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Management of Teeth with Large Apical Periodontitis Lesions: A Series of Six Case Reports

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Abstract

Large apical periodontitis poses significant challenges for nonsurgical treatment due to the complexity of root canal infection and periradicular tissue destruction. This multicenter case series describes the management of six teeth with extensive apical periodontitis. Diagnosis, treatment planning, and follow-up were supported by cone-beam computed tomography (CBCT). All cases were initially managed with chemomechanical preparation with 2.5% sodium hypochlorite, supplemental irrigant agitation, and calcium hydroxide intracanal medication. Four cases healed following nonsurgical treatment, whereas two cases presented persistent clinical signs of infection, objectively defined by continuous purulent exudate and active sinus tracts, despite repeated nonsurgical management. These cases underwent periradicular surgery with retrograde apical sealing as a tooth-preserving approach. Clinical and CBCT follow-up demonstrated complete periapical healing in all cases. Given the heterogeneity of this case series, outcomes cannot be attributed to any specific protocol. However, these cases demonstrate the potential for successful management of extensive apical periodontitis through individualized treatment approaches.

Keywords: Cone-beam Computed Tomography; Endodontics; Periapical Periodontitis; Root Canal Therapy; Treatment Outcome

Introduction

Apical periodontitis (AP) is an inflammatory disease characterised radiographically by a periapical radiolucency. Its aetiology involves microbial infection and toxic byproducts within the root canal system (RCS), which trigger and maintain periradicular inflammation [1].

AP size is proportional to the diversity, quantity, and organisation of bacteria in the RCS. Extensive lesions harbour complex infections where microorganisms spread to regions distant from the main canal, such as isthmuses and dentinal tubules[1]. These areas act as infection reservoirs, favouring AP persistence and challenging decontamination [2].

Thus, large lesions may heal more slowly and have lower nonsurgical success rates, sometimes requiring surgical intervention [3]. Indeed, large periapical lesions that fail to regress after conventional therapies often necessitate conservative surgical approaches to eliminate the pathological tissue and facilitate healing [4]. This study reports a series of six teeth with large AP lesions successfully treated using nonsurgical endodontic therapies, with or without complementary surgery.

Case Presentation

All included patients signed an informed consent form (ICF), authorizing the use of their clinical data and images for scientific and academic dissemination purposes, in accordance with the Declaration of Helsinki. Thus, because the study involves only the analysis of clinical cases and explicit participant consent was obtained for the use of their information, the Research Ethics

Committee of the University of Pernambuco determined that the study does not qualify as human subject's research under Resolution NHC (National Health Council) No. 466/2012. Therefore, ethical approval was deemed unnecessary.

Details regarding the patient's demographics, diagnosis, and clinical timeline are provided in Table 1. AP lesion size was measured using cone-beam computed tomography (CBCT) and classified as large (≥5 mm to <10 mm) or very large (≥10 mm). The acquired CBCT images were evaluated by two experienced endodontists. Prior to the assessment, the examiners were calibrated by independently evaluating a subset of CBCT scans not included in this study, under the same lighting and screen conditions. Inter-examiner reliability was calculated using Cohen's kappa coefficient based on 20 scans [5], achieving a high level of agreement (k=0.88). Any disagreements during the evaluation of the study cases were resolved through discussion until a consensus was reached. Furthermore, to provide a standardized outcome assessment, the periradicular status was determined using the Cone-Beam Computed Tomography Periapical Index (CBCT-PAI) [6]. Complete repair, classified as "healed", was strictly defined as a return to a CBCT-PAI score of 0 or 1, characterized by the re-establishment of normal cortical and trabecular bone architecture, restoration of the periodontal ligament space, and an intact lamina dura.

Standard therapeutic protocol:

All teeth were treated under local anaesthesia and rubber dam isolation. Chemomechanical preparation was performed using 2.5% sodium hypochlorite (NaOCl) as the irrigating solution. The working length was determined by using an electronic apex locator. Final irrigation was carried out using a hybrid activation protocol consisting of mechanical agitation with the Easy Clean instrument (Easy Equipamentos Odontológicos, Belo Horizonte, MG, Brazil), followed by ultrasonic agitation with the Irrisonic tip (Helse Ultrasonics, Santa Rosa de Viterbo, SP, Brazil), using 2.5% NaOCl and 17% EDTA in three 20-sec activation cycles in cases 1, 2, 4, and 6, or solely ultrasonic agitation in cases 3 and 5. Intracanal medication with calcium hydroxide was applied in all cases between sessions.

Nonsurgical management (Cases 1-4)

Case 1 was completed in three visits. After preparation with WaveOne Gold 45/0.05 (Dentsply Sirona, Ballaigues, Switzerland) and placement of calcium hydroxide (UltraCal XS, Ultradent, Joinville, SC, Brazil), persistent purulent exudate required apical enlargement to a size #60 K-file (Dentsply Sirona, Ballaigues, Switzerland) and replacement of the intracanal medication. At the third visit, no purulent exudate was observed, allowing root canal obturation.

Case 2 was also completed in three visits. Initial preparation was performed with WaveOne Gold 35/0.06 and calcium hydroxide (UltraCal XS); due to persistent pain on mastication, the apical enlargement with WaveOne Gold 45/0.05 was performed and the intracanal medication was changed to calcium hydroxide associated with camphorated paramonochlorophenol (PMCC; Fórmula & Ação, São Paulo, SP, Brazil).

Case 3 was completed in two visits using the manual crown-down technique and calcium hydroxide (UltraCal XS) as the intracanal medication. Case 4 was prepared with the ProTaper Ultimate rotary system up to FXL 50/0.10 and received calcium hydroxide associated with PMCC. Cases 1 and 2 were obturated with AH-Plus Jet (Dentsply Sirona, Ballaigues, Switzerland), whereas Cases 3 and 4 received bioceramic sealers, Bio-C Sealer (Angelus, Londrina, PR, Brazil) and AH-Plus Bioceramic Sealer (Dentsply Sirona, Ballaigues, Switzerland), respectively. Clinical and tomographic follow-up demonstrated favorable periapical healing in all four cases (Figs 1 & 2).

Surgical complementation (Cases 5-6)

Case 5 was referred because of a recurrent periapical sinus tract associated with a previously initiated endodontic treatment. Before referral, calcium hydroxide (UltraCal XS, Ultradent, Joinville, SC, Brazil) had been maintained as the intracanal medication for 15 days. Nonsurgical treatment was then repeated in two visits using the manual crown-down technique, with apical preparation up to a size #70 K-file and replacement of the intracanal medication with a new calcium hydroxide dressing (UltraCal XS) for an additional 30 days. Because the sinus tract persisted despite repeated nonsurgical disinfection attempts, the canal was obturated with gutta-percha and AH-Plus Jet (Dentsply Sirona, Ballaigues, Switzerland), followed by periradicular surgery in the same appointment.

Case 6 was referred for nonsurgical endodontic retreatment and was completed in three visits. After removal of the previous filling material using the Clearblack ultrasonic insert (Helse, Santa Rosa de Viterbo, SP, Brazil) and the R25 M-Wire instrument (VDW, Munich, Germany), chemomechanical preparation was performed with the Race EVO rotary system (FKG, Le Crêt-du-Locle, Switzerland) up to size 40/0.04. Calcium hydroxide (UltraCal XS) was maintained for 30 days. Because purulent exudate persisted, the root canals underwent a second disinfection protocol, including supplemental antimicrobial photodynamic therapy (aPDT), and the intracanal medication was replaced with calcium hydroxide associated with 2% chlorhexidine for an additional 30 days. As persistent exudate still prevented adequate canal drying, the canal was obturated with Sealer Plus (MK Life, Porto Alegre, RS, Brazil), followed by periradicular surgery in the same appointment (Fig. 3).

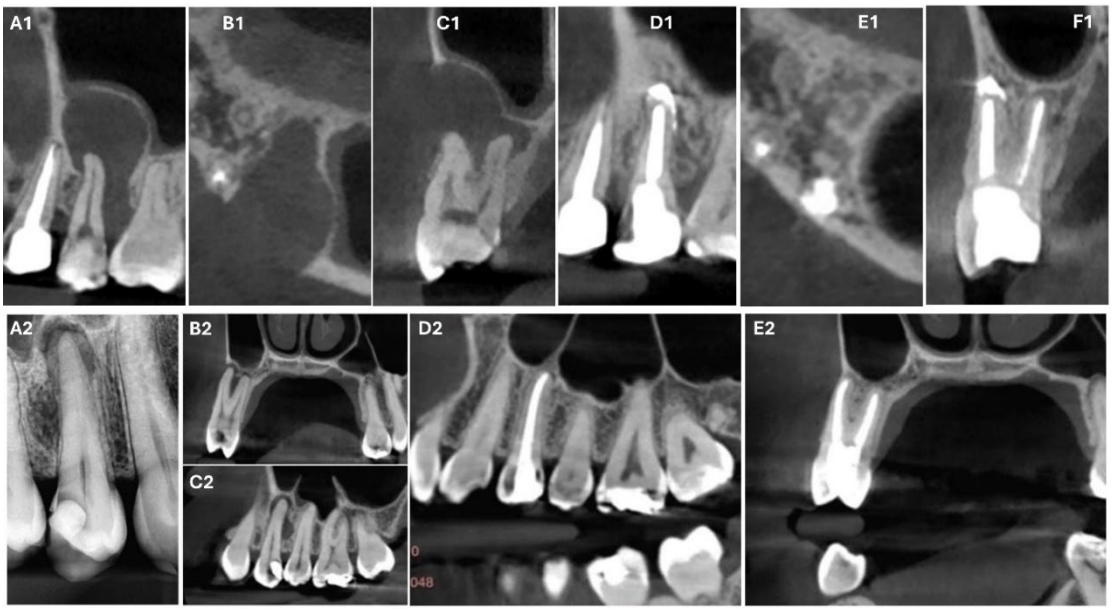

Figure 1. Cases 1 (A1-F1) and 2 (A2-E2): Initial imaging showing large apical periodontitis lesions with cortical bone rupture (arrows). Follow-ups at 36 and 12 months, respectively, reveal complete periapical bone repair and neoformation

Figure 2. Cases 3 (A3-E3) and 4 (A4-D4): Initial imaging revealing extensive apical periodontitis lesions (arrows). Follow-ups at 12 months demonstrate complete resolution of the radiolucencies and significant periapical bone repair

Figure 3. Cases 5 (A5-G5) and 6 (A6-I6): Initial and immediate postsurgical imaging (arrows). Follow-ups at 24 and 12 months, respectively, confirm complete periradicular bone repair following surgical intervention

Discussion

The cases presented in this study involved complex clinical conditions characterized by extensive periradicular lesions and initially unfavorable prognoses. Treatment planning was based on clinical, radiographic, and CBCT findings. CBCT contributed to a more accurate assessment of lesion extension and anatomical challenges, supporting diagnosis, treatment planning, and follow-up evaluation [7].

The management of all cases was focused on controlling intraradicular infection, which is a key factor associated with periradicular healing. Extensive lesions are frequently associated with greater bacterial complexity and microorganisms located in anatomical areas that may be difficult to access, such as isthmuses, ramifications, and irregularities of the root canal system [3, 8]. Therefore, all cases were managed over multiple sessions, combining chemomechanical preparation, supplemental irrigation activation, and intracanal medication. These strategies were selected based on current evidence regarding their potential to enhance root canal disinfection. However, because this multicenter case series involved different operators and individualized treatment protocols according to the clinical characteristics of each case, the favorable outcomes observed cannot be attributed to any specific diagnostic method, material, or therapeutic approach.

Supplemental irrigation activation was incorporated into the treatment protocols as an adjunctive strategy to improve irrigant distribution and enhance cleaning of the root canal system. Ultrasonic activation has been associated with improved fluid dynamics through acoustic streaming and cavitation effects, potentially increasing the removal of debris and biofilm remnants [9, 10]. In the present series, ultrasonic activation was used either alone or in combination with mechanical activation, according to the clinical characteristics of each case.

Intracanal medication with calcium hydroxide was used as an adjunctive approach between treatment sessions. Calcium hydroxide remains widely recommended due to its antimicrobial properties and ability to contribute to microbial reduction when used between appointments [11]. Associations with antimicrobial vehicles, such as camphorated paramonochlorophenol (PMCC) or chlorhexidine, have been proposed to enhance antimicrobial activity in selected clinical situations [12]. In the present cases, medication selection was individualized according to clinical findings, including persistent exudate, pain on mastication, or sinus tract formation. Resolution of these signs was considered an important clinical parameter before obturation.

In none of the cases was periradicular surgery considered a first-line treatment. Instead, it was indicated only after appropriate nonsurgical management failed to achieve infection control. The decision was based on persistent objective clinical findings, including a recurrent sinus tract (Case 5) and persistent purulent exudate preventing canal drying (Case 6), rather than on lesion size alone.

The present case series cannot determine the biological mechanisms underlying disease persistence in these cases. Persistent intraradicular infection, anatomical complexities that limit root canal disinfection [13], previous treatment-related factors [14, 15], host-related factors, and extraradicular infection [16] have all been described as possible causes of persistent apical periodontitis [1, 8, 17]. Although extraradicular biofilms have been associated with refractory cases, no microbiological

Table 1. Diagnostic data, treatment, and outcome of six clinical cases with large and very large apical periodontitis lesions

Case	Sex (Age)	History	Systemic Alteration		Tooth	Clinical Tests	Diagnosis	Lesion	Imaging	Treatment	Outcome (FU)
1	M (32)	Pain on chewing; swelling; previous RCT initiated	None		25	PST−, PC−, PP+, MO−, PD 8 mm	AAA	≥10 mm (5D)	Buccal cortical perforation	RCT	Healed (0), 36 mo
2	F (29)	Pain on chewing; gingival bleeding; composite restoration	None		14	PST−, PC+, PP+, MO−, PD N	SAP	>5 mm (4D)	Buccal perforation; furcation & lateral lesion	RCT	Healed (0), 12 mo
3	M (14)	Trauma; sinus tract (12)	None		12–14	T12: MO II+; T13–14: normal	CAA (12); AAP (13–14)	≥10 mm (5D)	Buccal cortical perforation	RCT	Healed (0), 12 mo
4	M (32)	Tenderness >1 y; previous RCT initiated	None		11	PST−, PC−, PP−, MO−, PD N	AAP	>5 mm (4D)	Buccal cortical perforation	RCT	Healed (0), 12 mo
5	F (49)	Recurrent sinus tract; previous RCT initiated	None		22	PST−, PC−, PP−, MO−, PD N	CAA	≥10 mm (5E)	No cortical perforation	RCT+PS	Healed (0), 24 mo
6	F (58)	Trauma; swelling; recurrent pain; previous RCT	None		31–32	T31 normal; T32 MO I+	AAP (31–32)	≥10 mm (5D)	Buccal perforation; lingual thinning; inadequate RCT	Re-RCT+PS	Healed (0), 12 mo

PST: Pulp sensitivity test; PC: Percussion; PP: Palpation; MO: Mobility; PD: Probing depth; N: Normal; CAA: Chronic apical abscess; AAP: Asymptomatic apical periodontitis; RCT: Root canal treatment; AAA: Acute apical abscess; SAP: Symptomatic apical periodontitis; AAP: Asymptomatic apical periodontitis; CAA: Chronic apical abscess

sampling, molecular analyses, or histopathological examinations were performed in the present study. Therefore, these mechanisms should be regarded as biologically plausible hypotheses supported by previous evidence rather than confirmed explanations for the observed outcoms [17, 18].

When nonsurgical treatment was unable to provide predictable infection control, endodontic microsurgery provided direct access to the apical region [19, 20] through apicoectomy, root-end preparation, retrograde filling, and removal of diseased periapical tissues. In the present cases, guided bone regeneration was additionally performed due to the extensive osseous defects, aiming to support healing of the surgical site. Although both surgically treated cases demonstrated complete periapical healing, these findings should not be interpreted as evidence supporting the superiority of any specific surgical technique, regenerative procedure, or biomaterial.

This study has limitations inherent to its case series design, including the small sample size, treatment heterogeneity, and the absence of microbiological or histopathological analyses. Variations among cases regarding instrumentation systems, preparation parameters, irrigation activation methods, intracanal medications, sealers, and the use of surgical intervention prevent comparisons between approaches and limit conclusions regarding the relative contribution of individual therapeutic components. Furthermore, because healing of extensive periradicular lesions is time-dependent, a 12-month follow-up might be insufficient for CBCT evaluation, as illustrated in Cases 1 and 5 [3].

Conclusion

Within the limitations of this case series, extensive periradicular lesions showed favorable healing outcomes after individualized endodontic management. Accurate diagnosis, infection control, and appropriate follow-up were important aspects in both nonsurgical and surgical approaches for preserving affected teeth. Due to the heterogeneity of treatment protocols, these outcomes cannot be attributed to any specific material or therapeutic strategy.

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Authors' contributions
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References

1. Siqueira JF, Jr., Rôças IN. Present status and future directions: Microbiology of endodontic infections. Int Endod J. 2022;55 Suppl 3:512-30.
2. Siqueira JF, Jr., Rôças IN, Ricucci D, Hülsmann M. Causes and management of post-treatment apical periodontitis. Br Dent J. 2014;216(6):305-12.
3. Artaza L, Campello AF, Soimu G, Alves FRF, Rôças IN, Siqueira JF, Jr. Outcome of Nonsurgical Root Canal Treatment of Teeth With Large Apical Periodontitis Lesions: A Retrospective Study. J Endod. 2024;50(10):1403-11.
4. Mehdizadeh AH, Soltani Nejad F, Yusefi M, Sadeghi R, Shahravan A. Conservative Management of a Large Periapical Lesion Using Decompression Technique: A Case Report. Iran Endod J. 2025;20(1):e35.
5. Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics. 1977;33(1):159-74.
6. Estrela C, Bueno MR, Azevedo BC, Azevedo JR, Pécora JD. A new periapical index based on cone beam computed tomography. J Endod. 2008;34(11):1325-31.
7. Chan F, Brown LF, Parashos P. CBCT in contemporary endodontics. Aust Dent J. 2023;68 Suppl 1:S39-s55.
8. Siqueira JF, Jr., Rôças IN. Clinical implications and microbiology of bacterial persistence after treatment procedures. J Endod. 2008;34(11):1291-301.e3.
9. Boutsioukis C, Arias-Moliz MT. Present status and future directions - irrigants and irrigation methods. Int Endod J. 2022;55 Suppl 3(Suppl 3):588-612.
10. Retsas A, Boutsioukis C. An update on ultrasonic irrigant activation. Endod practice today. 2019;13(2):115-29.
11. Ordinola-Zapata R, Noblett WC, Perez-Ron A, Ye Z, Vera J. Present status and future directions of intracanal medicaments. Int Endod J. 2022;55 Suppl 3(Suppl 3):613-36.
12. Rôças IN, Provenzano JC, Neves MS, Alves FRF, Gonçalves LS, Siqueira JF, Jr. Effects of Calcium Hydroxide Paste in Different Vehicles on Bacterial Reduction during Treatment of Teeth with Apical Periodontitis. J Endod. 2023;49(1):55-61.
13. Saeidi S, Hamedi A, Kheradmand Z. Non-surgical Management of a C-shaped Mandibular Second Molar with Apical Periodontitis and External Root Resorption: A Case Report. Iran Endod J. 2025;20(1):e45.
14. Shaban A, Elsewify TM, Hassaneina EE. Multiple Endodontic Guides for Root Canal Localization and Preparation in Furcation Perforations: A Report of Two Cases. Iran Endod J. 2023;18(1):65-70.
15. Asgary S. Management of a Late Complication of Strip Perforation with Overextended Gutta-percha Using Intentional Replantation: A 10-Year Follow-up Case Report. Iran Endod J. 2025;20(1):e22.
16. Asgary S, Roghanizadeh L. Rapid Bone Healing after Intentional Replantation of a Molar with Apical Actinomycosis. Iran Endod J. 2018;13(1):135-8.
17. Ricucci D, Siqueira JF, Jr., Lopes WS, Vieira AR, Rôças IN. Extraradicular infection as the cause of persistent symptoms: a case series. J Endod. 2015;41(2):265-73.
18. Ricucci D, Candeiro GT, Bugea C, Siqueira JF, Jr. Complex Apical Intraradicular Infection and Extraradicular Mineralized Biofilms as the Cause of Wet Canals and Treatment Failure: Report of 2 Cases. J Endod. 2016;42(3):509-15.
19. 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.
20. Asgary S, Roghanizadeh L, Haeri A. Surgical Endodontics vs Regenerative Periodontal Surgery for Management of a Large Periradicular Lesion. Iran Endod J. 2018;13(2):271-6.

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