

CASE REPORT

REPAIR OF FURCAL PERFORATION WITH MINERAL TRIOXIDE AGGREGATE: A CASE REPORT

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ABSTRACT

Mineral Trioxide Aggregate is a material developed for endodontics that appears to be a significant improvement over other materials for procedures in bone. It is the first restorative material that allows for the overgrowth of cementum and the regeneration of periodontal ligament. The present case report illustrates the use of MTA in treating a case of perforation in the furcation area with long term follow up, that shows repair of the perforation defect and regeneration of the lost periodontium in the furcation area.

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Introduction

A common iatrogenic error in endodontic and restorative treatments is accidental perforation of the roots or the pulp chamber floor. Such perforation may occur during nonsurgical root canal treatment or during preparation for a variety of restorative procedures.¹ The prognosis may be questionable if treatment involves a lesion occurring at the level of the radicular furcation as prognosis also depends on the level of the furcation, but the prognosis is usually good if the problem is diagnosed correctly and treated with a material having suitable sealing ability and biocompatibility.¹

Although use of Mineral Trioxide Aggregate (MTA) has been reported for several different endodontic treatments, the literature on its success in cases of furcal perforation is limited. This article describes a case in which MTA was used to repair furcation perforation which illustrate the potential benefits of MTA and its relative ease of use for management of perforation.

CASE REPORT

A 36-year-old female patient was referred with accidental furcal perforation, which had occurred during access preparation for root canal treatment of tooth 46. The furcal perforation was confirmed by periapical radiography of tooth 46, which revealed osseous breakdown at the furcation (Fig 1). Several treatment options were discussed with the patient which included extraction, bicuspidization and nonsurgical repair of the perforation with MTA. The patient never wanted to extract her tooth and opted for root canal treatment along with repair of the perforation with MTA. Shaping and cleaning of the root canal was completed by hybrid technique (Fig 4), and the pulpal chamber was then irrigated with 3% sodium hypochlorite with precaution to prevent extrusion, to control hemorrhage and to allow visualization of the perforation. Cotton pellets moistened in saline were placed in orifices of the root canals, and the perforation was sealed with Pro-Root MTA (Maillefer, Dentsply, Switzerland) mixed with sterile saline, as suggested by the manufacturer. The MTA was covered with a cotton pellet moistened with distilled water and Cavit temporary restoration material (3M ESPE, St. Paul, Minn.). Two days after

placement of MTA at the perforation, the patient underwent root canal treatment without complications and the access cavity was restored with composite (Fig 3). At the 15-day follow-up, the patient was asymptomatic with no signs of inflammation or sinus tract. Three months after the treatment, there was radiographic evidence of bone formation adjacent to the MTA. At the last check-up, 6 months after treatment, radiography showed complete osseous healing at the apex and the furcation (Fig. 4).

Discussion

Iatrogenic perforations in the radicular furcation area is a common mishap that occurs during access preparations especially in teeth with calcified pulp chambers, due to which the tooth have to undergo extraction. But nowadays several materials have been used to repair furcation perforations, including zinc oxide-eugenol cements and its modifications like IRM and Super-EBA, glass ionomer cement, composite resins, resin-glass ionomer hybrids, and mineral trioxide aggregate (MTA).²

MTA materials are derived from Portland cement parent compound and have been demonstrated to be biocompatible endodontic repair materials, with its biocompatible nature strongly suggested by its ability to form hydroxyapatite when exposed to physiologic solutions. MTA materials provide better microleakage protection than traditional endodontic repair materials using dye, fluid filtration, and bacterial penetration leakage models

A successful repair will result in the reattachment of the periodontal ligament. To allow healing, a perforation repair material must provide a leak proof seal to ensure that contaminants within the tooth are unable to reach the periodontal ligament and vice versa. The material must be biocompatible and must be strong enough to withstand apical pressures. Mineral Trioxide aggregate has been recommended for the treatment of furcation perforations.³ Pro-Root MTA (Maillefer, Dentsply, Switzerland) is composed of 75% Portland cement, 20% bismuth oxide and 5% dehydrated calcium sulfate.⁴ MTA is difficult to manipulate because of its granular consistency, slow setting time and looseness.⁵ Contamina-

tion of the blood should be avoided when using this type of material, as such contamination can reduce the retention capacity of the MTA.⁶ At present, all treatment options are considered to have a guarded prognosis.⁷ When evaluating a perforated tooth, 4 variables should be considered: level, location, size and shape, and time.⁸

1. Level. Perforations can occur in the coronal, middle, or apical one third of the tooth. The prognosis of radicular perforations of the apical and middle third is much better than perforations of the coronal third or of the pulp chamber floor of multirooted teeth.^{9,10}

2. Location. Perforations which occur circumferentially on the buccal, lingual, mesial, or distal aspects of the roots. This is an important consideration if surgical access is considered, while it is not as important in the case of nonsurgical retreatment.

3. Size and shape. The dimension and shape of the perforation primarily influence the establishment of a good seal. The larger the bur causing the perforation, the bigger the area to seal. Furthermore, lateral perforations are never round, but are elliptical in shape, since the bur meets the canal wall at a 45° angle.

Finally, the perforating cavity has no taper, and this makes it difficult to establish a good apical seal without disturbing the surrounding periodontium.

4. Time. Perforations create an inflammatory reaction in the adjacent tissues, and consequently a loss

of attachment. Therefore, to discourage further loss of attachment and periodontal breakdown, perforations should be sealed as soon as possible, preferably during the same appointment they occur.

To achieve success following treatment of a perforation, the treated tooth must meet the following requirements:¹¹

Absence of symptoms, such as spontaneous pain, or pain on palpation or percussion

Absence of excessive mobility

Absence of a communication between the perforation and the gingival crevice

Absence of a fistula

The tooth must be functional

Absence of radiographic signs of demineralization of the bone adjacent to the perforation

Thickness of the periodontal ligament adjacent to the repair material should be no more than double the thickness of the surrounding ligament. If any one of these criteria cannot be met, therapy cannot be considered as a success.¹¹

The good outcomes of MTA were obtained because it is the material that is not affected by moisture or blood contamination. MTA sets only in contact with moisture. It is a hydrophilic material and can be considered as the best material to seal perforations¹²



Fig 1 Periapical image of tooth 46 showing inadvertent furcal perforation, caused by drilling during access preparation for root canal treatment.



Fig 2 Tooth 46 after Shaping and cleaning

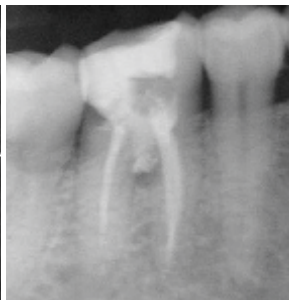


Fig 3 Post operative after placing Mineral trioxide aggregate (MTA) and obturation



Fig 4 Bone formation is visible at 6-month follow-up.

Conclusion

Perforations represent pathologic or iatrogenic communications between the root canal system and the periodontal attachment apparatus. Prevention is the most important factor to avoid accidents during endodontic therapy. Treating a perforation may often require a multidisciplinary approach in order to establish an appropriate treatment plan, and the clinicians must decide whether to extract the tooth or treat it with a nonsurgical and/or surgical approach. The prognosis of perforated teeth is better today than it was in the past, and this is due to the improved vision provided by the operating microscope as well as the use of biocompatible materials such as MTA. With this approach, perforations can be more predictably repaired without surgery, thus reducing the need for invasive and more costly procedures.

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