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Case Report

# Endodontic Treatment of a Tooth with Horizontal Root Fracture by MTA Apical Plug: A Case Report

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## Abstract

Horizontal root fracture is one of the common outcomes of the dental trauma. Conventional endodontic treatment of these teeth is not simple due to difficulties faced with obturation such as wide apical foramen of fragment, unpredictable prognosis and absence of barrier. Mineral trioxide aggregate (MTA) has become the material of choice in artificial apical barrier procedures due to many positive mechanical and chemical properties. This case report describes the management of the tooth#10 with horizontal root fracture with a big apical lesion after many years following trauma by placing MTA plug. 18 months follow up showed a successful treatment outcome.

**Keywords:** Apical Plug; Dental Trauma; Endodontic Treatment; Horizontal Root Fracture; Mineral Trioxide Aggregate

## Introduction

Maxillary incisors are the most common affected teeth after dental trauma [1]. A traumatic injury to the tooth may also result in a horizontal root fracture [2]. As a result of this kind of injury, the coronal segment is displaced while the apical segment displacement is relatively rare [3]. Middle third root fracture is the most common type of the root fracture followed by apical and coronal third [2]. The location of the root fracture can affect the long-term success rate [1]. The endodontic prognosis of a tooth with the root fracture close to the root tip is better than the fracture close to gum line [3]. It has been reported that pulp necrosis occurred in 20% of teeth with the history of trauma. Also, 31% of patients with root fracture were identified during routine dental radiographs examinations [4]. Endodontic treatment is essential when pain and discoloration is present or the x-ray shows radiolucency around the root segments [5]. However, there are cases of horizontal root fractures which spontaneous remission may be triggered without any intervention [6]. A traumatic tooth with horizontal root fracture can be treated by several different endodontic procedure [3,4]. MTA was reported to have a variety of potential benefits such as superior biocompatibility, excellent sealing ability and good mechanical properties [5,6]. Using MTA in endodontic procedures can stimulate the regeneration of periodontal ligament, bone and cementum [5]. Considering these encouraging characteristics, the application of MTA has been recommended as an appropriate material for creation of an apical seal [6].

A tooth with history of trauma must be monitored regularly before and after any endodontic treatments because invisible change in root, periodontium and bone may still occur [7].

Following article reports the management of a tooth with horizontal root fracture at apical third which was treated endodontically by placement of MTA as an apical barrier.

## Case Report

A 32-year-old male patient was referred to the Department of Endodontics of Shahed University, with a chief complaint of pain and a labial sinus track above the maxillary left lateral. Patient revealed the history of a car accident when she was 15 but despite the discoloration of the tooth, he didn't consult with any dentists. Clinical and radiographic examinations were performed. Medical history was non-contributory. Intraoral examination revealed a

little bit mobility and a labial sinus track above tooth#10 (Figure 1A). The tooth was tender to vertical percussion. A vitality test was negative. Radiographic examinations demonstrated a big apical lesion around the root of tooth#10 with horizontal root fracture at apical third (Figure 2A). Based on clinical and radiographic findings, the diagnosis of pulp necrosis and symptomatic apical periodontitis was made for tooth#10. Endodontic therapy was carried out under local anesthesia with Lidocaine with 1:100,000 epinephrine (Daroupakhsh, Tehran, Iran). When the access cavity was made, pulp necrosis was confirmed. The tooth isolated by rubber dam. After initial filing with K file # 45 (Mani, Tochigi, Japan) and several cleansing with 2.5% sodium hypochlorite, the canal was dried and a calcium hydroxide intracanal medicament was placed. The access cavity was sealed with cotton pellet and temporized with a temporary restorative material. Patient was recalled after 2 weeks. In the second visit, the sinus track was disappeared (Figure 1B). The intracanal medicament and temporary filling material was removed under local anesthesia and application of rubber dam. An electronic apex locator (Raypex5, VDW GmbH, Munich, Germany) was used to determine the initial working length. Working length was confirmed radiographically with a K file #80 (Figure 3). Root canal of tooth #10 was dried by sterile paper points (Aria Dent, Tehran, Iran). MTA mixture (Dentsply, Tulsa Dental, Johanson city, USA) was made and placed with Endo gun (Medidenta, los vegas, Usa) in apical portion of root canal to create an apical plug about 4 mm. After the positioning of the MTA apical plug, the MTA was adapted to the canal walls using a hand plugger. To verify the correct position of the MTA mixture, an x-ray control was taken (Figure 4). The x-ray showed that the placement of MTA was perfect concerning length and adaptation. A cotton pellet soaked with sterile water was placed in the pulp chamber and the access cavity was sealed with Cavit (3M, Seefeld, Germany) as a temporary coronal seal. After 4 days, temporary filling material and cotton pallet were removed. Canal was dried with paper points. The rest of the canal was obturated with thermoplastic gutta-percha (obtura III Max, Kerr, Bioggio, Switzerland) accompanied by a canal sealer (AH-26, DeTrey, Dentsply, Konstanz, Germany). The final radiograph was requested. As confirmed radiographically, condensation of root filling material and sealing of apical were ideal in the root canal of tooth#10 (Figure 5). At the same visit, the coronal access was sealed with composite resin. At 3, 6 months, the patient was asymptomatic and healing of the periapical lesion was noted radiographically (Figure 6A and6 B). Moreover, the radiographic follow up at 18 months revealed apical closure of the open apex of maxillary left lateral as well as replacement of apical lesion by intact bone (Figure 7).


***Figure 1:*** *photograph of patient before(A) and after (B) treatment*


***Figure 2:*** *Periapical of a patient with maxillary left lateral involvement*

***Figure 3:*** *Working length radiograph*


***Figure 4:*** *Periapical radiograph to confirm MTA apical plug placement*


***Figure 5:*** *Final periapical radiograph*

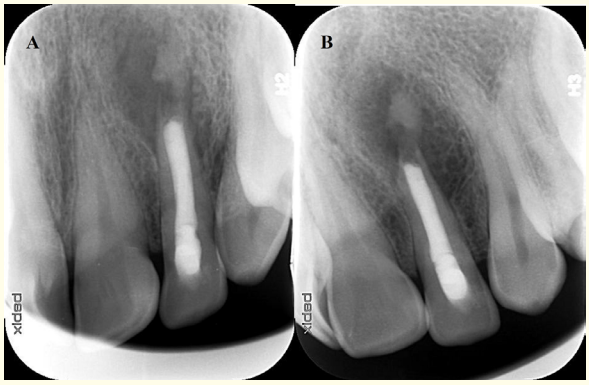


***Figure 6:*** *Periapical radiographs of tooth #10 after 3(A), 6(B) months of follow-up*

***Figure 7:*** *Periapical radiograph of tooth #10 after 18 months of follow-up*

## Discussion

In many cases of traumatic dental injuries, horizontal root fracture is the common findings [1,2]. Horizontal root fractures may cause disruption of neurovascular supply of the coronal segment that always result in the pulp necrosis of the coronal segment while the apical segment is viable due to maintained pulpal circulation [7]. Mature and discolored teeth show the higher risk of the pulp necrosis [8]. In contrast, obliteration of root canals could be a sign of apical or coronal segment vitality [9]. In our case, discoloration of coronal segment and root canal obliteration of apical segment were detectable in clinical and radiographical examination, respectively. So, it was concluded that the pulp of apical segment remained vital while the pulp of coronal segment was necrotic. It was confirmed during endodontic procedure and in follow-up radiographs. On the other hand, it was recommended that if the apical segment was necrotic, surgical removal of the apical fragment must be carried out [10]. In our case, the apical segment of the root was left untreated since it was diagnosed vital according to signs and symptoms. Another reason that confirmed the vitality of apical segment in our case was that in 18 months follow-up radiographs the big lesion was replaced by bone formation even around the untreated apical segment.

In most teeth with horizontal root fractures, the apical portion of the coronal segment is wide [11]. Apical part of coronal fragment of these kinds of teeth resembles the teeth with immature root canals with open apices, especially anterior maxillary teeth in which root canals are wide [12]. Endodontic obturation of

these teeth is difficult due to inability to create a proper apical barrier with the conventional root filling material [4]. Thus, MTA is recommended to make an apical barrier [13]. MTA is the better root canal filling material than gutta-percha in the case of horizontal root fracture [14]. It is because of its ability to provide the suitable apical seal, high biocompatibility, better antibacterial properties, high marginal adaptation and conduction of cementum formation [6,14,15]. So, MTA apical plug can be considered as an effective filling substance in stimulating regeneration of apical tissue including cementum, periodontium and bone in teeth with horizontal root fractures [15].

According to some case reports, conventional gutta-percha with lateral condensation technique was used to obturate the root canals after making an apical plug by MTA, but sometimes acquisition of a perfect seal is not possible with gutta-percha. So, in present case, thermoplasticized gutta-percha was applied to avoid creation of voids in filling root materials and better adaptation with root walls.

A tooth with horizontal root fracture has good prognosis if it is treated adequately and scheduled for follow-up regularly [16]. Appropriate follow-up can help clinicians to make further assessments and adjust treatments as it was done in present case in period of 3, 6 and 18 months.

## Conclusion

This case report showed that a necrotic tooth with horizontal root fracture could be treated successfully by placing MTA apical plug in coronal segment to make an apical seal even though it was traumatized many years ago. Besides, frequent monitoring of the horizontal root fractures can lead to acceptable clinical outcomes.

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