CASE REPORT

Clinical Applications of Mineral Trioxide Aggregate: Report of Three Cases

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ABSTRACT:
The greatest threats to teeth are dental caries and traumatic injuries. The primary goal of all restorative treatment is to maintain vitality of pulp. If pulpal exposure occurs, then vital pulp procedure should be done to preserve pulp vitality. Historically, calcium hydroxide has been the material of choice for vital pulp procedures. As of late, an option material called mineral trioxide total (MTA) has exhibited the capacity to prompt hard-tissue development in pulpal tissue. This article portrays the clinical and radiographic result of cases including the utilization of MTA in furcal perforation repair, closure of open apex and direct pulp capping.

Keywords: Closure of open apex, Direct pulp capping, MTA, Perforation repair.

INTRODUCTION
A perfect endodontic repair material should seal the pathways of correspondence between the root canal system and its surrounding tissues. It should be noncarcinogenic, nontoxic, biocompatible, insoluble in tissue fluids, and dimensionally stable.1 Because any previous materials did not have these all characteristics, MTA is being used in a wide range of clinical treatments such as a perforation repair material, as a root-end filling material and as a pulp capping agent during vital pulp therapy and1 MTA showed excellent sealing ability and promoted osteoblast activity3. It is less cytotoxic had an antimicrobial effect.4,5

In this article three cases of furcal perforation repair, closure of open apex and direct pulp capping by using MTA are shown.

CASE REPORT
CASE 1: Furcal Perforation repair using MTA
A 34-yr-old female patient reported to the Department, with the chief complain of pain in her lower right back region of the jaw since one month. On clinical examination a deep carious lesion was found in relation to 46. Radiographic examination revealed extensive occlusal caries involving pulp and furcal area.(Figure 1)

Figure 1: Radiograph showing furcation involvement in 46

Vitality test showed negative response with both thermal tests and Electric pulp tester. The diagnosis was necrosis of the tooth and involvement of furcal area because of deep carious lesion. On first appointment tooth was isolated with rubber dam. The caries was removed, and Perforation was confirmed clinically with probe. Canals were cleaned and shaped with ProTaper files up to the F1-ProTaper and patient was recalled after three days. On second appointment tooth was asymptomatic canals were obturated & on same day the perforation was sealed with
MTA (Angelus, Londrina, Brazil) 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. After 2 days the cavity was sealed with composite restoration. (Figure 2)

CASE 2: Direct pulp capping with MTA
A 26-year-old female patient reported to the department with complaints of sensitivity to sweet and cold in lower left back side region of jaw. Clinical examination revealed gross occlusal caries on her lower left first molar. Normal response seen with pulp vitality test. Radiographic examination revealed caries near to the distal pulp horn and no evidence of periradicular pathology. (Figure 3)

The diagnosis was made reversible pulpitis. The treatment plan was made Vital pulp therapy with mineral trioxide aggregate. Following administration of local anaesthesia the tooth was isolated with rubber dam. Caries removal was performed using a round bur. After removal of caries, exposure of pulp horns with moderate bleeding was observed. A cotton pellet moistened with saline was applied with pressure to the exposed pulp to achieve hemostasis. After that sodium hypochlorite was used to disinfect the surgical exposure and the dentin. Mineral trioxide aggregate (Angelus, Londrina, Brazil) was mixed according to the manufacturer’s instructions and placed over the exposure. A moist cotton pellet with saline was placed over the MTA and the rest of the cavity was restored with temporary filling material (Cavit, 3M). The patient was scheduled after 5 days for follow-up and the patient was asymptomatic so composite restoration was placed over MTA. (Figure 4)

CASE 3: Nonsurgical root canal treatment using MTA as an apical barrier
A 36 year old male patient The patient reported to the department of Conservative Dentistry and with the chief complaint of Broken upper anterior teeth. The patient reported that trauma had occurred about 15 years back. The root canal treatment had been started in both upper anteriors before about 2 years but patient failed to continue with further appointments. Clinical examination revealed that Crown fracture in relation to maxillary right central incisor with discoloration and access openings with respect to maxillary right central and lateral incisors. Radiographic examination revealed immature right central and lateral incisors with open apices and a radiolucent area in proximity of the root apices. (Figure 5)
The diagnosis made was of chronic periapical abscess and immature open apex with relation to maxillary right central and lateral incisors. Treatment plan included artificial apical barrier formation using MTA (Angelus, Londrina, Brazil) plug in both maxillary right central and lateral incisors (Figure 6) followed by obturation using thermoplastisized gutta percha. (Figure 7)

**DISCUSSION**

MTA was developed by Dr Torabinejad at Loma Linda University in 1993.³ Mineral trioxide aggregate consists Tricalcium silicate, Dicalcium silicate, Tricalcium aluminate, Tetracalcium aluminoferrite.⁶ Radioopacifier Bismuth oxide free crystalline silica that is in the form of insoluble residue.⁶ Two types of MTA are available in market that are grey mineral trioxide aggregate (GMTA) and white mineral trioxide aggregate (WMTA). The white mineral trioxide aggregate lacks the aluminoferrite phase that causes the grey color to grey mineral trioxide aggregate.⁷ Studies have shown that mineral trioxide aggregate stimulate cytokine release from bone indicating that it useful in promoting hard tissue formation. MTA is advantageous in its ability to effectively seal the tooth material interface to prevent bacterial penetration and to it has good biocompatibility.⁸ In contrast to calcium hydroxide, which deteriorates over period of time and gradually disintegrates thereby leaving space for potential microleakage. MTA does not appear to change overtime. Therefore, it preserves the protective cover for developing reparative dentin and prevents bacterial invasion of the pulp. To save the vitality of pulp tissue and prevent pathological changes in the periradicular tissues, mechanical and carious pulp exposures without signs of irreversible pulpitis must be sealed⁷. Furthermore, pathways of communications between the root canal system and the periodontium like iatrogenic perforations should be sealed with restorative materials that prevent bacterial leakage.⁹ Schwartz RS, Mauger M, Clement DJ, William A discussed various uses of mineral trioxide aggregate¹⁰ like used in both surgical and non-surgical applications including direct pulp capping, root-end fillings, apexification and perforation repairs in roots or in furcations.¹¹,¹⁴ Previously many materials have been used to seal the communication between root canal system and the surrounding as well as the periradicular tissues. The main disadvantage of these materials are microleakage, varying degrees of toxicity and sensitivity to the presence of moisture.¹²,¹⁵ Recently, MTA has been investigated as a potential material to seal the pathways of communication between root canal system and the external tooth surface.¹⁶ MTA has been used as a pulp capping material, for closure of open apex, repair of root and furcation perforation and as a barrier in treatment of internal bleaching of endodontically treated teeth.¹³,¹⁷

**CONCLUSION**

Mineral trioxide total is new material that has different energizing potential outcomes for
pulpal therapy. Certainly mineral trioxide aggregate can not be utilize to spare each tooth with pulpal involvement, however it is very useful and advance pulp medicament to add to a clinician armamentarium. So MTA is an ideal material with predictable sealability, good biocompatibility and increased moisture sensitivity.

REFERENCES