



## CASE REPORT

### MINERAL TRIOXIDE AGGREGATE PULPOTOMY OF AN IMMATURE PERMANENT SECOND MOLAR: A CASE REPORT

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#### ABSTRACT

**Aim:** To describe a pulpotomy using Mineral trioxide aggregate in an immature permanent mandibular second molar. **Summary:** Partial pulpotomy was performed on a cariously exposed permanent second mandibular molar showing symptoms of irreversible pulpitis. Follow-up examination revealed complete root formation with resolution of clinical and radiographic symptoms thereby successfully preserving the tooth and vitality of its pulp. **Conclusion:** MTA may be used as a successful pulpotomy agent in immature permanent molars.

#### Key words:

Mineral trioxide aggregate,  
Permanent tooth, Pulpotomy.

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## INTRODUCTION

Irreversible pulpitis is the most common reason for endodontic treatment (Boykin, 2003). The long term prognosis of root canal therapy is well-accepted (Hasselgren, 1989), but it is expensive, complicated, and time-consuming. Unfortunately, due to patient's financial restrictions, the only alternative treatment may be tooth extraction (Kojima, 2004). Therefore, an economic, conservative, and simple technique like vital pulp therapy presents a better option particularly in treating teeth with exposed vital pulp where the root formation has not yet been completed (Bender, 2000). The objective is to maintain vitality of the radicular pulp so that normal root development can occur (Love, 1997; Shabahang, 2000 and Webber, 1984). Currently several studies have reported successful outcome of vital pulp therapy in vital teeth with cariously exposed pulp. It has been postulated that maintaining an aseptic environment is an integral and fundamental approach to the success of all vital pulp procedures. Apart from this the success rate of vital pulp therapy depends upon the inflammatory status of pulp,

proper haemorrhage control, cytotoxicity and biocompatibility of the pulp therapy agent used, the technique employed and finally the period of observation and the criteria used to determine success (Rcaicedo, 2006). Historically, calcium hydroxide has been in use for long in vital pulp therapy (Ulmansky, 1971; Eliyahu Mass, 2011 and Holland, 1979). In 1929, Hess reported a technique of pulpotomy using calcium hydroxide (Hess, 1929). Subsequently many researchers agreed that calcium hydroxide encourages dentine bridge formation (Heys, 1981). But many authors reported multiple defects in the bridge, which allows fluid and bacterial penetration into the tooth, which in turn can lead to pulpal irritation, internal resorption, and ultimately tooth loss (Kopel, 1997; Murray, 2003 and Cox, 1996). Mineral trioxide aggregate (MTA) (Chueh, 2010) is a relatively new material that has been used in a variety of situations in permanent teeth including vital pulp therapy (Parirokh, 2010). Clinicians report favourable treatment outcomes and various research reports indicate that this material is biocompatible, encourages pulp, bone and periodontal ligament repair and it seals well in fluid penetration (Torabinejad, 2010). Hydroxyapatite crystals form over MTA when it comes in contact with tissue synthetic fluid. This can act as a nidus for the formation of calcified structures after the use of this material in endodontic treatments (Parirokh, 2010).

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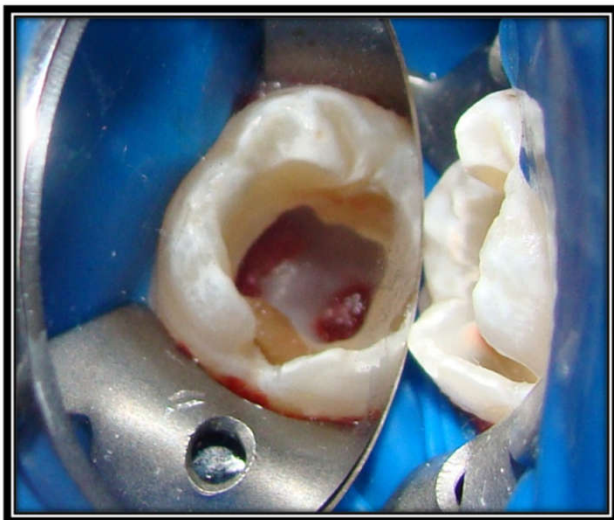
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Aeinehchi *et al.* in 2003 emphasized the advantage of using MTA dentine bridge formation when compared to calcium hydroxide (Aeinehchi, 2003). Similarly study by Chako and Kurikose showed that dentine bridge formation was more homogenous and continuous after MTA pulpotomy compared with calcium hydroxide pulpotomy (Chacko, 2006). The present case report describes the clinical outcomes of MTA pulpotomy of an immature permanent molar with caries exposure and signs of irreversible pulpitis.

### Case report

A 15 years old patient presented with history of spontaneous pain since one week in right posterior mandible. On examination a large carious lesion was evident in right mandibular second molar. Tooth 47 showed no response to cold testing or EPT and was tender on percussion. Periodontal probing depths were all within normal limits. Radiographic examination of the tooth showed an immature root with an open apex and periapical radiolucency associated with both mesial and distal roots. Based on these findings a preliminary diagnosis of immature tooth with symptomatic apical periodontitis was made. Tooth 47 was isolated using rubber dam. All further steps were carried under operating microscope. Caries was removed using a large round bur with copious irrigation. Upon access cavity, gentle irrigation with 20 ml of 3% sodium hypochlorite for 3 minutes followed by 10 ml of normal saline for 3 minutes with no mechanical instrumentation was carried out. After washing out of necrotic debris, a pink, coherent vital pulp was visible in the coronal part of the root canal. Given the incomplete root formation and open apex partial pulpotomy treatment was proposed in view of continuing the root formation. The chamber was dried with sterile cotton pellets and a blood clot was formed at the exposed vital pulp tissue (Figure 1).



**Figure 1. Operating microscopic view of tooth 47 showing complete hemostasis at canal orifices after removal of necrotic pulp tissue**

White MTA was then mixed with sterile water to a paste like consistency and an approximately 2-mm-thick layer of this material was applied onto the pulp tissue. A moist cotton pellet was kept on the MTA and the access cavity was restored with temporary filling. The patient was recalled the next day. No post-operative pain was experienced by the patient. Cotton pellet placed over the MTA was removed and setting of MTA

was confirmed. The tooth was then restored with a 3mm layer of glass ionomer cement directly over set MTA followed by placing composite as a final restoration (Figure 2). An eighteen months follow up was maintained (Figure 3). The patient remained clinically asymptomatic. No tenderness on percussion could be elicited on follow up visits. The tooth was non-responsive to cold and electric pulp testing. Radiographically, periapical radiolucency had completely disappeared. No signs of periradicular bone or root resorption were noted. A dentinal bridge formation below MTA was clearly evident. Also, marked thickening of the root walls in the apical third with the physiological continuation of root formation and complete apex closure occurred.



**Figure 2. Radiograph showing tooth 47 immediately after placement of coronal MTA plug over exposed root canals. Immature roots having wide open apex associated with radiolucency are evidently seen**



**Figure 3. Tooth 47 at 18 months follow up.**

### DISCUSSION

Mineral trioxide aggregate has been successfully applied as a pulpotomy agent in cariously exposed permanent molars.<sup>25</sup> It has been shown to produce a thicker dentinal bridge, less inflammation and less pulpal necrosis as a result of its biocompatibility, alkalinity, antibacterial properties and excellent sealing properties. The present case signifies a painful condition with a preoperative diagnosis of irreversible pulpitis being favourably treated using MTA. Partial pulpotomy was

the treatment of choice in this case as the patient was young with immature roots having wide open apices; and a complete pulpotomy would destroy the cell rich coronal pulp resulting in arrest of dentine formation and obliteration of root canals. A radio-opaque dentinal bridge was observed coronally in the pulps covered with MTA suggesting that a hard tissue formation was stimulated after vital pulp therapy. It has been documented that this particular effect of MTA occurs not only because of its controlling infection via high alkalinity which denatured bacterial proteins (Siquera, 1996), but also due to release of calcium and hydroxyl ions (Sarkar, 2005). The roots were able to complete their formation with subsequent narrowing of apical foramen. Sarkar *et al* (2005), stated that when further recontamination is prevented with a tight coronal seal, the exposed dental pulp has the capacity to maintain vitality. In addition, the patient's age must have contributed to the success of this case as older pulps are more fibrous and less cellular and may have less blood supply (Massler, 1972). No evidence of internal root resorption or calcification was detected. The tooth did not show any response to the sensibility testing during future follow ups. This although does not necessarily indicate a lack of vitality. Torabinejad *et al*, stated that the thick MTA plug used coronally affects pulp response to sensibility testing (Torabinejad, 2011).

## Conclusion

This case revealed that MTA was an effective pulpotomy agent for immature permanent molar with irreversible pulpitis in short term follow up. Also, partial pulpotomy helps to reliably maintain the pulp vitality in the radicular portion and allowed further root development.

## REFERENCES

- Aeinehchi M, Eslami B, Ghanbariha M, Saffar AS. Mineral trioxide aggregate (MTA) and calcium hydroxide as pulp-capping agents in human teeth: a preliminary report. *Int Endod J*. 2003;36(3):225-31.
- Barrieshi-Nusair KM<sup>1</sup>, Qudeimat MA. A prospective clinical study of mineral trioxide aggregate for partial pulpotomy in cariously exposed permanent teeth. *J endod*. 2006;32(8):731-5.
- Bender IB. Reversible and irreversible painful pulpitis: diagnosis and treatment. *Aust Endod J* 2000; 26:10-4.
- Boykin MJ, Gilbert GH, Tilashalski KR, Shelton BJ. Incidence of endodontic treatment: a 48-month prospective study. *J Endod* 2003; 29:806-9.
- Calışkan MK. Pulpotomy of carious vital teeth with periapical involvement. *Int Endod J*. 1995;28(3):172-69
- Chacko V, Kurikose S. Human pulpal response to mineral trioxide aggregate (MTA): a histologic study. *J Clin Pediatr Dent*. 2006;30(3):203-9.
- Chueh LH, Chiang CP. Histology of Irreversible pulpitis premolars treated with mineral trioxide aggregate pulpotomy. *Oper Dent*. 2010;35(3):370-4.
- Cox CF, Subay RK, Ostro E, Suzuki S, Suzuki SH. Tunnel defects in dentin bridges: their formation following direct pulp capping. *Oper Dent* 1996;21:4-11.
- Eliyahu Mass and Uri Zilberman. Long-term radiologic pulp evaluation after partial pulpotomy in young permanent molars. *Quintessence Int*. 2011;42(7):547-54.
- Hasselgren G, Reit C. Emergency pulpotomy: pain relieving effect with and without the use of sedative dressings. *J Endod* 1989;15(6):254-6.
- Hess W. Pulp amputation as a method of treating root canals. *Dent Items Interest* 1929; 51:596.
- Heys DR, Cox CF, Heys RJ, Avery JK. Histological considerations of direct pulp capping agents. *J Dent Res* 1981;60:1371-9.
- Holland R, de Souza V, de Mello W, Nery MJ, Bernabe PF, Otoboni Filho JA. Permeability of the hard tissue bridge formed after pulpotomy with calcium hydroxide: a histologic study. *JADA* 1979;99:472-5.
- Kojima K, Inamoto K, Nagamatsu K, *et al*. Success rate of endodontic treatment of teeth with vital and nonvital pulps. A meta-analysis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004;97:95-9.
- Kopel HM. The pulp capping procedure in primary teeth "revisited". *ASDC J Dent Child* 1997;64:327-333.
- Love RM. Effects of dental trauma on the pulp. *Pract Periodontics Aesthet Dent* 1997;9:427-36;quiz 38.
- Massler M. Therapy conducive to healing of the human pulp. *Oral Surg* 1972;34:122-30.
- Murray PE, Hafez AA, Smith AJ, Cox CF. Identification of hierarchical factors to guide clinical decision making for successful long-term pulp capping. *Quintessence Int* 2003;34:61-70.
- Parirokh M, Torabinejad M. Mineral trioxide aggregate: a comprehensive literature review--Part III: Clinical applications, drawbacks, and mechanism of action. *J Endod*. 2010;36(3):400-13.
- Parirokh M, Torabinejad M. Mineral trioxide aggregate: a comprehensive literature review--Part I: chemical, physical, and antibacterial properties. *J Endod*. 2010;36(1):16-27.
- R caicedo,PV Abbott,DJ Alongi. Clinical, radiographic and histological analysis of the effects of mineral trioxide aggregate used in direct pulp capping and pulpotomies in primary teeth. *Australian dental journal* 2006; 51(4):297-305
- Sarkar NK, Caicedo R, Ritwik P, Moiseyeva R, Kawashima I. Physicochemical basis of the biologic properties of Mineral Trioxide Aggregate. *J Endod* 2005; 31: 97-100.
- Shabahang S, Torabinejad M. Treatment of teeth with open apices using mineral trioxide aggregate. *Pract Periodontics Aesthet Dent* 2000; 12:315-20;quiz 22.
- Siquera JF Jr, Lopes HP. Mechanisms of antimicrobial activity of calcium hydroxide: a critical review. *Int Endod J* 1999; 32: 361-9.
- Teixera LS ,Demarco FF, CoppolaMC, Bonow ML. Clinical and radiographic evaluations of pulpotomies performed under intrapulpal injection of anesthetic solution. *Int Endod j* 2001;34:440-6
- Torabinejad M, Turman M. Revitalization of tooth with necrotic pulp and open apex by using platelet-rich plasma: a case report. *J Endod* 2011;37:265-8.
- Torabinejad M, Parirokh M. Mineral trioxide aggregate: a comprehensive literature review--part II: leakage and biocompatibility investigations. *J Endod*. 2010;36(2):190-202.
- Ulmansky M, Sela J, Langer M, Yaari A. Response of pulpotomy wounds in normal human teeth to successively applied Ledermix and Calxyl. *Arch Oral Biol* 1971; 16:1393-8.
- Webber RT. Apexogenesis versus apexification. *Dent Clin North Am* 1984; 28:669-97.