CASE REPORT

Single Visit MTA Appexification of a Blunderbuss Canal: A Case Report

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ABSTRACT

Mineral Trioxide Aggregate (MTA) an alternative to commonly used material for the repair of root perforations, pulp-capping also as a retrograde root filling due to its superior biocompatibility and ability to seal the root canal system. Earlier, calcium hydroxide has been the material of choice for the apexification of immature permanent teeth, but MTA shows significant promise as an alternative to multiple treatments with calcium hydroxide. These case discusses the use of calcium hydroxide as a traditional apexification material and provides an overview of the composition, properties and applications of Mineral Trioxide Aggregate with highlight on its use in apexification of immature permanent teeth.

KEYWORDS: Open-apex, Mineral Trioxide Aggregate

INTRODUCTION

Trauma is a reason of cessation of root development. Fragile root canals become weak. It is difficult to create an artificial barrier or induce closure of apical foramen with calcified tissue.[1] MTA was first defined in dental scientific literature in 1993[2] and was given sanctioned for endodontic therapy by the US Food and Drug Administration in 1998. Up to 2002, only MTA material containing of gray colored powder was available and then white MTA was presented. Both formulae contain 75% Portland cement, 5% gypsum and 20% bismuth oxide by weight. The purpose of this procedure is to limit bacterial infection and production of mineralized apical tissues in an immature anterior tooth. The inadequacy of calcium hydroxide apexification due to its long time span and re-infection because of temporary seal[3,4] lead to the use of MTA This forms a barrier and prevents micro leakage. It is bio-compatible and forms a dentinal bridge, cementum, and periodontal ligament regeneration.[5] It has the ability to stimulate cytoclin release from the bone cells, indicating that it active and promotes hard tissue formation.[6]

CASE REPORT

A 19 year old female patient who had encountered with accident about six years ago, before she visited the Department of Conservative Dentistry and Endodontics , Triveni Dental College Hospital and Research Centre for the treatment of maxillary right central and lateral incisor. The patient had come across with a trauma and no treatment was performed until the moment. She had a chief complaint of pain which was mild, intermittent and had started few days back. Clinical examination revealed the crown size was shortened and discoloured with mobility was within their limits. Radiolucency with context to 11, 12 (Right Central and Right lateral Incisor) and open apex with only central incisor was apparent on radiographic evaluation. On the foundation of clinical and radiographical examination, the case was detected as necrosis of pulp with open apex. On the first visit, after proper isolation access cavity preparation was done and working length was established (Fig. 1). Copious

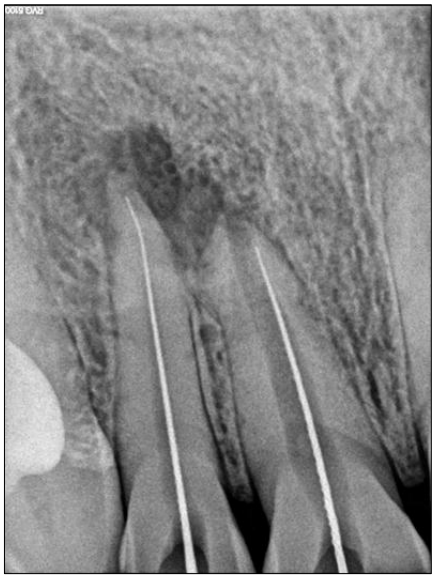

Figure 1:- Working Length Determination

irrigation was done using 2% chlorhexidine throughout the biomechanical preparation. The canals were dressed with calcium hydroxide and the access cavity was sealed with Cavit-G (3 M ESPE, Seefeld, Germany), the patient was recalled after a week. The Temporary seal was removed from the central incisor; calcium hydroxide was eliminated by mechanical instrumentation and rinsed out

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of root canals by means of saline irrigation. The canals were dried using sterile paper points. MTA (Angelus, Brazil) was arranged immediately before use, placed into the canals with an MTA carrier and compacted with a hand plugger to create an apical plug of 3 to 4 mm (Fig. 2) as described by the manufacturer. Radiography was taken to check if no apical extension occurred and a moist cotton pallet was left behind on top of the MTA to ensure setting, the access cavity was sealed with Cavit. The patient was recalled after 48 hours, and the remaining part was obturated with gutta percha using warm lateral and vertical condensation along with the lateral incisor (Fig. 3).

Figure 2:- MTA Plug Placement

Figure 3:- Final obturation with Gutta Percha

DISCUSSION

The old-style use of calcium hydroxide apical barriers has been associated with fickle apical closure, time taken for barrier formation, patient compliance, risks of re-infection resulting from the difficulty in creating long term seals with temporary restorations and vulnerability to root fractures arising from the presence of thin roots or prolonged exposure of the root dentin to Ca(OH)2.[7] Thus there is increasing acceptance with one visit apexification procedure. One visit Apexification has been defined as the nonsurgical condensation of biocompatible material into the apical end of a root canal. The logic is to establish an apical stop that would permit the root canal to be filled straightaway. Torneck[8] and others have showed that when apical closure takes place clinically with $Ca(OH)_2$, there is no complete linking of the apex histologically. Periapical inflammation persists about the apices of many teeth because necrotic tissue exists in bends and cracks of the bridge. A major target area of biomedical research is a mechanism to restore lost bone. A resorbable tricalcium phosphate ceramic has been developed. Koenig's, Brilliant and Driskell[9] found that use of this material prompted apical closure in vital teeth of primates with open apices. Rebirth of periodontal ligament occurred all over the apices of teeth, and it was related with a minimal inflammatory response. Harbert documented the long-term accomplishment of using a tri calcium phosphate plug as an apical barrier for single visit apexification. In other studies, teeth with open apices were obturated using an apical barrier with dentin and $Ca(OH)_2$ plugs or dentin chips and hydroxyapatite.[10]

There is increasing acceptance with one visit apexification technique using Mineral Trioxide Aggregate (MTA) as osteoconductive apical barrier. MTA is comparatively non cytotoxic and stimulates cementogenesis. This Portland cement based material generates a highly alkaline aqueous environment by filtering of calcium and hydroxyl ions, adapting it bioactive by forming hydroxyappatite in presence of phosphate containing fluids. Dissimilar the extended use of $Ca(OH)_2$ in immature roots, prolonged filling of these roots with MTA did not reduce their fracture resistance.[11] Torabinejad[12] reported the ingredients in MTA as tricalcium aluminate, tricalcium silicate, tricalcium oxide and silicate oxide with some other mineral oxides that were responsible for the chemical and physical properties of aggregate. The powder consists of fine hydrophilic particles that set in the moist condition. The hydration of the powder results in a colloidal gel with a pH of 12.5 that will set in approximately 3 hours. MTA has a compressive strength equal to temporary restorative material and Super - EBA but less than that of amalgam. MTA has the skill to induce cementum like hard tissue when used in line to the periradicular tissues. MTA is a capable material as a result of its greater sealing property, its ability to set in the company of blood and its biocompatibility. Moisture contagion at the apex of tooth before barrier formation is often a problem with other materials used in apexification. As a result of its hydrophilic property, the presence of moisture does not affect its sealing ability. Shabahang[13] et al inspected hard tissue development and inflammation histomorphologically after handling open apices in canine teeth with

osteogenic protein-1, MTA and calcium hydroxide. MTA induced hard tissue formation with the most reliability, but the amount of hard tissue development and inflammation was not statistically different among the three materials. MTA has established the ability to stimulate cells to differentiate into hard tissue – forming cells and to harvest a hard tissue matrix. A number of animal studies have demonstrated a more expectable healing outcome when MTA is used when related with teeth treated with calcium hydroxide.[14] In a potential human outcome study, 57 teeth with open apices were obturated with MTA in one visit. Forty three of these cases were accessible for recall at 12 months, of which 81% of cases were categorised as healed.[15] Despite its good physical and biologic properties, lengthy setting time has been a main drawback. Calcium chloride was used with aim to stimulate hardening process of MTA. Studies have shown that not only the sealing ability but its physicochemical property was improved by addition of $CaCl_2$.

CONCLUSION

Mineral trioxide aggregate showed clinical and radiographic success as a material used to induce root-end closure in necrotic immature permanent teeth and MTA is a suitable replacement for calcium hydroxide for the apexification procedure.

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