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Case Report

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MTA Apexification: A case report

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ABSTRACT

Introduction

Apexification is the procedure to induce a calcified barrier in a root with open apex.

Objective

To describe the case of one step apexification using Mineral Trioxide Aggregate.

Case report

A 19 years old male patient was referred to private dental clinic. The patient's medical history was noncontributory. On intraoral examination it showed discolored maxillary right central incisor with sinus tract formation and maxillary left central incisor tender when percussed. History of trauma was given approximately 10 years back. Radiographic examination showed fractured maxillary right central incisor with evident pulp exposure showing blunder buss apices and widening of periodontal ligament was seen related to maxillary left central incisor suggestive of apical periodontitis and tooth was tender to percussion. One step Apexification was done for blunderbuss apices of maxillary right central incisor and routine endodontic procedure was performed with maxillary left central incisor.

Conclusion

The present case describes one step MTA apexification related to maxillary right central incisor having blunderbuss apices and endodontic procedure related to maxillary left central incisor.

Keywords: Mineral Trioxide Aggregate, Calcium hydroxide, Double Antibiotic Paste. (DAP)Triple antibiotic paste (TAP)

INTRODUCTION

The main goal of endodontic treatment is to debride the root canal system effectively and to achieve three dimensional obturation as much as possible. This can be achieved in almost all cases by routine endodontic procedures but still there are some cases like teeth with incompletely formed roots; open apex which requires different treatment procedures.

There are many cases in which teeth lose their vitality due to trauma especially in young patients. Upper anterior teeth with incompletely formed roots are more prone to trauma. Treatment of such teeth requires tailored treatment plan & require more than one year to complete the apical closure [1].

The management of nonvital tooth with open apex consists of the induction of a natural or artificial apical barrier which can act as a stop for the obturating material. 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" [2]. Conventional apexification procedure is induction of the formation of an apical barrier while the recent approach is to form an artificial apical barrier by the placement of an apical plug.

Several materials have been used to induce the hard tissue barrier such as calcium hydroxide, Mineral Trioxide Aggregate, Biodentine, Endosequence etc. Calcium hydroxide has been commonly used as an intracanal dressing to induce hard tissue formation in open apices. The Calcium hydroxide is renewed periodically until an apical barrier is formed. Time needed to form an apical barrier is unpredictable, usually ranging from 6 to 18 months and depends upon size of apical foramen, presence of infection and host response [3].

Mineral Trioxide Aggregate (MTA) is currently considered as one of the most promising materials

because of its superior biocompatibility and less cytotoxicity due to its alkaline pH and presence of calcium and phosphate ions resulting in capacity to attract blastic cells and promote favorable conditions for cementum deposition [4]. Mineral Trioxide Aggregate is composed of bismuth oxide, tricalcium silicate, dicalcium silicate, dicalcium dialuminate, calcium sulphate etc [5].

MTA has shown potential as a root end filling material. Despite its outstanding tissue biocompatibility, MTA has several disadvantages which include delayed setting time (2 hour and 45 min), poor handling characteristics and high cost [6].

This article describes the successful management of a symptomatic, traumatized, necrotic permanent maxillary central incisor with wide open apex using MTA as an artificial apical barrier.

CASE REPORT

A 19 year old male patient reported to private dental clinic with the chief complaint of pain in upper front region since 1 month with the history of trauma to upper central incisors 10 years back. Medical history of the patient was non contributory.

Clinical examination revealed tenderness on percussion with 21, discoloration & sinus opening with 11 (figure 1) It showed negative response to both electrical and cold pulp test. Detailed radiographic examination revealed incomplete formation of apex with 11 and apical radiolucency involving both the central incisors (figure 2). Periodontal status was fair. Based on history and radiographic findings a provisional diagnosis of chronic apical periodontitis was given in relation to maxillary left central incisor and chronic periapical abscess with blunderbuss apices with maxillary right central incisor.



Figure 1 - Preoperative photograph

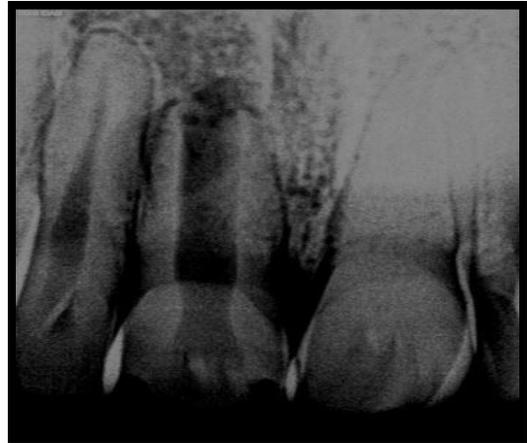


Figure 2-Preoperative radiograph

After rubber dam application, under local anesthesia access opening was done. Working length was established with the help of apex locator (ROOT ZX MINI) in relation to 21 and radiograph was taken for 11 that has blunderbuss apex (Figure 3). Biomechanical preparation was performed using No 50 stainless steel K file (Dentsply, Maillefer) under copious irrigation with 2.5% NaOCl for 21 using step back technique. No biomechanical preparation was done with 11 because of thin radicular dentin and open apex. So only the walls

were smoothed by circumferential filing using H-FILE (1mm short of apex). Double antibiotic paste {ciprofloxacin, metronidazole} as an intracanal medicament was placed for 2 weeks. The patient was recalled after 2 weeks and the involved tooth was found to be asymptomatic. The access cavity was reopened, copious irrigation was done with 2.5%NaOCl solution using side vented needle and then finally irrigated with normal saline. Root canal was dried with sterile paper points.



Figure 3-Working length

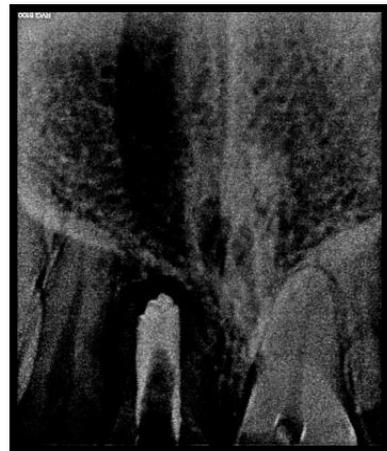


Figure 4-MTA Plug

MTA (MTA ANGELUS) was mixed according to manufacturer's protocol and it was placed with the help of a hand plugger {Dentsply Maillefer} in two increments until plug of 3-5 mm was achieved. Moist cotton pellet was placed within the canal

orifice for 24 hours to facilitate setting of MTA [fig 4].

On the next day root canal was obturated by thermo plasticized Gutta-percha (Obtura) with 11 and lateral condensation technique with 21 [fig 5]. The access cavity was then sealed with the

composite restoration [Filtek Z 350 3M ESPE] and both incisors were restored by porcelain fused to metal crown [Fig 8, 9]. Follow up examinations were carried out at 6 months and 1 year [Fig 6, 7].

During follow up periods the involved tooth was asymptomatic and the post operative radiographs were taken at 6 months and 1 year. They showed remarkable healing of osseous lesion.



Fig 5- Post obturation

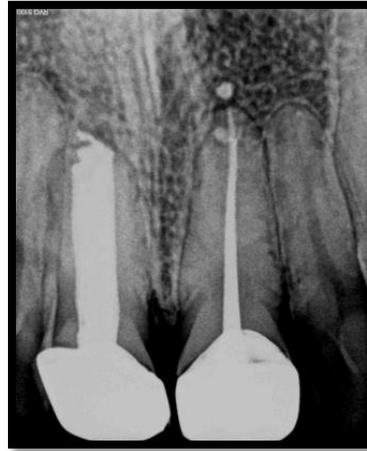


Fig 6- Follow up after 6 month



Fig 7- Follow up after 1 year



Figure 8- Crown Preparation



Figure 9- Crown Cementation

DISCUSSION

Calcium hydroxide has been used with great success to form an apical hard tissue barrier in immature open apices. The time interval for calcium hydroxide apexification has been reported to be variable, ranging from 3-24 months [7]. Long term use of calcium hydroxide decreases the fracture resistance of the root dentin which makes tooth susceptible to fracture. This is attributed to decreased organic support of dentin matrix leading to disruption of bond between the collagen fibrils and hydroxyapatite crystals that negatively influence the mechanical properties of dentin [8]. In this case; the speedy barrier formation could be attributed to the frequent calcium hydroxide dressing replacement. The barrier produced by

calcium hydroxide apexification has been reported to be incomplete having swiss cheese appearance and allows apical microleakage.

Double antibiotic paste was used as an intracanal medicament for 2 weeks instead of triple antibiotic paste. Double antibiotic paste was used because Minocycline in TAP causes discoloration of tooth structure and many studies showed that effect of both TAP and DAP is the same [9]. The 5-mm barrier is significantly stronger and shows less microleakage as compared to the 2-mm barrier of MTA [10]. Thus a permanent root canal filling is still mandatory. Pulp revascularization remains a good treatment option for such cases but the patient in this case didn't agree to this treatment modality because of time constraints. So, one step

apexification with MTA was decided. MTA has been widely recommended for plugging open apices. It has good apical seal, biocompatibility, pulpal and periodontal tissue regenerating capabilities [11]. In addition, there is reduced potential for fracture of immature teeth with thin roots, because of immediate placement of bonded core within the root canal [12]. For maintaining good apical seal left maxillary central incisor was biomechanically prepared till 2% (50) no ISO file [13].

The six- month and one year follow up showed clinical and radiographic signs of healing. Long term follow up is however necessary to ensure success, especially since this therapy would probably increase chances of tooth fracture.

In this case crown structure of the tooth was intact so there was no need of post placement and chances of fracture were minimal. There is neither any need to do intraradicular rehabilitation because of presence of sufficient amount of root dentin.

CONCLUSION

Calcium hydroxide still remains the most widely used material for the treatment of apexification in necrotic teeth with open apices. But time constraints and reduced fracture resistance due to long term use of calcium hydroxide in teeth with already thin dentinal walls are major disadvantages. To overcome these disadvantages of calcium hydroxide, MTA was preferred in this case.

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