SINGLE VISIT APEXIFICATION WITH MINERAL TRIOXIDE AGGREGATE

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ABSTRACT

Mineral trioxide aggregate appears to be a promising alternative to calcium hydroxide apexification because of its high biocompatibility, superior sealing ability and reduced treatment time.. Two case reports where the patients presented with fractured upper anterior teeth. Radiographic evaluation revealed open apices with blunderbuss canals. Apical stop was created with mineral trioxide aggregate by apexification and the root canals were obturated with thermoplasticized gutta-percha.

KEYWORDS: ***Apical stop, mineral trioxide aggregate, nonvital immature permanent teeth, open apex, single visit apexification.***

INTRODUCTION

The primary objective in endodontic therapy is the complete obturation of the root canal space to prevent re-infection. In teeth with incomplete root development caused by trauma, caries and other pulpal pathosis, the absence of the natural constriction at the end of the root canal presents a challenge and makes control of filling materials difficult. The aim is to seal a sizeable communication between the root canal system and the periradicular tissue and provide a barrier against which obturation material can be compacted. Because of the lack of an apical constriction, an alternative to standard root canal treatment, apexification or root end closure has been advocated.[1]

Three techniques have been suggested to obturate an immature tooth, which involved the use of a root filling material without the induction of apical closure.[2]

- Placement of a large gutta-percha filling or customized gutta-percha cone with sealer at the apex.
- Placement of gutta-percha with sealer short of the apex.
- Periapical surgery.

These techniques did not gain popularity since there was no physical apical barrier to facilitate obturation. However, two other techniques were reported which aimed to provide an apical barrier.[2].

- Placement of calcium hydroxide to induce a mineralized apical barrier.
- Placement of a biocompatible material such as dentinal chips against which a root filling could be placed.

Apexification can be defined as a 'method to induce a calcific barrier in a root with an open apex or continued apical development of teeth with incomplete roots and a necrotic pulp.[3]

Calcium hydroxide has been the first choice of material for apexification[4] with repeated changes over the course of 5-20 months to induce the formation of calcific barrier.[5] Its efficiency has been demonstrated by many authors even in the presence of an apical lesion.[6,7]

The unpredictable and often lengthy course of this treatment modality presents challenges, including the vulnerability of the temporary coronal restoration to re-infection[8] and has several disadvantages such as variability of treatment time (average 12.9 months)[9], difficulty of the patients recall management, delay in the treatment and increase in the risk of tooth fracture after dressing with calcium hydroxide for extended periods.[10] For these reasons, single visit apexification has been suggested.[2] Mineral trioxide aggregate (MTA) has been proposed as a material suitable for one visit apexification[11,12,13] because of its biocompatibility,[14,15] bacteriostatic activity,[16] favourable sealing ability [17,18] and as root end filling material.[16]

CASE REPORT I

Fig.1.Pretreatment radio-graph showing open apex

Fig.2. Determination of working length

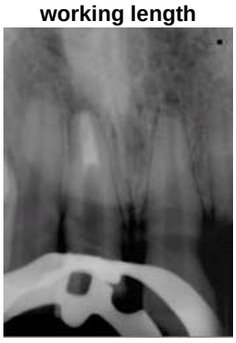

Fig.3. Apical Plug of MTA

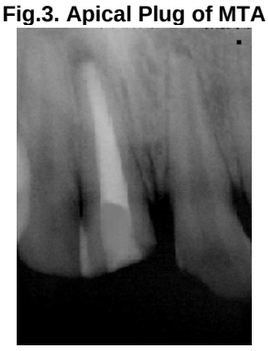

Fig.4. Restoration of Access cavity with composite.

MTA offers the barrier at the end of the root canal in teeth with necrotic pulps and open apices[11] that permits vertical condensation of warm gutta-percha in the remainder of the canal.

The practical technique and two case reports are presented in which MTA was used for apexification in open apex cases to develop an apical stop to facilitate obturation.

Case Report 1:

A 20 year old male patient reported to the Department of Conservative Dentistry and Endodontics, Kamineni Institute of Dental Sciences, Nalgonda, with a chief complaint of fractured upper anterior tooth with a history of trauma nine years ago. Clinical examination revealed Ellis class III fracture in maxillary right central incisor. Tooth responded normally to percussion, palpation and had normal periodontal probing and mobility. Radiographic examination demonstrated the presence of open apex (Fig.1). The tooth did not respond to the pulp vitality tests. The available treatment options were discussed with the patient and root canal therapy using MTA as an apical barrier was selected.

The tooth was isolated under rubber dam and access cavity prepared. Working length was established by radiographs (Fig.2) and checked with paper point. The canal was gently debrided with large H-files (Mani, Prime Dental, Mumbai) and copious amounts of 5% sodium hypochlorite. Calcium hydroxide intra canal medicament was placed for one week to disinfect the root canal.

At the second appointment, calcium hydroxide was flushed with 5% sodium hypochlorite and rinsed with saline. Final irrigation was done with 2% chlorhexidine and the canal was dried with paper points. MTA (Dentsply, Tulsa Dental, Johnson City, USA) was mixed according to the manufacturer's instructions and carried to the canal with an amalgam carrier. Apical plug of 4mm of MTA was placed and confirmed radiographically (Fig. 3). A sterile cotton pellet moistened with sterile water was placed over the canal orifice and the access cavity was sealed with Cavit (3M ESPE, Seefeld, Germany). After 72 hours, the hard set of MTA was confirmed and the remainder of the root canal was obturated with thermoplasticized gutta-percha (Obtura II, Obtura Spartan, Fenton, Missouri, USA) and AH-Plus sealer (Dentsply, De-

CASE REPORT II

Fig.5.Blunder buss Canal

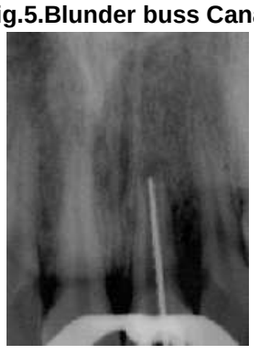

Fig.6. Determination of working length

Fig.7. Apical Plug of MTA

Fig.8. Restoration of Access cavity with composite.

Trey, Konstanz, Germany). At the same visit, the access cavity was restored with composite (Ceram-x Duo, Dentsply, De-Trey, Konstanz, Germany) (Fig. 4).

Case Report 2:

An 18 year old female patient who had trauma ten years ago reported with a chief complaint of discoloration of maxillary left central incisor. On radiographic examination blunder buss canal was evident (Fig 5). The same treatment protocol for apexification (Fig.6 and Fig.7) and obturation (Fig. 8) as above was followed and later the tooth was restored with porcelain fused to metal crown to restore the esthetics.

Discussion:

An immature permanent incisor tooth is defined as one where the apex can be considered to be open. Root canal treatment of these teeth requires a root end closure technique to form a complete calcific barrier at the apex of the tooth against which a guttapercha filling can be condensed without the possibility of sealant or guttapercha going through the apex into the periapical tissues.

The aim of root canal treatment is to eliminate the microbial cause of the infection. Hence the antimicrobial irrigants sodium hypochlorite and chlorhexidine were used and calcium hydroxide intracanal medicament for one week. The latter has been shown to eliminate bacteria in the root canal when applied for this period.[19] H files were used because the aim is to clean the root canal walls of debris, not to “shape” the canal as the canals of immature non vital teeth are wide and have thin dentinal walls.

MTA has been developed by Torabinejad and co workers in 1990 at Loma Linda University. It is available as grey and white MTA. The material consists of tricalcium silicate, tricalcium aluminate, tetracalcium aluminoferrite, calcium sulphate dihydrate and silicate oxide. Presence of bismuth oxide makes it radioopaque.[16, 20] pH of the material is 12.5 at three hours. MTA has a compressive strength comparable to IRM and Super EBA and reaches its maximum compressive strength in 72 hours.[21] Due to this reason, obturation was done after 72 hours as MTA attains its maximum strength in this time period. In teeth with necrotic pulps, divergent open apices make adaptation of MTA difficult. Aminoshariae et al. (2003) evaluated placement of MTA using hand and ultrasonic condensation and suggested that hand condensation resulted in better adaptation and fewer

voids than ultrasonic condensation. Accordingly, in these cases hand condensation was used to compact MTA at the apex.[22]

In the above case reports, the protocol for apexification with MTA was followed and obturation was done with thermoplasticized guttapercha as it does not cause excessive compaction forces on the thin dentinal walls of an immature tooth.

CONCLUSION:

MTA has numerous applications in endodontic therapy that range from apexification to pulpotomy. The primary advantages of this material as an apical barrier include reduction in the number of appointments, development of proper apical seal and excellent biocompatibility. This article demonstrated one of the indications of MTA as apexification material. Although additional research is necessary to determine additional indications for MTA, its use in endodontics certainly appears favourable and promising.

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