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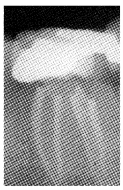

CASE REPORT

Mineral trioxide aggregate in the treatment of external invasive resorption: a case report

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Abstract

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Aim To describe the management of external invasive resorption using mineral trioxide aggregate (MTA).

Summary External invasive root resorption may occur as a consequence of trauma, orthodontic treatment, intracoronal bleaching and surgical procedures, and may lead to the progressive and destructive loss of tooth structure. Depending on the extent of the resorptive process, different treatment regimens have been proposed. A 19-year-old male patient presented with tooth 11 (FDI) showing signs and symptoms of irreversible pulpitis, external invasive resorption and periodontal pocket on the disto-palatal. After root canal treatment, the defect was accessed coronally. The resorption area was chemo-mechanically debrided using ultrasonic tips and irrigant solution. MTA was used to fill the resorptive defect, and the coronal access was temporarily sealed. The definitive coronal restoration was performed after 3 days. Radiographs at 1, 2 and 4 years showed adequate repair of the resorption and endodontic success. Clinically, the tooth was asymptomatic, and no periodontal pocket was found.

Key learning points

- Mineral trioxide aggregate was successfully used to restore a small area of external invasive resorption.
- A coronal approach can sometimes be successfully used in order to avoid surgery and periodontal complications.

Keywords: external invasive resorption, mineral trioxide aggregate.

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Introduction

External invasive resorption is a rare form of external root resorption. It can occur in teeth with necrotic pulps, infected root canals, previously filled root canals and in vital teeth.

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Traumatic injuries, orthodontic tooth movement, orthognathic and dento-alveolar surgery, periodontal treatment and internal bleaching have been identified as potential predisposing factors (Harrington & Natkin 1979, Tronstad 1988, Madison & Walter 1990, Frank & Torabinejad 1998, Heithersay 1999b).

Tronstad (1988) and Trope (1998) hypothesized a dual cause: injury and stimulation by sulcular microorganisms in the adjacent marginal tissues (Gold & Hasselgren 1992). This type of resorption can be classified as inflammatory resorption (Bergmans *et al.* 2002).

Heithersay (2004) has recently quoted cases in the literature, which showed that the root resorption process is not a result of inflammation. In these cases, the resorption lacuna may be invaded by microorganisms at a later stage.

Clinically, external invasive resorption is often detected during routine radiographic examination. It could be associated with periodontal inflammation, a local 'pocket' may be detected; copious bleeding and spongy feeling are commonly observed at the site of the resorptive defect.

Different approaches have been suggested for the treatment of external invasive resorption. To provide a clinical guide for debridement and filling of the resorption, Frank & Torabinejad (1998) identified three different classes of resorption defect based on the location of the portal of entry in the cementum: supraosseus, crestal and intraosseus.

Heithersay (1999a) has suggested four different classes of invasive cervical resorption based on the extension and depth of the resorption within the radicular and coronal dentine: class 1 represents the shallowest penetration into the dentine with resorption generally located at the cervical level, whilst class 4 represents the most invasive resorptive process. Heithersay (2004) further emphasized the importance of using trichloroacetic acid to obtain complete curettage of the defect.

After the chemo-mechanical debridement of the defect, glass–ionomer, light-cured resin composite, amalgam and mineral trioxide aggregate (MTA) combined with guided tissue regeneration have been recommended to restore the resorption, and often associated bony defect (Heithersay 1999a, 2004, White & Bryant 2002).

Mineral trioxide aggregate is a biocompatible cement (Camilleri *et al.* 2004), which has good sealing ability (Torabinejad *et al.* 1993), and is moisture tolerant (Torabinejad *et al.* 1994). When MTA was used to seal perforations in the furcal area, it induced repair of the periodontium, and new cementum formation over the material (Pitt Ford *et al.* 1995, Menezes *et al.* 2005).

This case report describes the treatment of a maxillary central incisor with an invasive external resorption and an associated periodontal lesion.

Case report

A 19-year-old male patient was referred to the Department of Endodontics, University of Florence in March 2000, after a traumatic injury which caused a complicated crown fracture and subsequent pulp necrosis in tooth 21 (FDI), and an uncomplicated coronal fracture of tooth 11. The tooth 21 was root-filled, and tooth 11 was restored with a resin-bonded material.

After 2 years, the patient reported dentine hypersensitivity and pain to thermal stimulation (cold and hot water) on tooth 11. The electric pulp test was positive, and the heat test (heated gutta-percha) evoked persistent pain. Periodontal probing depths were physiological (<3 mm) at all sites except for the disto-palatal surface where copious bleeding and periodontal pockets (6 mm) were found (Fig. 1).

The first radiographic examination revealed an irregular radiolucent area in the cervical third of the external root surface (Fig. 2), a second image, taken from a different angle,

Figure 1 Palatal surface of maxillary central incisor with periodontal probing of 6 mm on the disto-palatal surface.

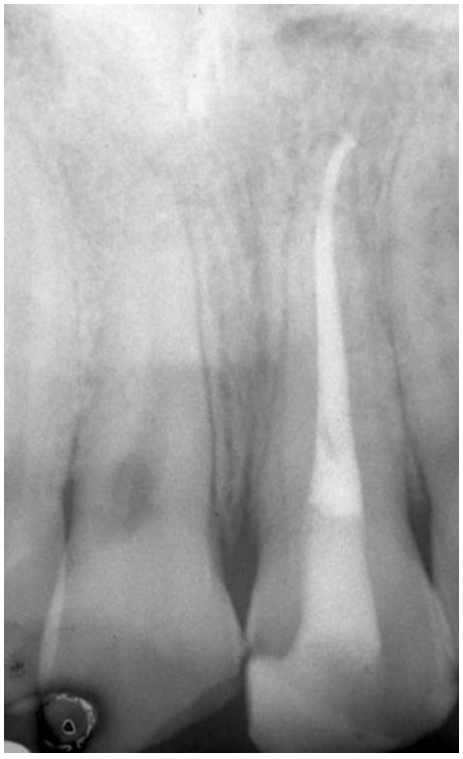

Figure 2 Radiograph of tooth 11 with an irregular radiolucent area overlying the root canal outline.

revealed a thin radiopaque mineralized outline of the canal, which separated the pulp from the external resorptive defect (Fig. 3).

No periapical radiolucent lesion was detected. The clinical diagnosis was irreversible pulpitis with class 3 invasive cervical resorption. Root canal treatment with debridement and restoration of the resorption lacuna was the treatment of choice. Consent was obtained from the patient. The tooth was isolated with a rubber dam. The access cavity was opened on the palatal surface, the root canal was cleaned with manual instruments and 5% NaOCl irrigation (Niclor 5 OGNA, Milan, Italy). After the root canal system was debrided, it was rinsed with sterile water and dried with paper points. The apical part of

Figure 3 Radiograph of tooth 11, with different angulation, showing a radiolucent area separated from the pulp space by a radiopaque line.

the root canal was filled with a gutta-percha point (0.06 taper Dentsply Maillefer, Ballaigues, Switzerland) and a Kerr Pulp Canal Sealer (Kerr, Romulus, MI, USA), by warm vertical condensation.

The rest of the canal, except the resorption area, was back-filled with injection-moulded thermoplastic gutta-percha (Obtura Corp., Fenton, MO, USA) and Pulp Canal Sealer (Kerr). The resorption defect was exposed through the access cavity under microscope vision (×10). Access to the defect was slightly widened using an ultrasonic tip (Spartan MTS, CPR 3 tip Dentsply Tulsa, Tulsa, OK, USA), and the resorptive area was cleaned by rinsing with alternating solutions of 5% NaOCl and 17% EDTA (OGNA) (Fig. 4).

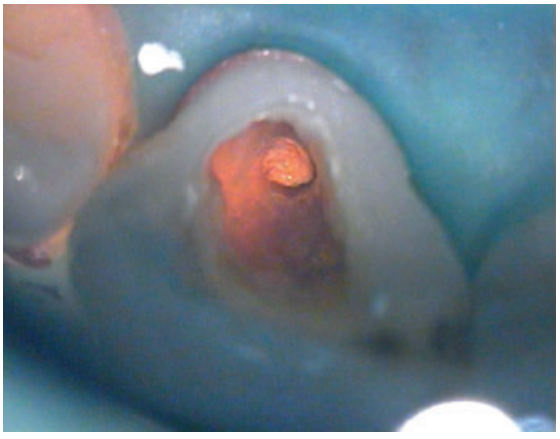

Figure 4 Resorption defect after debridement from a coronal approach.

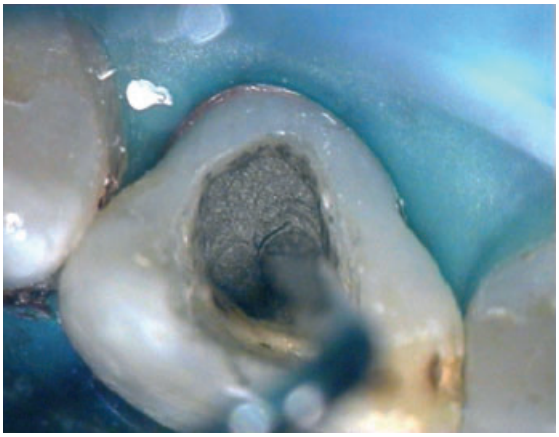

Figure 5 Repair of resorption defect with grey MTA.

The resorption area was filled through the access cavity with grey MTA (Dentsply Tulsa) using the MTA Endo Gun (Dentsply Maillefer) (Fig. 5).

A sterile sponge pellet moistened with sterile water was placed over the MTA, and the access cavity was temporarily sealed (Fig. 6). After 3 days, the tooth was restored with dentine and enamel-bonded composite. The patient subsequently received periodontal maintenance at 4-month intervals for 1 year. Clinical and radiographic examinations were performed at 12, 24 and 48 months. The patient was free of clinical (and subjective)

Figure 6 Radiograph after filling resorptive defect with MTA.

Figure 7 Radiographic follow-up at 12 months.

Figure 8 Radiographic follow-up at 24 months.

symptoms at all the follow-ups. Radiographic examination after 12 months showed good adaptation of MTA to the root contours (Fig. 7). Periodontal probing 5 mm into the disto-palatal did not cause bleeding. Two and 4-year radiographic follow-ups revealed growth of

Figure 9 Radiographic follow-up at 48 months.

the marginal crestal bone on the surface of the MTA (Figs 8 and 9); periodontal probing detected no pathological periodontal signs.

Discussion

The basic aim of treating external invasive resorption is the complete removal of resorptive tissue, and restoration of the defect area. Because the pulp survives until late in the resorptive process, debridement of the defect should protect the vitality of the tooth. This report describes a case of external invasive resorption in which the tooth presented early signs of pulp infection, and consequently required root canal treatment. As reported in previous studies, a successful outcome in supraosseus defects (Frank & Torabinejad 1998) or in class 3 invasive cervical resorption (Heithersay 1999a, 2004, Gulsahi *et al.* 2007) can be achieved by approaching the defect through the access cavity. In the case presented here, that can be classified as a supraosseus defect or class 3 invasive cervical resorption, the communication between the resorption lacuna and the root canal system was small, and the defect was easily reached through the coronal access. Root canal treatment and management of the resorption were performed in one session in order to avoid secondary infection (Heithersay 1999a).

During the debridement of the resorptive lacuna, the use of chemical escharotic agents, such as trichloroacetic acid, improves the possibility of completely eliminating resorbing cells, which penetrate into the deeper parts of the defect, and enhance the visualization of the defect. In the case presented, the resorptive area was debrided with ultrasonic tips, and alternating solutions of 5% NaOCl and 17% EDTA. The final rinse with sterile water was performed (Sluyk *et al.* 1998) in the resorption site to enhance the adaptation of MTA.

Mineral trioxide aggregate was chosen as the filling material for its biocompatibility (Camilleri *et al.* 2004), and for its sealing ability (Matt *et al.* 2004). In this case, the defect was located in the disto-palatal site where the use of grey MTA did not compromise the

appearance of the tooth; for example, no discoloration of the tooth, and no soft tissue tattoos were observed. MTA is available in a tooth-coloured formulation, allowing its application in areas of aesthetic concern.

In previous studies, MTA was successfully used to repair communication between the pulp canal space and the periodontal tissue that occurs in cases of root perforation in dogs (Pitt Ford *et al.* 1995, Holland *et al.* 2001) and humans (Main *et al.* 2004), as well as in teeth with necrotic pulps and open apices (Torabinejad & Chivian 1999).

Consistent with this case report, White & Bryant (2002) reported an increase in radiodense crestal bone, when MTA was used in combination with guided tissue regeneration to fill an external root resorption associated with a bony defect.

Heithersay (2004) affirmed that the prognosis of the treatment of invasive cervical resorption depends on the lesion class. In class 3 resorption, which is the class presented in this case, he reported a 78% success.

This case is also interesting from an aetiological standpoint. The patient only presented with one of the recognized predisposing factors/causes, traumatic injury. He had neither received orthodontic treatment nor undergone any oral surgical procedure. There were no signs of infection, and most significantly, no intracoronal bleaching.

Although this case report presents a favourable outcome, further studies are encouraged to support the use of MTA to fill external invasive resorptions.

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