CASE REPORT

Treatment of Teeth with Open Apices and Apical Pathology with MTA Cement used as Orthograde Root Filling Material

Harpreet Singh Chhabra, Satyendra Agarwal, Kshiti Bhardwaj

ABSTRACT

A major problem in performing endodontics in immature teeth with necrotic pulp and wide open apices is obtaining an optimal seal of the root canal system. The aim of the procedure is to remove periapical pathology and to limit bacterial infection to create an environment conductive for the production of mineralized tissue barrier or root end formation at the immature root end, i.e. apexification. Calcium hydroxide is commonly used for this purpose. Mineral trioxide aggregate (MTA) has been proposed as a potential material to create an apical plug at the end of the root canal system and facilitate a favorable environment for apexification. MTA is a powder that consists of fine hydrophilic particles that set in the presence of moisture. The setting time of MTA is less than 4 hours. The major compounds of MTA are tricalcium silicate, tricalcium aluminate, tricalcium oxide and silicate oxide.

Keywords: Calcium hydroxide, Mineral trioxide aggregate, Apexification.

How to cite this article: Chhabra HS, Agarwal S, Bhardwaj K. Treatment of Teeth with Open Apices and Apical Pathology with MTA Cement used as Orthograde Root Filling Material. J Orofac Res 2013;3(2):128-131.

Source of support: Nil

Conflict of interest: None declared

INTRODUCTION

Mineral trioxide aggregate (MTA) is a powder consisting of fine hydrophilic particles that bind in the presence of moisture. Set MTA provides a good seal and excellent marginal adaptation. *In vivo* studies have confirmed biocompatibility of this material and have shown a hard tissue inductive effect such as periodontal ligament, bone and cementum. MTA has a variety of potential use including its use as a root canal obturating material and apexification of immature root because it facilitate normal periradicular architecture by inducing hard tissue barrier.

Endodontic surgery is the surgical procedure that consists on the removal of a pulpal, apical or periapical lesion while conserving the causal tooth. It is the elective option in those clinical cases in which conservative endodontic treatment has not achieved the wanted success or when we cannot advance the success by intracanalicular. Usually this surgical procedure needs the consecutive realization of three basic techniques: elimination of the apical pathology, apical resection of the causal tooth (apicoectomy) and creating a tight apical, lateral and coronal seal by means of the retrograde or orthograde obturation is necessary to prevent recontamination which provide favorable environment for healing and to achieve long-term clinical success.

CASE REPORT

An 18-year-old female reported to the outpatient Department of Conservative Dentistry and Endodontics with swelling and pain in upper front region since 7 days (Fig. 1). On examination, tooth failed vitality test. Her intraoral periapical radiograph reveals a large radiolucent area at the apex of 11 and a wide open apex (Fig. 2).

After taking medical and dental history access cavity was prepared in tooth 11. The canal was lightly cleaned mechanically using hand K-files (Dentsply Maillefer,

Fig. 1: Preoperative view

Fig. 2: Diagnostic radiograph

Ballaigues, Switzerland) to the working length, which was determined radiographically. The root canal was irrigated with a mixture of normal saline and sodium hypochlorite (NaOCl), and then dried with paper points. Tooth was relieved from occlusion and open dressing was given for drainage.

On second appointment canal was again irrigated with chlorhexidine and calcium hydroxide powder, mixed with saline to a toothpaste consistency, was placed in the canal using hand Lentulo spiral filler (Mani, Japan). The access cavity was sealed with reinforced zinc oxide eugenol temporary restoration (Cavit) placed over a sterile cotton pellet left in the pulp chamber.

At a third appointment after 10 days surgical endodontics was planned. After giving local anesthesia at surgical site, a full thickness flap was reflected by a sulcular incision followed by vertical releasing incisions (Fig. 3). All infected fibrous tissues were removed (Fig. 4). A moist pellet of cotton was placed on the apex of the tooth and MTA was mixed as per manufacturer instruction into a thick consistency and placed into the canal orthograde (Fig. 5). Compacting the MTA with every increment with the aid of a plugger. Whole of the canal was obturated with MTA. Moist cotton was then removed and apical seal of the canal was verified with the aid of a radiograph (Fig. 6). Flap was repositioned and wound closure was obtained with 3-0 silk sutures and access cavity sealed with temporary restoration (Cavit) (Fig. 7). Following surgery, the patient was given a cold compress intraorally to minimize swelling and bleeding. She was prescribed 0.2% chlorhexidine gluconate and instructed to rinse gently for 3 weeks. She was also prescribed antibiotics and analgesics for 5 days. Five days after surgery, the sutures were removed and access cavity sealed with permanent restoration (glass ionomer cement). The patient was seen at the 24 hours, 5 days, 2, 6 and 12-month intervals. These recall visits included routine intraoral/radiographical examinations and professional plaque control. Two months after the surgical procedure, no symptoms of pain, inflammation, or discomfort in the surgical area were noted (Fig. 8).

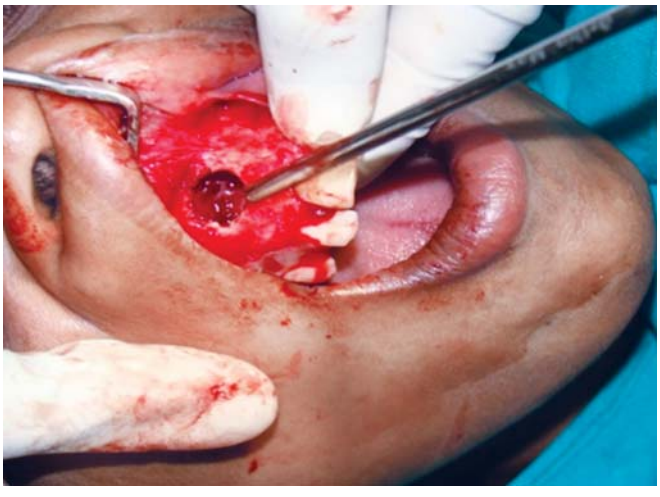

Fig. 3: Flap reflection

Fig. 5: Moist cotton pellet placed on the apex before obturation

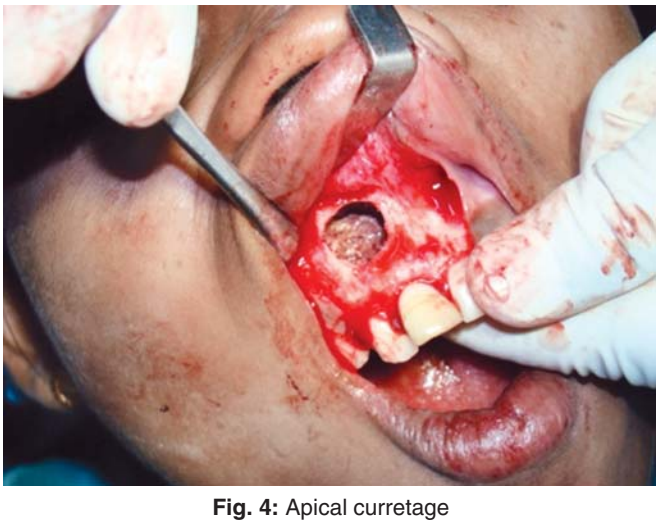

Fig. 4: Apical curretage

Fig. 6: Orthograde-filled MTA

Fig. 7: Postoperative view

Fig. 9: Re-evaluation radiograph after 6 months

Fig. 8: Re-evaluation radiograph after 2 months

Fig. 10: Re-evaluation radiograph after 12 months

At 6-month interval apical barrier formation was seen and periapical radiolucency was markedly reduced and patient was asymptomatic (Fig. 9). Completion of apical barrier was seen at 12-month interval in follow-up radiograph as well as periapical area also have shown complete healing (Fig. 10).

DISCUSSION

The tooth described in this case had an open apex and associated periapical pathology. The patient had no medical condition that would interfere with either the treatment plan or the outcome of the treatment. When treating nonvital teeth, a main issue is eliminating bacteria from the root canal system. As instruments cannot be used properly in teeth with open apex, cleaning and disinfection of the root canal system rely on the chemical action of NaOCl as an irrigant and calcium hydroxide as an intracanal medicament.[1] NaOCl is known to be toxic, especially in high concentrations. When rinsing immature teeth with open apex, there is an increased risk of pushing the irrigant beyond the apical foramen. Therefore, it is advisable to use less concentrated NaOCl, which is less toxic.[2] Calcium hydroxide pastes were used in because of their antimicrobial activity. Different vehicles can be used with calcium hydroxide depending on the length of time the dressing will remain in the canal. When the period is up to 2 weeks, saline can used as the vehicle.[3] For more extended periods, polyethylene glycol can be used as vehicle because calcium hydroxide ions are released more slowly and the medication can remain active in the canal for longer periods. Smear clear (17% EDTA) rinse was carried out before placement of the intracanal dressing to remove the smear layer and facilitate diffusion of calcium hydroxide through the dentin and before obturation to ensure better removal of calcium hydroxide.[5] In this case, apexification was reached and osseous healing occurred. Although calcium hydroxide has been shown to be a good material for treating immature teeth, various studies have revealed some disadvantages to using this material, such

as long treatment time, the need for multiple appointments with several radiographs and possible canal infection as the access cavity is sealed with only temporary materials which is lost or depressed over a long period of time.[5]

In this case, treatment time for apexification procedure was approximately 12 months. A recent prospective clinical study showed that the mean time necessary for the formation of an apical barrier with calcium hydroxide technique is more than 12 months. The apical barrier formed by using calcium hydroxide may be porous and has sometimes even been found to contain small amounts of soft tissue.[6]

Because of MTA has excellent biological properties and ability to create a good seal, it has been recommended for creating an artificial barrier in the apical area of teeth with open apex, thus compressing treatment time to 1 or 2 visits.[7] The cell's response to MTA and the mechanism of deposition in barrier formation are unknown and require further investigation. MTA was used in case, because the tooth was very immature and adaptation of a gutta-percha master point would be very difficult, therefore root canal was completely obturated with MTA. Zahed Mohammadi compared the orthograde root filling material and sealing ability of MTA and gutta-percha points and found that there was no statistical difference between the two groups compared.[8]

MTA consists of fine hydrophilic particles that set in the presence of moisture in approximately 4 hours.[9] Follow-up radiographs showed osseous healing and, during clinical examination, the patient was asymptomatic. The results obtained with MTA in this case seem to be similar to those of other studies. The choice of treatment regimen for teeth with open apices depends on the individual case and operator experience and familiarity with handling the various materials. Patient availability for follow-up appointments should be considered.

CONCLUSION

MTA can be considered a very effective option as an obturating material and creating apical calcific barrier in an immature nonvital teeth with an open apices with the advantage of reduce treatment time, good sealing ability, high biocompatibility and osteogenic potential.

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