MANAGEMENT OF TRAUMATIZED TOOTH BY MINERAL TRIOXIDE AGGREGATE (MTA): CASE REPORT

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Abstract

Dental injuries in immature permanent teeth frequently lead to endodontic complications. Traditional apexification using calcium hydroxide has limitations, including prolonged treatment time, risk of tooth fracture, and incomplete root closure. Mineral trioxide aggregate (MTA) offers an effective alternative by forming an apical plug. Case Report: This report presents the successful management of maxillary central incisor in a 16-year-old girl with open apices and periapical lesions. MTA was used to create apical plugs, followed by gutta-percha and sealer in the coronal portions of the canals. At the 6-month follow-up, case showed healthy clinical outcomes and radiographic healing, with no signs of pathology. Conclusion: MTA appears to be a reliable material for apical plugging in teeth affected by trauma and endodontic issues.

Keywords: [Tooth fractures, root canal therapy, mineral trioxide aggregate, endodontics and conservative dentistry]

Introduction

Mineral Trioxide Aggregate (MTA) has emerged as one of the most versatile and biocompatible materials in endodontic therapy, especially in cases involving pulp capping, apexification, perforation repair, and root-end filling. First introduced in the 1990s, MTA was developed to provide a material that offers excellent sealing ability, promotes periradicular healing, and sets in the presence of moisture[1]. Its composition, primarily consisting of tricalcium silicate, dicalcium silicate, and bismuth oxide for radiopacity, contributes to its unique bioactive properties[2].

The use of MTA is particularly significant in cases requiring a hermetic seal in challenging clinical conditions. Studies have demonstrated its ability to induce cementogenesis and favorable responses from the pulp-dentin complex[3]. Moreover, its antibacterial properties, attributed to the high pH during setting, further support its clinical effectiveness[4].

This case report presents the application of MTA, highlighting its clinical handling characteristics and the biological outcome over a follow-up period.

Case Report:

A 16-year-old female came to the Department of Conservative Dentistry and Endodontics in Desh Bhagat Dental College and Hospital for a dental check-up, two months after sustaining a traumatic injury. Clinical examination revealed Ellis class III fracture of the upper left central incisor (21) (Figure 1a).

Endodontic treatment was initiated on the upper left central incisor by accessing the pulp chamber, removing necrotic tissue, irrigating the canal with sodium hypochlorite and saline, placing calcium hydroxide as an intracanal medicament, and temporarily sealing the tooth. The calcium hydroxide dressing was replaced weekly over the course of three months.

After 3 months calcium dressing was removed and irrigation was performed and working length was determined on 21. Again the canals were irrigated with chlorhexidine 2% solution, dried and apical 5mm region was filled with MTA. Subsequently the canal was given a moist cotton plug and the access was sealed with temporary restorative material.

Next day, the remaining canal was obturated using custom made guttapercha, with rolled cone technique and made into one thick custom made gutta percha then it was inserted within root canal. (Figure 1 d,e). After that restoration of access cavity was done using glass inomer cement. (Figure 1 f). Zirconia crown was given after Endodontic treatment.

On six months follow-up, the patient remained asymptomatic. Radiographic evaluation revealed no signs of periapical pathology (Figure 1h).

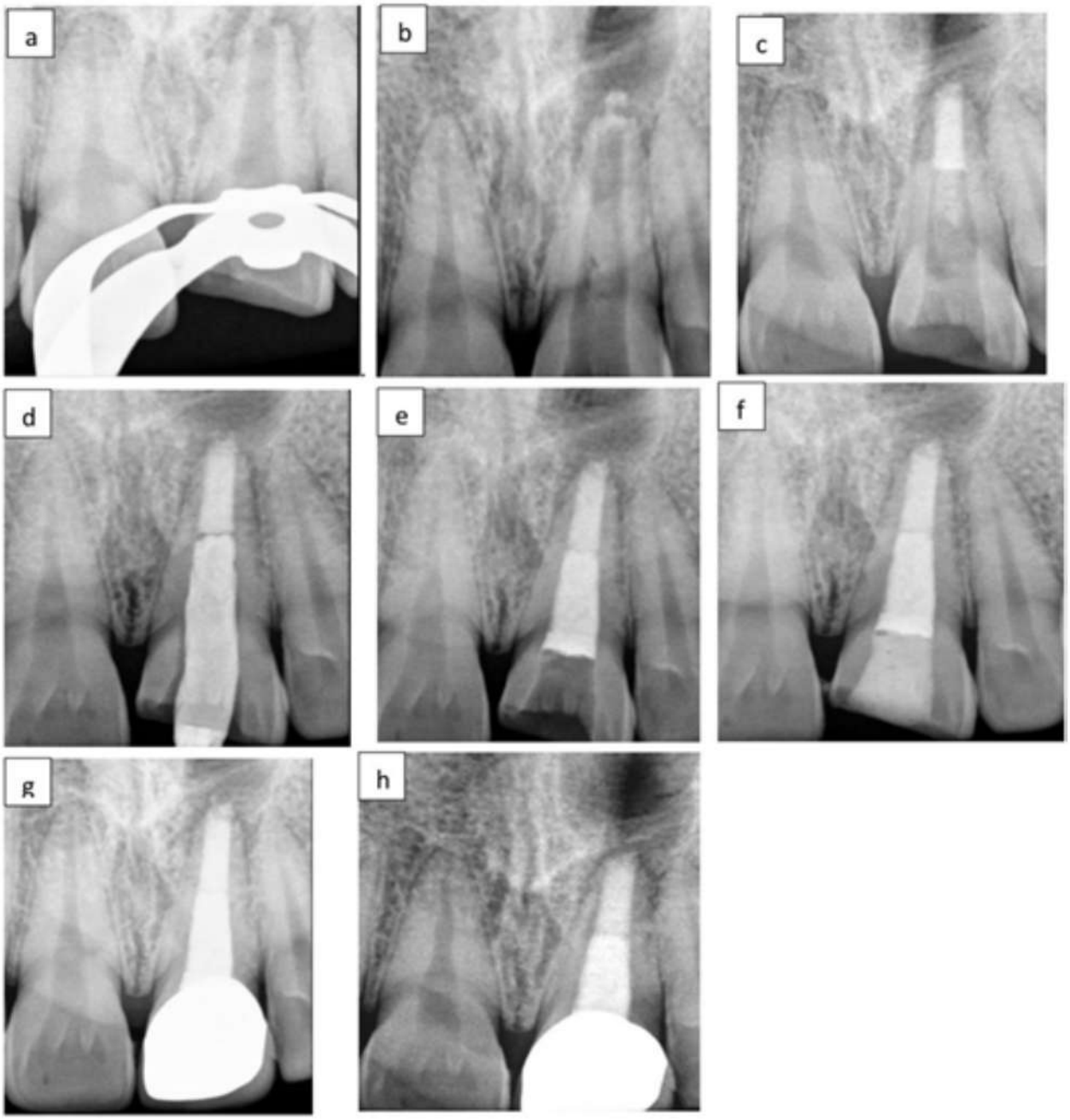

Figure No: 1 a) pre operative, b) apex closed using first 1 mm increment of MTA for apical stop, c) 5mm MTA plug apexification, d) custom made gp obturation, e) GIC as post endo restoration, f) three shades of MTA gp and GIC, g) prosthesis given zirconia, h) 6 months follow up showing peri apical healing.

Discussion

Management of traumatic dental injuries in young patients is particularly challenging when immature permanent teeth are involved. Such cases require treatment strategies that promote periapical healing while enabling the continued development or artificial closure of the root apex. In this case, mineral trioxide aggregate (MTA) was effectively used to achieve apexification in traumatized, non-vital anterior teeth with open apices.

Traditionally, calcium hydroxide has been the material of choice for apexification. It encourages hard tissue formation at the root apex and has antibacterial properties, but it requires long-term application, often several months, to be effective[5]. Prolonged use of calcium hydroxide has also been associated with a higher risk of root fracture due to its effect on dentin strength[6]

MTA offers a predictable and efficient alternative. It allows for the creation of an artificial apical barrier within a shorter time frame, significantly reducing the total duration of treatment[7]. In the present case, MTA was placed in the apical third of the canals, followed by obturation with gutta-percha and sealer. The radiographic and clinical follow-up at six months showed no signs of periapical pathology and complete resolution of sinus tracts, indicating successful treatment.

MTA's success can be attributed to its biocompatibility, excellent sealing ability, and its capacity to set in the presence of moisture an important feature in cases where drying of the canal is difficult, such as with sinus tract drainage[8].

However, one of the major drawbacks of mineral trioxide aggregate (MTA), particularly in anterior teeth, is its potential to cause crown discoloration. This discoloration is primarily attributed to the presence of bismuth oxide, which is used as a radiopacifier in conventional MTA formulations. Bismuth oxide can interact with dentinal collagen and other irrigants (e.g., sodium hypochlorite), leading to dark staining of the crown over time[9]. Additionally, the technique sensitivity of MTA requiring careful placement and moisture control remains a clinical concern[10]. In this case, esthetic rehabilitation was successfully achieved through composite restorations, which helped manage the cosmetic implications effectively. Despite its advantages, more clinical studies with long-term follow-up are required to confirm the reliability of MTA in apexification, particularly in a larger population of immature, non-vital teeth[11]. Nonetheless, current literature and this clinical case support the use of MTA as a superior material in modern apexification protocols.

Conclusion

Mineral trioxide aggregate (MTA) has proven to be an effective therapeutic option for managing traumatized and infected teeth in young patients, particularly in cases involving immature root development. Its primary advantages include a significant reduction in treatment duration and excellent apical sealing ability. However, despite these benefits, further clinical studies with extended follow-up periods are needed to fully establish the long-term efficacy and outcomes of MTA in apexification procedures.

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