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CASE REPORT

APICAL MICROSURGERY IN THE MANAGEMENT OF SYMPTOMATIC APICAL PERIODONTITIS OF TOOTH 2.2 AFTER ORTHOGRADE RETREATMENT: A CLINICAL CASE

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Abstract

Background: Apical periodontitis is a host-mediated inflammatory disease of periradicular tissues initiated and sustained by microbial infection of the root canal system. Persistent apical periodontitis following technically adequate orthograde retreatment remains a significant biological and clinical challenge.Although contemporary endodontic therapy demonstrates high long-term success rates, post-treatment apical periodontitis continues to present a clinically relevant problem.

Objective: This report describes the diagnostic rationale, microsurgical management, and 12-month cone-beam computed tomography (CBCT) outcome of a maxillary lateral incisor presenting with recurrent symptoms after retreatment.

Materials and Methods:A 23-year-old male presented with pain on biting two months after nonsurgical retreatment of tooth 2.2. Clinical examination and CBCT imaging demonstrated homogeneous root canal obturation and a localized 3-mm periapical radiolucency with preserved cortical integrity. Apical microsurgery was performed under magnification, including flap elevation, conservative osteotomy, resection of 2.5 mm of the apical root segment, ultrasonic retrograde cavity preparation (3 mm), and retrograde filling with mineral trioxide aggregate (MTA). Clinical and CBCT follow-up was conducted at 12 months.

Results:Postoperative healing was uneventful. At 12 months, the patient was asymptomatic, and CBCT imaging demonstrated complete resolution of the periapical lesion with restoration of normal trabecular architecture.

Conclusion: Apical microsurgery is a predictable, biologically rational, and minimally invasive treatment modality for persistent symptomatic apical periodontitis following technically adequate orthograde retreatment. Careful case selection, CBCT-guided diagnosis, and adherence to contemporary microsurgical principles enable preservation of natural dentition with favorable clinical and radiographic outcomes.

Keywords: apical microsurgery; endodontic microsurgery; retrograde filling; mineral trioxide aggregate (MTA); cone-beam computed tomography (CBCT); symptomatic apical periodontitis.

INTRODUCTION

Persistent apical periodontitis following primary root canal treatment or orthograde retreatment remains a significant clinical challenge. Even when canals are prepared and obturated to an adequate technical standard, microorganisms may persist within apical ramifications, lateral canals, and dentinal tubules[1]. In addition, extraradicular infection has been demonstrated as a potential independent cause of persistent periapical inflammation[2,8].

Early recurrence of symptoms after retreatment suggests limited effectiveness of repeated orthograde intervention. In such cases, apical microsurgery provides direct access to the apical root segment and periapical tissues.

The use of cone-beam computed tomography (CBCT) has become essential for case selection and surgical planning. Professional position statements emphasize its selective application in complex endodontic cases [3,4].

The primary etiological factor of post-treatment disease is persistent intraradicular infection. The apical third of the root canal system is characterized by complex microanatomy, including accessory canals, apical deltas, isthmuses, and lateral ramifications. These anatomical irregularities may harbor structured bacterial biofilms resistant to chemomechanical preparation and intracanal medicaments. Therefore, radiographically adequate obturation does not necessarily indicate complete microbial eradication.

In addition to intraradicular infection, extraradicular biofilms and persistent periapical actinomycotic infections have been described as independent contributors to persistent periapical inflammation. In such cases, further orthograde retreatment may offer limited therapeutic benefit, and surgical intervention becomes biologically justified.

Over the past three decades, apical surgery has undergone substantial refinement. The introduction of operating microscopes, microsurgical instruments, ultrasonic retropreparation, and bioactive retrograde filling materials such as mineral trioxide aggregate (MTA) has significantly improved treatment outcomes. Contemporary systematic reviews report success rates exceeding 85–90% when strict case selection criteria and modern microsurgical protocols are applied.

Cone-beam computed tomography has become an important diagnostic tool in complex endodontic cases. Three-dimensional visualization enables accurate assessment of lesion size, cortical plate integrity, anatomical relationships, and exclusion of vertical root fractures, thereby facilitating precise treatment planning and prognostic evaluation. Recent CBCT-based studies indicate that the prevalence of persistent periapical lesions may be substantially underestimated when assessed using conventional two-dimensional radiography.

Modern apical microsurgery represents an evolution of traditional root-end resection and is characterized by the use of magnification, microsurgical instrumentation, and ultrasonic retrograde preparation. Clinical studies and meta-analyses demonstrate high rates of clinical and radiographic healing when contemporary microsurgical protocols are implemented (6). Randomized controlled trials with CBCT-based evaluation show comparable success rates when using MTA and contemporary bioceramic materials such as root repair materials (RRM) [7].

Particular attention should be given to retrograde preparation techniques. Ultrasonic preparation allows cavity preparation along the long axis of the root canal while preserving radicular dentin; however, it requires careful execution and appropriate case selection [5].

Long-term clinical follow-up studies (5–9 years) confirm the stability of microsurgical outcomes, maintaining high success rates over time [9].

Collectively, current evidence supports the high predictability of apical microsurgery in cases of persistent apical inflammation following orthograde retreatment and confirms its validity as a tooth-preserving alternative to extraction. Despite the high healing rates achieved with contemporary apical microsurgery, the choice of treatment strategy in cases of early symptom recurrence after orthograde treatment performed under an operating microscope remains controversial. Of particular interest are clinical scenarios involving small periapical lesions with intact cortical plates, where the decision between repeated orthograde intervention and surgical management requires careful consideration.

Modern apical microsurgery, based on minimally invasive principles and microscopic magnification, has demonstrated success rates exceeding 90% when performed according to contemporary protocols.

The aim of this report is to present the clinical rationale, surgical management, and 12-month cone-beam computed tomography outcomes of persistent symptomatic apical periodontitis following technically adequate orthograde retreatment.

MATERIALS AND METHODS

A 23-year-old male was referred with pain on biting associated with tooth 2.2. Two months prior, nonsurgical retreatment had been performed under operating microscope magnification. The retreatment protocol included removal of previous filling material, mechanical preparation using nickel-titanium rotary instrumentation, copious irrigation with sodium hypochlorite, chelation with EDTA, and obturation with gutta-percha and resin-based sealer using a warm vertical compaction technique. Postoperative radiographs demonstrated homogeneous obturation to working length without visible voids.

Clinical Examination

- Positive response to percussion and palpation
- Negative pulp vitality testing
- Physiological tooth mobility
- Normal periodontal probing depths
- Intact ceramic restoration
- Absence of sinus tract

Radiographic Assessment

CBCT imaging revealed:(fig.1,2)

- Homogeneous root canal obturation
- A well-defined periapical radiolucency measuring approximately 3 mm
- Thinning but preservation of the buccal cortical plate
- No evidence of vertical root fracture

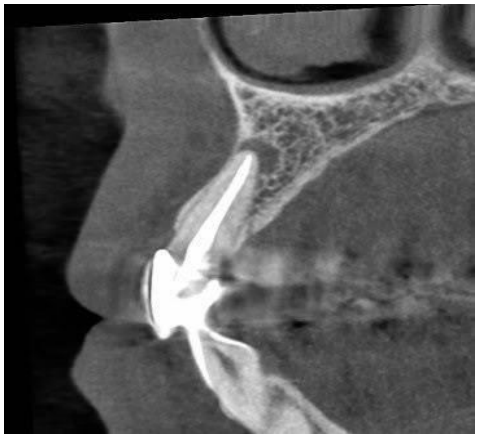


Figure 1. Sagittal CBCT section of tooth 2.2. The root canal is obturated to the physiological apex. The obturation appears homogeneous and void-free. A radiolucent lesion measuring approximately 3 mm in diameter is observed in the periapical region.

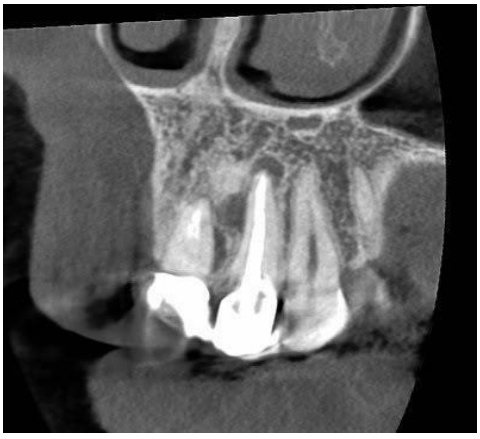


Figure 2. Coronal CBCT section of tooth 2.2. A single root canal is identified and obturated to the physiological apical constriction. The filling appears homogeneous, with no visible internal defects or voids. In the apical region, a well-defined radiolucent periapical lesion measuring approximately 3 mm in diameter is present. The diagnosis was **symptomatic apical periodontitis (ICD-10 K04.5)**.

Treatment Planning

Given the recent technically adequate retreatment and localized apical pathology, further orthograde retreatment was deemed unlikely to improve the biological outcome. Treatment options discussed with the patient included:

1. Repeat retreatment
2. Extraction with implant placement
3. Apical microsurgery

After informed consent, apical microsurgery was selected.

Surgical Procedure

Under local infiltration anesthesia with 4% articaine solution (1.8 mL), the surgical procedure was performed. The operation began with an intrasulcular incision along the marginal gingival edge of the anterior tooth group, combined with a distal releasing incision in the movable mucosa, using a No. 15C scalpel blade. A full-thickness mucoperiosteal flap was elevated with a periosteal elevator, allowing visualization of the cortical bone.

An osteotomy was performed in the projection of the apex of tooth 2.2. Following osteotomy, 2.5 mm of the apical root segment was resected. The resected surface was inspected under magnification (Fig. 3).

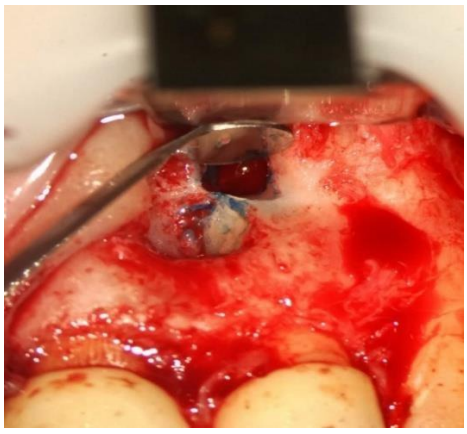


Figure 3. Intraoperative view of the resected apical root surface of tooth 2.2, visualized with a dental micromirror following apical resection.

To ensure a dry operative field, local hemostasis was achieved using sterile cotton pellets moistened with ferric sulfate solution; excess hemostatic agent was carefully removed. After bleeding control was established, ultrasonic retrograde preparation was carried out to a depth of 3 mm along the axis of the root canal. Retrograde obturation was performed with mineral trioxide aggregate (MTA, a bioceramic material) under visual control using micromirrors (Fig. 4).

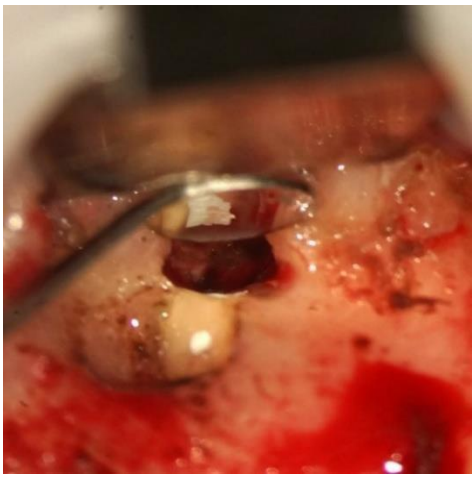


Figure 4. Retrograde filling of the apical portion of tooth 2.2 using mineral trioxide aggregate (MTA). The material was compacted within the apical cavity, ensuring adaptation to the prepared retrograde space.

The wound was closed with non-resorbable 5-0 nylon sutures, ensuring precise adaptation of the flap margins (Fig. 5).

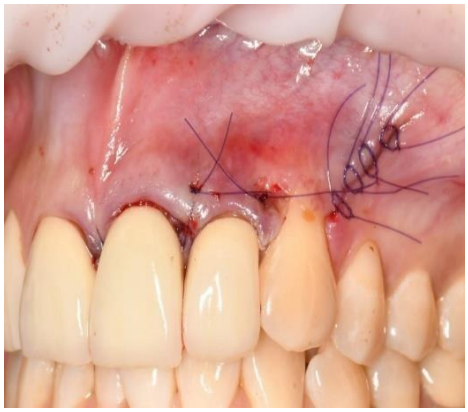


Figure 5. Intraoperative stage showing surgical wound closure with non-resorbable 5-0 nylon sutures.

After completion of the procedure, a periapical radiograph of tooth 2.2 was obtained to evaluate the immediate treatment outcome (Fig. 6).

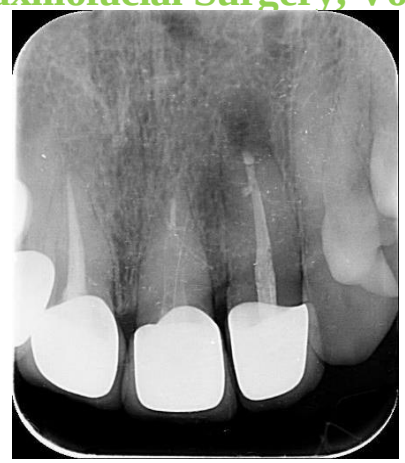


Figure 6. Periapical radiograph of tooth 2.2 obtained immediately after the surgical procedure.

Suture removal was scheduled for postoperative day 10.

In the postoperative period, selective nonsteroidal anti-inflammatory drugs (NSAIDs) were recommended as needed for pain control. Systemic antibiotic therapy was not prescribed due to the absence of clinical signs of spreading infection.

Healing progressed without complications. At the 12-month follow-up, no clinical symptoms were present: there was no pain on biting, and percussion and palpation tests were negative.

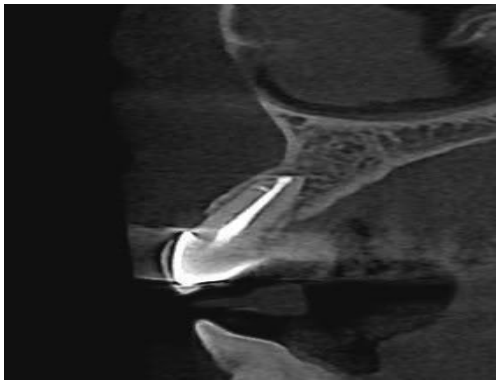
RESULTS

Postoperative healing was uneventful. No swelling, infection, hematoma formation, or wound dehiscence was observed.

At 12-month follow-up:

- The patient reported complete absence of pain
- Percussion and palpation tests were negative
- Tooth mobility was within normal physiological limits
- No sinus tract was present

CBCT evaluation demonstrated complete resolution of the periapical radiolucency of the apex of tooth 2.2 (Figs. 7, 8), re-establishment of trabecular bone pattern, and restoration of cortical plate integrity. The treatment outcome was classified as complete healing.



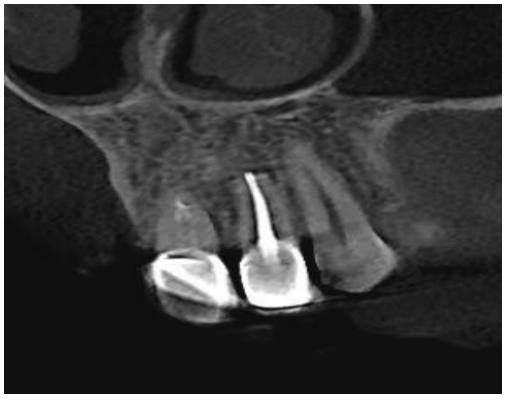


Figure7,8 Follow-up cone-beam computed tomography (CBCT) of tooth 2.2 in sagittal and coronal views 12 months after apical resection; no periapical pathological changes are observed.

DISCUSSION

Persistence of clinical symptoms and maintenance of a periapical lesion after orthograde retreatment remain among the most challenging problems in contemporary endodontics. Despite the use of an operating microscope and strict adherence to mechanical and chemical debridement protocols, elimination of infection in the apical portion of the root is not always achievable, as confirmed by clinical and microbiological studies [1,2]. This is largely attributable to the morphological complexity of the apical anatomy, including the presence of an apical delta, lateral canals, and isthmuses, which may harbor microbial biofilms even after repeated instrumentation and irrigation. In the present clinical case, recurrence of symptoms occurred two months after repeat orthograde retreatment. Such an early return of inflammatory signs suggests persistence of an infectious substrate, most likely localized in the apical region or outside the root canal system (extraradicular infection). In the absence of periodontal pockets and signs of a vertical root fracture, the apical segment was considered the most probable source of persistence [2,8]. The lesion size (approximately 3 mm) and preservation of the cortical plate on CBCT indicated a localized inflammatory process, which is generally associated with a more favorable surgical prognosis [3,4]. CBCT not only allowed precise assessment of the lesion's size and boundaries but also facilitated exclusion of additional anatomical complicating factors, which is essential for appropriate surgical planning.

Modern apical microsurgery fundamentally differs from traditional root-end resection. The use of magnification, ultrasonic retrograde preparation, and bioceramic materials allows minimization of the resection extent while ensuring hermetic apical sealing. Resection of 2.5–3 mm of the apical root portion is considered justified, as the majority of lateral canals and apical ramifications are located within this segment. Clinical studies and meta-analyses report high rates of clinical and radiographic healing when contemporary microsurgical protocols are applied, as supported by large clinical series [6,9].

Ultrasonic retrograde preparation to a depth of 3 mm ensures coaxial alignment of the cavity with the main canal and reduces the risk of perforation. The use of mineral trioxide aggregate (MTA) is justified by its biocompatibility, osteoinductive properties, and ability to form a dense apical barrier. Current systematic reviews and meta-analyses have not demonstrated statistically significant superiority of newer bioceramic materials over MTA in terms of clinical and radiographic healing rates [6,10].

At the 12-month follow-up, absence of clinical symptoms and radiographic evidence of bone regeneration on CBCT were observed. Considering the typical timeline of bone healing in the anterior maxilla, this period may be regarded as sufficient for preliminary evaluation of treatment success. However, definitive assessment of long-term prognosis requires extended follow-up (24–36 months). Repeat orthograde intervention in a tooth that has already undergone retreatment under magnification and shows no radiographic signs of technical deficiencies has limited potential to eliminate extraradicular infection [2.] In contrast, contemporary clinical studies and meta-analyses demonstrate high healing rates for endodontic microsurgery when appropriate case selection criteria are applied, particularly in cases of small periapical lesions and early symptom recurrence [6,7,9]. This evidence supports the surgical approach as a justified treatment strategy in similar clinical scenarios. This report describes a single clinical case, limiting generalizability, absence of histological verification of the periapical lesion and the inability to directly confirm extraradicular infection. Furthermore, the 12-month follow-up should be considered intermediate; longer observation (24–36 months) is required to confirm long-term clinical and

radiographic stability. Thus, in cases of symptom recurrence after previous orthograde treatment, apical microsurgery may be regarded as a biologically sound and clinically effective approach when appropriate case selection is ensured. The presented clinical case demonstrates the successful application of apical microsurgery in the management of symptomatic apical periodontitis persisting after orthograde retreatment. Early recurrence of clinical symptoms in the absence of radiographic evidence of technical deficiencies reduces the predictability of repeated orthograde intervention; in such cases, surgical access enables direct management of the apical root segment and periapical tissues. Application of a microsurgical protocol—including apical root resection, ultrasonic retrograde preparation, and MTA retrograde obturation—ensures hermetic apical sealing and promotes periradicular tissue repair. The absence of clinical symptoms and CBCT signs of periapical bone destruction at the 12-month follow-up confirms a favorable outcome in this case. Therefore, with appropriate patient selection and adherence to contemporary microsurgical principles, apical microsurgery may be considered a justified tooth-preserving alternative to extraction followed by implant placement

DECLARATIONS

Ethics approval and consent to participate
Not applicable

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Competing Interests
The authors have no competing interests to declare.

Informed Consent
Not applicable.

Author Contributions

Alishikhov I.N. participated in literature analysis and in the preparation and structuring of the “Discussion” section.

Amirgamzaev D.A. participated in data collection, preparation of illustrations, and technical preparation of the manuscript for submission.

Dzhamalutdinova A.D. participated in the analysis of results and preparation of draft versions of individual sections of the manuscript.

Supieva S.A. participated in the analysis of clinical material and manuscript editing.

Gadjimusaeva F.Sh. participated in the processing and analysis of CBCT data and preparation of radiological descriptions.

Magomedov R.A. participated in data collection and preparation of illustrative material.

Ordashev Kh.A. provided scientific supervision of the study, participated in the development of the study concept and design, critically revised the manuscript, and approved the final version of the article.

REFERENCES

1. Provenzano JC, Antunes HS, Alves FR, Rôças IN, Alves WS, Silva MR, et al. Host-bacterial interactions in post-treatment apical periodontitis: a metaproteome analysis. J Endod. 2016;42(6):880–5.
2. Ricucci D, Loghin S, Gonçalves LS, Rôças IN, Siqueira JF Jr. Histobacteriologic conditions of the apical root canal system and periapical tissues in teeth associated with sinus tracts. J Endod. 2018;44(3):405–13.
3. Special Committee to Revise the Joint AAE/AAOMR Position Statement. AAE and AAOMR joint position statement: use of cone beam computed tomography in endodontics—2015 update. Oral Surg Oral Med Oral Pathol Oral Radiol. 2015;120(4):508–12.
4. Patel S, Brown J, Semper M, Abella F, Mannocci F. European Society of Endodontology position statement: use of cone beam computed tomography in endodontics. Int Endod J. 2019;52(12):1675–8.
5. Tawil PZ. Periapical microsurgery: can ultrasonic root-end preparations clinically create or propagate dentinal defects? J Endod. 2016;42(10):1472–5.
6. Kohli MR, Berenji H, Setzer FC, Lee SM, Karabucak B. Outcome of endodontic surgery: a meta-analysis—part 3. J Endod. 2018;44(6):923–31.
7. Safi C, Kohli MR, Kratchman SI, Setzer FC, Karabucak B. Outcome of endodontic microsurgery using MTA or root repair material. J Endod. 2019;45(7):831–9.
8. Bordagaray MJ, Fernández A, Garrido M, Astorga J, Hoare A, Hernández M. Systemic and extraradicular bacterial translocation in apical periodontitis. Front Cell Infect Microbiol. 2021;11:649925.
9. Pallarés-Serrano A, Glera-Suarez P, Tarazona-Alvarez B, Peñarrocha-Oltra D, Peñarrocha-Diago M, et al. Healing of 295 endodontic microsurgery cases after long-term follow-up. J Endod. 2022;48(6):714–21.
10. Ibáñez-Aravena PC, Sánchez-Sanhueza GA, Fernández CE. New bioceramics vs mineral trioxide aggregate in endodontic microsurgery: a systematic review. Aust Endod J. 2025;51(3):609–18.