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KEYWORDS

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CBCT;
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Root resorption;
Volume CT

Iatrogenic root perforations are a serious complication in endodontic practice, creating an unnatural communication between the root canal system and the external tooth surface, i.e., periodontium. Often resulting from procedural mishaps during instrumentation or post placement, these defects permit the egress of irritants, triggering rapid inflammation of the supporting periodontium and potentially leading to catastrophic treatment failure. The ultimate prognosis is highly dependent on several key factors: the defect's size and location, the duration of contamination, and, critically, the sealing ability and biocompatibility of the root repair material.¹ An ideal material should establish a perfect seal and promote periodontal regeneration. This report highlights the successful management of a large, contaminated lateral root perforation using calcium-enriched mixture (CEM) cement, a bioactive endodontic material lauded for its excellent sealing properties and capacity to facilitate hard-tissue healing.

A 39-year-old female presented with severe pain from the mandibular right second premolar, which had been root-filled with amalgam one year prior (Fig. 1A). A periapical radiograph revealed a large, well-defined radiolucent lesion on the mesial root surface, indicative of a massive lateral perforation (Fig. 1B). The treatment plan involved nonsurgical retreatment and perforation repair.

After obtaining informed consent, the tooth was properly isolated. The old amalgam coronal restoration and root canal fillings were precisely removed. The canal was meticulously cleaned with a 5.25 % NaOCl solution. The perforation site was identified on the mesial wall. After drying the canal, the perforation defect was bio-obtured (i.e., filled and sealed),^{2,3} with CEM cement (BioniqueDent, Tehran, Iran) according to the manufacturer's instructions. An observable extrusion of biomaterial into the periodontal space was noted (Fig. 1C). The coronal cavity was then sealed with composite resin (Z100, 3M ESPE, St. Paul, MN, USA).

The patient became asymptomatic within one week. At the 27-month recall, the tooth was functional and asymptomatic. Periapical radiography demonstrated complete resolution of the lateral radiolucent lesion (Fig. 1D). Cone-beam computed tomography (CBCT) confirmed three-dimensional bone regeneration and complete bone healing in the perforation area, with the sagittal, coronal, and axial planes showing excellent osseous integration and tolerance to the extruded CEM biomaterial (Fig. 1E–H).

This case underscores the critical role of biocompatible materials in managing endodontic complications. CEM cement, a hydrophilic endodontic biomaterial, is known for its excellent sealability, bio-activity/compatibility, and

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Figure 1 Radiographic sequence of the diagnosis, management, and 27-month follow-up of a large iatrogenic lateral root perforation on the right mandibular second premolar. (A) Pre-operative panoramic radiograph showing the tooth following initial root canal treatment and coronal restoration with amalgam; the patient was asymptomatic at this time. (B) Periapical radiograph taken one year later upon the patient's return, presenting with severe pain, revealing a large, well-defined radiolucent lateral lesion associated with the mesial root surface, indicative of a massive perforation. (C) Immediate post-operative periapical radiograph following the removal of the previous amalgam root canal filling, chemomechanical preparation, and meticulous sealing of the perforation site with calcium-enriched mixture cement; note the unintentional extrusion of biomaterial into the lateral periodontal space. The patient's symptoms resolved completely within one week. (D) Twenty-seven-month recall periapical radiograph demonstrating complete resolution of the previous radiolucent lesion and the tooth being fully functional and asymptomatic. (E–H) Cone-beam computed tomography images at the 27-month recall, confirming three-dimensional bone regeneration and complete healing in the perforation area: (E and F) sagittal, (G) coronal, and (H) axial planes. These images also illustrate the excellent biocompatibility and good tolerance of the surrounding bone to the extruded biomaterial.

capacity to facilitate hard tissue deposition, i.e., cementogenesis and osteogenesis.^{4,5} Its success here, even in the presence of initial extrusion, can be attributed to its high pH, which creates an antimicrobial environment, and its ability to release calcium and hydroxyl ions, promoting hard tissue formation. The complete healing of a large endodontic defect, as confirmed by CBCT images, suggests that CEM cement can create a favorable environment for periodontal healing and regeneration, even in challenging root perforation cases.

In conclusion, within the limitations of a single case, CEM cement is proved to be a highly effective endodontic biomaterial for the nonsurgical repair of a large iatrogenic perforation, facilitating the complete regeneration of the surrounding periodontium.

Declaration of competing interest

The author has no conflicts of interest relevant to this report.

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