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CASE REPORT

Endodontic Management Of Tooth With Open Apex Using Mta : A Case Report

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ABSTRACT
Endodontic therapy of a tooth with open apex and necrotic pulp presents multiple challenges during treatment. Microbial elimination from chronic lesions makes treatment all the more difficult. Apexification and pulp revascularization are the treatment options available. Apexification with calcium hydroxide has certain disadvantages and mineral trioxide aggregate (MTA) may be considered as a promising alternative.
Keywords : open apex, MTA, Calcium hydroxide, apexification.

INTRODUCTION

Complete root formation and apical closure of a permanent tooth continues for up to 3 years following tooth eruption. Immature teeth have wide dentinal tubules and allow the penetration of bacteria and their irritants.[1] So, any trauma or caries in immature permanent teeth can trigger the loss of pulpal vitality as well as directly have an impact on root development. This results in short roots with very thin walls, thus increasing the risk of fracture. Also, root resorption occurs rapidly after trauma in these teeth.[2]

Apexification is a procedure done for inducing a calcific barrier in the apical zone of an incompletely formed root.[3] Calcium hydroxide [Ca(OH)2] apexification may involve multiple monthly appointments to achieve elimination of the intracanal infection. The placement of Ca(OH)2 stimulates calcification and produces the apical closure. But, it has several disadvantages like alteration of the mechanical properties of dentin making the teeth more susceptible to root fracture. Also, it takes 5 to 20 months to form a calcific barrier.[4] The formed apical plug is not completely impervious due to increased porosities within the barrier.[5]

Mineral trioxide aggregate (MTA), a recently introduced cement, has a variety of potential uses, including as a root canal obturating material. Studies have demonstrated encouraging regeneration of periradicular tissues, such as periodontal ligament, bone, and cementum, when MTA was used in endodontic procedures[6–8]. There are also several reports of its superior biocompatibility with periodontal tissues [9-10], excellent sealing ability in the presence

of moisture [11-12], and appropriate mechanical properties as apical sealing material.[8] These encouraging outcomes from in vivo and in vitro studies have prompted many clinicians to consider the use of MTA as a root end filling material and as a material suitable for repairing perforations and performing apexifications [6-8]. MTA has been used for apexification of immature roots instead of Ca(OH)2 because of its facilitation of normal periradicular architecture by inducing hard tissue barriers.[13]MTA has also presented promising outcomes when used for the repair of lateral and furcation perforations. Formation of cementum surrounding MTA was observed, even after extrusion of MTA into a furcation [14].On the basis of these findings, MTA may be an appropriate material for apical sealing of mature root canals with open apices, which may impose technical challenges in obtaining adequate obturation because of apical perforation, over-instrumentation, resorption, or former surgical treatment. Successful prognosis from conservative treatment with MTA for such difficult cases without surgical treatment would be of great benefit for patients.
The aim of this case report is to introduce a new method of MTA placement at the root apex of immature root with large apical foramen.

CASE REPORT

A 23-year-old male reported at the Department of Conservative Dentistry and Endodontics, with the complaint of intermittent pain on the upper front tooth. Pain aggravated on biting. The patient gave a history of trauma 9–10 years back. The patient had no tenderness on percussion. He had a history of trauma 15 years ago. Radiographically, tooth 21 showed open apex, periodontal space widening and mild periapical radiolucency [Fig 1] . The treatment options for open apex were explained to the patient and root canal therapy following MTA apexification was chosen.
Access cavity preparation was done using endo Z bur and the canal was explored with DG 16. The root canal orifice was enlarged using gates glidden drills # 4, 3 . Working length of the root canal was determined with a K-file (Mani Inc., Japan) ISO number 10 using apex locator and confirmed with a radiograph [Fig 2]. Biomechanical preparation was done using hand K-files with intermittent irrigation using 30 G irrigating needles . The irrigants used were 5 ml of 3% sodium hypochlorite , 5 ml of 17% EDTA and 5 ml of 0.9% saline . Calcium hydroxide intra-canal medicament was placed and sealed using a temporary restorative material for one week to disinfect the root canal. In the second appointment, the intra-canal medicament was flushed out with saline and ultrasonics. 2% Chlorhexidine was used as the final irrigant and the canal was dried using paper points . Temporary restoration was placed on the access cavity and the patient was recalled the next day. MTA (ANGELUS, Brazil) was then condensed into the mould layered with sterile Teflon tape to get a 5 mm MTA plug . MTA plug was transferred into the prepared root canal with a thin coating of freshly mixed MTA [Fig 3d]. A radiograph was taken to confirm the position of apical plug [Fig 3]. A sterile cotton pellet moistened with sterile water was placed over the orifice and the access cavity was sealed with a temporary restorative material. Three days later, the set of MTA was confirmed and the root canal was obturated with gutta-percha and zinc oxide eugenol sealer [Fig 4] followed by permanent restoration of the access cavity with composite. Patient was recalled after 3 months [Figure 5] .

Figure 1 : Pre-operative radiograph of 21 **Figure 2 : Working length radiograph of 21**

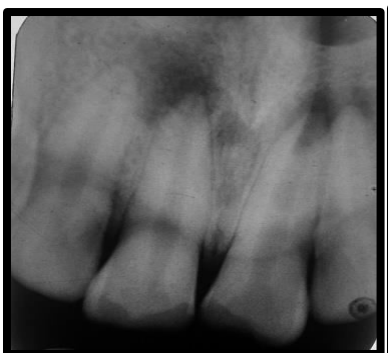


Figure 3: MTA plug oF 21

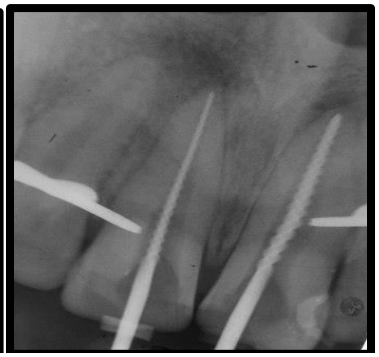


Figure 4 : Obturation of 21

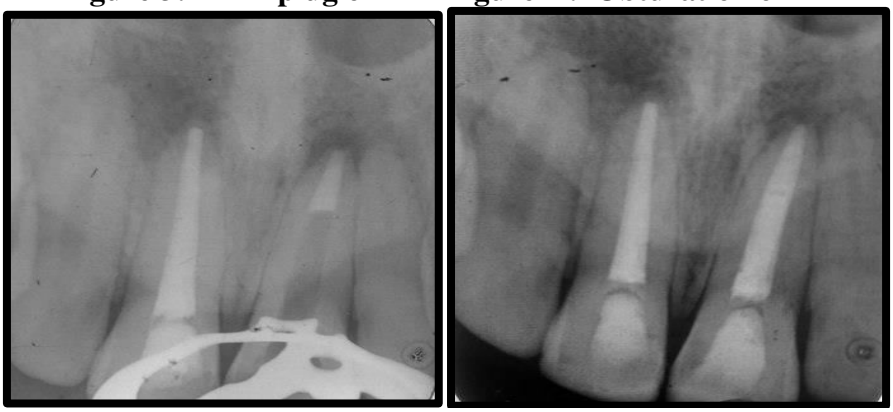
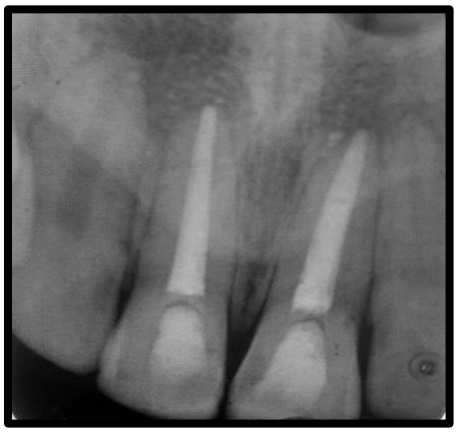


Figure 5: Radiograph of 21
After 3 months



DISCUSSION

Apart from insufficient disinfection and debridement of canals, another factor which is responsible for endodontic failure is the improper apical seal.[15,30] Immature root with a necrotic pulp and apical periodontitis presents multiple challenges to the clinicians. The standard protocols for root canal treatment cannot be followed because the open apex provides no barrier to prevent the irrigants or root filling materials from impinging the periodontal tissues. Even when the challenges described above are overcome, the roots of these teeth are thin with a higher susceptibility to fracture.[16,29]

MTA creates an osteoconductive apical barrier. It is a powder containing fine hydrophilic particles of tricalcium silicate, tricalcium oxide and silicate oxide. These particles have the ability to stimulate cells to differentiate into hard tissue, thus producing a hard tissue matrix. The set MTA has a pH similar to Ca(OH)2 i.e. 12.5 pH and this may show some antimicrobial properties. It shows less solubility and its radiopacity is slightly higher than

dentin.[17] This material has demonstrated good sealability and biocompatibility.[18,27] It has been used in both surgical and non-surgical applications including root end filling, direct pulp capping, perforation repairs and apexification.[19] But, most of the dental practitioners encounter difficulty in handling MTA clinically.[20,26] MTA should be confined to the root canal space and should not be extruded beyond the apex. Once extruded, it may not harden and may be associated with continuous periapical irritation. This is because, it gets encapsulated in the mucosa and not surrounded by bony matrix, thus could act as a chronic irritant.[21,25] The above demerits of the conventional method was the actual reason for introducing this novel technique of MTA apical plug placement.

Despite the serious damage to the apices of the treated teeth, a dramatic regeneration of periapical tissue was observed 2 years after the obturation. This excellent healing demonstrates the high ability for regeneration of periradicular tissue promoted by MTA, as has been reported elsewhere [6-7,]. The present case report confirms that MTA acts an apical barrier, not only in apexification cases, but also in failed infected root canal systems. In addition, its superior sealing ability under moist conditions was also an essential requirement for healing in this case. Hachmeister et al. [22,24,29] have reported the potential of the sealing ability of MTA used for the obturation of open apices by the intracanal delivery technique. MTA can be considered a very effective material to promote regeneration of apical tissue, even in infected fully developed teeth with open apices.[23,28]

CONCLUSION

The novel method of MTA compaction shows superior apical seal and will surely serve as a better technique for the operator to produce a successful treatment outcome.

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