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Case Report

APEXIFICATION WITH MINERAL TRIOXIDE AGGREGATE: A CASE REPORT

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ABSTRACT

Root development and apex closure after the eruption of teeth takes a minimum of 3-4 years. If trauma to the pulp occurs during this period, it becomes a challenge for the clinician to treat the pulpal injury. Apexification is the treatment of choice for necrotic teeth with immature apex. Apexification done with calcium hydroxide encounters certain difficulties like very long treatment time, possibility of tooth fracture and incomplete calcification of the bridge. Mineral trioxide aggregate (MTA) was introduced as an alternative material to traditional materials for the apexification of immature permanent teeth. This case report presents the successful healing and apexification done with MTA.

INTRODUCTION

Conventional endodontic therapy cannot be done in cases of immature teeth with necrotic pulp. Trauma causes cessation of root development and the fragile root canals become weak making the process more difficult[1]. Complete asepsis and three-dimensional obturation of the root canal system are essential for long-term endodontic success[2]. But in case with immature teeth, the absence of natural apical constriction creates a challenge. Therefore, one of the aims of endodontic treatment is to produce an apical barrier or stop, against which one can place a root canal filling material avoiding overextrusion. This technique is termed apexification. In conventional apexification procedures, the most advocated medicament is calcium hydroxide. Kaiser first introduced the use of calcium hydroxide in 1964 and proposed that this material mixed with camphorated parachlorophenol induced the formation of a calcified barrier across the apex. Calcium hydroxide can be mixed with different substances such as camphorated mono chlorophenol, distilled water, saline, anesthetic solutions, chlorhexidene and cresatin to induce apical closure[3]. The inadequacy of Ca(OH)2 apexification owing to the need for multiple visits for refreshment and reinfection because of its temporary seal[4,5] led to the use of MTA, which forms a barrier and prevents microleakage. MTA is biocompatible and facilitates the formation of dentinal bridges and cementum, and regeneration of the periodontal ligament[6]. It has the ability to stimulate cytokine release from the bone cells, indicating that it actively promotes hard tissue formation[7].

Case Report

A 12 year old male patient reported to the department with a chief complaint of pain in the upper front tooth since two days. Clinical examination revealed the presence of ellis class III fracture in relation to right maxillary central incisor. Periapical radiograph was done which showed incomplete formation of roots with wide open apices with respect to the same tooth. (Figure 1) Apexification procedure with mineral trioxide aggregate was planned as the treatment of choice. Access cavity was prepared in the first visit with a straight line entry into the root canal. Working length was established, the canal was instrumented with intracanal instruments and complete debridement was done using H file number 40 followed by careful passive irrigation with 2.5% sodium hypochlorite. After drying the canal with paper points, the MTA powder was mixed with sterile water to form soft paste and was carried to the apical portion (4mm) of the root canal with the help of amalgam carrier and modified pluugers. A moist cotton plug was placed into the canal for 24 hours as MTA requires moist environment for complete setting. Access opening was restored with glass ionomer cement. (Figure 2) Patient was recalled next day and obturation was completed using thermoplasticised gutta percha (obturaII). Access cavity was sealed with final restoration (Figure 3). The patient was asymptomatic thereafter and six month and twelve month follow up showed healing of the periapical lesion (Figure 4). The use of MTA followed by conventional endodontic treatment resulted in apical formation.

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Figure 1 Pre-operative periapical radiograph showing wide open apex

Figure 2 MTA plug in the apical third of the root canal

Figure 3 Conventional obturation of the root canal

Figure 4 Radiographic follow up at 12 months

DISCUSSION

The goal of apexification is to obtain an apical barrier to prevent the passage of toxins and bacteria into periapical tissues from root canal[8]. The traditional use of $Ca(OH)_2$ apical barriers has been associated with unpredictable apical closure, extended time taken for barrier formation, difficulties in patient compliance, and the risk of reinfection 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 dentine to calcium hydroxide[5]. Apexification using mineral trioxide aggregate provides an alternative treatment modality in immature pulpless teeth. Apexification with MTA requires significantly less time[9]. MTA has superior biocompatibility and sealing ability and is less cytotoxic than other materials currently used in pulpal therapy[10]. The 4-5mm barrier is significantly stronger and shows less microleakage as compared to the 2-mm barrier of MTA[11]. Apexification using MTA lessens the treatment time between the patient's first appointment and the final restoration. In addition, there is reduced potential for fracture of immature teeth with thin roots, because of immediate placement of bonded core within the root canal[12]. Despite its good physical and biological properties, its extended setting time has been a disadvantage. MTA has demonstrated the ability to stimulate cells to differentiate into cells that form hard tissue and to produce a hard-tissue matrix[13].

One visit apexification technique using mineral trioxide aggregate is becoming increasingly popular as osteoconductive apical barrier. This material generates a highly alkaline aqueous environment by leaching of calcium and hydroxyl ions making it bioactive by forming hydroxyapatite in presence of phosphate containing fluids. MTA has compressive strength equal to intermediate restorative material and super- EBA but less than that of amalgam. Commercially it is available as pro-root MTA and is advocated in immediate obturation of open root apex cases.

CONCLUSION

Based on the existing literature and this study, it is concluded that MTA showed clinical and radiographic success as a material used to induce the apical end closure in case of necrotic immature permanent teeth.

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