# **CASE REPORT**

# Treatment of inflammatory internal root resorption with mineral trioxide aggregate: a case report

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## Abstract

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**Aim** To report the treatment and follow-up of a maxillary central incisor with internal resorption managed by root canal treatment, white mineral trioxide aggregate (MTA) repair and a fibre-glass post for reinforcement.

**Summary** This study presents a case of extensive internal root resorption affecting tooth 11 (FDI) in a 28-year-old male patient, with a history of trauma in that region. The substantial loss of tooth structure, including cementum, and a perforation with lateral periodontal communication were complicating factors. Despite a guarded prognosis but encouraged by a healthy periodontal condition, treatment based on reconstructing the tooth with white MTA and a fibre-glass core was carried out. Follow-up radiographs over 20 months demonstrated the maintenance of a functional tooth. The tooth did, however, discolour after MTA treatment.

#### **Key learning points**

- Because of its insidious pathology, internal root resorption can extend to significant dimensions before being recognized.
- MTA plus the fitting of a fibre-glass post provided adequate, functional rehabilitation of a compromised tooth for 20 months.
- Despite the favourable biological and mechanical properties of white MTA, considerable tooth discolouration may occur.

**Keywords:** fibre-glass post, internal inflammatory root resorption, mineral trioxide aggregate, root canal.

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#### Introduction

Internal root resorption originating from pulp inflammation is always pathological. Internal root resorption is established after necrosis of odontoblasts and is associated with chronic

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partial pulp inflammation and partial pulpal necrosis (Consolaro 2002). Three-dimensional imaging (Lyroudia *et al.* 2002) has shown such defects to be circumscribed and oval-shaped. Internal resorption is usually asymptomatic and discovered by chance on routine radiographic examinations (Trope & Chivian 1997) or by the clinical sign of a 'pink spot' on the crown (Lyroudia *et al.* 2002). Tissue loss can be extensive and often unrestorable.

After considering the differential diagnosis, including external root resorption, treatment must aim at complete removal of the resorptive tissue from the root canal system, in an attempt to prevent further loss of hard tissue. However, selecting suitable restorative materials for these cases remain a challenge, especially if tooth loss is extensive; extraction is the only realistic option in some cases.

Mineral trioxide aggregate (MTA) has satisfactory properties for solving many endodontic problems, including: biocompatibility (Torabinejad *et al.* 1995b, Holland *et al.* 2002), favourable sealing ability (Torabinejad *et al.* 1993), mechanical strength (Torabinejad *et al.* 1995a) and a capacity to promote periradicular tissue healing (Torabinejad & Chivian 1999).

Originally developed as a surgical root-end filling material, MTA has been used successfully in several clinical applications such as pulp capping (Pitt Ford *et al.* 1996), pulpotomy (Salako *et al.* 2003, Menezes *et al.* 2004), perforation repair (Main *et al.* 2004), treatment of traumatized teeth with immature apices (Bakland 2000, Simon *et al.* 2007) and for treatment of root resorptions (White & Bryant 2002, Hsien *et al.* 2003).

This case report describes the 20-month follow-up of extensive internal inflammatory root resorption in a maxillary central incisor, where MTA and a fibre-glass post, were employed to restore function.

#### **Clinical report**

A periapical radiograph of an asymptomatic 28-year-old male patient with a history of trauma revealed evidence of extensive internal root resorption affecting both maxillary central incisors (Fig. 1).

Because of the degree of tissue loss, both teeth were initially condemned for extraction, but owing to the favourable periodontal condition (Fig. 2), the possibility of conserving tooth 11 was considered through a combination of root canal treatment, internal MTA repair and fibre-post reinforcement.

Root canal treatment was accomplished by established methods. The tooth was isolated with a rubber dam without a clamp, to avoid the possibility of horizontal fracture. After coronal access, the pulp tissue was removed. A small communication between the resorption cavity and the lateral periodontium was observed as a haemorrhagic area (Fig.3).

After working length determination, the canal was prepared by the EndoEze oscillatory system (Ultradent Products Co., South Jordan, UT, USA). An apical stop was created with a rotary nickel–titanium size 60, .04 Profile file (Dentsply Maillefer, Ballaigues, Switzerland). This was accompanied by copious irrigation with freshly prepared 1% sodium hypochlorite (Farmácia Amazon, São Carlos, SP, Brazil) and a calcium hydroxide paste dressing (Calen, SSW Artigos Dentários Ltda., Rio de Janeiro, RJ, Brazil) was placed to alkalinize the environment, remove remaining pulp tissue and control bleeding at the perforation.

After 7 days, the dressing material was removed with 1% sodium hypochlorite irrigation and aspiration. The root canal was irrigated with a 3-min rinse with a buffered solution EDTA of pH 7.4 (Odahcam; Dentsply, Petrópolis, RJ, Brazil) under instrument agitation. The internal portion of resorbed space was filled with white MTA (MTA Angelus, Londrina, PR, Brazil), inserted by means of an amalgam carrier and condensed with a size 40 Gutta Condensor (Dentsply Maillefer) aiming to remove air inclusions from the material.



Figure 1 Preoperative radiograph. Extensive internal root resorption in both maxillary central incisors.



Figure 2 Remaining central incisor and healthy gingiva.

After this, the apical part of the root canal was re-established by the introduction of a D finger plugger (Dentsply Maillefer), and immediately afterwards, an auxiliary gutta-percha point (Dentsply Maillefer, Ballaigues, Switzerland), was introduced to the working length of the root canal (Fig.4a) and fitted to its apical preparation to preserve the original root canal space. All excess filling material was removed from the coronal pulp chamber, which was promptly sealed with a provisional cement.

At the third clinical session, successful hardening of the MTA was verified (Fig. 4b). The 'guide' gutta-percha point was removed Fig. 4c,d) and the empty root canal space was filled with EndoRez Dual cement (Ultradent Products Co., South Jordan, UT, USA) and a gutta-percha point, together with a fibre-glass post (Reforpost; Angelus) bonded to a length of 14 mm with a chemically activated cement (Cement Post; Angelus). Finally, the coronal chamber was restored with composite. An immediate postoperative radiograph was taken (Fig. 5), confirming satisfactory filling of the root canal and resorptive defect.



Figure 3 Lateral periodontium bleeding evidencing pathological perforation.



**Figure 4** (a) Use of a 'guide' gutta-percha point, to preserve the apical access throughout the root canal. (b) Successful curing of white MTA. (c) Removing of the 'guide' gutta-percha after cement set. (d) Preservation of root canal space for root canal filling and post installation.

Clinical and radiographic follow-up was conducted for 20 months (Figs 6 and 7), demonstrating a functional tooth with no endodontic pathosis. Despite the tooth's retention in a functional condition, it discoloured to a grey tone (Fig. 8).

# Discussion

Internal inflammatory root resorption is an insidious pathological process, initiated within the pulp space and associated with loss of dentine. It is often described as an oval shaped enlargement of the root canal space and is usually asymptomatic and detectable by radiographs. When diagnosed, immediate removal of the causative agent must be



Figure 5 Immediate post-treatment radiograph (August 2005).



Figure 6 Twelve-month post-treatment radiograph (August 2006).

considered, aiming to arrest the cellular activity responsible for the resorptive activity (Trope & Chivian 1997, Trope 2002).

According to Culbreath *et al.* (2000), the treatment for internal resorption can include several materials such as gutta-percha, zinc oxide eugenol and amalgam alloy. However,



Figure 7 Twenty-month post-treatment radiograph (April 2007).



Figure 8 Post-treatment clinical aspect after 20 months, showing tooth discoloration (April 2007).

these materials do not provide strength to the tooth structure and may be responsible for considerable tooth discolouration.

The use of a root canal dressing with a material based on calcium hydroxide between sessions was aimed at dissolving remaining pulpal debris, alkalinizing the environment and controlling periodontal bleeding (Siqueira & Lopes 2004). In the following session, the defect in the canal was filled with white MTA to seal the perforation and fill the resorbed area. For this case, MTA was selected because of its known abilities as a repair material, along with its sealing ability and mechanical strength (Torabinejad *et al.* 1995a).

The fibre-glass posts were used to enhance the fracture resistance of the tooth. Maccari *et al.* (2003) concluded that compromised teeth could be strengthened with distribution of functional forces through the tooth's long axis.

Clinical use of MTA in humans has demonstrated their applicability in wet environments, preventing bacterial microleakage and alkalinizing the medium. On account of the predominant presence of calcium oxide in its formula (Camilleri & Pitt Ford 2006), its biological properties show similarity to those of calcium hydroxide, making it useful for tissue healing. The relative roles of MTA and the fibre post in mechanically reinforcing the current tooth are unclear. Little evidence is also available on the bonding of composites and other materials to MTA.

White MTA was introduced as a low-iron, nonstaining formula. Despite this, the cement in this case discoloured the tooth perhaps as a result of oxidation of iron in the product formulation: tetracalcium aluminoferrite (Camilleri & Pitt Ford 2006). This has not been reported before and warrants further investigation.

## Conclusion

Mineral trioxide aggregate and a fibre-glass post were employed to restore a severely weakened, internally resorbed tooth, with satisfactory follow-up of 20 months. The tooth discoloured despite the use of white MTA, highlighting the need for further research.

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#### Disclaimer

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