

Conservative Management of Teeth with an Open Apex

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Abstract

Aim: To present a case of immature tooth which was obturated with MTA and discoloration treated by direct composite veneering.

Summary: A discolored upper left central incisor was subjected to radiographic examination revealing an open apex and a periapical radiolucency. The canal was cleaned using K-files and 5.25% of NaOCl irrigation. The canal was disinfected with slurry of calcium hydroxide repeated two times at the interval of 1 week. After two weeks the canal was obturated with MTA and remainder of canal was filled with glass-ionomer cement. The discoloration was treated with direct composite veneering. A six-month follow up demonstrated clinically asymptomatic and adequately functional tooth, with radiographic signs of healing.

Keywords: Immature tooth, MTA, Direct composite veneering.

Introduction

Conventional root canal filling techniques rely on the presence of a constriction at the apical level of the canal; therefore, the absence of the apical constriction because of incomplete root development, aggressive apical resorption, or iatrogenic enlargement presents a management challenge. Placement of the root filling in a canal with an open apical foramen carries the risk of root filling material extrusion^{1,2}.

Of the options currently available for the management of root canals with an open apex, the use of calcium hydroxide dressing to induce an apical hard tissue barrier (apexification) has gained the widest acceptance. This procedure normally requires several visits to the dentist over a period of 5 to 20 months³. This approach requires temporary restoration to be paced for long period of time which may result in microleakage and also long term Calcium hydroxide may alter the mechanical properties of dentin^{4,5,6}.

A one step apexification procedure eliminates these problems. It implies the non-surgical compaction of a biocompatible material into the apical end of the root canal, thus, creating an apical stop and enabling immediate filling of the root canal⁷.

An alternative to apexification with calcium hydroxide is to seal the open apical foramen with a mineral trioxide aggregate (MTA) apical plug⁸. This procedure can be completed in one or two treatment sessions, making it possible to restore the tooth within a

short timeframe while avoiding reliance on patient compliance and prolonged exposure of root dentin to calcium hydroxide⁹.¹⁰. Clinical studies have reported that 77% to 85% of teeth with open apices healed completely 1 to 3 years after the placement of MTA apical plugs.

MTA has been described as a good material for this procedure owing to its good canal sealing property, biocompatibility and ability to promote dental pulp and periradicular tissue regeneration^{11,12,13}.

Recently, MTA has been used as an obturating material in cases of apexification, dens in dente, before surgery, and in internal resorption cases¹⁴.

This report demonstrates a tooth with open apex and discoloration which was treated by MTA obturation and direct composite veneering.

Case Report

A 32 year old female presented to the department of conservative dentistry and endodontics in the St Joseph dental college, Eluru, with discolored upper left central incisor. The patient gave history of trauma when she was 10 year old. The treatment was not taken as the tooth was asymptomatic. When patient was about 18 years old she underwent orthodontic treatment for the malocclusion. The tooth showed evidence of color change during the course of treatment. Once treatment was finished sinus opening was noted with relation to upper left incisor. She consulted dentist for which medication was prescribed and patient didn't went for further treatment as sinus opening resolved. The episode of sinus opening and resolving occurred for quite number of time. Then finally she visited our college where detail history was taken. Clinical and radiographic examination revealed a discolored tooth 21, sinus tract over the attached gingiva, wide open apex and periapically radiolucent area (Fig.1).

A diagnosis of immature nonvital tooth with periapical radiolucency was made. A one step apexification preceded by canal disinfection for two weeks with calcium hydroxide followed by composite veneering was planned for this tooth.

After application of rubber dam and access cavity preparation, working length was obtained. At this stage, the number 80 file was found loose and easily passing beyond the apical limit of the canal. The working length was determined by apex locator (Root ZX, J Morita corporation, Kyoto, Japan) and subsequently confirmed by radiograph. The canal was thoroughly cleaned using intracanal

instruments and 5.25% hypochlorite irrigation. To obtain canal disinfection prior to MTA placement, a slurry of calcium hydroxide mixed with Metrohex was applied twice within an interval of two weeks and temporized. After two weeks sinus tract disappeared and placement of MTA was decided.

The white MTA (ProRoot, Dentsply, Tulsa, OK) was mixed to a paste consistency with sterile water and delivered to the canal using an amalgam carrier in about 3mm thickness. Cotton was wrapped onto a 80 K-file, moistened and used as a plugger to condense the MTA apically. MTA can also be used as obturating material. So it was decided to fill the canal with MTA upto middle third. A moist cotton pellet was sealed inside for setting of MTA. Patient was recalled after two days and the hard set of MTA was confirmed and remainder of canal was filled with glass ionomer cement followed by composite resin to reinforce and to obtain better seal.

Patient returned after 1 week requesting treatment for the discolored tooth. Treatment alternatives and cost was explained and patient opted for composite veneering. Shade selection was done taking left lateral incisor as reference. A uniform reduction of 0.5 to 1 mm was done. The tooth was slightly placed labially so reduction was done accordingly. The preparation was etched with 37% orthophosphoric acid for 15 seconds, and was thoroughly rinsed with air and water leaving moist for wet bonding adhesion. Bonding agent was applied to the water-moistened preparation. Excess solvent was blown off with a one second blast of air. Light curing was done for 10 seconds. Composite resin was applied incrementally and cured for 20 seconds. Finishing and polishing was done to provide contour and proper texture to the restoration.

Discussion

There are many ways of treating a tooth with an immature apex. These include apexogenesis, apexification, apical plug, conventional root canal treatment with tailor-made gutta-percha, surgery¹⁵. Apexogenesis can be followed only when the inflammation is limited to coronal pulp and is carried out by performing pulpotomy¹⁶.

Apexification with calcium hydroxide has been the traditional method followed. However, the technique has some disadvantages. The primary disadvantage is that it typically takes between 6 and 18 months for the body to form the hard tissue barrier. The patient needs to report every 3

months to evaluate whether the calcium hydroxide has washed out and/or the barrier is complete enough to provide a stop to a filling material. This requires patient compliance for up to 6 visits before the procedure is completed. It has also been shown that the use of calcium hydroxide weakens the resistance of the dentin to fracture. Thus it is common for the patient to sustain another injury and also fracture the root before the hard tissue barrier is formed⁴. The barrier produced by calcium hydroxide apexification has been reported to be incomplete having a swiss cheese appearance, and can allow apical microleakage¹⁷. The use of calcium hydroxide apical barriers has also been associated with unpredictability of apical closure, risks of re-infection resulting from the difficulty in creating long term seals with provisional restorations¹⁸.

Pulp revascularization remains a good treatment option for such cases but the patient was not agreeable to the time constraints. So, one step apexification with MTA was decided for this case.

Recenty MTA was used as an alternative to gutta-percha¹⁴. The reported advantage of using MTA as an obturating material include superior sealability against bacterial microleakage, demonstrates antibacterial and bioinductive properties that can improve treatment outcomes. Furthermore, the material is sterile, radiopaque, resistant to moisture, and nonshrinking and stimulates mechanisms responsible for the bioremineralization and resolution of periapical disease. Hence it was thought to obturate the root canal with MTA upto middle third of the canal.

MTA consists of fine hydrophilic particles that set in the presence of moisture in approximately 4 hours¹⁹. In this case final

obturation was carried out at a subsequent visit to enable setting of MTA. A moist cotton pellet was left over the MTA to facilitate setting.

Studies have shown that intracoronally bonded restorations can internally strengthen endodontically treated teeth and increase their resistance to fracture^{20,21}. Since the canal was wide at the coronal and middle third, glass ionomer was placed with ease in remainder of the canal.

Among the different approaches for the management of discolored teeth, composite veneering was selected as a temporary mode of treatment since the patient was placed under observation to evaluate the healing.

Conclusion

MTA has numerous applications in endodontic therapy that range from apexification to pulpotomy. The primary advantages of this material include development of proper apical seal and excellent biocompatibility. The use of MTA as an obturating material along with composite veneering showed a positive initial clinical outcome for the immature tooth. Long term follow up is necessary to ensure success.

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Legends

- Fig. 1 Pre-operative radiograph
- Fig. 2 Working length determination
- Fig. 3 Radiograph showing MTA obturation up to middle third.
- Fig. 4 Backfilling the remainder of the canal with glass-ionomer cements.
- Fig. 5 Discolored left central incisor
- Fig. 6 Tooth preparation for direct composite veneering
- Fig. 7 After direct composite veneering

