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Apexification with apical plug of MTA-Report of Case

Abdulgani Azzaldeen, Abu-Hussein Muhamad

*Istituto Stomatologico Toscano, University Guglielmo Marconi of ROME,Italy, Al-Quds University, School of Dentistry, Jerusalem, Palestine

Corresponding Author: Dr.Abu-Hussein Muhamad, DDS, MScD, MSc, MDentSci (PaedDent) ,FICD, 123Argus Street, 10441 Athens Greece

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Introduction

Traumatic injuries are more common in anterior teeth especially maxillary central incisors where 16% are complicated fractures involving pulp. The prevalence of dental traumatic injuries ranges from 13.8-15.1% [1-3]. When severe, results in inflammation of pulp and later advances to pulpal necrosis. Trauma which occurring in young age affects the root formation and leads to incomplete development of dentinal walls at root apices, which results in Blunderbass canals.[1-6] Morse et al. reported that placing calcium hydroxide in management of incompletely formed roots showed better results, Apexification is the treatment of choice by inducing a calcific barrier at the root apices, which can be done for all ages using MTA, a root canal repair material developed at the beginning of 1990s at Loma Linda University in California. MTA showed better results than multiple visit calciumhydroxides dressing in many recent studies[7-11]

The present case reports highlight the non-surgical management of asymptomatic tooth with blunderbuss canal using MTA apical plug technique.

Case Report

A 17 year old female patient, reported to my pediatric dental clinics ,Athens , with a chief compliant of discoloured left maxillary central ncisor and history revealed that patient had suffered trauma at the age of 10. The concerned tooth showed no response to both electric and heat test. On radiographic examination, it revealed a large blunderbuss canal with a radiolucent area in proximity of the apex of the tooth (Fig. 1).

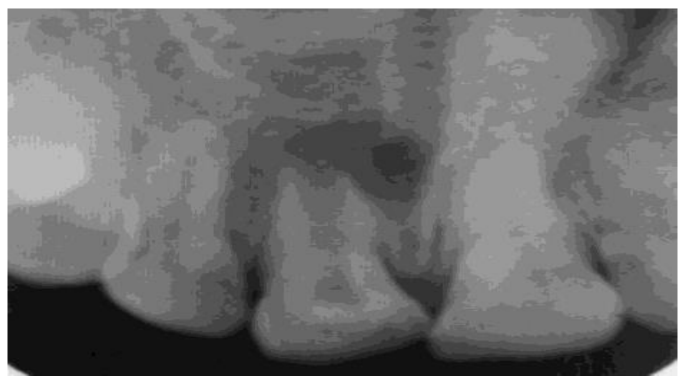

Fig. 1: Preoperative radiograph

There are two treatment options either surgical removal of periapical lesion and retrograde filling or apexification using apical plug of MTA, followed by non surgical root canal treatment. Considering the age of the patient ,crown-to-root ratio (the ratio measuring the length of the part of the tooth that protrudes from the bone, versus the length of the part of the tooth that is fully captured in the bone), need for limiting the restoration within the apex and formation of the lost bone structure, nonsurgical treatment was opted. After rubber dam application conventional access opening was prepared and working length was determined (Fig. 2).

Fig. 2: Working length determination

Gentle instrumentation was done using #90 K-file in circumferential filing motion. Root canal debridement was done using alternate irrigation with 2.5% NaOCl and saline throughout cleaning and shaping procedure. Canal was dried with multiple paper adsorbent paper points and Metapex was packed in the root canal and patient recalled after one month. After 1 month, tooth was again isolated and root canal dressing was removed and canal was irrigated with 2.5% NaOCl followed by 17% EDTA (and final rinse with 2% chlorohexidine. The canal was dried with adsorbent paper points and small pieces of CollaCote , a synthetic collagen material, were gently compacted using hand pluggers to produce a barrier at the level of the apex. ProRoot® MTA was placed with MTA carrier in the apical portion of the canal and compacted against the CollaCote barrier. Subsequent increments were condensed with hand pluggers to form a apical plug of thickness 2- 5 mm (Fig. 3). A wet cotton pellet was placed and access cavity was sealed with temporary cement. At the second visit, the tooth remained asymptomatic and the tooth was isolated and accessed as before. A hand plugger was lightly tapped against the MTA plug to confirm a hardened set.

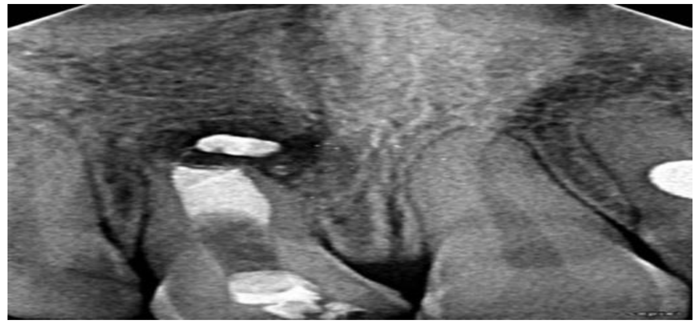

Fig. 3: Apical plug of MTA

The root canal was back filled using Apexit Plus sealer and injectable thermoplasticized gutta percha-Calamus and access cavity was sealed with glass inomer restorative cement and crown was given (Fig. 4).

Discussion

Environment to permit deposition of cementum, bone and periodontal ligament to continue its function of root development. [7]The goal of this treatment is to obtain an apical barrier to prevent the passage of toxins and bacteria into periapical tissues from root canal.[9] Technically this barrier is necessary to allow compaction of root filling material.[6] Mineral Trioxide Aggregate (MTA) was developed at Loma Linda University, in the 1990s, as a root-end filling material as an alternative to traditional materials for the repair of root perforations, pulp-capping and as a retrograde root filling due to its superior biocompatibilty and ability to seal the root canal system. Torabinejad reported the ingredients in MTA as tri calcium silicate, tricalciumaluminate, tricalcium oxide and silicate oxide with some other mineral oxides that were responsible for the chemical and physical properties of aggregate.[1-5] The powder consists of fine hydrophilic particles that set in the presence of moisture.[11] The hydration of the powder results in a colloidal gel with a pH of 12.5 that will set in approximately 3 hours.[7] Whilst the advantage of calcium hydroxide lies in the fact that it has been widely studied and has shown success, the disadvantages are its prolonged treatment time, the need for multiple visits and radiographs. Thus there is increasing popularity with one visit apexification techniques.[11] One visit apexification has been defined as the non surgical condensation of a biocompatible material into the apical end of root canal. The rationale is to establish an apical stop that would enable the root canal to be filled immediately. The advantages of MTA are multiple: (i) reduction in treatment time, (ii) possibility to restore the tooth with a minimal delay, and thus to prevent the fracture of the root and (iii) it also avoids changes in the mechanical properties of dentine because of the prolonged use of calcium hydroxide.[8] In addition, because of its non-cytotoxicity, MTA has good biological properties and stimulates repair.[9] MTA has been reported to strengthen the cervical fracture resistance of immature sheep incisors as compared to the use of calcium hydroxide.[10] When used in dogs' teeth with incomplete root formation and contaminated canals, MTA induced the formation of an apical barrier with hard tissue. MTA has the ability to induce cementum like hard tissue when used adjacent to the periradicular tissues. MTA is a promising material as a result of its superior seali ng property, its ability to set in the presence of blood and its biocompatibility. [11-12]

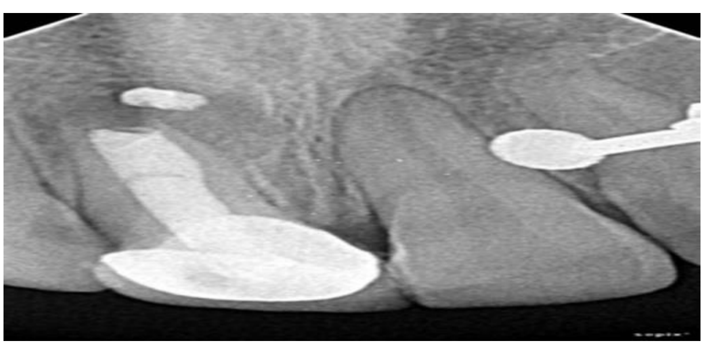

Fig. 4: Obturation with crown

Moisture contamination at the apex of tooth before barrier formation is often a problem with other materials used in apexification. [13]As a result of its hydrophilic property, the presence of moisture does not affect its sealing ability. Shabahang et al., examined hard tissue formation and inflammation histomorphologically after treating open apices in canine teeth with osteogenic protein-1, MTA and calcium hydroxide. MTA induced hard tissue formation with the most consistency, but the amount of hard tissue formation and inflammation was not statistically different among the three materials. MTA has been used over the last 10 years as a suitable alternative to achieve a peri-radicular seal with favourable success rates.[14-17]

Johannes Mente et al., conducted a controlled cohort clinical and radiographic study on 229 teeth treated with direct pulp capping with MTA and calcium hydroxide between 2001 and 2011. The results of this study indicate that MTA provides better long-term results after direct pulp capping compared with calcium hydroxide. Despite this MTA has some known drawbacks such as a long setting time, high cost, and potential of discoloration. 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. Although the overall results in human studies involving MTA materials are very positive, further longitudinal studies are encouraged, as at present insufficient well-designed and controlled clinical studies exists that allow systematic and meta-analysis review of MTA materials in all of its suggested clinical indications. [1-6]

MTA has been widely recommended for plugging open apices(15-17).It has good apical seal, biocompatibility , pulpal and periodontal tissue regenerating capabilities(8-11). Authors have reported that MTA root fillings placed at the cemental canal limit showed better results than overfillings[12-13] .Various materials have been used to prevent MTA extrusion into the periodontal tissues, including hyroxyapatite, collagen, calcium phosphate cement and calcium sulphate. In this case, the apical stop gained by calcium hydroxide use was used to obtain a dense MTA plug contained within the apical limit of the tooth. The anatomy of the canal dictated the use of a plastic filling material.[18] Access was sealed with composite restoration starting from 3mms below the cervical line to reinforce this tooth against fracture.[17]The six- month follow up showed clinical and radiographic signs of healing. Long term follow up is however necessary to ensure success, especially since this therapy would probably increase chances of tooth fracture [18]

Conclusion

MTA has numerous applications in endodontic therapy that range from apexification to pulpotomy**.** The primary advantages of this material as an apical barrier include development of proper apical seal and excellent biocompatibility. Single visit apexification with a novel biocompatible material like MTA is a new boon in effective management of teeth with open apex .This innovative procedure is predictable and less time consuming one.

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