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Case Report

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Selective Root Canal Retreatment as an Alternative Option in Patient at Risk of MRONJ: A Case Report

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Abstract

Aims: This case report aims to demonstrate an alternative treatment approach of a failed endodontically treated tooth (ETT) in a patient at risk of medication-related osteonecrosis of the jaw (MRONJ), in which conventional retreatment of all canals had limited access and surgical interventions possessed osteonecrotic risk.

Methods and Results: A 65-year-old female presented with discomfort at the upper right posterior region, where a sinus tract opening was observed adjacent to maxillary right first molar. She had osteoporosis and had been taking oral Alendronate for more than five years, placing her at a higher risk of MRONJ. A preoperative radiograph of maxillary right first molar revealed prefabricated fibre posts in the palatal and distobuccal canals, and an absence of root canal filling material in the mesiobuccal root canal. The diagnosis of maxillary right first molar was previously treated with chronic apical abscess. Selective root canal retreatment was performed as one of the plans following comprehensive, patient-centred consideration. After a 1.5-year follow-up period, the patient remained asymptomatic, and both clinical and radiographic evaluations demonstrated favourable healing.

Conclusions: Selective root canal retreatment may serve as a viable and effective alternative treatment for managing failed ETTs when conventional and surgical approaches pose increased risks. Successful outcomes depend on prudent case selection, prognosis assessment, and thorough informed consent.

Keywords: endodontic retreatment, medication-related osteonecrosis of the jaw, minimal invasive approach, root canal retreatment, selective root canal retreatment, special care dentistry

Introduction

Primary root canal treatment (RCT) generally demonstrates favourable success rates, ranging from 93% after the first decade to 85% at the twentieth year, and 81% at 37 years.[1] The primary RCT may fail due to various factors, including persistent bacterial or fungal infections, untreated/missed canals, inadequate or overextended root canal fillings, suboptimal coronal seals, iatrogenic procedural errors, and other complications during instrumentation.[2,3] Furthermore, clinical signs and symptoms of infection, increased size of periapical radiolucency, and root resorption are considered indicators of failure.[4] A period of four years is commonly used as a cut-off point to evaluate the size of a periapical lesion, whether it has persisted or not healed.[4-7] Still, asymptomatic periapical lesions may take over ten years to resolve.[8] To manage failed endodontically treated tooth (ETT), relevant factors include clinical and radiographic findings, causes of failure, accessibility to root canals, anatomical difficulties, quality of root canal obturation, and the need for prosthetic restoration.[9-11] Established management options include follow-up, conventional endodontic retreatment, surgical endodontic retreatment, intentional replantation, root section or hemisection, and extraction.[11-13]

Not all teeth with suboptimal quality of root canal filling require intervention. Nonetheless, conventional retreatment is often performed when root canal access is feasible.[11] With this approach, it is advised to remove existing restorations and obturating materials entirely.[14] However, this may weaken the tooth structure through excessive dentine removal, iatrogenic errors, and heat generation during post removal, potentially causing surrounding tissue necrosis.[14,15] On the other hand, surgical retreatment targets only the diseased root(s) through root-end resection and root-end filling, thereby avoiding disturbance of the existing restoration or intraradicular post.[14] Tooth extraction should be reserved only for cases of root fracture or lack of restorability, as tooth loss may contribute to malocclusion and temporomandibular disorders.[16] Moreover, tooth loss is associated with oral impairment, resulting in poor oral health-related quality of life[17], decreased chewing efficiency[18,19], and a decline in cognitive function.[20]

The formulation of a tentative plan should incorporate patient-related considerations guided by the shared-decision-making concept[21], along with the treatment-related factors, such as advantages and disadvantages, feasibility, and costs of each option. Some options may pose significant risks in certain situations. For example, tooth extraction may raise concerns in patients treated with anti-resorptive and anti-angiogenic medications because of medication-related osteonecrosis of the jaw (MRONJ).[22] Clinically, MRONJ is defined by exposed necrotic bone persisting for more than eight weeks.[23] Many hypotheses of pathophysiology have been proposed, including bone remodelling inhibition, oral inflammation or infection, angiogenesis inhibition, immune dysfunction, and genetic predisposition.[23,24] The risk of MRONJ following tooth extraction in patients treated for osteoporosis and cancer was 0.15% and 3.2%, respectively.[25] It could be as high as 15% in certain situations.[23] Intravenous administration of bisphosphonates carries a higher incidence of MRONJ compared to oral administration, as it has a more potent effect.[26] Apart from exodontia, other dental comorbidities, such as periodontal disease, acute dental infections, trauma, bony exostosis, and poor oral hygiene, can also increase the MRONJ risks.[27] However, the risks of MRONJ associated with implant surgery, endodontics, or periodontics intervention remain uncertain.[23,27] Several MRONJ cases have been reported following dental implant surgery in patients taking oral bisphosphonates.[28] Thus, a more conservative and less invasive approach should be to minimise the risk of osteonecrosis.[22,29]

Interestingly, an alternative option for the failed ETT has recently been proposed, known as selective root canal retreatment (sRCT).[14] The procedure targets only the root with a periapical lesion, while leaving other disease-free roots untouched. It is advantageous as it preserves tooth structure with a more conservative access cavity directed to the diseased root, diminishes the risks of iatrogenic errors associated with attempting to remove existing intraradicular posts, and reduces the cost to the patient. In contrast, risks of re-infection or inflammation of the untouched roots could be a drawback.[30] An experienced and skilful operator is generally suggested, and it may require additional equipment, such as ultrasonic tips and a dental operating microscope. A previous study demonstrated a favourable outcome of nearly 90% when follow-up was conducted over a period of up to four years. Conversely, only 3.5% of untouched roots showed radiographic signs of failure.[30] Therefore, sRCT could be a

promising option in a multi-rooted tooth when only a canal or some canals show signs of unsuccessful RCT.

This case report presents a conservative alternative treatment approach for managing a failed ETT in a patient at high risk of MRONJ, where conventional retreatment of all canals had limited access, and tooth extraction could provoke alveolar complications. Indications and contraindications for sRCT are also proposed.

Case Description

A 65-year-old female, living with osteoporosis, presented with discomfort in the upper right posterior region. Since she had been taking oral Alendronate 70 mg weekly for more than five years, her condition was considered to have a higher risk of MRONJ.[22] At examination, a sinus tract opening was observed at buccal gingiva between the maxillary right first and second molars (Figure 1A). The distopalatal part maxillary right first molar was fractured (Figure 1B), with tenderness to percussion and palpation. The patient reported an RCT completed over four years ago. A preoperative radiograph (Figure 1C) showed that the palatal and distobuccal canals contained prefabricated fibre posts without periapical lesions. In contrast, root canal filling material at the mesiobuccal root canal was absent, with an existing periapical radiolucency. The cause of failure was therefore diagnosed as a missed canal. Evidently, gutta-percha tracing confirmed that the sinus tract originated from the apex of the mesiobuccal root (Figure 1D). Periodontal probing depths were ≤3mm, except for 6mm mesiopalatally and 4mm mesiobuccally. These non-deep, non-narrow pockets helped exclude a potential root fracture. Conclusively, the diagnosis was maxillary right first molar, previously treated with chronic apical abscess.[31]

Figure 1: Preoperative assessment. (1A) A red arrow pointing sinus tract opening at the buccal gingiva; (1B) Intraoral photograph showing the fracture of the distopalatal part of maxillary right first molar; (1C) Preoperative periapical radiograph; (1D) Preoperative periapical radiograph with gutta-percha tracing.

Treatment options, their associated fees, and potential risks and benefits were discussed comprehensively with the patient. Options provided included tooth extraction with implant placement, conventional RCT, sRCT, and no treatment with regular reviews. The patient was explicitly informed of an increased MRONJ risk associated with invasive dental procedures.[22] Following discussions, sRCT was agreed upon as a tentative treatment, and informed consent was obtained prior to the procedure.

Local anaesthesia was administered using 2% mepivacaine with epinephrine 1:100,000 (Scandonest 2% special, Septodent). Rubber dam isolation was achieved according to endodontic standard.[4] A conservative yet adequate access cavity was prepared directly to the mesiobuccal root using a round-end tapered diamond bur (Figure 2). Exploration for a second mesiobuccal canal was attempted, but its absence was confirmed.

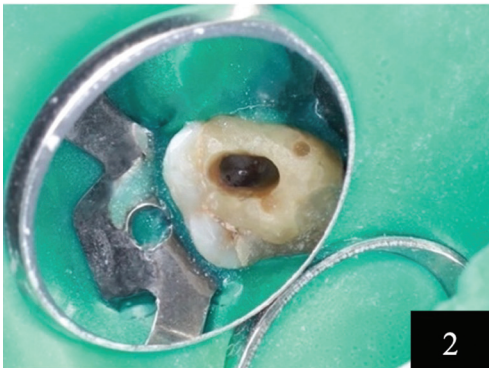

Figure 2: Conservative endodontic access of maxillary right first molar.

Coronal flaring of the mesiobuccal root canal was performed. Working length (15 mm) was determined using an electronic apex locator (root ZX, J Morita Co.) and verified radiographically. Cleaning and shaping were completed using rotary files (Protaper Gold, Dentsply) with a crown-down technique. Intracanal irrigation with 2.5% sodium hypochlorite (NaOCl) and intracanal medication with calcium hydroxide paste (Ultracal XS, Ultradent) were then performed. At the end of the visit, the access cavity was temporarily sealed using Cavit (Cavit, 3M) and intermediate restoration material (IRM, Dentsply) following a double-seal technique.[32]

At the three-week review, the patient was asymptomatic, and the sinus tract opening had resolved. A size-35 gutta-percha master cone (Gutta-percha point, Dentsply) was fitted and confirmed radiographically. Irrigation was repeated using 2.5% NaOCl for a minute, 17% Ethylenediamine tetraacetic acid (EDTA) for a minute, and 2.5% NaOCl for 30 seconds.[33] The root canal was dried with paper points and obturated by lateral condensation with an epoxy resin-based root sealer (AH Plus, Dentsply). The access cavity was then restored with resin composite (Filtek Z350XT, 3M), and a postoperative radiograph was taken (Figure 3A). A zirconia crown was subsequently placed for a full-coverage restoration (Figure 3B). Comprehensive dental care, including fluoride treatment, oral hygiene advice, non-surgical periodontal therapy, and restorative procedures, was also provided to complete all dental work for the patient.

At the 1-year follow-up visit, the patient remained asymptomatic. Clinical examination revealed an intact coronal restoration, normal soft tissue, and no tenderness to percussion and palpation. Periodontal probing depths were ≤3mm with healthy gingival tissue. The periapical radiograph showed mild periodontal ligament (PDL) space widening at the mesiobuccal root but no periapical lesions (Figure 4A). At 1.5 years, the tooth remained symptoms-free, with radiographically normal PDL space and no periapical pathology, indicating complete healing with a periapical index (PAI) score of 1[34,35] (Figure 4B).

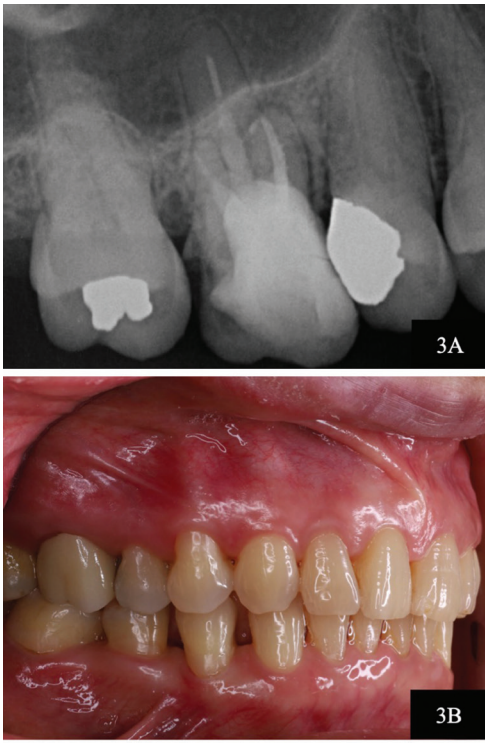

Figure 3: Postoperative outcomes. (3A) Post-obturation periapical radiograph; (3B) Intraoral photograph following coronal restoration.

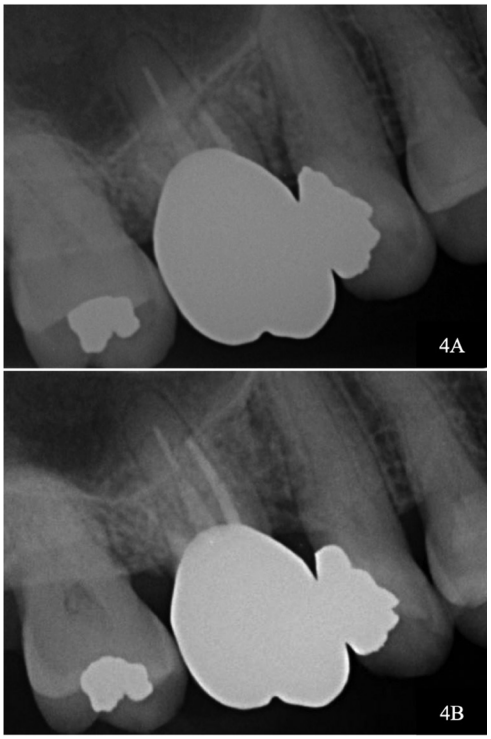

Figure 4: Follow-up periapical radiographs. (4A) At 1-year; (4B) At 1.5-year.

Discussion

This case report demonstrates a successful outcome of sRCT as a conservative alternative option for a multirooted tooth in a patient at elevated risk of MRONJ. The technique is less invasive and can be performed more rapidly and with greater precision than full retreatment or surgical interventions. Understandingly, while extraction is not absolutely contraindicated, a conservative strategy is preferable in patients at increased MRONJ risk.[22] In instances of pulpal involvement, endodontic therapy is often preferred because it generally does not trigger MRONJ, except when procedural complications occur.[29] In this situation, conventional full retreatment was challenging due to prefabricated fibre posts occupying the distobuccal and palatal canals. Given that surgical options such as extraction or apical surgery carry a potential risk of MRONJ in susceptible patients[23], sRCT was chosen to minimise possible complications.

By addressing only the affected root, sRCT helps

preserve structural integrity and fracture resistance of the previously failed ETT. Laboratory and *ex vivo* evidence suggests that limiting access preserves tooth fracture resistance compare with complete conventional retreatment.[36] Moreover, sRCT reduces the risk of iatrogenic errors, such as root perforation during post-removal, which can occur if post-removal is required. Attempts to remove intraradicular posts may further compromise the remaining tooth structure and increase the possibilities of perforation and fracture.[37] It is reasonable to assume that sRCT requires less clinical time than full conventional retreatment due to the smaller number of canals to manage. According to the Markov simulation model, sRCT was both less costly and more effective than complete retreatment for ETT with persistent apical periodontitis.[38] Additionally, the literature suggested that nonsurgical retreatment often yields more favourable long-term outcomes than surgical retreatment.[39] In line with this, sRCT - as a form of nonsurgical management – has reported favourable outcomes in 86.7% of cases and a survival rate of 91.5% over follow-up periods ranging from 12 to 48 months.[30]

In contrast, un-retreated roots remain at risk of developing new periapical lesions. In a retrospective study, only 3.5% of untouched roots developed radiographic signs of emerging periapical lesions.[30] In the present case, the remaining canals did not show radiographic periapical changes after 1.5 years. If new disease emerges, it typically becomes apparent within one year following the endodontic intervention.[40] Currently, sRCT is still not universally accepted and was not included in a recent review of management strategies for secondary endodontic disease, which can complicate preoperative discussions between patients and influence future guideline recommendations.[13]

Cone-beam computed tomography (CBCT) has become an important diagnostic adjunct in endodontics as it provides three-dimensional visualisation of root and periapical anatomy. Studies reported superior sensitivity and specificity of CBCT in detection of periapical lesions and complex canal morphology, compared with two-dimensional radiography.[14,41] CBCT is therefore valuable for detecting periapical pathology, evaluating obturation quality, identifying complex canal morphology, and assessing persistent endodontic disease.[42] In this case, a conventional radiograph revealed a straightforward anatomy at the mesiobuccal root; together with patient's financial constraints, CBCT was not deemed necessary at baseline. Instead, CBCT was reserved for use only if persistent signs or symptoms warranted further three-dimensional assessment.

The pretreatment periodontal examination revealed pocket depths of 6 mm and 4 mm at the mesiopalatal and mesiobuccal sites, respectively. A root fracture must be ruled out prior to the retreatment since the prognosis would become hopeless if the fracture is present. In our case, these pockets were not narrow and deep, making a root fracture unlikely. sRCT was performed in conjunction with non-surgical periodontal therapy and oral hygiene advice, which may have contributed to pocket resolution at follow-up. We therefore consider root fracture a potential contraindication for sRCT.

Appropriate case selection is critical for sRCT success. Before initiating the treatment, the aetiology of failure and the expected prognosis must be carefully evaluated. In the present case, a missed mesiobuccal canal was the aetiology, which is a common reason recognised in many failed ETTs. Missed canals have been reported as one of the frequent causes of endodontic failure; for example, one study identified missed canals in 42% of over a thousand failed ETTs.[43] For conventional retreatment, three important predictors are the quality of the previous root filling, the presence of perforation, and the existence of apical periodontitis.[44,45] Although the concept of sRCT has been described for about a decade[14], formal selection criteria remain undeveloped. To address this gap, we propose preliminary indications and contraindications for sRCT (Table 1).

Limitations of this report include the single-case design and the relatively short follow-up (1.5 years) for

Table 1: Proposed indications and contraindications for sRCT.

Indications	Contraindications
1. Failed multi-rooted ETT in which at least one root has no periapical lesion	1. Unidentified aetiology of failure
2. The diseased root is able to accessed for conventional retreatment	2. Signs or symptoms of root fracture
3. The non-diseased root and diseased root must be isolated in separate environments	3. Unrestorable tooth

establishing long-term prognosis. Although the clinical and radiographic outcome at 1.5 years is favourable, longer-term follow-up in larger cohorts is strongly suggested to confirm the durability of sRCT outcomes. Future research should include prospective trials and longer observational studies comparing sRCT with other modalities, or explore novel procedural techniques or materials for sRCT.

Conclusions

Selective root canal retreatment represents a viable option for managing failed endodontic cases in which surgical intervention carries higher risks or complete conventional retreatment is impractical. This approach should be considered when full access to all canals is limited or when surgical procedures may predispose the patient to complications, such as MRONJ. Successful outcomes rely on careful case selection, accurate identification of the failure cause, comprehensive informed consent, and consistent postoperative monitoring.

Conflict of Interest

The authors declare no conflict of interest.

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