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Bio-obturation of a large perforated internal root resorption: A case report

KEYWORDS
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Mineral trioxide aggregate;
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Internal root resorption (IRR) is a rare but aggressive endodontic condition characterized by the progressive loss of dentin due to the activity of odontoclast cells. Early lesions are often asymptomatic and are detected radiographically, whereas advanced IRR may lead to perforation, periodontal communication, and structural compromise, which complicates treatment and has a poor prognosis.[1,2] Historically, teeth with large perforating IRR were considered poor candidates for orthograde therapy, often requiring extraction or surgical repair.[3] Conventional root canal obturation techniques frequently fail to fill/seal irregular cavities, and perforation provides a route for persistent bacterial contamination. Advances in bioactive calcium-silicate-based cements, particularly calcium-enriched mixture (CEM) cement, have enabled a shift toward conservative approaches. CEM offers excellent sealing, antibacterial activity, biocompatibility, and the ability to induce cementogenesis/osteogenesis,[4] making it ideal for bio-obturation (complete root canal obturation using a bioactive material instead of gutta-percha/sealer).[5]

A 36-year-old woman was referred to evaluate a maxillary right central incisor with IRR identified by routine periapical radiographies. The tooth was asymptomatic, with normal color, physiologic probing depths, and no tenderness. Pulp sensibility testing elicited a positive response, suggesting a vital but inflamed pulp. Periapical radiography revealed a large, irregular radiolucency within the root canal space (Fig. 1A). Cone-beam computed tomography (CBCT) confirmed an extensive perforating mid-root defect communicating with the periodontal ligament, while the apical segment remained intact (Fig. 1B–F). The diagnosis was chronic pulpitis with perforating IRR.

Following informed consent, local anesthesia, and isolation, an access cavity was prepared. Irrigation with 5.25 % sodium hypochlorite was used to dissolve inflamed pulp tissue and clean the complex cavity, while mechanical preparation was minimized to preserve dentin. The canal was dried with sterile paper points, and orthograde bio-obturation was performed by filling the entire root canal and resorptive defect with CEM cement, which was carefully added/compacted. The tooth was immediately restored with a resin composite. Postoperative imaging showed adequate bio-obturation with limited extrusion of CEM into the interdental bone adjacent to the lateral incisor (Fig. 1G).

At the 1-year follow-up, the tooth remained functional and asymptomatic. Radiographs demonstrated bone healing and a distinct linear demarcation between the coronally obturated resorptive site and the apical segment of the main root (Fig. 1H). At 3 years, periapical (Fig. 1I) and CBCT imaging (Fig. 1J–L) confirmed stable healing, absence of further resorption, and a sharper demarcation line reflecting anatomical separation between coronal and apical tooth root segments without compromise of tooth function. Remarkably, the extruded CEM was fully

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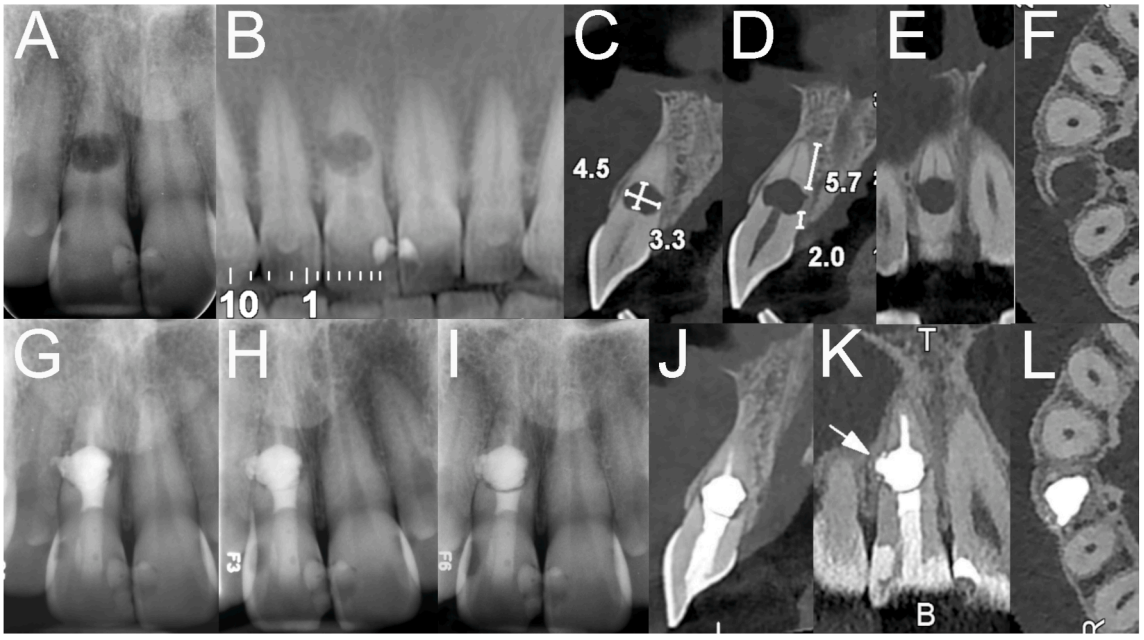

Figure 1 Radiographic and cone-beam computed tomography (CBCT) images of a maxillary right central incisor with extensive perforating internal root resorption (IRR) managed with orthograde bio-obturation using calcium-enriched mixture (CEM) cement. (A) Preoperative periapical radiograph showing an irregular radiolucency in the root canal space. (B—F) Preoperative (sagittal/coronal/axial) CBCT images confirming a large mid-root perforating IRR with communication to the periodontal ligament space. (G) Immediate postoperative radiograph demonstrating complete bio-obturation and limited CEM extrusion into the interdental bone adjacent to the lateral incisor. (H) One-year follow-up radiograph showing periradicular healing and a linear demarcation between the coronal bio-obturated defect and apical portion of the main root. (I) Three-year follow-up periapical radiograph confirming complete healing and stabilization. (J—L) Three-year CBCT scans showing a distinct demarcation line, stable obturation, and complete osseous integration of extruded CEM cement.

integrated, surrounded by newly formed bone, confirming long-term material biocompatibility and osteoconductive behavior.

This case highlights the effectiveness of bio-obturation in managing severe perforating IRR. The long-term radiographic findings provide clinical evidence of the ability of CEM cement to achieve re-infection control, seal complex defects, and support periradicular bone regeneration, even when extruded beyond the root. Bio-obturation offers a predictable, minimally invasive alternative to surgery or extraction, demonstrating that strategic use of bioactive endodontic materials can preserve teeth previously deemed unsalvageable. Broader adoption of such biomaterial-based strategies could shift treatment paradigms toward biologically driven, tooth-preserving therapies, emphasizing regeneration and integration over replacement.

Declaration of competing interest

The authors have no conflicts of interest relevant to this paper.

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