Management of immature nonvital tooth with single-step apexification with MTA: A case report

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ABSTRACT

Apexification is a procedure for closure of the open apex in an immature necrotic tooth. Apexification with calcium hydroxide is considered as the gold standard. However, this technique is associated with certain difficulties such as multiple visit, possibility of tooth fracture, and incomplete calcification of the bridge, poor quality bridge. Single-visit mineral trioxide aggregate (MTA) apexification has become popular over the calcium hydroxide technique. In this article, a case report, which was treated by the single visit apexification procedure with MTA as the apical plug and the rest of the canal was obturated with thermoplastized gutta-percha technique.

Keywords: Apical barrier, Apexification, MTA

1. INTRODUCTION

Traumatic injuries of the permanent teeth often results in crown fracture with or without associated fracture of root. Maxillary anteriors are commonly affected in this case. The most frequently involved teeth are the maxillary incisors with a percentage of 75% in permanent teeth.

Apexification is a method to induce calcific bridge formation in an immature non-vital permanent tooth by removing the necrotic pulp just short of root end and placing a suitable biocompatible agent to close root apex. Its purpose is to allow the formation of an apical barrier in immature teeth where advancement, as well as the development of root terminate. Previously several attempts were made for the treatment of an immature non-vital tooth with wide-open root apex by a custom made cone (employing a blunt-ended gutta-percha cone which is large and performing conventional root canal obturation); a short fill technique (keeping the obturation short of apex); periapical surgery and retrograde filling; one visit apexification (restoration of the root apex by the use of a biocompatible materials like dentinal chips or tricalcium phosphate) and lastly apexification. Among them apexification is the most popular method which may involve one or many monthly appointments for placing suitable medicament to achieve elimination of intracanal infection and stimulates calcification and produces apical closure. To carry out apexification, calcium hydroxide is being replaced by MTA as a single visit technique. In this article, a clinical case which showed nonvital, immature permanent tooth with open apex and treated by a single-visit apexification procedure using MTA as an apical plug.

2. CASE REPORT

A 22-year-old male patient reported to the department of Conservative dentistry and Endodontics with the chief complaint of pain in upper front teeth. Patient gave history of trauma 12 years ago. On clinical examination, Discoloration and tenderness on percussion was present with 11(Figure1). Radiographic examination revealed wide open apex with periapical radiolucency in relation to 11 (Figure2). Based on the history and the radiographic findings, diagnosis of acute exacerbation of chronic apical periodontitis was made in relation to maxillary right central incisor. Nonsurgical endodontic apexification with MTA apical plug was planned.
3. CLINICAL PROCEDURE
Access cavity preparation was done with 11(Figure3). Apex locator produced inconsistent canal length reading so a check radiograph was used to confirm the actual working length (figure4). The canal was instrumented lightly with K files in circumferential filing motion with the aim of cleaning the root canal walls of debris.

The canal was thoroughly debrided with a copious irrigation of sodium hypochlorite (2.5%) and saline, coupled with ultrasonic agitation to ensure complete removal of the necrotic pulp tissue. The canal was dried with sterile paper points, and Calcium hydroxide was placed as an intracanal medicament and the access cavity was temporized with Cavit G for 4 weeks (Figure 5). The patient was recalled after 4 weeks & tooth was totally asymptomatic after dressing removal. The canal was irrigated with 2.5% NaOCl followed by 17% EDTA. The canal was dried with paper points and MTA was mixed according to the manufacturer’s instructions and MTA was placed with MTA carrier in the apical portion of the canal & subsequent increments were condensed with hand pluggers to form a apical plug of thickness 4 mm. After checking apical plug of MTA with radiograph (Figure6), wet cotton pellet was introduced inside the canal to hydrate the material & the tooth restored with temporary cement.

After 24 hours, temporary restoration was removed and a hand plugger was lightly tapped against the MTA plug to confirm a hardened set.

The root canal was obturated with backfill technique using Apexit Plus sealer (Figure 7). The access cavity was restored with a light cured composite restoration.

4. DISCUSSION
Necrotic pulp in permanent tooth with incompletely formed or wide-open apex results in the death of cells that were required for root formation. This slows down the possibility of apical closure as well as maturation of root. Endodontic management consisting of diseased or dead pulp with adolescent permanent tooth along with a blunderbuss root apex is a challenging concern. During obturation in that tooth, it is very difficult to obtain a proper seal at the tip. For more than 40 years, such cases are approached clinically with apexification using Ca(OH)2, which acts as an initiator for the formation of osteoid or cementoid barrier over the apical foramen. The traditional use of calcium hydroxide apical barriers has been associated with unpredictable & poor quality of apical closure, long time taken for barrier formation, patient compliance, risk of re-infection resulting from the difficulty in creating
long-term seals with provisional restorations, and susceptibility to root fractures arising from the presence of thin roots or prolonged exposure of the root dentin to Ca(OH)\textsubscript{2}\textsuperscript{3}. Thus, there is increasing popularity with one-visit apexification techniques. Bioactive materials like MTA and later on Biodentine were developed to form artificial apical barrier in a single visit so as to provide a positive stop for the obturating material\textsuperscript{4}.

During the apexification procedure, canals were gently instrumented till the correct working length and irrigated with 2.5% NaOCl to disinfect the canal and canal walls. Temporary calcium hydroxide intracanal medicament was placed after completely drying the canals. The calcium hydroxide was left in the canal for 2-4 weeks. The rationale is to control bacterial infection and to create an alkaline environment which is more ideal for MTA. After 4 weeks, again canals were gently instrumented and irrigated with 2.5% NaOCl to remove calcium hydroxide completely from the canal walls\textsuperscript{7}. Antibiotic paste treatment is that it may cause bacterial resistance and allergy. The paste contains both bactericidal (metronidazole and ciprofloxacin) and bacteriostatic (minocycline) antibiotics. There is currently no study on the effect of the bacterial resistance of antibiotic paste in canals. Minocycline causes tooth discoloration, like Ledermix,\textsuperscript{12} more severely in the chamber than below the CEJ. To prevent tooth discoloration and bacterial resistance, Calcium hydroxide is used as intracanal medicament in this case report.

Mineral trioxide aggregate has come up as a very good alternative in treating these types of cases, where the material sets and creates an apical barrier readily. It has got a very good sealing ability, as the material immediately bonds with the roots and creates a monoblock\textsuperscript{4}. Its high pH helps to destroy the surrounding microorganisms and its bioactive nature stimulates blastic cells to create favorable environment for healing. It also promotes cementum deposition on it. Moreover, due to its fast setting time, fewer follow up appointments are required to carry out this treatment. Not only the selection of material, but also the thickness of apical MTA barrier has played a key role in clinical success. A 4-5 mm thick apical MTA barrier has proven to be significantly stronger with lesser leakage than a 2 mm thick barrier. In the present case, a condensed 4 mm apical MTA plug was made\textsuperscript{5}.

5. CONCLUSION
Single-visit apexification is the recommended procedure for nonvital immature teeth with wide-open apex because the procedure is simple, less time-consuming, predictable, gives immediate result, and well accepted by the patient. MTA is a promising biocompatible material which is used as an apical plug to seal the wide-open apex.

6. REFERENCES