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Case Report

Unexpected reversal of internal root resorption following tampon partial pulpotomy in irreversible pulpitis: Challenging endodontic dogma

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Internal root resorption (IRR) is classically deemed an inexorably progressive condition necessitating root canal treatment (RCT) or extraction.[1] We reported unprecedented spontaneous healing and hard tissue regeneration within an IRR defect following tampon partial pulpotomy in a mature molar diagnosed with irreversible pulpitis and symptomatic apical periodontitis, contradicting conventional endodontic paradigms.

A 32-year-old female presented with severe/lingering pain in tooth 46, exacerbated by cold/mastication/percussion, commencing two months post-deep Class II amalgam restoration. Radiographs revealed the restoration approximating the mesial pulp horn and widened periodontal ligament (PDL) spaces apically (Fig. 1A and B). Clinical diagnosis was irreversible pulpitis with symptomatic apical periodontitis. Despite this, the patient declined RCT, opting for vital pulp therapy (VPT).

Partial pulpotomy was performed one month later, confined to the mesial pulp chamber. Profuse and prolonged hemorrhage mandated a tampon approach to achieve hemostasis before pulp capping with calcium-enriched mixture (CEM) cement (BioniqueDent, Tehran, Iran) (Fig. 1C); an incidental, well-circumscribed radiolucency in

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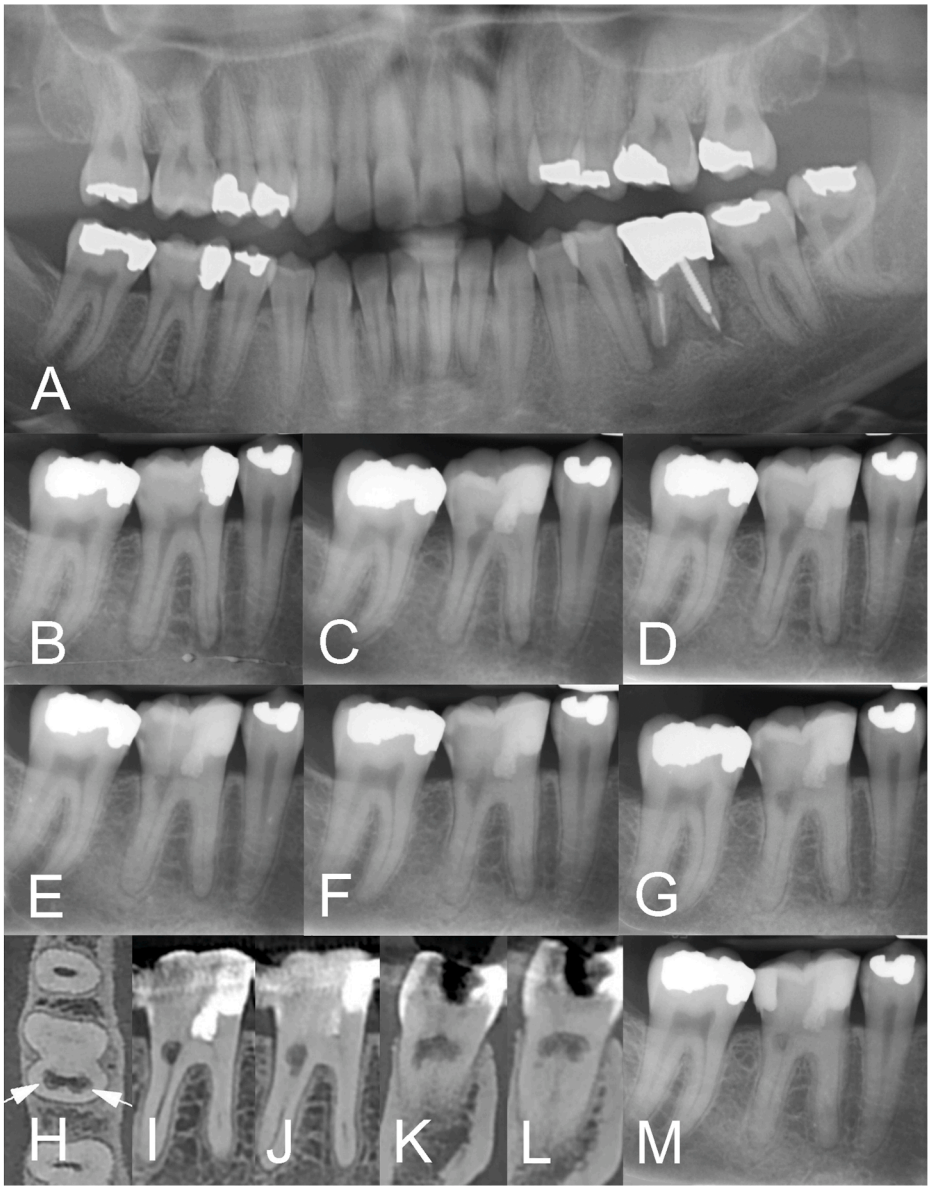

Figure 1 Radiographic progression and healing of internal root resorption (IRR) following tampon partial pulpotomy in tooth 46. (A) Preoperative panoramic radiograph showing a deep Class II amalgam restoration approximating the mesial pulp horn, with widened periodontal ligament (PDL) space in both roots. (B) Preoperative periapical radiograph confirming apical periodontitis, with a distinct lesion in the mesial root. (C) Immediate postoperative radiograph following partial pulpotomy with the tampon approach in the mesial pulp chamber; note the proper sealing of the pulp capping biomaterial (CEM cement) and composite resin restoration. An incidental IRR is visible in the coronal third of the distal canal. (D) Two-month follow-up shows reduced PDL widening and no progression of IRR. (E—G) Periapical radiographs at 8, 14, and 20 months demonstrate progressive healing: complete resolution of periapical pathology, dentin bridge formation in the distal pulp chamber, and gradual reduction in the radiolucency of the resorptive defect. (H—L) CBCT images at 26 months: axial (H), coronal (I and J), and sagittal (K and L) views reveal hard tissue infill within the resorptive defect, confirming spontaneous repair of IRR. (M) Three-year follow-up periapical radiograph shows continued regression of IRR and preservation of distal canal anatomy without calcific obliteration.

the coronal third of the distal canal, consistent with IRR, was detected and identified. The patient elected monitoring over intervention. Symptoms resolved completely by a week and remained absent at the two-month recall, which also revealed partial PDL space regression and stable IRR dimensions (Fig. 1D).

Follow-up at 8, 14, and 20 months demonstrated progressive healing: complete resolution of apical radiolucency, formation of a mineralized tissue bridge beneath the CEM in the distal chamber, and diminishing IRR radiolucency (Fig. 1E—G). Cone-beam computed tomography at 26 months confirmed 3D evidence of hard tissue deposition within the resorptive defect across all planes (Fig. 1H—L). The 3-year periapical radiograph revealed further IRR regression, patent distal canal anatomy, and absence of calcific metamorphosis (Fig. 1M).

This case presents the first documented evidence of IRR reversal and hard tissue infill following VPT in a tooth diagnosed with irreversible pulpitis. Key implications challenge established doctrines: (1) **Etiology & arrest:** IRR likely initiated from persistent pulp inflammation post-restoration. Removal of inflamed coronal pulp via partial pulpotomy and elimination of microbial ingress via effective sealing arguably eliminated the stimulus for clastic activity, enabling arrest.[2] (2) **Regenerative mechanism:** The tampon technique's control of hemorrhage,[3] paired with the bioactivity of CEM (promoting odontoblastic differentiation, angiogenesis, and dentinogenesis),[4] likely facilitated mesenchymal cell recruitment and osteodentin deposition within the resorptive lacuna. (3) **Diagnostic reappraisal:** *Irreversible pulpitis* is a misleading term;[5] inflammation may be localized. Even with apical periodontitis, pulpal vitality/regeneration is possible if the disease is confined and properly managed, even with concurrent IRR. (4) **Paradigm shift:** While IRR typically mandates RCT, this case shows that with targeted pulpotomy, hemostasis, sealing, and bioactive materials, regeneration is possible if inflammation is controlled.

This case challenges the inevitability of IRR progression. It expands potential indications for VPT in select mature teeth exhibiting early IRR adjacent to the site of pulp exposure/inflammation, provided the etiological factors are eliminated and optimal conditions for regeneration are established. It highlights the potential of biologically based approaches over traditional extirpation methods. Further research is warranted to elucidate predictors of such reparative responses and refine case selection criteria.

Declaration of competing interest

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

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