Regeneration, Reconstruction & Restoration **Case Report**

Open Access

10-Year Success of Root-End Re-Surgery in a Central Incisor with Severe Mobility

Saaed Asgary[1,*]

1. Iranian Center for Endodontic Research, Research Institute of Dental Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Article Info

Received: 24 December, 2024
Accepted: 25 December, 2024
Published: 31 December, 2024

[*]**Corresponding Author**
Saaed Asgary, Iranian Center for Endodontic Research, Research Institute of Dental Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Email: saasgary@yahoo.com

Abstract

This case report describes the 10-year follow-up of a root-end re-surgery in a 38-year-old woman patient who had symptomatic apical periodontitis and failed endodontic surgery in the upper left central incisor. Past dental history revealed root-end surgery with amalgam in that tooth, which continued to swell and discomfort after the surgery. Upon clinical/radiographic examination, she revealed a grossly compromised crown-to-root ratio of 3:1 with severe mobility of the tooth and apical radiolucency. After thorough treatment planning and patient consent, re-surgery was carried out with calcium-enriched mixture cement as a biocompatible root-end filling material. Postoperative care included strict occlusal management and instructions to the patient to avoid hard foods. At the 10-year follow-up, the tooth was functional, and complete periapical healing was evident with no recurrence of symptoms. This case illustrates the role of modern endodontic microsurgery, appropriate biomaterial selection, and meticulous surgical technique in the long-term success of even challenging cases.

Please cite this paper as:
Asgary A. 10-Year Success of Root-End Re-Surgery in a Central Incisor with Severe Mobility. Journal of "Regeneration, Reconstruction & Restoration" (Triple R). 2024; Volume 9: e17. Doi: 10.22037/rrr.v9.47071

1. Introduction

Endodontic surgery encompasses a range of procedures for the treatment of previously-treated teeth with failed root canal therapy (RCT), including root-end surgery, root resections, surgical perforation repair, and intentional replantation or transplantation. This field has evolved through advancements in endodontic microsurgery, which refine traditional apicoectomy techniques by incorporating biocompatible root-end filling biomaterials, magnification, and ultrasonic root-end preparation (1). While nonsurgical endodontic retreatment remains the first-line approach for addressing most cases of treatment failure, endodontic microsurgeries have become foreseeable and minimally-invasive alternatives for the goal of conserving natural teeth.

Surgical intervention, particularly root-end surgery, is typically indicated when conventional RCT fails to resolve infection, or when anatomical complexities hinder non-surgical management. Root-end surgery is typically indicated when retreatment is not feasible or when apical lesions persist despite appropriate non-surgical management (2). The primary goal of endodontic surgery is to remove infected tissue, re-establish the apical seal, and prevent further re-infection, ultimately preserving the affected tooth.

An essential component of successful root-end surgery is the use of an appropriate root-end filling material. Ideal properties for such materials include biocompatibility, long-term stability, ease of handling, and the ability to form an effective seal against microbial leakage (3). These materials should also facilitate periapical healing and promote bone regeneration. Furthermore, the material must be radiopaque for post-surgical monitoring and should not interfere with the normal physiological process of healing at the root-end site.

Amalgam has been widely used as a root-end filling material for many years, with a history of success in clinical applications (4). Its durability, ease of manipulation, and ability to provide a strong seal have made it a common choice in the past. However, it is now less commonly recommended due to concerns about its biocompatibility and the potential for adverse tissue reactions. Additionally, its potential for microleakage and difficulty in achieving a truly hermetic seal have prompted the search for more ideal biomaterials in surgical endodontics.

In recent years, calcium-silicate based cements, such as calcium-enriched mixture (CEM) cement, mineral trioxide aggregate (MTA), and newer bioceramic materials, have emerged as promising alternatives to traditional root-end filling materials (5, 6). These biomaterials are highly biocompatible, promote hard tissue formation, and provide an excellent seal against bacterial invasion. Their ability to support healing of the periapical tissues has made them particularly suitable for use in surgical endodontics. Their superior sealing ability and favorable biological properties have led to their increased adoption in clinical practice.

The aim of this case report is to present the 10-year follow-up of root-end re-surgery performed on a central incisor with severe mobility. This report highlights the clinical decision-making process, the use of modern root-end filling materials, and the long-term success of the procedure in preserving the tooth. Through this case, we aim to contribute to the understanding of surgical endodontics outcomes, emphasizing the importance of selecting appropriate biomaterials for successful, long-term clinical results.

2. Case presentation

A 38-year-old female, with no significant medical history, was referred for evaluation due to recurrent swelling and discomfort associated with her upper left central incisor. The referring dentist's report indicated that the tooth had undergone surgical treatment with amalgam placement three years prior. The patient's dental history included complex restorative procedures, including suboptimal esthetic treatments performed 10 years ago. Intraoral examination showed tenderness upon palpation of the tissues adjacent to the apex of involved tooth. The periodontium was inflamed, with a mobility grade 3 observed (severe mobility indicating a compromised periodontal attachment). A porcelain-fused-to-metal (PFM) crown was in place, which had been part of prior restorative treatment. Initial radiographic examination revealed a tooth with a significantly short root (crown-to-root ratio of 3:1), periapical rarefaction, and slight extruded amalgam material (Figure 1A). Based on the clinical and radiographic findings, The final diagnosis was symptomatic apical periodontitis with failure of the overfilled amalgam, which had resulted in previous endodontic surgery not resolving the infection.

Several treatment options were presented to the patient, including tooth extraction and implant replacement. However, the patient opted for tooth retention, and endodontic re-surgery was recommended using biocompatible materials. The risks and benefits of the proposed treatment were thoroughly discussed, and the patient provided written informed consent.

The surgical procedure was carried out under local anesthesia with 2% lidocaine and 1:80,000 epinephrine (DarouPakhsh, Tehran, Iran). A full mucoperiosteal flap was raised. Upon flap reflection and initial curettage, a mass of dark amalgam tattoo material was identified and completely removed. No additional root-end resection was performed. The root-end was prepared with an ultrasonic retrotip (Joya Electronics, Tehran, Iran). CEM cement (BioniqueDent, Tehran, Iran) was mixed according to the manufacturer's instructions, and the cement was placed into the root-end cavity. Following root-end filling/sealing and radiographic confirmation of proper root-end filling (Figure 1B), the flap was repositioned and sutured. The occlusion was carefully checked to ensure there were no premature contacts that could lead to undue stress on the tooth. Additionally, the patient was advised to avoid biting hard foods to reduce the risk of excessive forces on the treated tooth. Strict oral hygiene instructions were provided to ensure the optimal healing and prevent any potential complications.

One-week post-surgery, the patient reported being symptom-free. At the 10-year follow-up appointment, the patient presented with no complaints. Clinical examination revealed no sensitivity to percussion or palpation, and the tooth was fully functional with normal probing depths. Radiographic examination demonstrated complete healing of the apical lesion, with the re-establishment of a normal periodontal ligament (Figure 1C).

3. Discussion

Endodontic microsurgery has advanced significantly, offering a highly predictable and minimally invasive alternative to traditional treatments for failing RCTs (1, 2). Root-end re-surgery is indicated when previous endodontic treatments, such as conventional retreatment, have failed, or when anatomical complexities prevent effective non-surgical intervention. This case highlights the importance of selecting the right biomaterials, techniques, and careful planning for long-term success in root-end surgery. The use of ultrasonic root-end preparation techniques and biocompatible materials like CEM cement facilitated effective sealing and periapical healing, demonstrating the value of modern endodontic microsurgical techniques.

The material choice plays a pivotal role in the success of root-end procedures. Historically, amalgam was used widely due to its ease of use and ability to provide a reliable seal. However, concerns regarding its biocompatibility and sealing efficiency have led to the adoption of more biocompatible alternatives. In this case, CEM cement was chosen due to its excellent biological properties, including superior biocompatibility, ability to stimulate hard tissue formation, and a strong seal that prevents bacterial leakage (6-8). The long-term healing observed in this patient supports the growing body of evidence favoring calcium-silicate based biomaterials, such as MTA and CEM, over

traditional materials like amalgam. Studies have consistently demonstrated that these biomaterials result in better clinical outcomes, including higher success rates and minimal complications.

The long-term success observed in this case can be attributed to the careful surgical approach and the effective sealing properties of CEM cement. The decision not to resect the root further, despite the compromised crown-to-root ratio, was a critical factor in preserving the tooth's structural integrity. A reduced crown-to-root ratio, such as the 3:1 ratio seen in this case, significantly impacts the tooth's biomechanical stability, increasing the risk of mobilty/fracture under masticatory forces. To mitigate this risk, we avoided root resection and ensured that no premature occlusal contacts could exacerbate the mechanical stress on the tooth. The patient was also advised to avoid biting hard foods, further minimizing the potential for overloading the weakened tooth.

The 10-year follow-up demonstrates the potential for root-end re-surgery, when performed with modern biomaterials and techniques, to provide long-term success even in challenging cases with severe mobility and compromised crown-to-root ratios. This outcome aligns with findings from previous studies, such as the retrospective series by Setzer et al., which identified proper sealing as the most crucial factor in ensuring the success of re-surgery (9). In addition, the findings of Del Fabbro et al. highlight the importance of preoperative assessment and proper material selection in achieving favorable outcomes in surgical retreatment (10).

4. Conclusion

This case report exemplifies the successful management of a difficult endodontic case through careful surgical planning, appropriate material selection, and advanced diagnostic tools. Root-end re-surgery with biocompatible materials such as CEM cement provides a viable option for preserving natural teeth and achieving long-term healing, even in cases with complex treatment histories, severe mobility, and compromised structural integrity. This case reinforces the importance of a patient-centered approach, meticulous attention to detail in technique, and the use of modern biomaterials in optimizing clinical outcomes in surgical endodontics.

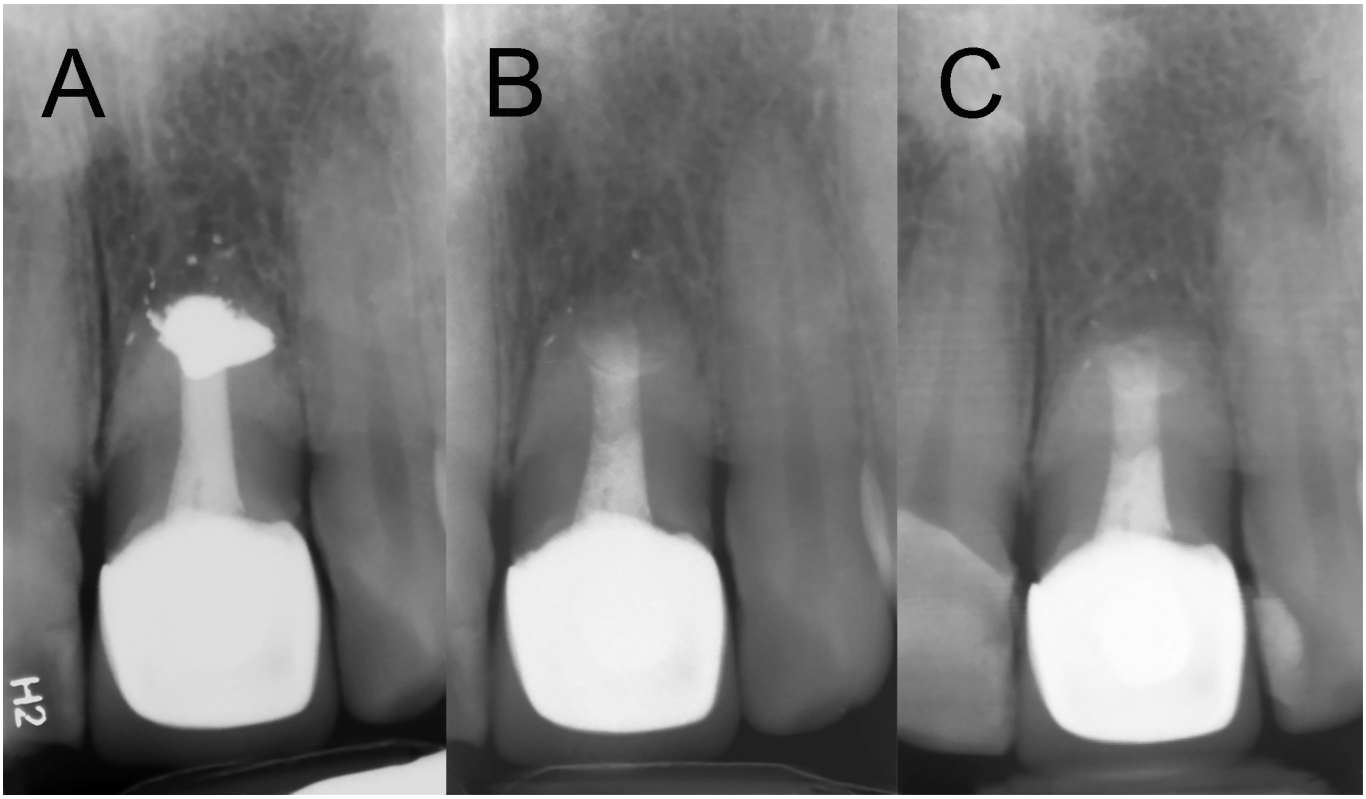

Figure 1. A) Initial radiograph showing the upper left central incisor with a significantly short root (crown-to-root ratio of 3:1) and periapical rarefaction. The extruded amalgam material is visible at the root-end. **B**) Post-surgical radiograph confirming proper root-end filling with CEM cement, providing an effective seal at the root-end cavity. **C**) Radiograph at the 10-year follow-up showing complete healing of the apical lesion and the re-establishment of the normal periodontal ligament, indicating the long-term success of the root-end re-surgery.

Acknowledgements

None.

Ethics

The risks and benefits of the proposed treatment were thoroughly discussed, and the patient provided written informed consent.

Author contributions

Saeed Asgary: Conceptualization, Supervision, Validation, Writing- Review & Editing, Writing- Original Draft, Methodology.

Conflict of interest

The author declares no conflict of interest.

Funding

None.

References

1. Niemczyk SP. Essentials of endodontic microsurgery. Dent. Clin. North Am. 2010;54(2):375-399.
2. Hülsmann M, Tulus G. Non-surgical retreatment of teeth with persisting apical periodontitis following apicoectomy: decision making, treatment strategies and problems, and case reports. Endodontic Topics 2016;34(1):64-89.
3. CHONG BS, PITT FORD TR. Root-end filling materials: rationale and tissue response. Endodontic topics 2005;11(1):114-130.
4. Borisova-Papancheva T, Panov V, Peev S, Papanchev G. Root-end filling materials-review. Scripta Scientifica Medicinae Dentalis 2015;1(1):9-15.
5. Torabinejad M, Parirokh M. Mineral trioxide aggregate: a comprehensive literature review--part II: leakage and biocompatibility investigations. J. Endod. 2010;36(2):190-202.
6. Asgary S, Aram M, Fazlyab M. Comprehensive review of composition, properties, clinical applications, and future perspectives of calcium-enriched mixture (CEM) cement: a systematic analysis. Biomed. Eng. Online 2024;23(1):96.
7. Rahimi S, Mokhtari H, Shahi S, Kazemi A, Asgary S, Eghbal MJ, et al. Osseous reaction to implantation of two endodontic cements: Mineral trioxide aggregate (MTA) and calcium enriched mixture (CEM). Med. Oral Patol. Oral Cir. Bucal. 2012;17(5):e907-911.
8. Nosrat A, Asgary S, Eghbal MJ, Ghoddusi J, Bayat-Movahed S. Calcium-enriched mixture cement as artificial apical barrier: A case series. J Conserv Dent 2011;14(4):427-431.
9. Setzer F, Harley M, Cheung J, Karabucak B. Possible Causes for Failure of Endodontic Surgery - A Retrospective Series of 20 Resurgery Cases. Eur Endod J 2021;6(2):235-241.
10. Del Fabbro M, Corbella S, Sequeira-Byron P, Tsesis I, Rosen E, Lolato A, Taschieri S. Endodontic procedures for retreatment of periapical lesions. Cochrane Database Syst. Rev. 2016;10(10):Cd005511.