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Endodontic ManagementOf Open Apex in Permanent Teeth Using MTA and PRF Membrane as an Internal Matrix: A Case Report

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ABSTRACT
A tooth with an immature open apex presents a special challenge to dentists all over because of large open apices, divergent root walls, thin dentinal walls that are susceptible to fracture and frequent periapical lesions. They often pose a threat for iatrogenic errors like over filling or poor apical seal after obturation. So Apexification is the process of induction of calcific barrier across the open apex or the continued apical development in an immature tooth. So, this casereport demonstratesapexification with an MTA (Mineral trioxide aggregate) plug in immature open apex where an apical seal was created using PRF.
Keywords: Apexification, MTA, PRF

I.INTRODUCTION

The fundamental rule in endodontics is to debride and obturate the root canals as efficiently and effectively in the amount of time reasonable to both the patient and the dentist.[1] The success of an endodontic treatment depends significantly on a proper apical and coronal seal .[2]When tooth with incomplete root formation undergoes pulp necrosis due to trauma, caries or other pulpal pathosis, dentin formation is interrupted and root development ceases. Consequently, the root canal is wide, with thin and fragile walls and the apex remains open.[3]Teeth with open apex often pose a challenge to the dentist because of the lack of an apical seal for obturation and higher risk of over filling.[1]

Apexification is defined as a method to induce a calcified barrier in a root with an open apex or the continued apical development of an incomplete root in teeth with necrotic pulp. The goal of this treatment is to obtain an apical barrier to allow compaction of root filling material. [4]

Traditionally, the formation of the barrier was accomplished using calcium hydroxide in a multi visit procedure. The disadvantages associated with this procedure are the unpredictable time needed to form an apical barrier, the need for multiple visits, patient compliance, re-infection due to loss of temporary restoration and also predisposition of the tooth to fracture.[5,6] Another disadvantage of this technique is the nature of the barrier which although apparently calcified is actually porous and is sometimes even found to contain small amounts of soft tissue.[7]In the recent times, an artificial apical barrier is formed by theplacement of various materialswhich included tricalcium phosphate, freeze‐dried bone, freeze‐dried dentin andmineral trioxideaggregate (MTA). However, these materials tend to extrude beyond the apex impinging on the periodontal tissue. The placement of an artificial barrier or matrix provides an apical stop against which sealing material can be placed and packed. Several materials proposed to create a matrix include calcium hydroxide, absorbable collagen, hydroxyapatite, and autologous platelet‐rich fibrin (PRF) membrane.[8]

This case report presents cases of successful closure of root apex in pulpless permanent incisors with open apex using MTA in combination with a PRF as an internal matrix.

II. CASE REPORT

A 25‐year‐old male patient reported with a chief complaintof discoloured and fractured upper front left tooth.Patient gave a history of trauma17 years back. Intraoralclinical examination revealed discoloration and EllisClass IV fracture with relation to #21 [Figure 1].

Thepatient gave no history of swelling or pus discharge.RCT was initiatedat some private dental clinic irt 21, 22 Noother significant medical history was found.Radiographic examination revealed an immature wideopen apex.

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Tooth was not tender to palpationand percussion. Following rubber dam placement,working length was determinedradiographically 1 mm short of radiographic apex.

Fig.1- A. Pre operative photograph B. Pre operative radiograph C. Working length determination D and E. Platelet Rich Fibrin Membrane F. MTA plug G. Post operative radiograph H.Postopearative photograph

Cleaning and shaping was performed with K- files (Mani,Prime Dental, Mumbai, India) using conventionalpreparation technique. Root canal irrigation was performedwith 3% sodium hypochlorite (NaOCl) between change ofinstruments followed by 17% ethelynediaminetetraaceticacid (EDTA) (Prime Dental, Mumbai, India) and saline.

Root canal was then dried with sterile paper points.Calcium hydroxide (Metapex, Meta Biomed, Korea) wasplaced in the root canal, and the access cavity was sealedwith cotton pellet and Cavit G (3M ESPE, Germany). After2 weeks in the subsequent appointment, under isolation,calcium hydroxide dressing was removed by H file andirrigating with alternating solutions of 3% NaOCl and 17%EDTA. A final irrigation with sterile saline was done. Theroot canal was then dried with sterile paper points (MetaBiomed, Korea).Simultaneously, PRF membrane was prepared. A 10 ml sampleof whole blood was drawn and transferred into a 10 ml sterileglass test tube without anticoagulant and was immediatelycentrifuged at 3000 revolutions per minute for 10 min. Theresultant product consisted of three layers: topmost layerconsisting of acellular platelet poor plasma, PRF clot in themiddle, and red blood cells at the bottom.

With a sterile tweezer the PRF clot was removed and squeezed between sterile gauze to drive out fluids trapped between in the fibrin to obtain an autologous PRF membrane.

The freshly prepared PRF membrane was fragmented, and incrementally placed into the root

canal and gently compacted using pre-fitted hand pluggers slightly beyond the apex into the bony spacein order to achieve a matrix at the level of the apexand gentlycompacted using hand pluggers to achieve a matrix at the level of the apex. The mixed MTA was carried into the canal with the help of MTA carrier and was condensed againstthe PRF matrix using hand pluggers. Several increments wererequired to form an apical plug of 4 mm thickness, whichwas confirmed radiographically.

A sterile cotton pellet moistened with sterile water was placed over the canal orifice and the access cavity was sealed temporarily with cavit. The patient was recalled after two days. The root canal was reentered. The setting of the MTA was confirmed by gentle probing with a file .The rest of the canal space was then obturated.

After obturation, non-vital bleaching was done using sodium perborate and saline. After bleaching, calcium hydroxide was placed in pulp chamber for 1 week and then patient was recalled for final compositerestoration.

As patient was not satisfied with the resultant color after bleaching so metal ceramic crown was palced. Six- month follow- up revealed the patient remained asymptomatic with restoredesthetics and functions.

III. DISCUSSION

The clinician has a number of options to treat a case of mature tooth with open apex. These include teeth extraction and subsequent replacement with fixed, removable or implant prosthesis, multiple visits with calcium hydroxide apexification, revascularization with subsequent follow up for apical closure and permanent prosthetic restoration of the tooth or MTA plug and subsequent restoration.

Several studies have shown a positive outcome using MTA as a barrier for apical plug formation. Also, studies have shown that MTA plug reinforces the root structure unlike long term calcium hydroxide that is shown to weeken the radicular dentine.MTA is a biomimetic, biocompatible material and has extensively been used in various dental application like repairing root perforation during root canal therapy, treating internal resorption and pulp capping. Using a matrix prior plugging MTA reduces the chances of overfill and extrusion of the material.[9]

This concept is not new Lemon et al proposed the internal matrix concept for perforation repair. [8]Using a matrix in an open apex case is an extension of the same principle. In this case we used PRF.

PRF derived from the blood has a healing property and is easily accepted by the body. It consists of platelets, leukocytes, cytokines and stem cells. PRF has osteogenic property. It contains platelets which can release platelet-derived growth factor (PDGF) and insulin-like growth factor (IGF), upto one week.

In a case report by Khanduri and Kurup et al used PRF as an internal matrix over which sealing material was placed.PRF and MTA provides good apical sealing ability because of release of calcium and hydroxyl ions from set matrix. Follow-up of 30 months showed good bone filling using CBCT.[10]

In a descriptive study ,Nazife et al.,usedCBCT for the assessment of bone healing in 40 participants, which were divided into four groups of (1) MTA, (2) PRF, (3) MTA +PRF, and (4) control. MTA + PRF showed better healing in comparison with other materials.[11]

IV. CONCLUSION

The use of PRF as a barrier prior material prior to apexification with MTA showed a positive clinical outcome for management of tooth with open apex. Further long term follow up is needed to ensure success

Declaration of patient consent

The authors certify that they have obtained all appropriatepatient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

REFERENCES

[1]. Mathew BP, Hegde MN. (2006). Management of Non Vital Immature Teeth Case Reports and Review. Endodontology, (18), 18-22.

[2]. Estrela Carlos et al. (2014) Characterization of successful root canal treatment. Brazilian Dental Journal, 25(1), 3-11.

[3]. Komabayashi T, Spångberg LS. Comparative analysis of the particle size and shape of commercially available mineral trioxide aggregates and Portland cement: A study with a flow particle image analyzer.JEndod 2008;34:94- 8.

[4]. Trope M. Treatment of immature teeth with non vital pulps and apical periodontitis. Endotopic 2007; 14:51-9.
[5]. Felippe MC, Felippe WT, Marques MM, Antoniazzi JH. The effect of renewal of calcium hydroxide paste on the apexification and periapical healing of teeth with incomplete root formation. IntEndodJ.2005;38:436–442 .
[6]. Metzger Z, Solomonov M, Mass E. Calcium hydroxide retention in wide root canals with flaring apices. DentTraumatol. 2001; 17:86–92.
[7]. Binnie WH, Rowe AH. A histological study of periapical tissues of incompletely formed pulpless teeth filled with calcium hydroxide. J Dent Res. 1973;52:1110–1116.
[8]. Lemon RR. Nonsurgical repair of perforation defects. Internal matrix concept. Dent Clin North Am 1992;36:439‑57.
[9]. Vanka A, Ravi K, Shashikiran N. Apexification with MTA using internal matrix: report of 2 cases. Journal of Clinical Pediatric Dentistry. 2010 Apr 1;34(3):197-200.
[10]. Khanduri, Nitin; Kurup, Deepak[1]. Single-visit apexification with Biodentine and platelet-rich fibrin. Endodontology 30(2):p 181-183, Jul–Dec 2018.
[11]. Karan NB, Aricioğlu B. Assessment of bone healing after mineral trioxide aggregate and platelet-rich fibrin application in periapical lesions using cone-beam computed tomographic imaging. Clin Oral Investig. 2020 Feb;24(2):1065-1072.