



Non Surgical Management of Large Periapical Lesion with Mineral Trioxide Aggregate and 4 Years Follow up after Unintentional Extrusion of MTA in Periapical Area: A Case Report

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Authors' contributions

This work was carried out in collaboration between both the authors. Author AG contributed substantially to conceptualization, design and acquisition of the data. Author AV drafted and provided critical revision of the manuscript. Both the authors read and approved the final manuscript.

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Case Report

ABSTRACT

The immature root (open apex) with a necrotic pulp and apical pathosis presents multiple challenges to successful treatment and is difficult to treat with conventional root canal therapy. Mineral Trioxide Aggregate (MTA) has been successfully used in treatment of open apex. Extrusion of MTA through an open apex is not a commonly seen during the apexification procedure. Here we report the management of a case of a non-vital maxillary incisor with immature root. In this case despite of the use of an apical matrix, accidental extrusion of MTA occurred in the periapical region which did not show any negative effect on healing.

Keywords: Apexification; open apex; inadvertent extrusion; mineral trioxide aggregate; nonsurgical healing; periapical lesion.

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1. INTRODUCTION

Trauma during root formation is one of the causes for cessation of root development due to pulp necrosis. Root canal treatment at this time is a significant challenge, because of the size of the canal, the thin and fragile dentinal walls and the large open apex [1]. Treatment success is based on early intervention and skill of the operator. Lack of apical stop often makes three dimensional obturation difficult [2,3]. Earlier, Calcium Hydroxide was used in treatment of open apex but required multiple visits and caused inconvenience to the patient. The time taken for creating an artificial barrier or for inducing apical closure with Calcium Hydroxide is approximately 5-20 months. However, long term placement of Calcium Hydroxide as an intracanal medicament increases the risk of root canal fracture [4,5].

Recently, Mineral Trioxide Aggregate (MTA) is successfully being used for single visit apexification procedures. Apexification using MTA has several advantages as it neither gets resorbed nor weakens the root canal dentin. MTA is hydrophilic in nature and due to this property, presence of moisture does not affect its sealing ability. MTA has superior sealing ability and is biocompatible [6]. It has the ability to stimulate cytokine release from the bone cells, indicating that it actively promotes hard tissue formation. MTA forms a hard and non resorbable apical barrier over which obturating material can be compacted. If this apical barrier is of minimum 5mm it will be significantly stronger and show less leakage compared to a 2mm barrier [6,7].

This report presents a case of a maxillary left central incisor with immature root and associated large periapical lesion wherein single step apexification was carried out with MTA. Inadvertent extrusion of MTA occurred in the periapical region during the procedure which posed a questionable outcome to the treatment. However, a four year follow up revealed complete healing of the periapical lesion.

2. CASE REPORT

A 20 year old male patient reported to the department of Conservative Dentistry and Endodontics for treatment of discoloured maxillary left central incisor (Fig. 1a). Medical history was noncontributory. Dental history revealed trauma to the maxilla 12 years back. On Clinical examination # 2-1 was discoloured with

Ellis class I fracture. Involved tooth was tender to percussion and exhibited grade I mobility. Draining sinus tract was seen in the maxillary left anterior region with active discharge (Fig. 1a). Sinus tract was traced with no. 35 Gutta Percha cone (Dentsply, Maillefer) (Fig. 1b). Tooth vitality test elicited a negative response to both electric pulp test and cold tests. On radiographic examination, intra oral periapical radiograph showed a large radiolucent lesion with a well-defined margin surrounding immature tooth # 2-1, which has wide open apex (Fig. 1c).

On basis of these findings diagnosis was made as a case of open apex in tooth # 2-1 associated with Radicular Cyst. The patient was informed about the long term prognosis of the tooth and decision was made to perform conventional root canal treatment and closure of open apex with MTA. At the same appointment root canal treatment was initiated under rubber dam application and the access cavity was prepared using Endo access bur no 2 (Dentsply, Maillefer). There was exudation of clear straw-colored fluid from the canals. The working length was estimated using an apex locator and confirmed radiographically (Fig. 1c) followed by debridement with a no. 70 K-file. (Dentsply, Maillefer) circumferentially. The canal was irrigated copiously with 2.5% sodium hypochlorite solution after each instrumentation using a 27-gauge endodontic side vented needle. Thereafter, calcium hydroxide paste (RC Cal, Prime dental, India) was placed in canal and patient scheduled for recall. At two weeks recall appointment, tooth was asymptomatic and draining sinus had completely resolved. At subsequent appointment following rubber dam placement calcium hydroxide was removed by thorough irrigation with 2.5% sodium hypochlorite and canal was dried with paper points. Apical barrier was created by carrying AbGel (USP, Sri Gopal Krishna labs, Mumbai) through the canal using hand pluggers (Dentsply, Maillefer) and packing it in periapical area. MTA was mixed according to manufacturers instructions which was then carried to canal with amalgam carrier. MTA was condensed apically against the matrix until a 5 mm apical plug (Fig. 2a) of white MTA (MTA Angelus) was achieved using a finger and hand plugger. Postoperative Radiograph revealed extrusion of MTA in periapical region despite of placing a barrier. A moist cotton pellet was then placed and the access cavity was sealed with Cavit (3M, ESPE). Patient recalled next day and the root canal space was obturated

with Gutta Percha (Dentsply, Maillefer) and AH Plus sealer (Dentsply, DeTrey) using roll cone technique. Access cavity was than filled with composite resin (3M ESPE) (Fig. 2b).

Patient was informed about MTA extrusion and scheduled for regular follow-up. At the following appointments metal ceramic crown was fabricated and luted using Glass Ionomer luting cement (GC, Fuji I) (Fig. 2c).The patient was reviewed after 2 weeks for a period of three months (Fig. 3a), and then after every 6 months (Fig. 3b). At the six month follow up there was no significant change in the periapical status. After about 1 year, considerable amount of periapical healing was seen (Fig. 3c). At the final recall after 4 years, patient was asymptomatic and complete healing of the periapical lesion was noted and the overfilled MTA appeared more compressed at the apex and was completely surrounded by bony (or bone-like) tissues (Fig. 3d).

3. DISCUSSION

Single visit Apexification with MTA is beneficial as it induces an osteoconductive apical barrier. This apical barrier prevents the passage of toxins and bacteria into periapical tissues from the root canal and also allows compaction of root filling material [5].

Orthograde placement of MTA is a difficult task. In an immature tooth, the root walls are thin and fragile, which increases the susceptibility of the tooth to fracture during compaction of MTA. Care has to be taken during condensation of MTA against apical matrix and towards walls of root canal. Hachmeister et al. [6] in 2002 found that the sealing ability of MTA is superior when used as an orthograde plug. A plug of around 5mm is required for good seal and to prevent fracture of root. Irregular dentinal walls and divergent apices make the adaptation of MTA more difficult. In this case, the access cavity was widened to enhance the visibility of the root canal and provide straight access to the apices of the tooth. The procedure should be done with caution to prevent extrusion of the material. The material should be limited to the confines of the root canal to promote adequate healing in the periapical region.

A resorbable matrix provides a base over which MTA can be compacted thus preventing overfilling of the material. Calcium sulfate has been used as an internal matrix [7] in a study conducted in 2008. Besides other materials like calcium hydroxide, hydroxyapatite and resorbable collagen can be used as barrier materials [7]. In the present case, inspite of

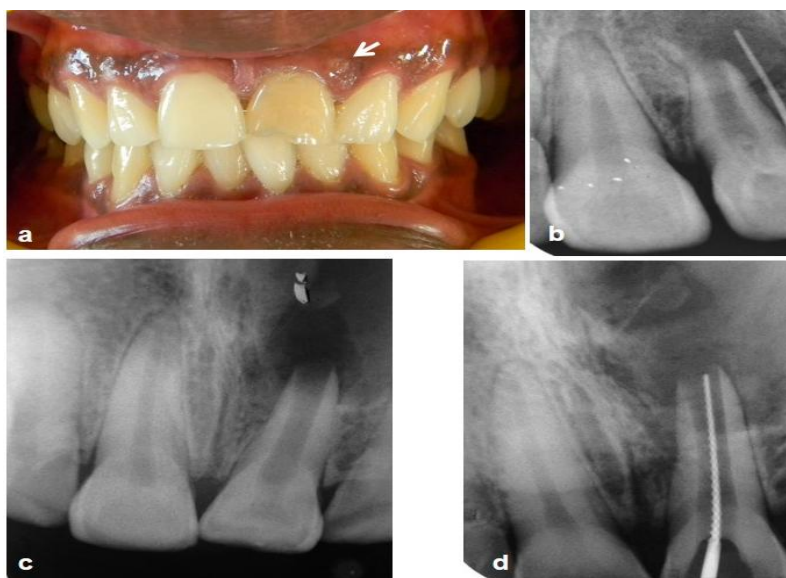


Fig. 1. Pre operative (a) photograph showing discoloured maxillary left central incisor with draining sinus tract [marked with white arrow]; (b) radiograph showing a maxillary left central incisor with a gutta-percha Cone tracing the sinus tract; (c) radiograph showing open apex and large periapical lesion in relation to 21; (d) working length determination

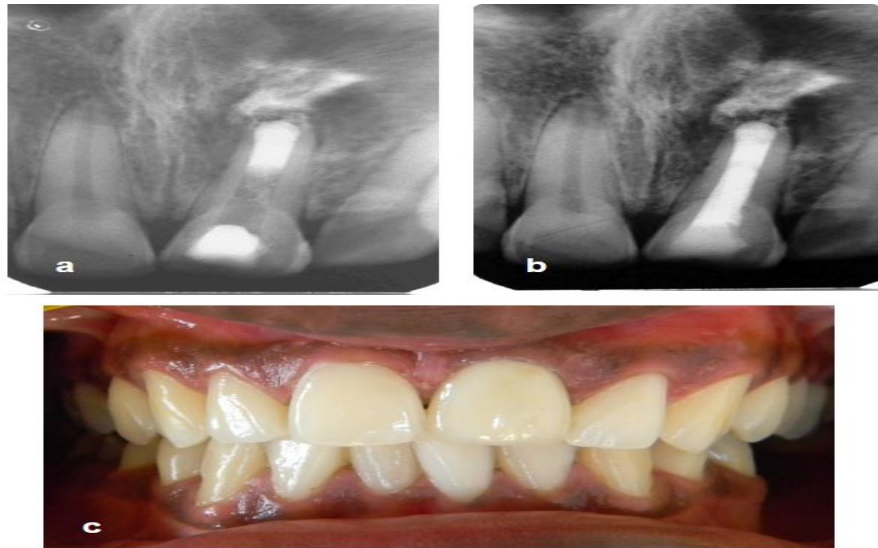


Fig. 2. Radiograph showing (a) apical MTA plug and extrusion of MTA into the periapical lesion during the one-step apexification; (b) obturation with gutta percha using roll cone technique; (c) postoperative intra oral view of metal ceramic crown on 21

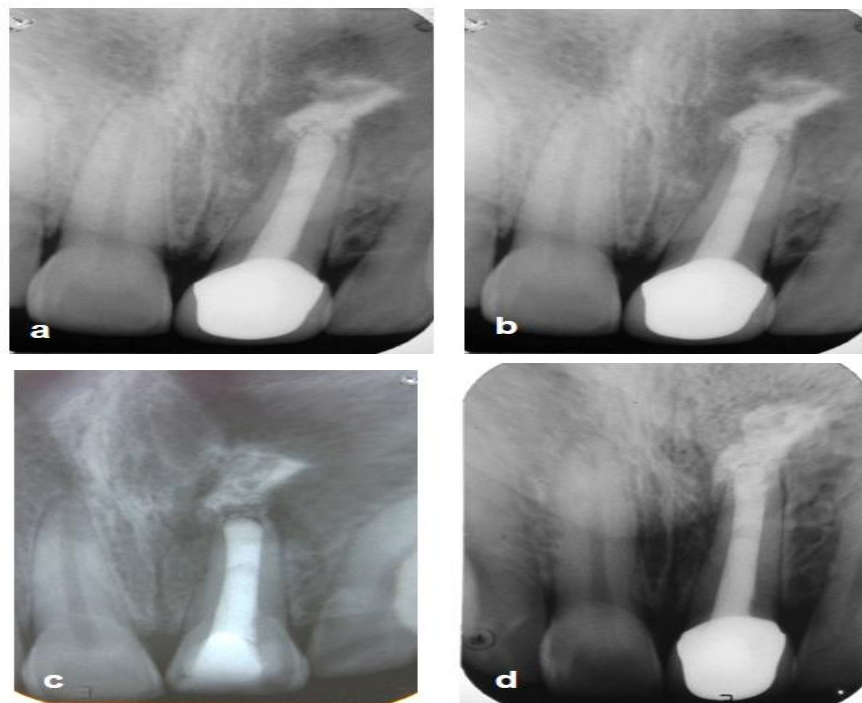


Fig. 3. Post operative radiograph showing (a) three month follow up; (b) Six month follow up; (c) one year follow up showing bone formation and the compression of MTA; (d) 4 year recall showing complete healing of periapical lesion around the extruded MTA

using an apical barrier, extrusion of MTA was seen. However, at a four year follow up, complete periapical healing was evident around the extruded MTA.

The use of Calcium Hydroxide as an intracanal medicament for a short period advantageous as it allows sufficient time to disinfect the root canal without significantly

weakening of the root strength [8]. Some authors have linked the extrusion of MTA to prior placement of Calcium Hydroxide [9]. In the present case too, Calcium Hydroxide was used as an intracanal medicament before placement of MTA.

When MTA comes in contact with tissue it forms an apatite layer which induces the expression of cytokines from bone cells and favors osteoblast attachment, thus favoring direct bone deposition [10,11]. Osteocalcin, also known as bone gamma-carboxyglutamic acid-containing protein (BGLAP), is a noncollagenous protein produced by osteoblasts and is found in bone and dentin. Increased levels of osteocalcin have found in the presence of MTA which favors the osteogenic potential of MTA [12].

In present case accidental extrusion of MTA resulted in healing of large periapical radiolucency without the need for surgical intervention. The increased levels of osteocalcin from the extruded MTA might have led to bone formation around the extruded material thereby bringing about healing of the lesion.

Other materials which can get extruded during root canal treatment can be irrigants, intracanal medicaments, sealers, root filling materials. Ideally the filling material should be restricted to the intraradicular space. Highest success rate for endodontic treatment is seen in teeth which are filled upto radiographic apex and cases with underfilling and overfilling displayed significantly lower success rates as seen in various studies [13]. In a retrospective study which evaluated unintentional extrusion of sealers and its influence on treatment outcome, showed significantly better results in teeth with no lesion in comparison to teeth with apical periodontitis [14].

However there are some situation where in it is not possible to control application of materials and some apical extrusion occurs in cases when thermoplasticized gutta percha used for root filling [15]. When extruded, the fate of the filling material will depend on its solubility in the tissue fluids and susceptibility to phagocytosis, whereas its influence on treatment outcome arguably depends on the material's biocompatibility [16]. In the present case since MTA is biocompatible material that direct contact with MTA had no negative effects on healing of the periapical tissues.

4. CONCLUSION

From the present case report it can be concluded that MTA whenever accidentally extruded in periapical tissues does have a healing potential and can promote hard tissue formation.

CONSENT AND ETHICAL APPROVAL

As per university standard guideline, participant consent and ethical approval have been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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