Jordan Journal of Dentistry, Volume **2**, No. **2**, **2025**
DOI: https://doi.org/10.14525/JJD.v2i2.09

Jordan Journal of Dentistry

www.jjd.just.edu.jo

Non-surgical Endodontic Treatment of Periapical Radicular Cyst in a Traumatized Maxillary Central and Lateral Incisor: A Case Report

Hadil Elawam[1], Elsanousi M. Taher[1], Nadeen Ali Saeid[1], Razan Othman[1]

1 Libyan International Medical University, Faculty of Dentistry, Benghazi, Libya.

ARTICLE INFO

Article History:
Received: 8/11/2024
Accepted: 14/12/2024

Correspondence:
Hadil Elawami,
Libyan International Medical University, Faculty of Dentistry, Benghazi, Libya.
Hadil_2112@limu.edu.ly

ABSTRACT

Periapical radicular cysts are the most common inflammatory lesions that arise due to an inflammatory response originating from pulpal necrosis of a non-vital tooth. This article reports a successful case of the conservative non-surgical management of a periapical radicular cyst that is associated with a traumatized permanent right upper central and lateral incisor with an open apex, in addition to using advanced radiographic techniques for accurate diagnosis and post-operative follow-up.

Keywords: Non-surgical, Endodontic treatment, Radicular cyst, Periapical lesion, CBCT.

1. Introduction

Periapical radicular cysts (PRCs) are the most prevalent inflammatory lesions affecting the jawbone. These fluid-filled sacs arise in the vicinity of the tooth root apex and stem from chronic dental pulp inflammation (1). Causes for the development of periapical cysts include: dental pulp necrosis, an inflammatory response that stimulates the proliferation of epithelial cell rests (rests of malassez) found within the periodontal ligament of the tooth. These remnants of embryonic tissue form a sac-like structure, gradually enlarging into a cyst (1). Once the cyst is formed, the cyst wall secretes fluids and enzymes that further contribute to bone resorption around the root of the affected tooth (2,3).

Management of PRCs primarily focuses on addressing the underlying cause - the infected dental pulp (3). Two main treatment approaches exist; the non-surgical endodontic therapy, a method which involves thoroughly cleaning and disinfecting the infected root canal system, followed by filling (obturation) to prevent re-infection (3). This approach aims to eliminate the bacterial source and stimulate periapical healing, promoting bone regeneration and potentially leading to the shrinkage or even disappearance of the cyst (3). Surgical interventions, that include marsupialization, decompression, and enucleation, are used in cases with extensive bone resorption, anatomical limitations, or failed non-surgical treatment, where surgical removal of the cyst and potentially the affected tooth root tip becomes necessary, with cases necessitating even the extraction of the affected tooth (4).

Different methods are used in the diagnosis of periapical cysts, including periapical biopsy specimens, periapical radiographs, and the use of imaging systems, such as cone beam computed tomography (CBCT) with high specificity and excellent accuracy potentially leading to enhance the chance of an accurate pre-operative diagnosis (5). Although histopathologic evaluation is the definitive method of differentiating between the periapical radiolucencies of endodontic origin, it is rarely carried out, as these diseases are often resolved with non-surgical endodontic treatment (1).

This article was written using the Preferred

Reporting Items for Case Reports in Endodontics (PRICE) 2020 guidelines, as it demonstrates the case of non-surgical endodontic management of a radicular cyst associated with maxillary right central and lateral incisors with the use of CBCT in the diagnosis.

2. Case Report

A 30-year-old male patient with a chief complaint of discolored and irregularly arranged upper front teeth (Figure 1) with a history of trauma 10 years back, with a negative history of pain, pus discharge, or swelling. No relevant past or current medical history was reported. On extra-oral clinical examination, lymph nodes were non-palpable. Intra-oral examination revealed an Ellis Class-II fracture in maxillary right lateral incisor tooth, and both teeth maxillary right central incisor tooth and maxillary right lateral incisor tooth were tender to percussion.

Figure 1: Pre-operative clinical radiograph showing the discolored maxillary right central incisor tooth and fractured maxillary right lateral incisor tooth

Electrical pulp vitality testing (EPT) produced no response on both teeth, while the adjacent teeth prompted a normal response. Palpation of the vestibule revealed no draining sinus tract. CBCT showed an osteolytic lesion in the periapical region of maxillary right central incisor and maxillary right lateral incisor teeth that is well-defined, corticated, and roughly oval in shape. It is uniformly radiolucent, with the approximate size as marked in the axial, coronal, and sagittal sections measuring about 7.7mm×5.6mm×10.3mm (superioinferiorly × buccolingually × mesiodistally "on the coronal section") using the measurement tool in the CS 3D imaging software (Figure 2). Evidence of external root resorption of both teeth was also identified, along with the thinning and perforation of the labial plate over the maxillary right lateral incisor tooth as viewed on the 3D reconstructed view

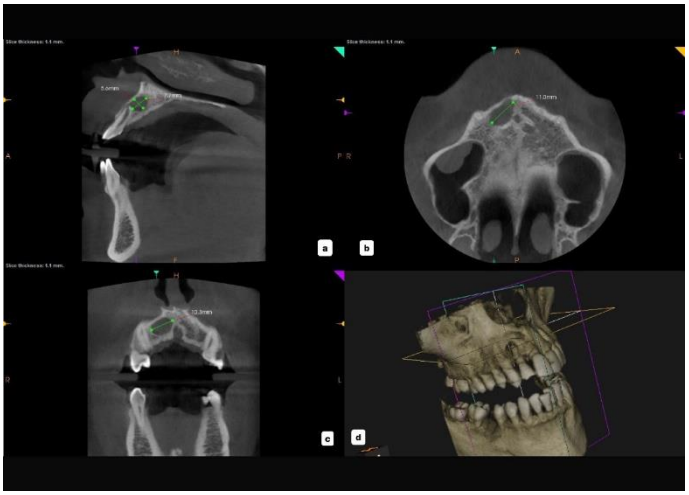

Figure 2: CBCT image showing the extent of the lesion marked with arrows. (a) Sagittal section (b) Axial section (c) Coronal section (d) 3D reconstruction of the extent of the lesion

Based on the patient's history, and clinical and radiographic examination, including the CBCT

evaluation, a definitive diagnosis of radicular cyst was established. A treatment plan consisting of a non-surgical root canal treatment of both maxillary right central incisor tooth and maxillary right lateral incisor tooth was decided on and performed, in addition to the continuous monitoring of the lesion at follow-up, following informing the patient of the risks, benefits, and alternatives of the procedure/treatment and provided written consent to proceed.

Under rubber dam isolation, the access opening and working length were determined using the radiographic method with multiple views from different angles for maxillary right central incisor tooth and maxillary right lateral incisor tooth using a 10K file (Figure 3). The bio-mechanical preparation (i.e., cleaning and shaping of the canal) of maxillary right central incisor tooth was done using the self-adjusting file system (SAF endo-system) with abundant irrigation with sodium hypochlorite solution 5.25%, 5ml ethylene diamine tetraacetic acid (17% EDTA), and chlorhexidine antibacterial solution. The root canal treatment was done using mineral trioxide aggregate (MTA) of Nexobio (MTA-Cem LC), where an MTA carrier was used to create an apical plug of 4 mm in maxillary right central incisor tooth (Figure 4). Afterward, it was decided to fill the entire canal with MTA as it offers numerous advantages, and a glass ionomer was placed as a provisional restoration, and the patient was kept on follow-up for the need to perform internal bleaching on tooth maxillary right central incisor tooth.

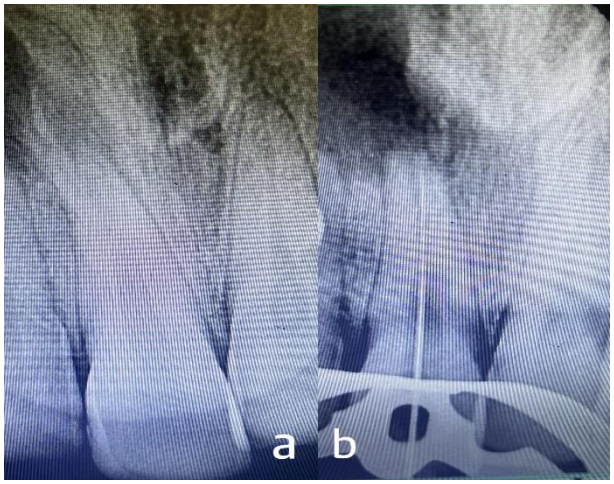

Figure 3: (a) Pre-operative intraoral periapical radiograph of the maxillary right central incisor tooth (b) Working length determination for maxillary right central incisor tooth

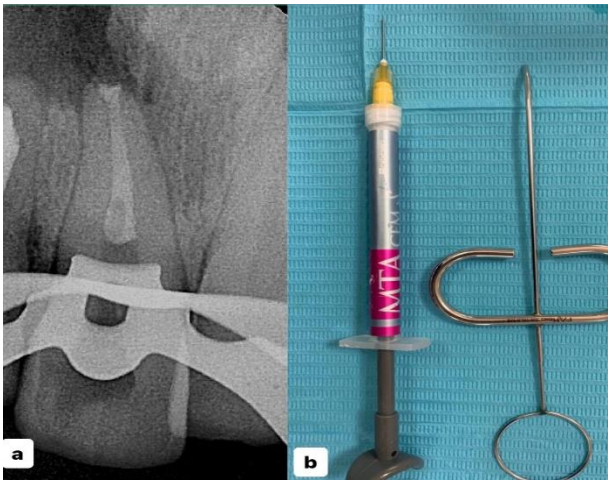

Figure 4: (a) Intraoral periapical radiograph showing the apical plug created using MTA (b) (MTA Cem LC) material and MTA carrier tool

Internal bleaching using (Opalescence Endo-Endodontic whitening system) for maxillary right central incisor tooth was performed after 7 days, where a 2-mm GI barrier was placed over the root canal filling material, followed by the placement of the bleaching material and the placement of the temporary restoration. After further 7 days, the patient was recalled to evaluate the results of the internal bleaching, and a significant change in the color of maxillary right central incisor tooth was seen (Figure 5). A similar approach was used while performing the root canal treatment for maxillary right lateral incisor tooth, (Figure 6 a-b), and both teeth were restored with a final composite restoration.

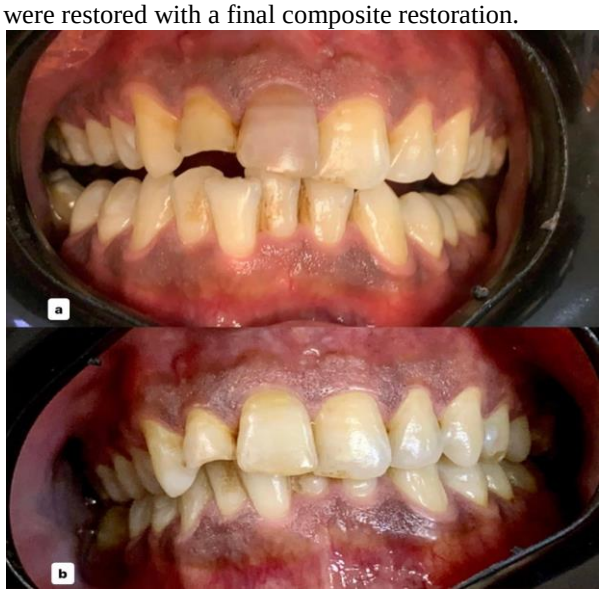

Figure 5: Maxillary central incisor before (a) and after (b) internal bleaching

Figure 6: (a) Pre-operative intraoral periapical radiograph of the maxillary right lateral incisor tooth (b) Post-operative intraoral periapical radiograph following the filling of the canal with MTA

At a 9-month check-up (Figure 7), an increased radiodensity and bone fill were observed radiographically, indicating the healing of the periapical lesion and the formation of new trabecular bone. The measurements were recorded also using the CS 3D imaging software and were as follows: 4.4mm×5.3mm×6.8mm.

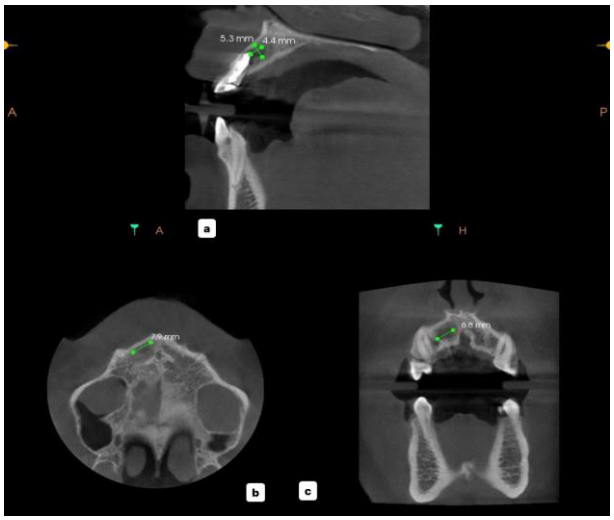

Figure 7: A 9-month follow-up CBCT demonstrating a reduction in the sizeof the lesion (a) Sagittal section (b) Axial section (c) Coronal section

The patient was recalled at the 12-month follow-up and another CBCT was performed to observe the evolution of the lesion using the CS 3D imaging software on the same computer screen. In all three sections, axial, coronal, and sagittal, the lesions appeared to have a reduction in size (Figure 8) with the perforation in the labial plate being restored with the continuous healing and remineralization of the lesion compared to the initial CBCT showing a reduction in size, representing the healing of the lesion. The recorded measurements were as follows: 3.9mm×3.9mm×5.3mm. At present, the patient is symptom-free and another clinical and radiological control at 18 months will follow.

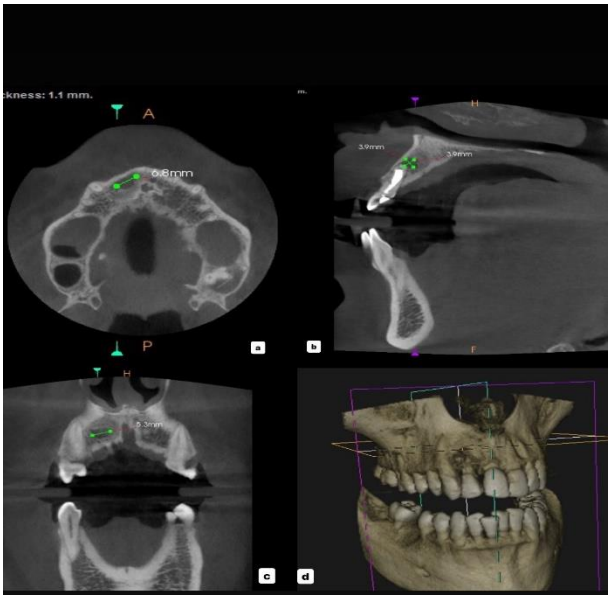

Figure 8: One-year follow-up CBCT. (a) Axial section (b) Sagittal section (c) Coronal section. (d) 3D reconstruction of the lesion; note the reduced size

3. Discussion

This case report advocates for the utilization of non-surgical endodontic therapy as the primary approach to managing periapical radicular cysts. While surgical intervention holds a place in severe cases, a well-executed non-surgical treatment plan offers significant advantages; the conservative approach, non-surgical endodontic treatment aims to address the root cause of the cyst which is the infected root canal system (6). It was mentioned in different case reports that this method preserves the natural tooth structure, reducing the need for invasive procedures and potential complications associated with surgery, such as bleeding, nerve damage, and prolonged healing time (6,7). Studies have shown high success rates (up to 90%) for non-surgical endodontic treatment in managing periapical cysts (7).

A clinical-significance emphasis on the use of a 10 K-file size for working length determination in this case of external root resorption needs to be highlighted, as its small size allowed for safe navigation through the

compromised root canal, minimizing further damage and reducing the risk of perforation. This approach is consistent with current endodontic principles for managing teeth with complex anatomy and compromised structure. The reasoning for the use of MTA throughout the entire canal is its biocompatibility, stimulation of hard tissue formation ability, as this is beneficial in this case of external root resorption and the strong sealing ability, as this is crucial in cases of bone perforation, where the seal is essential to prevent the spread of infection (6). MTA is a safe and effective material for root canal filling, especially in cases with external root resorption and bone perforation. It is important to note that MTA is a more expensive material than traditional root canal filling materials. However, the long-term benefits of using MTA may outweigh the extra cost (7).

Cost-effectiveness being compared to surgical procedures, non-surgical endodontic treatment is significantly less expensive, which translates to a reduced financial burden on patients and healthcare systems (8). While other studies have reported that there is a reduction in patient morbidity, non-surgical treatment minimizes post-operative discomfort and avoids the potential complications associated with surgery, leading to a faster and more comfortable recovery for the patient. Even large cyst-like periapical lesions containing cholesterol crystals can heal following non-surgical root canal treatment (8). Surgical intervention for periapical cysts typically involves removing the cyst along with the affected tooth root tip (3). A comparative study of both the conservative and surgical treatment modalities concluded that, while being effective in specific situations, surgery presents several drawbacks, including increased invasiveness and surgical procedures involve greater tissue manipulation, leading to potential complications, like bleeding, infection, and nerve damage (3).

Compared to non-surgical treatment, surgical procedures also require a longer healing period due to the creation of additional trauma during the operation (9), as proposed by another case report. Compromised aesthetics is another concern when considering a surgical treatment. Depending on the location of the cyst, surgical removal may necessitate additional procedures to address bone-loss and potential cosmetic concerns (10, 11).

CBCT provides a 3D image that allows complete visualization of an area in question, in the axial plane, the sagittal, and coronal planes. It also adds depth of field to conventional radiographs that only show a two-dimensional image of a 3D object, while it helps overcome image defects, such as overlap and deformation (4). Additionally, the use of CBCT pre-operatively helped assess the extent of the cyst better than with conventional radiographs because of its ability to 3D reconstructions in the craniofacial region. Post-operatively, CBCT benefited the patient in evaluating the outcome of healing and prognosis (4).

The use of CBCT in this case adhered to the guidelines of the American Association of Endodontists (AAE), the American Academy of Oral and Maxillofacial Radiology (AAOMR), the European Society of Endodontology, and the Swiss Society of Dento-maxillo-facial Radiology (SADMFR), as these guidelines advocate for CBCT use, not only for diagnosis and treatment planning, but also for follow-up and monitoring treatment outcomes (12-14).

CBCT provides a more precise localization and better evaluation of lesion position and extent, particularly in cases of replacement resorption and dentoalveolar trauma in the anterior region (12-14).

4. Conclusions

Considering the high success rates, minimal invasiveness, cost-effectiveness, and faster recovery associated with non-surgical endodontic treatment, it should be the preferred primary course of action for managing periapical radicular cysts whenever possible. However, it is crucial to acknowledge that complex cases with extensive bone resorption or anatomical limitations might necessitate a surgical approach in conjunction with endodontic therapy, as well as the integration of digital technology such as CBCT into the dental practice for more accurate diagnosis, treatment planning and also for future follow-up.

Acknowledgements

The authors would like to thank the Department of Restorative Endodontics, Oral Diagnosis and Radiology, and the Department of Oral and Maxillofacial Surgery for their support.

Conflict of Interests

There is no conflict of interests to be declared by the authors.

References

1. Karamifar K, Tondari A, Saghiri MA. Endodontic periapical lesion: An overview on the etiology, diagnosis and current treatment modalities. Eur Endod J. 2020;5:54-67.
2. Zhao Y, Liu B, Zhao YF. Controversies regarding the management of teeth associated with cystic lesions of the Jaws. Chin J Dent Res. 2019;22:81-92.
3. Maity I, Meena N, Kumari RA. Single-visit non-surgical endodontic therapy for periapical cysts: A clinical study. Contemp Clin Dent. 2014;5:195-202.
4. Althaf S, Hussaini N, Srirekha A, Santhosh L. The role of cone-beam computed tomography in evaluation of an extensive radicular cyst of the maxilla. J Restor Dent Endod. 2021;1:30-33.
5. Smadi L. Comparison between two methods of working length determination and its effect on radiographic extent of root canal filling: A clinical study [ISRCTN71486641]. BMC Oral Health. 2006;6:4.
6. Torabinejad M, Chivian N. Mineral trioxide aggregate: A versatile material for endodontic treatment. J Endod. 1999;25:499-505
7. Parirokh M, Torabinejad M. Mineral trioxide aggregate: A comprehensive literature review-Part I: Chemical, physical, and biological properties. Endod Today. 2010;21:22-35.
8. Talpos-Niculescu RM, Popa M, Rusu LC, Pricop MO, Nica LM, et al. Conservative approach in the management of large periapical cyst-like lesions. A report of two cases. Medicina (Kaunas). 2021;57:497.
9. Kadam NS, Ataide Ide N, Raghava P, Fernandes M, Hede R. Management of large radicular cyst by conservative surgical approach: A case report. J Clin Diagn Res. 2014;8:239-241.
10. Shelke S, Tekam D, Soni NG, Sahu N. Management of periapical cyst (radicular cyst): A non-surgical endodontic approach. Int J Appl Dent Sci. 2022;8:17-22.
11. Narula H, Ahuja B, Yeluri R, Baliga S, Munshi AK. Conservative non-surgical management of an infected radicular cyst. Contemp Clin Dent. 2011;2:368-371.
12. Patel S, Brown J, Semper M, Abella F, Mannocci F. European Society of Endodontology position statement: Use of cone-beam computed tomography in Endodontics: European Society of Endodontology (ESE)-developed by. Int Endod J. 2019;52:1675-1678.
13. Dula K, Bornstein MM, Buser D, et al. SADMFR guidelines for the use of cone-beam computed tomography/digital volume tomography. Swiss Dent J. 2014;124:1169-1183.
14. Special Committee to Revise the Joint AAE/AAOMR Position Statement on use of CBCT in Endodontics. 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;120:508-512.