



Simplified Orthograde Apical Plug and Intra-Orifice Barriers for Resolving a Complex Endodontic Challenge: A Case Report

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Article Type: Case Report

Received: 06 Jun 2023

Revised: 27 Jul 2023

Accepted: 10 Aug 2023

Doi: 10.22037/iej.v18i4.43108

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Successful endodontic treatments are contingent upon establishing a hermetic seal within the root canal system. This seal is pivotal in preventing/resolving apical periodontitis. This case report introduces a simplified orthograde apical plug and intra-orifice barrier technique as an effective alternative to previously unsuccessful invasive nonsurgical and surgical treatments. A 28-year-old patient presented with persistent discomfort and localized swelling in the furcation area of the mandibular left first molar. The tooth had previously undergone both root canal therapy and surgical retreatment. A distinctive feature of this case was the unconventional amputation of the mesial root, unlike conventional periradicular surgery or root amputation. This unusual scenario was accompanied by the presence of a large endodontic lesion. An apical plug, utilizing calcium-enriched mixture (CEM) cement, was placed, complemented by the use of CEM intra-orifice barriers to ensure the hermetic sealing of the entire root canal system. Long-term follow-up assessment demonstrated the complete healing of the preexisting large endodontic lesion. This case underscores the significance of proper diagnosis, right treatment planning, and considering conservative treatment options for complex cases, highlighting the pivotal role played by a reliable seal in achieving successful results in endodontic procedures.

Keywords: Apical plug, Calcium-enriched Mixture Cement; Endodontics; Intra-orifice barriers, Minimally invasive dentistry, Orthograde retreatment

Introduction

The paramount goal of successful endodontic treatments is the complete eradication of etiological factors within the root canal system while ensuring a hermetic seal. This objective is pivotal in averting the development of apical periodontitis or, if already present, facilitating its resolution [1].

Primary root canal treatment (RCT) is a fundamental procedure aimed at the complete eradication of etiological factors within the root canal system while ensuring a secure seal. This initial intervention is crucial in preventing the development or progression of apical periodontitis [2]. The success of primary RCT relies on the meticulous cleaning/shaping of the infected root canal system, followed by root canal filling, to create a hermetic seal [3]. However, the complexity of root canal anatomy and the

challenges posed by various clinical scenarios can sometimes lead to unsuccessful primary RCTs, necessitating further endodontic interventions such as surgical endodontic retreatment. Surgical retreatment becomes instrumental when primary RCT is compromised by factors like complex anatomy, persistent infection, or the presence of obstructions within the root canals [4, 5]. While surgical retreatment is considered a more invasive approach, its importance lies in its ability to salvage teeth that might otherwise be deemed non-restorable.

An apical plug represents a precise method for establishing a hermetic seal in the apical portion of teeth with open apices by utilizing specialized endodontic filling biomaterials [6, 7]. Apical plugs prove particularly valuable in situations where conventional filling of the entire root canal system is hindered by anatomical complexities, procedural errors, or persistent infections [8].





Figure 1. Periapical radiographs of the affected left mandibular first molar illustrating the treatment process and long-term outcome; A) Initial periapical radiograph showing a poorly obturated root canal without a proper coronal seal, an unusual amputation of the mesial root, and related endodontic lesion; B) Radiograph post-treatment demonstrating the placement of the apical plug using calcium-enriched mixture (CEM) cement in mesial root and intra-orifice barriers in distal root, with the access cavity sealed using a sandwich technique; C) The radiograph displaying the restoration of the tooth with the crown cemented in place; D) Follow-up periapical radiograph taken nine years later, revealing complete healing of the endodontic lesion

Intra-orifice barriers have proven to be valuable adjuncts in endodontic treatments, facilitating the creation of a secure coronal seal for each root canal [9]. These barriers play a pivotal role in enhancing the coronal sealing of root canals, effectively preventing the reentry of microorganisms and promoting periradicular healing.

Dental clinicians are tasked with the responsibility of selecting an effective/straightforward approach for the cleaning, shaping, filling, and sealing of the root canal(s). In this case report, we implemented a simplified orthograde method involving the placement of an apical plug complemented by intra-orifice barriers. This approach was employed to address issues arising from a previously flawed primary RCT, which had been further complicated by an erroneous surgical intervention that perpetuated an endodontic lesion.

Case Report

A 28-year-old patient presented with persistent discomfort and localized swelling in the furcation area of the mandibular left first molar. This tooth had previously undergone both RCT and surgical retreatment. The patient experienced this discomfort for a year before seeking our consultation. His medical history was noncontributory. Clinical examination revealed the presence of a reasonably intact porcelain-fused-to-metal crown, a deep pocket in the furcation area of the involved tooth, accompanied by overlying soft tissue redness and tenderness. The initial periapical radiograph revealed a poor root canal obturation in mesial canals (but reasonable in the distal root canal), without a proper coronal seal in both roots (Figure 1A). Notably, there was an unusual amputation

of the mesial root, distinct from conventional periradicular surgery or root amputation. Surrounding this site, a substantial endodontic lesion had developed, and signs of bone healing were evident at the extracted mesial root end.

We discussed various treatment options with the patient, including orthograde/nonsurgical endodontic retreatment of mesial canals. After obtaining written informed consent, the retreatment commenced with the removal of the crown. Subsequently, the access cavity was meticulously cleaned, and the root canal obturation from the mesial canals was completely removed, along with the removal of approximately one-third of the coronal portion of the distal root obturation.

The unique aspect of this case was the subsequent placement of an apical plug using calcium-enriched mixture (CEM) cement (BioniqueDent, Tehran, Iran). The CEM apical plug was carefully positioned within the entire part of the mesial root canals and simultaneously in the distal root as the best choice for intra-orifice barriers [10]. Then the access cavity was filled and sealed using a sandwich technique [11] using glass ionomer cement and resin composite (Figure 1B), and the crown was cemented again carefully (Figure 1C). These procedures effectively sealed the root canal system, and thus expected to prevent the reentrance of oral microorganisms as well as to promote periradicular healing.

A week later, the patient's signs and symptoms had completely resolved. However, the patient did not return for regular follow-up until nine years later. At this extended follow-up, clinical examination showed that the tooth was asymptomatic/functional, and radiographic assessments revealed the remarkable outcome of complete healing of the previously existing endodontic lesion (Figure 1D).

Discussion

Effective endodontic treatment hinges on achieving an impermeable seal within the root canal system. This case highlights the success of a simplified orthograde apical plug and intra-orifice barrier techniques in addressing a complex endodontic challenge, offering an alternative to more invasive surgical re-treatment procedures. By adopting a minimally invasive approach, patient discomfort was dissolved, tooth preservation was achieved, and the endodontic lesion healed completely. This underscores the importance of simple and conservative options for complex cases and emphasizes the central role of a reliable seal in endodontic procedures.

The use of an apical plug, incorporating calcium silicate-based cements like CEM, signifies a notable advancement in endodontic techniques [12]. These biomaterials has gained recognition for its excellent sealing properties, biocompatibility, and regenerative potential [13-17]. In this case, CEM cement was employed to create a reliable apical plug within the root canal system. This innovative approach not only ensures the hermetic sealing of the apical portion but also harnesses the therapeutic benefits of CEM cement, potentially aiding in periradicular healing. The use of CEM cement as an apical plug offers a minimally invasive alternative to more complex surgical interventions, emphasizing the importance of conservative yet effective techniques in modern endodontics.

In this case study, intra-orifice barriers were strategically employed to complement the apical plug using CEM cement [18]. This approach ensured the comprehensive sealing of the root canal system, further fortifying the treatment's success. The integration of intra-orifice barriers underscores the evolving landscape of endodontics, where innovative techniques are tailored to address complex scenarios while preserving tooth structure/function.

Conclusion

This case serves as a reminder to dental clinicians that with careful assessment, proper diagnosis and thoughtful treatment planning, conservative measures can yield favorable results, contributing to the overall success and longevity of endodontically treated teeth.

Conflict of Interest: 'None declared'.

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Please cite this paper as: Talebzadeh B. Simplified Orthograde Apical Plug and Intra-Orifice Barriers for Resolving a Complex Endodontic Challenge: A Case Report. *Iran Endod J.* 2023;18(4): 271-3. *Doi:* 10.22037/iej.v18i4.43108.