

Management of root resorption with mineral trioxide aggregate complicated by a luxation injury: report of a case with six-year follow-up

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Abstract

Trauma to the oral region occurs frequently, comprising 5% of all injuries. The most common dental injuries are lateral luxations which can be seen with a prevalence of up to 27% among dental injuries. Ectopic eruption of maxillary canines can lead to root resorption on maxillary lateral incisors especially on apical and middle thirds of the roots. Half of these resorbed lateral incisors show severe resorption, in which the pulp is exposed.

This case report describes non-surgical treatment with mineral trioxide aggregate (MTA) and a six-year follow-up of a maxillary lateral incisor, resorbed by ectopic eruption of the canine and affected by lateral luxation injury. The tooth was asymptomatic, and radiographic examination showed that the resorbed region had been successfully repaired with new hard tissue deposition within the six-year follow-up. MTA can be considered an effective repair material in nonsurgical treatment of this type of root resorption.

Keywords: Tooth luxation, Mineral trioxide aggregate, Root resorption, Case report.

Introduction

Trauma to the oral region is not rare and comprises 5% of all injuries. Among all facial injuries, lateral luxation is one of the prevalent dental injuries of the general population.¹

Resorption of the roots of adjacent incisors, resulting from eruption of the canine, is especially likely to occur between 11 and 12 years (51%). The problem more commonly appears on maxillary lateral incisors (38%), but may also affect the central incisors (9%).²

The apical and middle thirds of maxillary lateral incisor roots affected by ectopic eruption of the canine are commonly resorbed. Half of these resorbed lateral incisors

show severe resorption, in which the pulp is exposed.² Even in cases of severe resorption, the incisor teeth can maintain vitality in the oral cavity if the pulp is non-infective.³ In cases where the pulp is infective, root canal treatment should be performed by repairing the perforation site with a suitable sealing material. It is very difficult to treat the resorptive defect using traditional root canal filling technique and material.

Mineral trioxide aggregate (MTA) has been shown to provide bio-inductive effects with creating an environment conducive to periodontal healing and allowing new cementum growth on its surface.⁴⁻⁶ It has good sealing characteristics, biocompatibility, bactericidal effects and radiopacity, and it can be set up in the presence of blood. Although MTA has been used to treat furcation or lateral perforation defects,⁴ there are limited data about its use in non-surgical treatment of external resorptive defects in the middle third of the root.^{7,8} Furthermore, these studies did not have such long follow-up duration; most reported favourable outcomes in shorter time periods.

This case report describes the non-surgical treatment with MTA and a six-year follow-up of a maxillary lateral incisor, resorbed by ectopic eruption of the canine and complicated by a lateral luxation injury.

Case Report

A 12-year-old boy was referred to the Department of Paediatric Dentistry at the Faculty of Dentistry, Karadeniz Technical University for a dental problem involving his maxillary anterior teeth. There was no relevant medical history. The patient's dental history included a traumatic dental injury that occurred two months prior to visiting the department in June 2006. The patient reported that he had hit his face on the floor; tooth 21 had avulsed and was immediately replanted and splinted by a private dentist following the trauma.

The referring dentist reported that the avulsed tooth was replanted and the upper incisors were splinted using ligature wire when the patient came to the clinic on that same day. It was also reported that root canal treatment was commenced for teeth 21 and 22, as both responded

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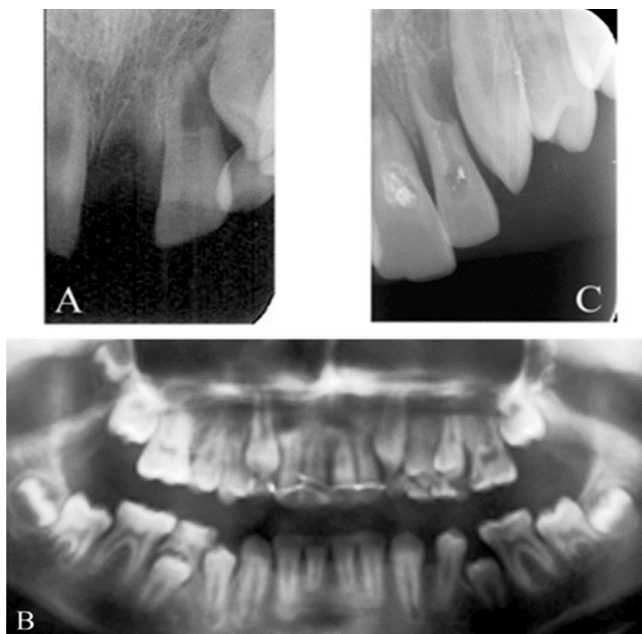


Figure-1: A) The pre-treatment periapical radiograph shows avulsion injury of tooth 21 and external root resorption of tooth 22 caused by ectopic eruption of the canine tooth. B) The panoramic radiograph shows replantation of avulsed tooth 21 and the resorbed tooth 22. C) First radiograph of the teeth when the patient came to our dental faculty. Note the empty access cavities as the temporary restorative material in the cavity had failed.

negatively to vitality testing over the course of time.

Extraoral examination of the patient showed no oedema, swelling or other symptoms. Intraoral examination revealed dislodgement of temporary restorative material in the cavity and endodontic access cavity of tooth 21 and 22 was made.

In the evaluation of earlier radiographs taken just after the trauma, external resorption associated with an ectopic maxillary canine was noted in the middle third of the root of tooth 22 (Figure-1A, 1B). In addition, root canal treatment of tooth 21 had been initiated but remained incomplete (Figure-1C). Furthermore, contrary to accepted trauma guidelines, root canal treatment of tooth 22 was initiated one week after trauma by a private dentist.

Informed consent was taken from the patient. After evaluating all the data, non-surgical management of root resorption with MTA and completion of root canal treatment of both teeth were planned.

Teeth 21 and 22 were instrumented under rubber dam, irrigated with 2.5% sodium hypochlorite, dressed with calcium hydroxide (Ca(OH)₂) and sealed with temporary

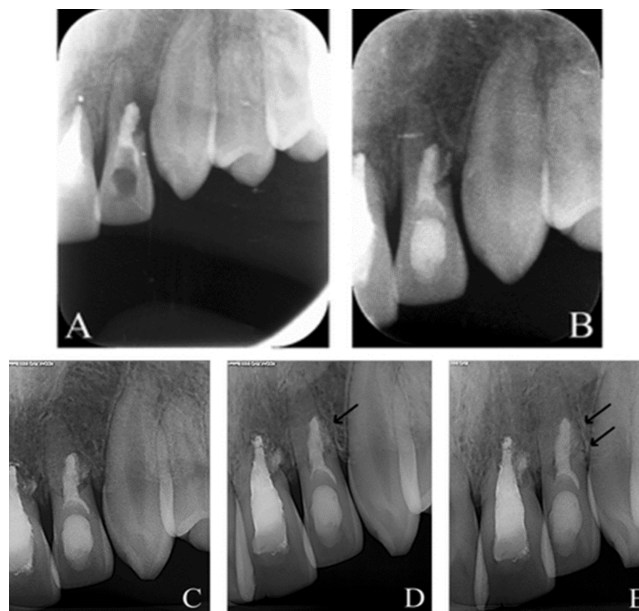


Figure-2: A) Periapical radiograph after the treatments. B) Radiograph after 8 months follow-up. C) Imaging 24 months after the treatment. Radiograph revealed a new hard tissue deposition around the mineral trioxide aggregate (MTA) of tooth 22. D) Radiograph shows resorption area was surrounded by new hard tissue formation, at 38 months of the treatment for tooth 22 (Arrow). E) Radiograph confirmed that the resorptive area filled with mineral trioxide aggregate (MTA) was fully surrounded by new hard tissue after 72 months of the treatment (Arrow).

restorative material. Tooth 21 was filled (gutta-percha/AH Plus cement) at a subsequent appointment.

The root resorption associated with the middle third of tooth 22 equated to a lateral perforation. Preparation of the canal was completed using Gates Glidden #2 and #3 drills.

To fill tooth 22, a resorbable membrane (Atrisorb, Atrix Laboratories, Fort Collins, CO) was placed by endodontic plugger in the periodontal area to prevent the overflow of material in this area. MTA (ProRoot MTA, DentsplyMaillefer, Ballaigues, Switzerland) was prepared in accordance with the manufacturer's instructions.⁹ An endodontic plugger appropriate to the working length was chosen; a stopper was placed 1 mm behind the working length and inserted into the external resorptive area of the root canal with a messing gun and then pushed slightly into the area by the endodontic plugger (DentsplyMaillefer, Ballaigues, Switzerland). The application was repeated until the root canal was totally filled with MTA to coronal 2 mm. A small moist cotton pellet was placed over the MTA, and the access cavity was sealed with temporary filling material. At the next visit, the rest of the canal was filled with glass ionomer cement (Ketac molar, 3M ESPE, St. Paul, MN, USA) as a coronal plug

(Figure-2A). Final restoration of all the teeth was accomplished using composite resin (Z250, 3M ESPE, St. Paul, MN, USA).

The patient was followed-up at 8, 24, 38 and 72 months (Figure-2B, 2C). The tooth 22 showed desirable results both clinically and radiographically for 6 years.

At the time of root filling, tooth 22 showed no symptomatic response to percussion and palpation. At 24 months, hard tissue formation began to be seen radiographically near the MTA plug. At the end of the 38 and 72 months follow-up periods, the resorption area was almost surrounded by new hard tissue formation (Figure-2D, 2E arrows).

Discussion

The location and size of the perforation are important factors affecting treatment prognosis. Treatment options vary according to the severity of root resorption involving the pulpal canal. If the pulp is not affected by the impacted tooth, the resorption generally needs no treatment and spontaneously heals after removal of the pressure of the impacted tooth. In some cases, even if the pulp is affected, resorption can heal spontaneously. Beckera and Chaushu reported that 11 patients with 20 severely resorbed maxillary incisors caused by an associated adjacent impacted canine were healed without any treatment once pressure on the impacted tooth was eliminated.³ In the current case, endodontic treatment of tooth 22 had been initiated at a private clinic. However, a more conservative approach may have been done with the lateral incisor. Although it is conjectural, it is possible that healing of the lateral incisor may have occurred without treatment. Because of the initial endodontic treatment and the subsequent root canal contamination, it was decided to perform non-surgical endodontic treatment to the severely resorbed maxillary lateral tooth using resorbable membrane and MTA.

Taking account of marginal bone loss, the possibility of removing excess bone tissue to reach the resorption area, the need to fill this area with graft materials, the risk of periodontal pockets and defects due to the localisation of resorption, surgical treatment of the root resorption was not considered. Surgical approach could also be performed when the non-surgical treatment was a failure. Therefore, non-surgical endodontic approach was chosen in the present case.

MTA has been successfully used to repair communication between the pulp canal space and the periodontal tissue.

It is also known as a biocompatible material that may induce cementum formation around perforations and MTA.¹⁰ The most important reason to choose MTA as the permanent repair material in this case is because it has the capacity to promote hard tissue formation and to inhibit osteoclastic bone resorption.¹¹ Here, at the patient's six-year follow-up, the resorbed tooth was asymptomatic, and radiographic examination confirmed that the large resorptive area filled with MTA was fully surrounded by new hard tissue (Figure-2D,E).

Conclusion

This report shows that MTA can be used in a non-surgical approach for the treatment of external resorption caused by ectopic eruption of an adjacent tooth complicated by luxation injury.

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