



# CBCT-3D radiographic analysis of an infected radicular cyst of the upper jaw: a case report

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## ABSTRACT

**Objectives:** The purpose of this case report is to show CBCT can analyze in detail a radicular cyst case where it has the ability to determine the density of a lesion. An overview of the density pattern of a radicular cyst can help determine the lesion and its margins.

**Case Report:** A 40-year-old patient complained of swelling in the palate that had been felt for about a year with a history of trauma due to an accident fifteen years ago. The patient underwent CBCT examination with the results of a hypodense area compared to the surrounding bone in the maxillary anterior area involving teeth 11,21,22 to 23

accompanied by a discontinuity of the cortical plate of the palatal bone and extending to involve the base of the nasal cavity. Part of the lesion is clearly demarcated, while the other side is diffuse. The suspected radiodiagnosis of the case was a moderately aggressive radicular cyst with a differential diagnosis of an odontogenic tumor.

**Conclusion:** The final diagnosis of this case was a radicular cyst with chronic granulomatous inflammation, based on a combination of radiographic findings, clinical findings, and histopathological examination.

**Keywords:** CBCT, radicular cyst, infected cyst

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## INTRODUCTION

The radicular cyst is also known by other names, such as a periapical cyst or root-end cyst, as it occurs in the periapical region or the root end of the affected tooth. The radicular cyst is usually asymptomatic and is accidentally discovered by routine radiographic examination. Patients affected by radicular cyst usually complain of swelling in the vicinity of the affected tooth region by such cyst. Some patients may even complain of pain in the affected tooth region if the radicular cyst is infected. Radicular cyst occurs more commonly among males in the anterior maxilla region.<sup>1,2</sup> The teeth commonly affected by radicular cyst are the ones that are more prone to trauma, including the maxillary central incisor, maxillary lateral incisor, mandibular central incisor, and mandibular lateral incisor. The patient usually gives a history of trauma; some even forget the history of the traumatic episode. Here we report a case of radicular cyst in a 22-year-old female, who underwent an access opening root canal treatment procedure in a nearby private dental clinic four years back but has not followed further follow-up visits.<sup>3,4</sup> Radicular cyst is one of the most common cysts in the jaw. With conventional radiographs sometimes difficult to distinguish from other lesions. To diagnose the lesion we can look at the

border of lesion. CBCT radiographs have the ability to determine the density of a lesion. The most common location is 60% in the maxilla, especially the anterior region and the mandible in the posterior region. The incidence is highest in the 3rd and 4th decade of life and rare in children. Radicular cysts are more common in males (approximately 58% compared to 48% in females).<sup>4</sup>

This case report presents the cone-beam computed tomography (CBCT) analysis and treatment plan of an extensive radicular cyst. The conventional radiographs show a two-dimensional image of the three-dimensional object and its surrounding structures. CBCT provides three-dimensional images of the object from sagittal, coronal, and axial directions to overcome image defects, such as overlap and deformation.

## CASE REPORT

A 40-year-old patient complained of swelling in the palate that had been felt for about a year with a history of trauma due to an accident fifteen years ago. The patient underwent CBCT examination with the results of a hypodense area compared to the surrounding bone in the maxillary anterior area



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involving teeth 11,21,22 to 23 accompanied by a discontinuity of the cortical plate of the palatal bone and extending to involve the base of the nasal cavity. Part of the lesion is clearly demarcated, while the other side is diffuse. The suspected radiodiagnosis of the case was a moderately aggressive radicular cyst with a differential diagnosis of an odontogenic tumor.

The treatment carried out on the patient was enucleation of the cyst and followed by a biopsy with histopathological examination results in the form of an epithelial cyst that could support a radicular cyst accompanied by chronic granulomatous inflammation.

## DISCUSSION

The word “cyst,” which is derived from the Greek “Kystis,” means “sac or bladder.” A cyst is a diseased hollow pathological cavity bordered with epithelium that grows in a centrifugal, expansive manner.<sup>1</sup> The radicular cyst is the most common inflammatory odontogenic cyst in the human jaw. It is known by other names such as “Periapical cyst,”

as it occurs in the periapical region of the affected tooth. “Root end cyst” occurs at the end of the tooth's root.<sup>5</sup> The radicular cyst is more common among males in the anterior region of the maxilla or mandible, as it is the most common site for trauma. It is crucial to note that dental caries not only result in forming a radicular cyst, but trauma can also induce the formation of a radicular cyst. The radicular cyst usually causes swelling, which may not be prominent initially. Still, if the treatment is neglected, it can gradually cause cortical expansion, devitalize the adjacent teeth, and result in pathological migration of the teeth. The pathogenesis of radicular cyst is controversial.<sup>6</sup>

Radiographically, the radicular cyst appears as round or pear-shaped unilocular radiolucency at the apex of a non-vital tooth as in the present case but was an extensive lesion. Other odontogenic cysts such as dentigerous cysts, odontogenic keratocysts, and odontogenic tumors such as mural ameloblastoma, Pindborg tumor, and odontogenic fibroma may share similar radiological features.<sup>2,7</sup> Hence, histopathological evaluation is necessary to diagnose these giant lesions. In extensive lesions, radiographs alone may not be sufficient to show the full extent of the lesions, and advanced imaging is



Figure 1. Clinical examination, (A) extra oral and (B) intra oral view of the patient



Figure 2. CBCT multiplanar radiograph of the lesion

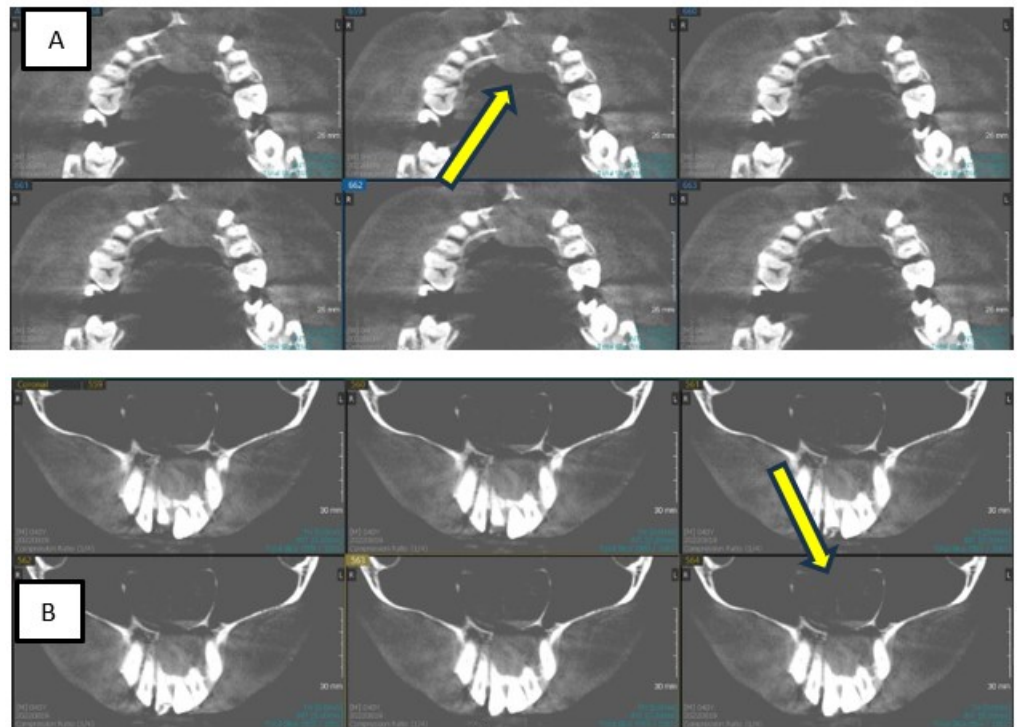


Figure 3. CBCT radiograph, (A)axial and (B) coronal view of the lesion

needed.<sup>5,13</sup> CBCT provides a 3D image that allows complete visualization of an area in question, in axial plane, the sagittal, and coronal planes and it also adds depth of field to conventional radiographs.<sup>14</sup>

Cone Beam Computed Tomography 3D is a radiographic technique that utilizes cone-shaped x-rays and computerized volumetric reconstruction to produce three-dimensional radiographs. It utilizes cone-shaped x-rays and computerized volumetric reconstruction that produces three-dimensional radiographs: sagittal, coronal, and axial. 3D CBCT can show histograms, radiographs in specific areas of interest to patients and doctors, distance and area measurements, density, distance measurements from a room to a slice, surface images, intensity modulation, osseointegrity, and others. This three-dimensional-based radiography aircraft can overcome the problems of conventional radiography tools that have existed before, such as the lack of accurate measurement of remaining bone thickness, the completeness of hard tissue details, the radiation dose that is large enough for patients, and the display of anatomical structures that are only in one aspect in one shot.<sup>15</sup> Based on the results of radiographic examination using CBCT, it can be seen from the sagittal, coronal, and axial views that there is a diapical radiolucent lesion from the region of teeth 11,21,22. Based on the quality of the radiographic image, it can be seen by eye that the radiolucent lesion in the 11,21,22 region is clearly demarcated and firm. This is in accordance with the radiologic features listed in several literatures that the image of a radicular cyst appears as an osteolytic or radiolucent lesion (circular or oval in shape) with a firm radiopaque

border of varying size surrounding the tooth apex, unless the cyst is infected then the radiopaque image at the edge will disappear.<sup>5,6,8</sup>

The radicular cyst is the most common inflammatory odontogenic cyst in human jaws. Patients affected by such infected radicular cysts usually complain of pain and report to the oral physician. A careful history and clinical and radiological evaluation are necessary for patients to decide on treatment planning and efficient management of radicular cyst. In addition to being caused by trauma, radicular cysts can also grow as a result of injury to the periapical tissues beneath the tooth, such as from improper follow-up after a root canal procedure and from an access opening done on the root canal attempted tooth.<sup>9,10</sup> When the patient has not followed up on further subsequent treatment visits, untreated radicular cysts may result in buccolingual growth of the underlying bone and asymmetric facial features. Radicular cysts are frequent in the tooth-bearing regions of the mandible and maxilla. Lesions accidentally discovered to be smaller during a radiological evaluation do not show any symptoms. CBCT can be used to assist in the diagnosis of radicular cysts. The density pattern at the periphery and inside of a radicular cyst lesion is tapered with a steep slope towards the inside of the lesion. Trope and colleagues state that in distinguishing between granulomas and radicular cysts, the density of the lesion area can be measured using computed tomography. Density is the density of mineral elements in a particular region of the measured area.<sup>11,12</sup> Bone densitometry is the art and science of measuring the bone mineral content and density of a particular skeletal or whole body. Such bone

measurements are used to assess bone strength, diagnose diseases associated with low bone density (e.g. osteoporosis), monitor the effects of therapy for some diseases, and estimate fracture risk. Lower density is seen in radicular cysts, while higher density is seen in granulomas compared to cysts. Determining the characteristics of the lesion margin based on quantity can be done by analyzing the density profile of the lesion margin.<sup>16,17</sup>

## CONCLUSION

The final diagnosis of this case was a radicular cyst with chronic granulomatous inflammation, based on a combination of radiographic findings, clinical findings, and histopathological examination. CBCT may provide more information for the diagnosis of a radicular cyst through the analysis the density of the lesion.

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## FOOTNOTES

All authors have no potential conflict of interest to declare for this article. Informed consent was obtained from the patient for being included in this case report.

## REFERENCES

1. 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. *Journal of Restorative Dentistry and Endodontics*. 2021;1(1):30-3.
2. Latoos S, Shah AA, Jan SM, Qadir S, Ahmed I, Purra AR et al. Radicular Cyst. *JK Science*. 2009;11(4):187-9.
3. Singh J, Bhagat S, Aneja A, Sharma R, Kaur M. Management of Radicular Cyst- A Case Report. *Annal Cas Rep Clin Stud (ACRCS)*. 2023;2(3):1-5.
4. Vignness A, Priyaa S, Thangavelu RP, Fenn SM, Mohan KR. The Three-Dimensional Evaluation of Radicular Cyst by Cone-Beam Computed Tomography. *Cureus*. 2023;15(3): e36162.
5. Brave D, Madhusudan AS, Ramesh G, Brave VR. Radicular cyst of anterior Maxilla. USA: *International Journal of Dental Clinics*. 2011;3(4):16-17.
6. Koju S, Chaurasia NK, Marla V, Deepa N, Poudel P. Radicular Cyst of The anterior Maxilla: An Insight into the Most Common Inflammatory Cyst of the Jaws. *Journal of Dental Research and Review*. 2019;6(1):26-9.
7. Velasco I, Vahdani S, Nuñez N, Ramos H. Large Recurrent Radicular Cyst in Maxillary Sinus: A Case Report. *Int J Odontostomat*. 2017;11(1):101-5.
8. Andresen AKH, Jonsson MV, Sulo G, Thelen DS, Shi XQ. Radiographic features in 2D imaging as predictors for justified CBCT examinations of canine-induced root resorption. *Dentomaxillofac Radiol*. 2022;51(1):20210165.
9. Kumar A, Singh N, Singh S, Talukdar M, Kisave PN, Saba I. Occurrence of radicular cyst in anterior maxilla of adolescent patient: A case report and its management. *International Journal of Applied Dental Sciences*. 2019; 5(1):20-2.
10. Pei J, Zhao S, Chen H, Wang J. Management of radicular cyst associated with primary teeth using decompression: a retrospective study. *BMC Oral Health*. 2022;22(1):560.
11. Prativi SA, Pramatika B. Gambaran Karakteristik Kista Radikular Menggunakan Cone Beam Computed Tomography (CBCT): Laporan Kasus. *B-Dent: Jurnal Kedokteran Gigi Universitas Baiturrahmah*. 2019;6(2):105-10.
12. Kumaravelu R, Jude NJ, Sathyanarayanan R. Radicular Cyst: A Case Report. *J Sci Dent*. 2021;11(1):23-5.
13. Pratyusha MV, Nadig P, Jayalakshmi KB, Math S. CBCT assessment of healing of a large radicular cyst treated with enucleation followed by PRF and osseograft placement: A case report. *Saudi J Oral Dent Res*. 2017;2(3):72-5.
14. Rajendran R, Sivapathasundharam B. *Shafer's Textbook of Oral Pathology*. 6th ed. New Delhi: Elsevier; 2009. p.487-90.
15. Pratyusha MV, Nadig P, Jayalakshmi KB, Math S. CBCT assessment of healing of a large radicular cyst treated with enucleation followed by PRF and osseograft placement: A case report. *Saudi J Oral Dent Res* 2017;2:72-5.
16. Deshmukh J, Shrivastava R, Bharath KP. Giant radicular cyst of the maxilla. *BMJ Case Rep* 2014;2014:bcr2014203678.
17. Kamburoglu K. Use of dentomaxillofacial cone beam computed tomography in dentistry. *World J Radiol* 2015;6:128-30.