MANAGEMENT OF APICAL INFLAMMATORY ROOT RESORPTION WITH MINERAL TRIOXIDE AGGREGATE FILLING: A CASE REPORT WITH 7-YEAR FOLLOW-UP

ABSTRACT

Endodontic treatment of the immature necrotic teeth with necrotic pulps and open apices usually present an endodontic challenge. In such teeth, the divergent apical architecture renders complete debridement and control of the obturation material almost impossible. This case report demonstrates the successful use of mineral trioxide aggregate (MTA) as a root canal filling that enabled healing of the periapical region of a mandibular right first molar with severe periodontal damage and apical inflammatory root resorption.

Key words: Apexification, Apical Inflammatory Root Resorption, Immature Apex, Mineral Trioxide Aggregate, Open Apex

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APİKAL İNFLAMATUAR KÖK REZORPSİYONUNUN MİNERAL TRİOKSİT AGREGAT DOLGU İLE TEDAVİSİ: 7 YIL TAKİP EDİLEN BİR OLGU RAPORU

ÖZET

Apeksi açık, nekrotik pulpal immatür devital dişlerin tedavisi, endodontik açıdan çoğunlukla son derece zordur. Böyle dişlerde, apikal yapının dizerjan olması, tam bir debridman gerçekleştirilmesini ve obturasyon materyalinin kontrolü şekilde yerleştirilmesini neredeyse imkansız kılmaktadır. Bu olgu raporu, şiddetli periodontal hasarı ve apikal inflamatuar kök rezorpsiyonu olan bir mandibular birinci molar dişte, mineral trioksit agregatın (MTA) kök kanal dolgusu olarak kullanımının periapikal iyileşmesi sağlamadaki başarısını göstermektedir.

Anahtar Kelimeler: Apeksifikasyon, Apikal Inflamatuar Kök Rezorpsiyonu, Immatur Apeks, Mineral Trioksit Agregat, Açık Apeks

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INTRODUCTION

Mineral Trioxide Aggregate (MTA) is hydraulic silicate cement, meaning its setting reaction relies primarily on hydration reactions, apart from other acid-base materials used in dentistry. MTA has been reported to be an osteogenic, biocompatible material, thus, inductive and conductive of hard tissue formation. MTA powder contains fine hydrophilic particles that set in the presence of moisture. On exposure to water, any excess calcium oxide reacts immediately and calcium hydroxide is released. By virtue of its strong alkalinity it has antibacterial and antifungal properties, it stimulates cementum-like hard tissue formation, osteoblastic adherence, and bone regeneration. Therefore, it has found many applications for primary and permanent teeth such as pulp capping, pulpotomy, apical barrier formation in teeth with necrotic pulps and open apices, repair of root and furcal perforations, root-end filling, and root canal filling.

During the treatment of teeth with open apices, it is more difficult to obtain complete debridement, canal disinfection and optimal sealing of the root canal system. In such cases canal walls remain thin and fragile and the instrumentation may weaken it more. Thus, it is more compelling to fill the canal because of the absence of natural apical construction. Long-term apexification treatment procedure with calcium hydroxide has been the choice over the years. But it has many disadvantages such as, non-specific treatment time, excess number of appointments and radiographs, difficulty in patient follow-up and more risk to tooth fracture and inflammatory root resorption.

The filling of the entire root canal with MTA is an uncommon procedure. To date, MTA has been mostly used to create an apical plug prior to final filling with laterally condensed gutta-percha, thermoplasticized gutta-percha, or composite resin. Karp et al. mentioned that MTA, placed in an apexification technique, could become the sole filling material which involves eliminating the gutta-percha filling step after apexification.

The purpose of this report is to demonstrate the use of MTA as a root canal filling that enabled healing of the periapical region of a mandibular right first molar with severe periodontal damage and apical inflammatory root resorption.

CASE REPORT

31-year-old female patient was referred to our clinic with the primary complaint of discomfort in her right mandibular region. The patient had non-contributory medical history. The patient’s dental history indicated that approximately 1 year earlier, a partial pulpotomy with composite resin had been performed on the mandibular right first molar. Clinical examination revealed that there was an intraoral sinus tract related to the tooth #46. A periodontal pocket measuring about 7 mm in depth and were found in the mesial aspect of the tooth. A grade III furcal involvement was also detected. No mobility was noted. The tooth didn’t respond to sensitivity testing with cold or electric pulp tester (Parkell, Farmingdale, NY, USA). Radiographic examination demonstrated a radiolucent lesion in the furcation area, a moderate bone lost in the mesial aspect of the tooth, and an open apex formation related to distal root (Figure 1). The tooth diagnosed as chronic apical periodontitis with apical inflammatory root resorption.

The local anaesthetic was supplemented by administration of 2 mL of 4% articaine hydrochloride containing epinephrine hydrochloride (1:100,000) (Ultracain D-S Forte; Aventis, Istanbul, Turkey) using 50-mm 27-gauge needles. A rubber dam was placed, and an adequate endodontic access cavity was created. The working length was confirmed by an apex locator (Root ZX; J. Morita Corp, Tokyo, Japan) and a radiograph. The middle and coronal thirds were prepared with Gates Glidden drills 1-3 (Produits Dentaires S.A., Vevey, Switzerland) and the root canals were shaped using up to a size 40 master apical file by means of a step-back technique. One millilitre of 2.5% sodium hypochlorite (NaOCl) was used for irrigation between each instrument. The root canal was then dried with paper points and dressed with a thick creamy paste prepared by mixing calcium hydroxide powder with distilled water. The access cavity was closed with IRM cement (Caulk/Dentsply, Milford, DE, USA). The patient also received supportive periodontal therapy.

Two months later, the patient was asymptomatic and her sinus tract had healed. Calcium hydroxide was removed from the canals by rinsing with 2.5% NaOCl. After drying the root canals with paper points, mesial canals were filled with gutta-percha (Diadent, Chongju, Korea) and AH Plus sealer (Dentsply De Trey GmbH, Konstanz, Germany) using the cold lateral condensation technique (Figure 2). As there
was no apical stop, the distal canal was continued to be treated with calcium hydroxide. The paste in distal canal was renewed every 2 months and a radiograph was taken to monitor development of a hard tissue barrier during 48-month period.

At the end of the 48-month period the patient remained asymptomatic, but as the intracanal examination using a size 40 K-file (Dentsply Maillefer, Ballaigues, Switzerland) didn’t reveal an apical hard tissue barrier for the distal root (Figure 3), it was decided to be filled with MTA (Pro Root MTA; Dentsply, Tulsa, OK, USA). Before the filling procedure, the root canal was irrigated with 1.7% EDTA and 2.5% NaOCl and dried with paper points. When drying the root canal, care was taken to avoid injuring the periapical tissue by inadvertent pushing. To avoid haemorrhage, large paper points were used at the correct working length. MTA was then mixed with the liquid provided to form thick slurry and then placed into the canal as close to the apex as possible with a small plugger by using a gentle apical tamping technique (Figure 4). A moist cotton pellet was placed in the pulp chamber, which was sealed with Cavit (ESPE, Seefeld, Germany) for 24 hours. During the next day, the cotton pellet was removed. After setting of the MTA had been verified, the rest of the tooth was restored with composite resin. The patient was re-examined in 3, 4, and 7 years after the operation for clinical and radiographic follow-up (Figures 5-7). In clinical examinations, the tooth was functional without sensitivity to palpation and percussion. The tooth also showed a normal physiologic mobility and normal probing depths including furcation area (<3). The results of radiographic examinations showed a mineralized barrier of apical tissue and advanced periodontal regeneration (Figures 6-7).
THE USE OF MTA AS A ROOT CANAL FILLING MATERIAL

DISCUSSION

MTA is reported to be an effective material in the treatment of teeth with non-vital and open apices.\(^7\) The main advantages of this material are its ability to set and good sealing properties in clinical environments in which blood and tissue fluids are always present.\(^8\) As the distal root canal was very wide in the case described in this report, a decision was made to fill the entire canal with MTA instead of using as an apical plug.\(^11\) This was also confirmed by Al-Hezaimi et al.\(^19\) who used human saliva penetration technique and showed that MTA alone is better sealing ability than vertically condensed gutta-percha and zinc oxide-eugenol based sealer (Kerr Pulp Canal Sealer EWT; Kerr, Sybron Dental Specialties, Romulus, MI, USA). Clinical
support for using MTA as a root canal filling was presented in case reports by Raldi et al.,11 Karp et al.,16 Onay and Ungör,17 O’Sullivan and Hartwell,20 Hayashi et al.,21 Villa and Fernandez,22 Mohammadi,23 and Mohammadi and Yazdizadeh.24 In those studies, MTA was used successfully as the complete filling material for the root canal systems of both primary and permanent teeth.

One of the difficulties encountered during MTA apexification procedure is handling the material. When MTA is orthogradely placed in teeth with open apices, compaction may be a problem because of the absence of a barrier in the apical region. There is a risk to overfill the root canal or just the opposite, filling could be performed inadequately and thus sealing may be suspicious. Bidar et al.25 reported that calcium hydroxide treatment improves marginal adaptation of MTA in the apical region. In the present case report, the root canal was medicated with calcium hydroxide during the 48-month period and this application might have led to a better adaptation of MTA even the hard tissue barrier didn’t form.

Among the inherent disadvantages of the MTA is that its inability to be retrieved from within the root canal.10 Al-Hezaimi et al.19 mentioned that completely removing set MTA from the root canal system is difficult and they recommended that orthograde canal filling with MTA should be limited to selected cases, such as one-step apexification and situations in which nonsurgical retreatment would be ineffective or not feasible. However, Karp et al.16 noted that the recent literature has yet to describe the feasibility of effectively removing MTA from the root canal system, and recently Nandini et al.27 investigated various chemicals as solvents on the dissolution of set white MTA. The authors concluded that carbonic acid can be effectively used as an adjunct to dissolve set white MTA even after 21 days of material placement.

CONCLUSION

The favourable results of this case demonstrate that root filling with MTA may be a valid option for treating teeth with necrotic pulps and immature apices and appears to be an alternative treatment to long-term use of calcium hydroxide apexification protocol. Prospective clinical trials comparing these alternative techniques are required.

REFERENCES


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