage and biocompatibility investigations. *J Endod.* 2010;36:190-202.

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