Conservative Management of Class 4 Invasive Cervical Root Resorption Using Calcium-enriched Mixture Cement

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Abstract

Class 4 invasive cervical root resorption (ICRR) presents a treatment dilemma in endodontics. The widely accepted treatment options for a class 4 ICRR are to leave these teeth untreated for as long as they are asymptomatic or extraction. This report presents a conservative approach for the management of class 4 ICRR. A 28-year-old woman was referred for root canal treatment of tooth #26. The patient had a history of orthodontic treatment. Radiographic evaluation showed class 4 ICRR that had perforated the root canal space, a radiolucent crestal bony defect, and a periapical lesion. Clinically, a deep (6-mm) probing area was found on the mesial side of the tooth that bled on probing. The tooth was sensitive to percussion. After the treatment options were discussed with the patient, she chose to save the tooth. After complete chemomechanical preparation of the root canal, the entire canal space and perforation area were filled with calcium-enriched mixture cement. No attempt was made to mechanically remove the resorptive lacuna. Twenty four months after treatment, the tooth was functional and asymptomatic, and probing was within normal limits (<3 mm) with no bleeding during probing. Radiographic examination revealed no progression of resorption, osseous healing of the crestal bony defect, and healing of the periapical lesion. Obturation of the root canal space with calcium-enriched mixture cement may be a viable treatment option for an otherwise non-treatable tooth with class 4 invasive cervical root resorption. *(J Endod 2016;42:1291–1294)*

Key Words

Calcium-enriched mixture, CEM cement, class 4 cervical resorption, healing, perforation, prognosis

Significance

Treatment of class 4 invasive cervical resorption is a challenge. Almost all treatment approaches (surgical or non-surgical) have unfavorable outcome due to either extensive damage to the periodontal tissues or inability to stop the resorption. This article presents successful management of a case of class 4 invasive cervical resorption using a novel noninvasive nonsurgical approach. A bioactive cement, CEM cement, was used as obturation material to stop the resorption and induce healing in periodontal tissues.

Invasive cervical root resorption (ICRR) is one of the least understood types of external root resorption that occurs immediately below the epithelial attachment (1). The mechanism of ICRR remains poorly understood. It has been accepted that defects in or damages to the cementum layer below the epithelial attachment can expose the root dentin to clastic cells, which can start resorption of the dentin (2). In addition, the anatomic structure of the cementoenamel junction area is prone to resorptive processes. Studies have shown several types of defects may occur between the cementum and enamel at the CEJ, leaving the root dentin exposed to the periodontal tissues (3). In a study of 257 teeth with ICRR, Heithersay (4) classified them into 4 classes based on location, size, proximity to the pulp chamber, and whether or not the lesion had invaded the root. Class 1 is a small lesion in the cervical area with a shallow penetration into the dentin. Class 2 is a lesion that has penetrated close to the pulp chamber but has no or little invasion into the root. Class 3 shows a deeper invasion into the coronal third of the root dentin. Finally, class 4 is a large lesion that has extended beyond the coronal third of the root and may involve almost the entire root (4). There are several predisposing factors associated with ICRR including trauma, orthodontic treatment, intracoronal bleaching, periodontal treatment, and bisphosphonate medications (1, 5–7).

Treatment strategies for ICRR are based on location; size; whether the root canal space is invaded; and, most importantly, whether the tooth is restorable. The objectives of the treatment of ICRR are to eliminate the resorptive tissues and their blood supply and to restore the resorptive defect (1). Therefore, a surgical approach in more severe cases is inevitable. If the root canal space is invaded, root canal treatment will also be necessary. However, the proximal and apical extension of the resorptive lacuna makes the surgical approach very challenging or even impossible. The success rate is 100% for ICRR classes 1 and 2, 78% for class 3, and 12.5% for class 4 (8). Thus, ICRR class 4 has a very unfavorable prognosis with a failure rate of nearly 88% (1, 8).

Calcium-enriched mixture (CEM) cement is a calcium silicate–based cement. Its bioactivity has been shown to be superior to mineral trioxide aggregate (MTA) because of its internal reservoir of phosphate (9). The major components of CEM cement

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powder are CaO, SO_3, P_2O_5, and SiO_2, with small amounts of Al_2O_3, Na_2O, MgO, and Cl. The cement is alkaline (pH > 10.5) and releases CH during and after setting (10, 11). CEM cement is biocompatible and induces periodontal regeneration when used as a root-end filling (12) and perforation repair material (13). CEM cement has been used successfully in the management of external inflammatory (infection-related) root resorption (14) and also in the surgical repair of class 3 ICRR (15).

Thus far, there is no definitive treatment for teeth with class 4 ICRR. Hence, this class of ICRR presents a serious challenge to clinicians when the patient desires to save the tooth. This article presents a case of class 4 invasive cervical root resorption that was treated with a conservative orthograde approach using CEM cement as an obturation material.

Case Report

A 28-year-old female patient was referred from a general dentist for the root canal treatment of tooth #26. The referral letter stated that the dentist started the root canal treatment but could not control the bleeding from the root canal space. The patient's original chief complaint was pain on biting. Although the patient's medical history was noncontributory, a review of the dental history revealed that the patient had completed orthodontic treatment 6 months before the initial visit. The patient was in the maintenance phase with a lingual splint on the mandibular anterior teeth. Clinical examination revealed an open access cavity on tooth #26, a lingual splint (#22–27), no palpation sensitivity, different feeling on percussion (compared with #25 and 27), and probing <3 mm except on the mesiolabial and mesiolingual where there were 6-mm probing depths with profuse bleeding on probing. The initial radiograph of #26 (Fig. 1*A*), which was provided by the referring dentist, showed a large class 4 invasive cervical root resorption in the midroot area, a mixed radiopaque/radiolucent area extending from the adjacent bone into the resorptive lacuna, a large perforation area (because of resorption) close to the crestal bone, a narrow vertical bony defect next to the resorptive lacuna, and a periapical radiolucency. The preoperative radiograph (Fig. 1*B*) taken at the time of the initial visit showed an access cavity in #26 and a radiopaque material inside the root canal space at the level of the resorptive lesion. The endodontic diagnosis for tooth #26 was previously initiated treatment with symptomatic apical periodontitis. The findings were explained to the patient. The treatment options presented to the patient were no treatment, extraction, or conservative treatment with CEM cement as a root canal filling. It was explained that with the class 4 resorption, endodontic treatment of #26 had an unfavorable prognosis with a success rate possibly as low as 12.5% (8). The patient wanted to save the tooth, so she elected the conservative treatment using CEM cement. Written informed consent was obtained.

After local anesthesia was obtained using a labial and lingual infiltration of 68 mg articaine 4% with 0.018 mg 1/100,000 epinephrine (Septodont, Saint-Maur des Fossés, France), the tooth was isolated with a rubber dam. The patency of the root canal space was confirmed using a size 15 K-file (Dentsply Maillefer, Ballaigues, Switzerland). Profuse bleeding started after entry into the root canal space. The working length was determined radiographically. Root canal preparation was first performed using rotary instruments (ProTaper Universal files size S1 to F2, Dentsply Maillefer) and then hand filing to an apical size of #35. An errant piece of gutta-percha was retrieved from the root canal space, which was consistent with the radiopaque material observed in the initial radiograph (Fig. 1*B*). Root canal space was irrigated with sodium hypochlorite 2.5% (~10 mL) in between each instrument. Bleeding subsided as the cleaning and shaping of the root canal progressed. Finally, the root canal space was irrigated with 3 mL 17% EDTA (Ariadent, Tehran, Iran) to remove the smear layer. CEM cement (BioniqueDent, Tehran, Iran) powder and liquid were mixed according to the manufacturer's instructions. The root canal was dried using paper points. However, there was still blood oozing from the perforation site into the canal. This was observed as bloody spots on the lateral side of the paper points. CEM cement was delivered incrementally using the MAP system (Produits Dentaires SA, Vevey, Switzerland). The increments were gently packed apically into the canal and laterally into the perforation area with paper points (Ariadent). A moist cotton pellet was placed on the CEM cement, and the access cavity was restored temporarily (Cavite; Asia Chemi Teb Co, Tehran, Iran). A day later the access cavity was restored with a composite resin (3M ESPE, St Paul, MN) (Fig. 1*C*).

The patient was recalled at 12 and 24 months after the initial visit. At both recalls, #26 was asymptomatic and functional. Clinically, there was no percussion or palpation sensitivity, probing depths were <3 mm with no bleeding, and the mobility was normal. Radiographic examination at 24 months showed an arrested resorptive process, healing of the

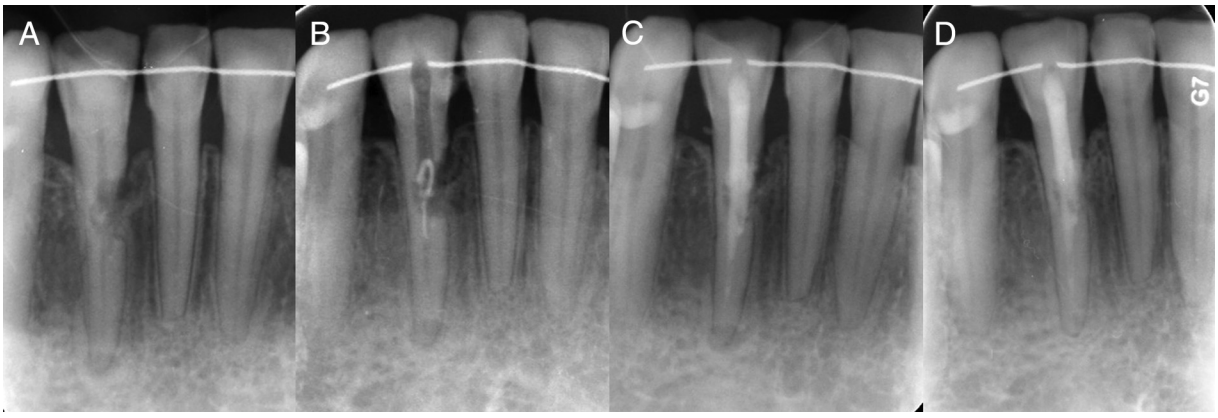

Figure 1. (*A*) A preoperative image of tooth #26 provided by the referring dentist. The radiograph shows class 4 ICRR in the coronal third and midroot area, perforation of the root because of resorption, a crestal bony defect adjacent to the perforation, and a small periapical lesion. (*B*) A preoperative image of tooth #26 at the initial visit. The access cavity prepared by the referring dentist left open to the oral cavity and radiopaque material in the root canal space determined to be a piece of gutta-percha. (*C*) A postoperative image of tooth #26 after the coronal restoration was performed. (*D*) The 24-month follow-up radiograph. Note that despite the presence of resorptive lacuna, there is no progression of the resorptive process; osseous healing of the crestal bony defect at the perforation site has occurred; and the periapical lesion has healed.