



Conservative Management of a Large Periapical Lesion Using Decompression Technique: A Case Report

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Abstract

The management of extensive periapical lesions poses a significant challenge in endodontic therapy due to their potential cystic nature, anatomical proximity to critical structures, risk of cortical perforation, and complex infection dynamics. This report presents a successful case of a large through-and-through periapical lesion managed conservatively via decompression. Initial periapical radiographs revealed poor-quality root canal therapy and a large radiolucent lesion associated with a maxillary lateral incisor. Cone-beam computed tomography (CBCT) imaging confirmed a through-and-through lesion approximately 12×9.5×10.5 mm in size. Based on the clinical and radiographic features, pulpal diagnosis was previous endodontic treatment with an infected root canal system and the periapical diagnosis was a radicular cyst; however, a definitive diagnosis would have required a serial sectioning biopsy, which was not feasible under the present circumstances. Initial non-surgical retreatment as the first treatment choice, with multiple intracanal medicament replacements, proved ineffective due to persistent discharge of the canal. Furthermore, surgical intervention was deemed high-risk due to the lesion's proximity to the incisive foramen, palatal mucosa, sinus floor, and nasal cavity. Decompression, a minimally invasive technique with low morbidity, was selected. Following drainage, a drain was inserted via the thinnest cortical plate, and daily irrigation was initiated. The lesion was monitored every two weeks, with progressive reduction in size documented radiographically. After 5 months, the root canal was obturated and the tooth was restored by composite resin due to the cessation of drainage. The drain was removed at 6 months, and by the 9-month follow-up, significant bone regeneration was evident radiographically. The tooth was asymptomatic, exhibited no mobility or sensitivity to percussion or palpation, and periodontal probing revealed no pathologic pockets.

Keywords: Antibiotics; Decompression; Drainage; Periapical Diseases; Periapical Periodontitis; Root Canal Therapy

Introduction

Non-surgical primary endodontic treatment demonstrates high success rates, ranging from 70% to 93% [1, 2]. Failures may result from inadequate canal debridement, suboptimal obturation [3], or the presence of persistent pathologies such as true cysts [3]. Post-treatment disease following failed endodontic therapy is generally classified into four categories [4]: intraradicular infection, extraradicular infection, foreign body reaction, and true cyst formation.

Residual intraradicular microorganisms can perpetuate periapical inflammation, prompting proliferation of epithelial rests of Malassez and cyst formation as a host attempt to isolate infection [5]. According to Nair *et al.*, the histological distribution of apical lesions comprises granulomas (50%), abscesses (35%), and cysts (15%) [4, 6], with the latter further divided into pocket and true cysts. Although granulomas are the most prevalent histopathological form of apical periodontitis, their radiographic appearance is indistinguishable from a cyst, necessitating cautious diagnostic interpretation. Pocket cysts and granulomas typically

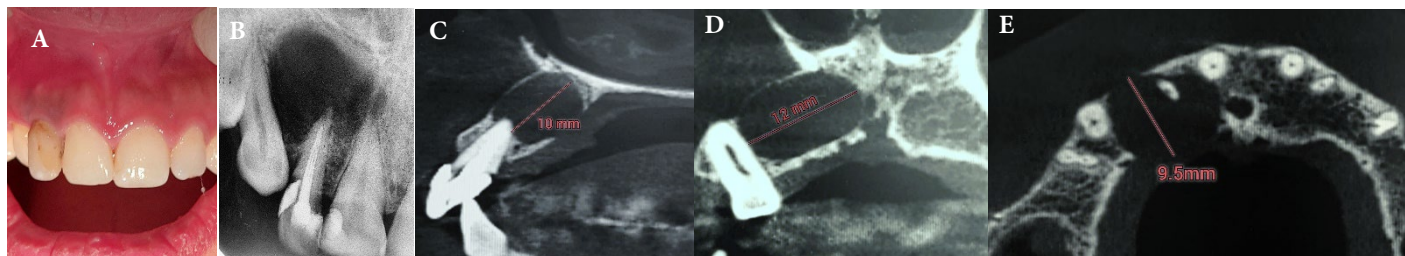


Figure 1. Maxillary Lateral Incisor. A) Preoperative clinical photograph; B) Preoperative periapical radiograph; C) Cone-beam computed tomography (CBCT), sagittal view; D) CBCT, coronal view; E) CBCT, axial view

respond to conventional endodontic therapy [7], while true cysts may necessitate surgical management.

Lesions exceeding 200 mm² in size statistically exhibit a greater probability of being cystic. Chronic periapical pathoses may remain asymptomatic while expanding significantly, potentially compromising adjacent teeth, sinus cavities, neurovascular bundles, or the nasal cavity [8]. In such cases, conventional non-surgical therapy may prove insufficient, and surgical treatment risks adjacent anatomical structures damage. Decompression, a minor surgical approach with minimal invasiveness, has been advocated to mitigate these risks. It functions by relieving intracystic pressure and decreasing inflammatory mediators, thereby facilitating lesion size reduction and promoting healing [9].

While most large lesions are manageable with non-surgical retreatment, decompression is indicated when non-surgical retreatment does not yield acceptable results. Although not typically curative, decompression often simplifies subsequent surgical procedures by reducing lesion volume. The technique involves radiographic localization of the thinnest cortical point, surgical access, saline irrigation, and drain placement. The drain maintains cyst-to-oral communication, mitigating osmotic pressure. Patients are instructed to irrigate the site with sterile saline once or twice daily. There is no standard protocol as to the length of time necessary to leave the drain; it can vary between two days to five years [10].

Endodontic therapy is deferred until radiographic signs of healing are evident at 3 to 6 months. Once adequate bone regeneration is observed, the drain is removed, the site sutured, and if necessary, enucleation surgery may follow. Failure of decompression necessitates conventional apical surgery intervention.

Drain selection includes flanged impression trays, latex catheters, IV tubes, and syringe plungers, with emphasis on stability, ease of hygiene, and resistance to blockage [11]. Despite its conservative merits, decompression remains underreported in endodontic literature. The present case, involving a maxillary

lateral incisor with a large lesion unresponsive to retreatment, illustrates the therapeutic value of decompression in proximity to sensitive anatomical landmarks. Cone-beam computed tomography (CBCT) proved invaluable in delineating lesion boundaries and guiding conservative surgical planning [12]. Documentation of such cases may encourage broader adoption of decompression protocols in complex cases.

Case Presentation

A 41-year-old female with no relevant systemic conditions presented with a chief complaint of a persistent pressure sensation in the periapical region of the maxillary lateral incisor, along with sensitivity to percussion and palpation. Endodontic therapy had been completed on the involved tooth two years prior, with no symptomatic relief. Clinical examination revealed buccal displacement of the lateral incisor and mesial inclination of the adjacent canine. The lateral incisor exhibited discolored and poorly restored composite material (Fig. 1A).

Periapical radiographs indicated inadequate obturation, characterized by voids and underfilling, and a substantial periapical radiolucency (Fig. 1B). CBCT imaging confirmed a large through-and-through lesion measuring approximately 12×9.5×10.5 mm, extending superiorly to the sinus and nasal floors, inferiorly to the maxillary alveolar process and anterior hard palate, medially to the incisive foramen and central incisor, and laterally to the canine root (Fig. 1C-1E). According to Abbott's classification [13], the final pulpal diagnosis was previous endodontic treatment with an infected root canal system, and the periapical diagnosis, based on clinical and radiographic evidence, was a radicular cyst; however, a definitive diagnosis would have required a serial sectioning biopsy [14], which was not feasible under the present circumstances.

The considerable size of the lesion is suggestive of a cystic etiology, prompting consideration of non-surgical retreatment due to the suboptimal quality of the initial endodontic treatment [15].

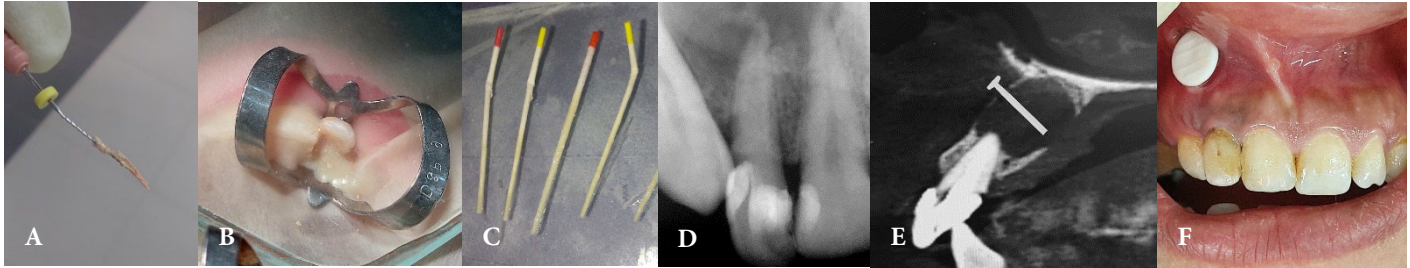


Figure 2. Treatment Procedure, A) Non-surgical retreatment involving removal of poorly condensed gutta-percha; B) Active drainage observed from the canal following gutta-percha removal; C) Amber-yellow exudate from the canal, preventing complete drying with paper points; D) Densely packed calcium hydroxide placed as an intracanal medicament; note the increased radiopacity within the canal at the dentin level due to the density of calcium hydroxide; E) Decompression technique: a syringe plunger was cut to the appropriate length and inserted into the lesion; F) Clinical photograph after drain placement

According to some studies, the large size of a periapical lesion does not significantly affect the prognosis of root canal treatment [16]. However, other reports have indicated that each millimeter increase in lesion size may decrease the success rate of treatment [17]. Nonsurgical retreatment, when the etiologic factors are adequately addressed, has a good prognosis [18], with a reported success rate of approximately 77% [19]. Nevertheless, the presence of a preoperative lesion is considered a negative prognostic factor.

The endodontic literature suggests that a large proportion of extensive periapical lesions, approximately 76%, heal following nonsurgical retreatment [20]. However, the histological status of any apical radiolucent lesion at the time of treatment is unknown to the clinician [21]. Based on these findings, the overall prognosis of retreatment in such cases may be regarded as fair to good.

Following interdisciplinary consultation and confirmation of tooth restorability [22] informed consent was obtained from the patient and the possible outcomes and side effects were explained, then nonsurgical retreatment commenced. Gutta-percha was removed (Fig. 2A), and irrigation was performed using sodium hypochlorite and EDTA [23]. Due to persistent purulent exudation, calcium hydroxide dressing was placed (Fig. 2B-2D) [24], but symptoms recurred. Subsequent sessions employed dual antibiotic paste (DAP; ciprofloxacin/metronidazole), but secretions persisted across multiple visits.

By the fourth appointment, persistent discharge despite medicament changes and imaging evidence raised the suspicion of a true cyst. Surgical intervention was not suggested due to anatomical proximity; thus, decompression was selected to alleviate intra-lesional pressure and inflammation.

CBCT-guided assessment identified the thinnest buccal cortical point. A syringe plunger was disinfected by placing it in Povidone-iodine for 5 min, isopropyl alcohol for 5 min, and

sterile saline for 5 min, and prepared as the drain. Under local anesthesia, a 1-cm vertical incision was made and the lesion accessed. The cavity was thoroughly irrigated with sterile saline, and the drain was inserted such that its flange rested on the mucosa (Fig. 2E-2F). The patient was instructed on daily irrigation with sterile saline and prescribed 0.12% chlorhexidine rinse for 2 weeks. When examining the drain site 7 days after its placement, it appeared healthy with no evidence of inflammation, infection, or drainage, and exhibited a normal tissue texture.

In the fifth session, a month after the drain was placed, a significant decrease in the size of the apical lesion was observed in the PA radiograph, and after removing the intracanal medication, persistent discharge was still present, so densely packed calcium hydroxide was placed again inside the canal, and the patient was scheduled for follow-up and re-examination of the tooth one month later.

In the sixth session, a significant decrease in the size of the lesion was still observed, but persistent discharge from the canal was still present, so the drain was removed for two min, and the inside of the lesion was irrigated with sterile saline.

In the seventh session, a month later, in addition to the reduction in the size of the lesion in the radiograph, the drain protruded slightly from the lesion, consistent with a reduction in the size of the lesion, and therefore, to prevent disruption of the healing process, the drain was shortened to the length of the lesion. In this session, due to the cessation of exudation, a pre-endodontic composite build-up was performed using a rubber dam and etch-and-rinse adhesive technique to ensure isolation. Considering that the apical foramen size was about #55, apical plug using a bioceramic material was chosen as the root end treatment. The bioceramics hydration process produces compounds such as hydroxyapatite, which is capable of inducing tissue regeneration and acts as a temporary mesh



Figure 3. Healing process; A) Preoperative radiograph; B) Two months postoperatively, due to the lack of noticeable changes in lesion dimensions and the presence of persistent discharge, decompression was initiated; C) At three months, a slight reduction in lesion size was observed; D) After five months, significant lesion shrinkage was evident. As the persistent discharge had ceased, an apical plug was placed, and the remaining canal space was obturated with gutta-percha; E) At seven months, a normal trabecular bone pattern was visible at the lesion margins; a fiber post was placed to reinforce the tooth structure; F) At nine months, further reduction in lesion size and the presence of normal bone trabeculation indicated continued healing

framework for hydroxyapatite deposition [25]. In this case, calcium-enriched mixture (CEM) cement (Bionique Dent, Tehran, Iran) was placed in apical 5 mm and the rest of the canal was obturated using the continuous wave technique with the backfill method, employing the Fast-Fill device (Eighteenth, Eighteenth Medical Technology Co., Ltd., Changzhou, China) and thermoplasticized gutta-percha (Eighteenth, Eighteenth Medical Technology Co., Ltd., Changzhou, China) (Fig. 3D).

In session 8, one month later, due to a significant reduction in the lesion's size and the lack of sensitivity to percussion and palpation in the lateral incisor, the drain was removed (about four months after the start of decompression). An incisional biopsy was made by inserting a curette obliquely into the lesion, and the small pieces of the lesion tissue were removed and placed in formalin. Then the drain site was refreshed with a scalpel blade and sutured with nylon sutures. Two weeks later, the mucosa of the drain area was repaired, and the biopsy results were "Fibrous connective tissue devoid of epithelial lining and without noticeable chronic inflammation". Given the biopsy results and continuous reduction of the lesion's size, apical surgery was avoided in consultation with the patient, and a decision was made to follow up the tooth.

In session 9, one month later, a further reduction in the size of the lesion was seen in the periapical radiograph. At this stage, a fiber post was placed inside the root to increase the strength of the tooth, and the access cavity was repaired with composite resins (Fig. 3E).

At session 10, two months later, more than 90% of the lesion volume had been replaced with normal bone trabeculation (Fig. 3F), the tooth had a normal response to

palpation and percussion, and no periodontal pockets were observed on probing. Fig. 3A-3F demonstrate the healing process during treatment and continuous reduction of the lesion's size.

Discussion

This case emphasizes the potential of decompression as a definitive treatment in certain cases, particularly when conventional surgical approaches pose undue risk. Progressive, predictable healing rendered apicoectomy unnecessary and avoided extensive osseous defects that would otherwise require regenerative procedures.

In this treatment, two important questions arise: If decompression had not been performed, would the lesion still have healed? And what role has decompression played?

The answer to these questions depends on the nature of the lesion. It is well known that periapical radiolucencies are histopathologically classified into three types: granuloma, pocket cyst, and true cyst, each with its own specific definition.

Granuloma is characterized by chronic inflammation and consists of granulation tissue elements infiltrated by immune defense cells.

The pocket apical cyst is a sac-shaped apical inflammatory lesion, with the epithelium-lined cystic cavity in direct communication with the root canal system through the apical foramen or lateral foramina, while the true apical cyst is a periradicular lesion with a distinct pathological cavity that is completely enclosed by epithelial lining, with no communication to the root canal system [7].

There have been controversies regarding the probability of a cyst healing after nonsurgical root canal treatment, as it is almost impossible to confirm a cyst diagnosis without a surgical biopsy [26]. However, a preliminary clinical diagnosis of a periapical cyst can be made based on the following criteria: (a) the lesion involves one or more non-vital teeth, (b) the lesion is larger than 200 mm² in size, (c) radiographically, it appears as a circumscribed, well-defined radiolucent area bounded by a thin radiopaque line, and (d) it produces a straw-colored fluid upon aspiration or as drainage through an accessed root canal system [27].

In the present case, we encountered a large periapical radiolucency associated with a root canal showing persistent discharge. Although the lesion size supported the possibility of a cystic nature [28], and the amber-colored exudate is a feature often consistent with cysts, both periapical granulomas and cysts (whether pocket or true) may present with active inflammation and exudation of serum or fluid. Thus, from a clinical and radiographic perspective, it is impossible to definitively differentiate granulomas from cysts, or pocket cysts from true cysts [29]; biopsy *via* surgical intervention remains the only reliable method.

In nonsurgical root canal treatment, the presence of persistent discharge, despite multiple sessions of intracanal medicament, strengthens the suspicion of communication between the periapical lesion and the root apex, increases the possibility of pocket cyst [30]. Furthermore, the amber-colored discharge raises clinical suspicion of a cystic lesion, although definitive diagnosis can only be achieved histologically.

Large periapical and cyst-like lesions should initially be managed by nonsurgical root canal treatment. The negative biopsy results, specifically the absence of cystic lining, could account for the favorable outcome of conservative management, which involved a combination of nonsurgical retreatment and decompression. The presence of active intracanal exudation during nonsurgical retreatment, necessitated the use of intracanal medicaments between sessions. The number of sessions required for intracanal dressing varies. In the study by Soares *et al.* [31] in most teeth with large lesions, drainage ceased after the first session with calcium hydroxide placement. However, certain cases exhibit persistent drainage despite long-term intracanal medication. Obturating in the presence of exudate impairs the adaptation of the filling material to the canal walls and the setting of the sealer, thereby increasing the risk of treatment failure [32]. Therefore, obturation cannot be performed until complete cessation of drainage, and the number of sessions required for

canal dryness is unpredictable. In some cases, medication must be maintained in the canal for several months [33]. According to Segura *et al.* [34], some cases of chronic exudation fail to resolve despite regular intracanal medication. Under such circumstances, the patient's choice is crucial in deciding whether to continue with further sessions of intracanal medication or to proceed with surgical intervention.

Ricucci *et al.* [35] reported that cases with persistently wet canals and failed root canal treatment harbored complex and persistent biofilms in the apical region. In the study by Niawarsi *et al.* [36] for large lesions with persistent active exudation resistant to obturation, surgical enucleation was recommended due to the unpredictability of sessions required to control exudation. However, given that surgery for large lesions may endanger adjacent anatomical structures, decompression has been introduced as a conservative minor surgical approach to reduce lesion size, followed by definitive enucleation.

If the lesion is a true cyst, its self-sustaining nature [7] prevents healing through nonsurgical management, necessitating surgical intervention. In such cases, enucleation of large lesions may compromise adjacent structures; decompression, by reducing osmotic pressure and inflammatory cytokines, decreases lesion size and increases the likelihood of adjacent structures remaining intact [36]. In contrast, if the lesion is a pocket cyst or granuloma, nonsurgical retreatment may lead to healing [4]. However, given the persistent discharge and the unpredictability of the required number of sessions, decompression can significantly accelerate lesion resolution when patient consent is obtained.

In summary, since the histopathological nature of the lesion cannot be determined at the initiation of nonsurgical retreatment [28], decompression plays a dual role. In true cysts or extraradicular infections, decompression decreases pressure and inflammatory mediators, thereby reducing lesion size and rendering subsequent surgery more conservative. On the other hand, in granulomas or pocket cysts with persistent exudation, decompression reduces the number of sessions required for canal dryness and thereby expedites healing [9]. In the present case, the absence of cystic lining strongly suggests the lesion was not a true cyst but rather a granuloma or pocket cyst. Accordingly, nonsurgical retreatment combined with decompression provided effective conservative management and eliminated the need for apical surgery. While decompression may accelerate healing in true cysts or extraradicular infections, surgical intervention is often ultimately required. In contrast, when the lesion originates

from intraradicular infection, nonsurgical retreatment along with decompression can effectively eradicate the etiology and promote rapid healing.

The anatomical preservation achieved through decompression is notable, particularly near critical structures such as the sinus, nasal floor, and incisive foramen.

Limitations include the need for patient compliance and extended treatment duration. Nonetheless, the conservative nature and favorable outcomes validate decompression as a viable option for complex lesions, and even teeth with complex endodontic conditions can be successfully retained through the application of advanced techniques and regular follow-up [37].

Conclusion

This report highlights the successful resolution of a large periapical lesion through decompression and nonsurgical retreatment. Radiographic and clinical evidence after 9 months supports the efficacy of this conservative modality. Decompression may serve as a minimally invasive alternative to surgery in appropriate cases. Further studies are encouraged to substantiate these findings and refine clinical protocols.

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Conflict of interest

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Authors' contributions

Conceptualization: FSN; Methodology: FSN/AS; Formal Analysis and Investigation: RS/AHM; Writing-Original draft preparation: RS/MY; Writing-review and editing: AS/MY; Supervision: AHM/AS. All authors read and approved the final manuscript.

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