Management of immature teeth with apical infections using mineral trioxide aggregate

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Abstract

Traumatic injuries to the young permanent teeth lead to devitalization of the pulp with concomitant arrest in further development of the immature root of the involved tooth. Hermetic seal of the root canal system during obturation is not possible in such cases, due to the lack of an apical constriction. The traditional management technique in such cases has been apexification involving induction of a calcific barrier at the apex using calcium hydroxide, which in turn facilitates obturation of the root canal. However this becomes complicated when there is persistent infection leading to periapical changes. This case report describes the use of mineral trioxide aggregate (MTA) for management of a periapically compromised immature tooth.

Keywords: Mineral trioxide aggregate, Immature teeth, apical infection

Introduction

One of the sequelae of traumatic injuries to the young permanent teeth is devitalization of the pulp with concomitant arrest in the further development of the immature roots of the involved teeth. In such teeth, hermetic seal of the root canal system during obturation is not possible, due to the lack of an apical constriction. For such cases, the traditional management technique has been apexification involving the induction of a calcific barrier at the apex using calcium hydroxide, which facilitates the obturation of the root canal. This however becomes complicated by persistent infection which leads to periapical changes.

In blunderbuss canals, the traditional radicular-closure procedure employs calcium hydroxide [Ca(OH)₂]. This technique was the mainstay for the management of immature apices for over half a decade. However, it is time consuming and requires up to 7–8 months for the apical barrier formation. The procedure is also dependent on the compliance of the patient, where follow-up appointments to radiographically assess the barrier formation become critical. Therefore, different materials such as IRM, silver amalgam, osteogenic protein, bonefill, Super-EBA, cement and MTA have been tried to create a physical barrier that enables the immediate obturation of the root canal. This case report describes the management of an immature maxillary central incisor with periapical infection.

Case Report

A girl aged 13 years reported to the out-patient clinic, Department of Pedodontics and Preventive Dentistry, with the complaint of pain and swelling in her upper left front tooth. She gave a history of a traumatic injury, about 1 year prior to the time of reporting. She mentioned that she had consulted a dentist after having a traumatic episode, and she was told that she needed to undergo a root canal treatment after the closure of the root end. She however, failed to report back to the dentist and did not pursue the treatment until the tooth began to pain. She had a noncontributory medical history. She expressed her concerns that she will not be able to pursue treatment for multiple appointments. Examination revealed a sinus tract in the labial vestibule of the maxillary left central incisor. Radiographic examination revealed radiolucency in the periradicular area of the upper left central incisor [Figure 1]. Clinical and radiological examination indicated pulp necrosis with acute exacerbation of chronic apical abscess in relation to the upper left central incisor. The patient was given a detailed explanation concerning the treatment and prognosis. Considering her inability to make frequent appointments, apexification with MTA was considered after the disinfection of the periradicular area.

In the first appointment, the already existing access cavity was refined with a safe-end tapered bur (Endo-Z; Dentsply/ Maillefer, Ballaigues, Switzerland) under rubber dam isolation. The root canal was irrigated with a 5.25% sodium hypochlorite solution and the final irrigation was done with a normal saline solution [Figure 2]. After drying, the root canal was filled with a mixture of calcium hydroxide powder and saline. The access cavity was sealed with IRM, analgesics and antibiotics were prescribed, and the patient was recalled in 1 week [Figure 3]. One week later, the access cavity was reopened and the canal was thoroughly irrigated with the 5.25% sodium hypochlorite solution and the canal was refilled with calcium hydroxide.
which was changed once within the interval of 1 week. At the third appointment, 1 week later, the sinus tract had resolved and the tooth was asymptomatic. Biomechanical preparation of the root canal was done using standard hand instruments (K-files and H-files) and the canal was enlarged up to a size of instrument number 80. All appointments were carried under rubber dam isolation. The canal was dried with paper points and MTA was dispensed and mixed according to the manufacturer’s instructions. The canal was filled up to half its length with MTA and condensed with hand plugger and back-end of a paper point. The thickness of the MTA plug was almost twice that of the recommended 3–4 mm as the tooth was compromised with acute exacerbation. A moist cotton pellet was inserted into the canal to aid in setting and was left undisturbed for 15 min according to the manufacturer’s instructions [Figure 4].

Lateral compaction technique was used to obturate the canal with gutta-percha and zinc oxide eugenol sealer. The access cavity was restored with glass ionomer cement [Figure 5]. A follow-up radiograph after 4 months showed that the lesion had begun to resolve [Figure 6]. The patient was given a composite resin crown to show improved esthetics which will be replaced by a ceramic crown later. The preoperative and postoperative appraisal is evident from the clinical picture [Figure 7].

Discussion

MTA is hydrophilic cement that sets in the presence of moisture.[5] This is of clinical significance in cases of periradicular inflammation. The presence of exudates, blood, or tissue fluid enhances the setting of MTA and leads to a hermetic seal.[6] This is also a reason that the manufacturer recommends the placement of a moist cotton pellet over the MTA plug.[7] Further the setting expansion of MTA helps in
achieving a seal against the canal walls and ensures a proper barrier.[8] It has been established that a good seal from the oral environment is vital to the resolution of periapical infection.[9] MTA, by its virtue of an alkaline pH (12.5) which remains at the same level after setting, is thought to impart an antibacterial effect.[10]

In this case, the patient was known to have problems with compliance. Therefore, a calcium hydroxide apexification which would have taken a longer time and involved several recall appointments was ruled out. Further, the presence of a sinus complicated the prognosis. The clinical success depends on the ability to sterilize the tissue of infection; this was achieved with calcium hydroxide dressings and systemic antibiotic therapy. The patient education on the importance of asepsis and antibiotics should not be neglected as the outcome depends on the compliance to follow the prescribed medication and timely review appointments. In this case, the potential complication of failure due to the presence of a draining sinus was emphasized to the patient. This was also important to motivate the patient and improve her compliance.

It can be seen at the 1-year follow-up that MTA apexification in cases of periapical infection can yield a successful outcome in shorter duration. This technique is simple with MTA being more affordable than previously. The advantage of a single-visit apexification[11] overrides the problem of patient compliance. This case demonstrates that the single-visit technique of apexification can be even applied in immature teeth with periradicular infection.

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