Effect of Unintentionally Extruded Mineral Trioxide Aggregate in Treatment of Tooth with Periradicular Lesion: A Case Report

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Abstract

Introduction: This case report describes the effect of unintentionally extruded mineral trioxide aggregate (MTA) into periradicular lesions and tissues on the prognosis of periradicular healing in maxillary left central incisor with periradicular lesion. **Methods:** A 17-year-old girl with a large periradicular lesion from the apices of her maxillary left central to lateral incisors was referred. Tooth #9 had an open apex, but tooth #10 was normal. Conservative root canal treatment was performed to tooth #10. The apical third of the canal of tooth #9 was filled with MTA as an apical plug because of open apex. During this procedure, a radiograph was taken, and it showed an excessive extrusion of MTA into the periradicular lesion. The remaining canal space was filled with gutta-percha and AH Plus sealer by using a lateral condensation technique. **Results:** At follow-up examinations, the tooth was asymptomatic and radiographically showed repair of the lesion. Healing was achieved without any need for further endodontic surgical intervention. **Conclusions:** The results of this case showed that complete periapical healing is possible despite the extrusion of the MTA. This might be due to biologic properties of the MTA. Even so, extrusion of the filling material is not advocated. *(J Endod 2010;36:760–763)*

Key Words

Extrusion, mineral trioxide aggregate, periradicular lesion

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The main objective of root canal therapy is the thorough mechanical and chemical cleaning of the entire pulp space and its complete obturation with an inert filling material and a coronal filling, preventing ingress of microorganisms (1). Sometimes the filling material can extrude into the periradicular tissues. This produces additional tissue inflammation, neurotoxic effects, and a foreign body reaction (2). For this reason, the use of biocompatible material has been advocated to avoid extrusions and the ensuing complications (3, 4).

Recently, mineral trioxide aggregate (MTA), which is a material with excellent sealing properties, was introduced by Torabinejad et al (5). MTA has been shown to be biocompatible (3) and can be used safely when placed adjacent to pulp and periradicular tissues (6, 7). It can also provide an environment that supports cementum regrowth (7). Good sealing property (8), low solubility (9), the ability to set in the presence of blood (10) and bactericidal products (11) are some of the other properties of MTA. Thus, MTA appears to be a most promising material for use in a variety of clinical applications, including vital pulp treatments (12), apical filling of teeth with open apices (13, 14), apexification (13), repair of root (15, 16), furcal perforations (17), and root-end fillings (3, 13). But prolonged setting time and manipulation difficulties are major disadvantages of MTA.

The following case report describes the effect of unintentionally extruded MTA into periradicular lesion and tissues on the prognosis of periradicular healing in maxillary left central incisor with periradicular lesion.

Case Report

A 17-year-old girl was referred to the Department of Endodontics at the Faculty of Dentistry, Karadeniz Technical University with aesthetic concerns resulting from the discoloration of the maxillary left central and lateral incisors. The medical history was noncontributory. The patient's history included a traumatic injury when she was 11 years old. Extraoral evaluation revealed normal soft tissue structures with no apparent pathosis. On intraoral examination, a sinus tract was located in the maxillary left anterior region; on radiographic examination, periapical radiographs were analyzed. A large radiolucent lesion with a well-defined margin around the radicular region of teeth #9 and #10 was seen (Fig. 1). Also, tooth #9 had an open apex, but tooth #10 was normal (Fig. 1). The teeth (#9 and #10) were tender to percussion and exhibited grade II mobility. Electronic pulp testing (Electric pulp tester; Parkell, Farmingdale, NY) and cold application with a carbon dioxide snow (Odontotest; Moyco Union Broach, York, PA) were negative for teeth #9 and #10. On the basis of these findings, the patient was diagnosed as having a large periradicular lesion in the left maxillary left central and lateral incisors. Afterwards, the patient was informed of the long-term prognosis of the teeth, and a decision was made to perform conventional root canal treatment.

At the same appointment, root canal treatment was initiated on teeth #9 and #10. The access cavity was prepared, and a rubber dam was applied. Necrotic pulp tissue was extirpated, and the working length was estimated as being 1 mm short of the radiographic apex. The drainage of pus was noted. The tooth #9 root canal was instrumented with size 15–40 K-files (Dentsply-Maillefer, Ballaigues, Switzerland) by using a step-back technique. Tooth #10 was instrumented with size 15–60 K-files



Figure 1. Radiograph of the left maxillary central and lateral incisors with periapical radiolucency.



Figure 2. Radiograph after root canal filling.

(Dentsply-Maillefer) by using the same technique. During the instrumentation the canal was irrigated copiously with 1% sodium hypochlorite (NaOCl) and distilled water solutions by using a 27-gauge endodontic needle after each instrument. The final irrigation was accomplished with 2% chlorhexidine gluconate (Klorhex; Drogsan, Ankara, Turkey) and distilled water solutions. After drying with sterile paper points, the canals were dressed with calcium hydroxide (Sultan, Englewood, NJ) by using a lentulo spiral instrument (Antaeos; VDW, München, Germany). Sterile cotton pellets were condensed to access cavities before sealing with temporary filling materials. The access cavity was sealed with zinc oxide–eugenol (ZOE) cement (Austenal, Harrow, UK).

When the patient returned after 2 weeks, the teeth were asymptomatic, and the sinus tract had closed. Also the drainage of pus had stopped. According to these data, the decision was made to fill the canals. The tooth was reopened, and the calcium hydroxide paste was removed. The canals were irrigated with 1% NaOCl/distilled water and dried with sterile paper points. After that, the root canal of tooth #10 was filled with gutta-percha (Diadent, Chongchong, Korea) and AH Plus sealer (Dentsply, Konstanz, Germany) by using a lateral condensation technique. Differently from tooth #10, the apical part of tooth #9 was filled with MTA (Dentsply-Maillefer) as an apical plug. MTA was prepared according to the manufacturer's recommendations by mixing with the proportion of one third. An endodontic plugger adequate for the length of the canal was used, and the stopper was fixed 1 mm behind the working length. MTA was inserted into the canal with a messing gun (Dentsply-Maillefer) and further pushed with the plugger. It was also condensed with a large gutta-percha point within the apical area. Then the plugger was fixed 2 mm behind the working length, and the same application was repeated. During this procedure, a radiograph was taken; it showed an excessive extrusion of MTA into the periradicular lesion. After the tooth was filled to the appropriate length, a moistened cotton pellet was placed for 24 hours. The access cavity was sealed with temporary filling material ZOE. At the following appointment the cotton pellet was removed, and after verifying the setting of MTA, the remaining pulp space was filled with gutta-percha (Diadent) and AH Plus sealer (Dentsply) by using a lateral condensation technique. Glass ionomer cement (Ketac-Molar Easymix; 3 M ESPE, Seefeld, Germany) was used as a coronal plug. After that, the restoration of this tooth was accomplished with a composite resin (Z250; 3 M ESPE, St Paul, MN). Radiography was taken to ensure the control of the filling (Fig. 2). A 6-month recall radiograph showed further bony healing (Fig. 3). A 12-month recall radiograph showed no pathology (Fig. 4). Clinical examination showed no sensitivity to percussion or palpation, and the soft tissues were healthy.

Discussion

MTA is a powder consisting of fine hydrophilic particles of tricalcium aluminate, tricalcium silicate, and tricalcium oxide. It also contains small amounts of other mineral oxides, which modify its chemical and physical properties (6). The calcium and phosphorus were the main ions in MTA. It is currently used as a filling material in various treatment procedures of endodontics because of its superior physiochemical and bioactive properties. Yildirim et al (18) and Torabinejad and Chivian (6) found minimal inflammation when MTA came in contact with surrounding periradicular tissues. Hakki et al (7) demonstrated that MTA does not have a negative effect on the viability and morphology of cementoblasts and induced biomineralization of cementoblasts. Torabinejad and Chivian recommended the use of MTA as an



Figure 3. Six-month follow-up radiograph.



Figure 4. Twelve-month follow-up radiograph.

apical plug in teeth with necrotic pulp and open apices and reported that it was surrounded with new cementum formation. Pace et al (14) demonstrated favorable healing in the series of cases in the management of teeth with incomplete root formation by using MTA.

Endodontic filling materials can be extruded apically during obturation. Contact with the periradicular tissues might cause complications ranging from mild inflammatory and allergic reactions to neurotoxic effects such as anesthesia and long-lasting paresthesia (2). The materials most commonly associated with these complications are compounds that contain paraformaldehyde, calcium hydroxide, and/or eugenol (2, 19, 20). It was demonstrated in this case report that when MTA was applied as a root canal filling and extruded through the periradicular lesion associated with necrotic pulps, there were no complications. Throughout the period after the MTA filling was extruded, the teeth were continuously free of symptoms. Complete resorption of the filling material did not occur, although the periradicular and periextrusion radiolucency disappeared. We could easily have seen new hard tissue formation in the periradicular area via a 12-month recall radiograph. Also, the area near the excess MTA material has fully been surrounded with new hard tissue formation (Fig. 4).

Conventional root canal filling techniques rely on the presence of a constriction at the apical level of the canal; therefore, the absence of the apical constriction because of incomplete root development, aggressive apical resorption, or iatrogenic enlargement presents a management challenge. Placement of the root filling in a canal with an open apical foramen carries the risk of root filling material extrusion (21). For this reason, placement of an artificial matrix before insertion of the repair material has been recommended (22). To date, various combinations of matrix and repair materials have been studied. However, in this case report we did not use any matrix for avoiding the extrusion.

The findings of the present case report showed that when MTA was extruded into a periradicular lesion, it had no detrimental effect. At 12 months the radiograph showed complete osseous repair of preoperative periradicular pathosis. The periradicular area remained intact with no radiographic and clinical signs of pathology, and the tooth remained asymptomatic. To avoid the extrusion of MTA, placement of an artificial matrix might be useful.

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