Mineral Trioxide Aggregate Repair of a Perforating Internal Resorption in a Mandibular Molar

Maarten Meire, DDS, MSc, and Roeland De Moor, DDS, PhD, MSc

Abstract

Internal resorption is a rare condition in permanent teeth that poses difficulties for treatment. The challenge is complicated further if the resorption extends beyond the confines of the root. This article describes treatment of a perforating internal resorption in the mesial root of a second lower molar, with adjacent destruction of the alveolar bone. After cleaning the root canal space and the resorption lacuna by mechanical instrumentation, irrigation, and interim calcium hydroxide dressing, the defect was filled with mineral trioxide aggregate, and the canals were obturated conventionally with gutta percha and epoxy resin sealer. At a 2-year follow-up examination, no clinical abnormalities were found, and complete resolution of the alveolar bone lesion and establishment of a new periodontal ligament were observed. *(J Endod 2008;34:220–223)*

Key Words

Internal root resorption, mineral trioxide aggregate, periradicular periodontitis, root canal

From the Department of Operative Dentistry and Endodontology, Dental School, Ghent University, Ghent University Hospital, Gent, Belgium.

Address requests for reprints to Dr Roeland Jozef Gentil De Moor, Department of Operative Dentistry and Endodontology, Dental School, Ghent University, Ghent University Hospital, De Pintelaan 185/P8, B-9000 Gent, Belgium. E-mail address: roeland.demoor@ugent.be.

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Internal inflammatory root resorption is a rare condition in permanent teeth (1), characterized by progressive loss of tooth substance starting from the root canal wall. It is caused by transformation of normal pulp tissue into granulomatous tissue with giant cells, which resorb dentin. This transformation is thought to stem from chronic inflammation of the coronal pulp (2) caused by continuing bacterial stimulation (3). Trauma, caries, and restorative procedures have been suggested to be contributory factors, but it also occurs as an idiopathic dystrophic change (4). Internal resorption can be found in all areas of the root canal but is most commonly found in the cervical region (5).

Usually, internal root resorption is an asymptomatic condition that is discovered during routine radiographic evaluation. Radiographically, the lesion appears as a uniform, round-to-oval radiolucent enlargement of the pulp space. The margins are smooth and clearly defined, with distortion of the original root canal outline (6). Labially or lingually located external root resorption may have a similar appearance. Because the etiology and treatment regimens for both resorption types are different, correct diagnosis is important (7). If the internal resorption involves the crown, a pink area may show through the enamel, referred to as a "pink spot" (8).

For internal resorption to take place, vital pulp tissue is required. Therefore, nonsurgical root canal therapy (pulp removal) is the treatment of choice to arrest the destructive process (5). The irregular confines of the resorptive cavity pose technical difficulties for thorough debridement and obturation of the pulp space. If the internal resorption has extended to the point that it reaches the external root surface, root integrity is lost and destruction of the adjacent periodontal tissues may occur.

Mineral trioxide aggregate (MTA) has suggested indications for root-end filling (9), pulp capping, apical filling of teeth with open apices, apexification therapy, and repair of root perforations (10). It has many favorable features, including good sealing properties, biocompatibility, bactericidal effects, radiopacity, and ability to set in the presence of blood. Thus, MTA is a suitable material for the treatment of root perforations with the goal of regenerating a periodontal attachment and inducing osteogenesis and cementogenesis (11, 12).

Case Report

A 32-year-old white man was referred to the Endodontic Department of the Ghent University Dental Clinic because of a resorptive lesion in the mesial root of the lower left second molar. The lesion was discovered on a periapical radiograph, which was taken by the referring dentist because of vague pain in this quadrant. Clinical examination revealed tooth 18 to be slightly tender to percussion. All teeth in this quadrant responded normally to cold testing except 18, which was unresponsive. The tooth was positive on electric pulp testing, as were the other teeth in the quadrant. The periodontal condition was excellent, with no gingivitis and absence of pocket depths exceeding 2 mm. The medical history was noncontributory.

Radiographic examination revealed a well-circumscribed, fairly oval radiolucency in the cervical third of the mesial root next to a crescent-shaped radiolucent lesion in the alveolar bone (Fig. 1A).

Based on the radiographic findings, the lesion was diagnosed as a perforating internal resorption, and root canal therapy was initiated. The tooth was isolated under rubber dam and accessed without anesthesia. Upon opening the pulp chamber, microscopic inspection (OPMI Pico Dental Microscope; Zeiss, Oberkochen, Germany) revealed superficial necrosis and vital tissue underneath (Fig. 2A). Anesthesia was administered accordingly. After crown-down preparation with ProTaper Sx and Gates

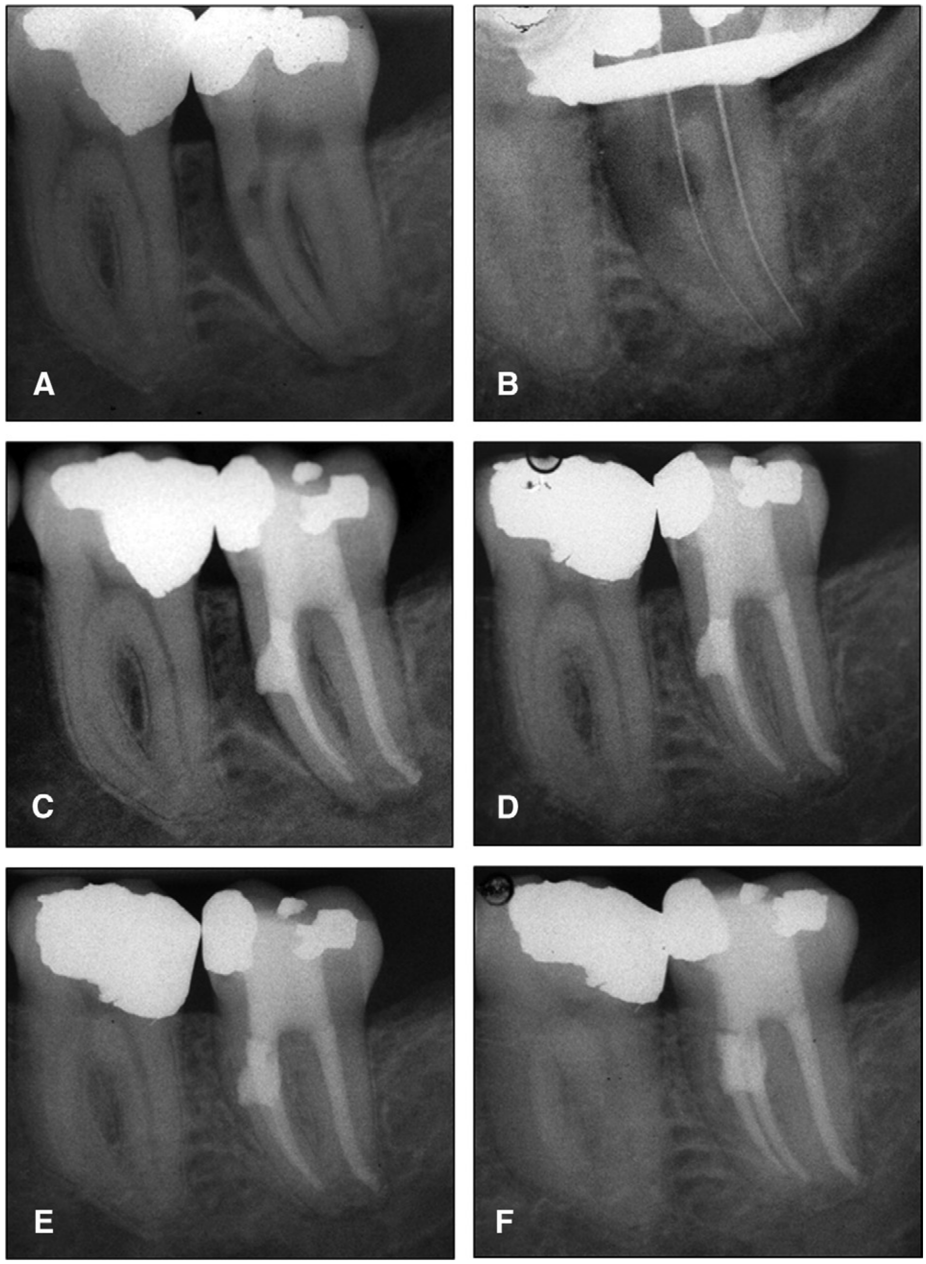

Figure 1. Periapical radiographs before, during,and after endodontic treatment of mandibular left second molar with internal resorption in mesial root. (*A*) Preoperative radiograph showing crescent radiolucent lesion in the alveolar bone next to a resorptive lesion in the mesial root. (*B*) A radiograph taken to establish working length in mesiobuccal and distal canal. (*C*) A radiograph taken immediately after filling of the resorption space with MTA and obturation of the root canals with gutta percha and sealer by hybrid condensation. (D) Eleven-month follow-up: healing of the mesial bone lesion is evident. (*E*) Two-year follow-up shows complete resolution of the radiolucency. (*F*) Distally angulated radiograph at 2-year follow-up.

Glidden Burs (Maillefer Dentsply, Baillaigues, Switzerland) and irrigation with 2.5% sodium hypochlorite, a large resorptive cavity was observed in the coronal third of the mesiolingual root (Fig. 2*B*). Length determination was performed electronically using the Apex Finder AFA Model 7005 (EIE Analytic Technology, Orange, CA) and radiographically (Fig. 1*B*), and the two mesial and distal canals were cleaned and shaped provisionally. Calcium hydroxide (Ultracal XS; Ultradent Products Inc., South Jordan, UT) was placed as a temporary dressing because the granulation tissue could not be removed completely by mechanical instrumentation.

The calcium hydroxide paste was changed 2 weeks later. In a third office visit 3 weeks later, the resorptive cavity was completely free of pulpal tissue. Communication with the external root surface was evident. While the mesiolingual canal was sealed with a paper point, white MTA (Maillefer Dentsply) was condensed into the resorption cavity using a nonsurgical MTA carrier (Micro Apical Placement System, Produits Dentaires, Vevey, Switzerland) and root canal pluggers (Maillefer Dentsply) (Fig. 2*C*). Again, calcium hydroxide and a temporary glass ionomer cement filling (Ketac-Fil; 3M Espe, Seefeld, Germany) were applied. In the final office visit, after checking the set of the MTA, all 3 canals were obturated with gutta percha and AH26 sealer (Detrey; Dentsply, Konstanz, Germany) using a hybrid condensation technique (a combination of apical cold lateral condensation and thermomechanical compaction using gutta condensers) (13) (Fig. 1*C*).

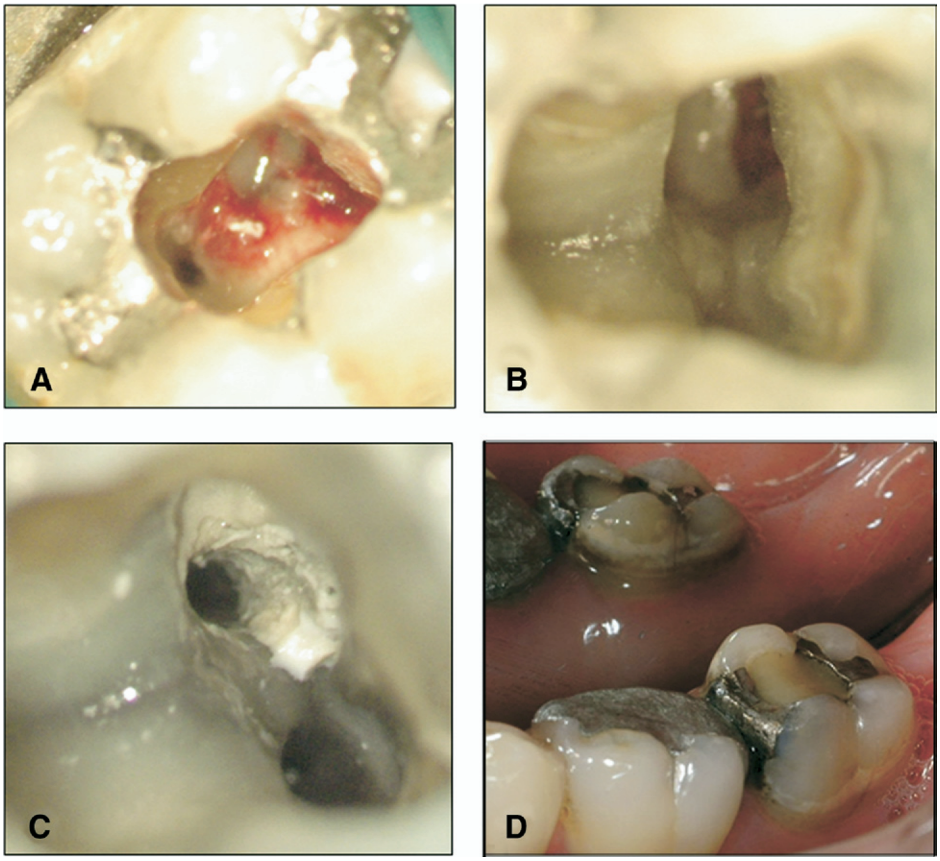

Figure 2. Clinical images of mandibular left second molar with internal resorption in mesial root. (*A*) The view of the pulp chamber after gaining access; superficial necrosis was observed. (*B*) The view of the resorption cavity showing extension beyond the confines of the root. (*C*) The resorptive cavity has been filled with MTA. (*D*) The clinical image of the tooth at the 2-year follow-up.

The access cavity was restored with a glass ionomer cement filling (Ketac-Fil), and the patient was sent to the referring dentist for further coronal restoration.

After 11 months, the patient was recalled, and the tooth was found to be symptom free. No percussion sensitivity was observed, and the patient had a healthy gingiva and no periodontal pockets on probing. The periapical radiograph showed satisfactory healing of the mesial radiolucency (Fig. 1*D*).

At a 2-year follow-up visit, the tooth was still symptom free. There was no percussion or palpation sensitivity, and periodontal probing did not exceed 3 mm. There were no signs of gingival retraction (Fig. 2*E*). Furthermore, the periapical radiograph showed complete resolution of the mesial radiolucency (Fig. 1*E*, *F*).

Discussion

The lesion in this case was diagnosed as internal resorption. This diagnosis was based on radiographic examination (clearly defined margins, uniform density, and root canal walls appear to balloon out) and clinical (inability to probe the defect via the periodontal ligament) features and was confirmed on entering the mesial canal system. The tissue in the mesiobuccal root entrance, when viewed microscopically, had a different texture than normal pulp tissue. It filled a large cavity confluent with the root canal, which was inconsistent with external root resorption in which the pulp space is usually not involved (14, 15).

Although most internal resorptive lesions are symmetrically distributed over the root, the location in this case was rather eccentric. This has also been described by other authors (7, 16). Furthermore, radiolucency in the alveolar bone, next to the cavity, was present, although the root contained only vital pulp tissue. Apparently, the process had destroyed the lamina dura and engaged on the cancellous bone.

We chose not to enlarge the entrance to the mesiolingual canal excessively for reasons of tooth substance preservation. However, this decision complicated the mechanical debridement of the resorptive cavity. The use of calcium hydroxide proved to be an effective aid in addition to mechanical instrumentation because its tissue-dissolving effect allowed remaining tissue to be flushed away after the calcium hydroxide paste had been in situ for several weeks. These tissue-dissolving properties are well documented in the literature (17).

Different approaches exist in the treatment of a perforating internal resorption. Root canal therapy combined with surgical correction may be the only option in some cases (18, 19). Remineralization therapy with calcium hydroxide, which forms a hard tissue matrix against which to condense the root-filling material, has been advocated by others (20). Application of MTA at the perforation site precluded, in this case, the need for surgical intervention or prolonged treatment with calcium hydroxide. MTA provided good sealing of the defect, subsequently allowing a conventional root canal–filling technique. More importantly, the biologic response to this material was excellent, and complete resolution of the alveolar bone lesion had occurred by the time of a follow-up visit 2 years after the procedure. Indeed, it has been shown that MTA stimulates the propagation of human osteoblasts by offering a biologically active substrate for the cells (11). By contrast, materials previously used to repair perforations (eg, amalgam, Cavit (3M Espe, Seefeld, Germany), Super-EBA (Harry J. Bosworth Co., Skokie, IL), glass ionomers) have been associated with formation of a fibrous connective tissue capsule in contact with the adjacent bone. The formation of a periodontal defect has been a common finding adjacent to these materials. No periodontal pocketing was observed in this case.

Unfortunately, at both follow-up visits, it was noted that a final restoration had not been placed. In this case, a full cuspal coverage in the form of a crown would have been appropriate. The need for permanent coronal restoration was once more pointed out to both the patient and referring dentist.

The surgical operation microscope was believed to be a very valuable tool in managing this nonsurgical perforation repair. The magnification and illumination allowed good assessment of the cleanliness of the resorptive cavity and proper placement of the repair material. Furthermore, specially designed equipment such as the Micro Apical Placement system facilitated this action.

The case presented here was successful both clinically and radiographically. There was complete healing of the radiolucency in the alveolar bone and a continued absence of pathologic features. After 2 years, the tooth remained asymptomatic, and the patient was satisfied because he was able to keep the tooth.

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