Single Visit Apexification In Young Permanent Tooth- A Case Report With 3 Year Follow Up.

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ABSTRACT
Trauma to permanent dentition during the period of root formation may result in inadequate root growth and an open apex. There is an enormous endodontic difficulty in treating these young permanent tooth with pulpal necrosis and periapical disease as there is absence of a natural apical constriction in these condition. Hence, in order to allow the obturating material to condense, an apical barrier must be induced or created.
Some disadvantages of the traditional calcium hydroxide apexification method include the requirement for long-term therapy to facilitate barrier development. Creating a dentinal bridge as an apical stop is the current trend.
Dentin bridge formation using recent materials, which have a more predictable outcome like mineral trioxide aggregate (MTA), Biodentine and other bioactive materials can show better results.
When compared to standard calcium hydroxide apexification, which takes an average of 12–19 months, one-step apexification with MTA shortens the treatment period and gives promising results.
In the root end apexification process, this case report documents apexification and effective healing using MTA as an apical barrier matrix in single visit.

Keywords: Immature tooth, apexification, Single visit, MTA.

INTRODUCTION:
The completion of root development and closure of the root apex occurs up to three years following eruption of the tooth. Dentin formation is halted and root development will stop if the tooth is impacted by caries, trauma, or other pulpal pathoses during the root-formation process.
A major problem for the practitioner during this time is treating pulpal injuries. Depending upon the vitality of the affected pulp, two approaches are possible- apexogenesis or apexification.
Apexogenesis is 'a vital pulp therapy procedure performed to encourage continued physiological development and formation of the root end.' Apexification is defined as 'a method to induce a calcified barrier in a root with an open apex or the continued apical development of an incomplete root in teeth with necrotic pulp'.
For the creation of the apical barrier, several materials have been suggested. For apexfication, calcium hydroxide has been utilized extensively. The thin dentinal walls of the root canal may shatter because to the alkaline pH of the calcium hydroxide, which denatures dentinal proteins.
Given the numerous disadvantages of calcium hydroxide apexification, the apical plug approach appears to be a good alternative course of treatment in these situations.
The selection of mineral trioxide aggregate (MTA) for inducing the formation of the apical barrier was based on its biocompatibility and sealing capabilities. Its ability to produce odontoblastic differentiation, good radiopacity, poor solubility, high pH, expansion after setting, and antibacterial action have all been proven in a number of investigations.
Morse et al. define one-visit apexification as the non-surgical condensation of a biocompatible material into the apical end of the root canal. The rationale is to establish an apical stop that would enable the root canal to be filled immediately.

The clinical success of MTA for one-visit apexification procedure has been reported by many authors in the literature. The present case report narrates a successful treatment of an immature permanent tooth with open apex wherein MTA was used for one-step apexification.

CASE REPORT:

A Twenty-two year old male patient reported with the chief complaint of pain in upper front tooth in the past 5 days. There was a history of trauma to the same tooth 7 years back. The medical history of the patient was non-significant. Clinical examination revealed Ellis class III fracture in relation to 11. The tooth no. 11 demonstrated sensitivity to percussion. Both cold and electric sensibility tests failed to elicit any response in relation to 11. Tooth no.12 showed vital response. Intra-Oral Periapical radiograph showed incomplete root development with open apex for the same tooth with interdental boneloss (Fig-1).

Fig-1: Ellis class III fracture with incomplete root development with open apex for the same tooth with interdental boneloss.

Single-visit MTA apexification was planned as the treatment of choice. The tooth no. 11 was accessed and working length was determined radiographically (Fig-2).

Fig-2: Access cavity was prepared in 11 and working length was determined.

The canal was irrigated with saline. Biomechanical preparation was carried out using International Organization for Standardization (ISO) 60 K file (Dentsply Maillefer, Switzerland) with circumferential filing motion. Thorough root canal debridement was done using alternative irrigation with copious amount of 2.5% sodium hypochlorite (NaOCl) (Ammdent, India) and saline. A volume of 3 ml of 17% ethylene diamine tetra acetic acid (EDTA) solution (Prevest Denpro, India) was used for smear layer removal. The canal was dried with absorbent paper points (Meta BioMed, Korea) and White MTA Angelus (Angelus, Londrina, PR, Brazil) was mixed with distilled water according to the manufacturer's instructions and carried to the canal with an amalgam carrier. Apical plug of about 4 mm of MTA was placed and confirmed radiographically. A sterile cotton pellet moistened with sterile water was placed over the canal orifice and the access cavity was sealed with Cavit (3 M ESPE, Seefeld, Germany). After 48 hours, the hard set of MTA was confirmed and the

remainder of the root canal was obturated with gutta-percha (Meta BioMed, Korea) and AH-Plus root canal sealer (Dentsply Detrey GMBH, Germany) using lateral condensation technique. (Fig-3)

Fig-3: MTA Apical plug of 4mm and obturation was done using gutta-percha and AH-Plus root canal sealer.

The access cavity was sealed with glass ionomer cement (3M Espe Ketac Cem) followed by restoration of the tooth with microhybrid composite resin restoration (Dentsply, Spectrum).
Post-operative 12 months follow-up radiograph shows root apical closure and bone formation interdentally (Fig-4).

Fig-4: Post-operative 12 months follow-up radiograph shows root apical closure and bone formation interdentally.

DISCUSSION:

There are several approaches for managing an open apex, including revascularization, apexogenesis, and apexification. In order to complete the creation of the root apex, apexogenesis is a procedure used to preserve important pulp tissue in the apical portion of a root canal.

Apexogenesis can therefore only occur while some essential pulp is still present. It was not feasible, though, because both of our teeth had necrotic pulps. One benefit of the Revascularization approach is the development of the pulp-dentin complex. It establishes pulp's defense mechanisms. On the other hand, long-term monitoring and outcome unpredictability are drawbacks.

Creating an apical barrier to stop germs and toxins from entering periapical tissues from the root canal is the aim of apexification. In a technical sense, this barrier is required to permit the compaction of root fill material. The traditional calcium hydroxide apexification method necessitates several appointments and takes three to four months to complete. There may be low patient compliance with this drawn-out treatment regimen, and many may miss their scheduled appointments.

The goal of the treatment outlined in these circumstances is to build an apical barrier in a single appointment that will stop bacteria and poisons from entering periapical tissues from the root canal.

In theory, this barrier is also required to permit the root filling material to compact.

Since, Torabinejad et al. discovered MTA, it has become the go-to material for apexification. Apexification in just one visit is now a practical treatment option for immature apexes. $CaSiO_4$, bismuth oxide, calcium carbonate ($CaCO_3$),

calcium sulfate, and calcium aluminate are the principal ingredients. It has a powder that is hydrophilic, which when combined with water forms a hydrated gel of calcium hydroxide and CaSiO4. According to a theory put forth by Holland et al., the tricalcium oxide in MTA combines with tissue fluids to produce calcium hydroxide, which creates an apical barrier.

The only limitation with the material is how long MTA material takes to set.

However, On radiographic observance after 12months follow-up, it was noted that initial as well as long term periapical healing was better in tooth filled with MTA. This may due to the fact that MTA has superior marginal adaptation.

CONCLUSION:

Single visit apexification with biocompatible materials such as MTA can be considered an effective treatment option for teeth presenting with open apices.

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