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A case report of odontogenic cyst by CBCT analysis: a calcifying odontogenic cyst or dentigerous cyst?

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ABSTRACT

Objectives: Odontogenic cysts are pathologic cavities filled with fluid originating from the odontogenic epithelium remnants forming teeth. Dentigerous and calcifying odontogenic cysts are examples of cysts that form during development. Based on how they form, they are one type of odontogenic cyst. Many lesions have similar characteristics, making it challenging to differentiate them.

Case Report: An oral surgeon referred a 19-year-old male patient for a CBCT radiographic examination of the maxilla, which revealed a dentigerous cyst in the patient's clinical report. The patient's overall health was delicate. An intraoral examination revealed no edema, symmetrical, painless facial structure, and no clinical signs of periodontal disease nor dental caries. A panoramic radiograph showed a multilocular, well-defined, and corticated radiolucent lesion that made teeth 11–12 and 21–23 shifted.

Conclusion: Clinical and imaging variables play essential roles in the diagnosis and differential diagnosis of odontogenic cysts. CBCT radiography could be a suitable modality for diagnosing odontogenic cysts, although histopathology is the gold standard for a definitive diagnosis.

Keywords: *Dentigerous cyst, calcifying odontogenic cyst, CBCT 3D*
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INTRODUCTION

Cyst is a pathological condition that refers to an abnormal lump on the underside of the skin that contains fluid, air, pus, to a substance such as hair. Cysts can be classified into three main groups which include cysts of the jaw, maxillary antrum, and soft tissues of the face, and neck. Fluids that fill pathological cavities in bone can be of odontogenic or non-odontogenic origin. Non-odontogenic sources may be respiratory epithelium or epithelial remnants from tissue fusion processes. The growth of these cysts occurs due to the presence of epithelial remnants in large quantities in the gingiva on unerupted teeth so that they are at risk of developing into an abnormal condition in the form of cysts.[1]

Periapical and panoramic radiographs are the most commonly used imaging modalities in dentistry for diagnostic and surgical planning.[2] However, these examinations constrain the data by representing the three-dimensional anatomy of the radiographed region in two dimensions with overlapping planes. These imaging modalities can potentially cause geometrical distortion of the structures being X-rayed. Magnetic Resonance Imaging (MRI) is a highly effective diagnostic modality for detecting dentigerous cyst, as it differentiates cysts from tumoral lesions, ensuring safe and efficient execution. However, MRI is an expensive examination with restricted availability, rendering it impractical for routine clinical applications.[3]

Over the past decade, Cone Beam Computed Tomography (CBCT) has provided dental surgeons with three-dimensional imaging of mineralized maxillofacial tissues, exhibiting minimal distortion and substantially reduced radiation exposure compared to traditional CT.[2] This paper aims to present a clinical instance of a dentigerous cyst, wherein the diagnostic hypothesis and treatment strategy were determined using CBCT.

Dentigerous cyst, also known as a follicular cyst, is an odontogenic cyst that develops from the pericoronal tissue (dental sac or dental follicle) of an impacted tooth, either permanent or deciduous or supernumerary.[3,4] Several factors have been investigated and are known to play an important role in the tooth eruption.[5]

Dentigerous cysts represent more than 24% of the cysts of the maxilla.[6] Their incidence peaks in the third decade of life, followed by gradual decrease with age. It is also slightly higher in men and is not influenced by ethnicity.[3,6] Furthermore, 2.5 to 4% of patients with an impacted tooth develop a dentigerous cyst[3,7], of which 95% are

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associated with a permanent tooth and 5% with a supernumerary tooth. Regarding localization, 74% of dentigerous cysts localize in the mandible and 26% in the maxilla with a symmetrical left/right distribution.[6,8] Bilateral lesions are extremely rare, and when occurring, association with development anomalies and syndromes, such as mucopolysaccharidosis or cleidocranial dysplasia, should be suspected.[9]

Clinically, dentigerous cysts are often asymptomatic but may occasionally cause swelling and dental displacement.[7,8] More rarely dentigerous cysts may be accompanied by pain caused by superposed infection or paresthesia when mechanical compression on a nerve occurs. Dentigerous cysts are most often diagnosed incidentally during an oral check-up, and the panoramic dental X-ray is generally the most frequent diagnostic imaging technique carried out.[10]

CASE REPORT

An oral surgeon referred a 19-year-old male patient for a CBCT radiographic examination of the maxilla, which revealed a dentigerous cyst in the patient's clinical report. The patient's overall health was fine; an intraoral examination revealed no edema, symmetrical, painless facial structure, or clinical signs of periodontal or dental caries. Teeth 11–12 and 21–23 were displaced due to a multilocular, symmetrical, well-defined corticated radiolucent lesion visible on a panoramic radiograph. The CBCT examination showed coronal, sagittal, and axial views of the maxillary (Figure 1). In the panoramic view, a radiolucent lesion appears in the periapical region of teeth 11-12 and 21-23, round symmetrical multilocular well-defined corticated, causing displacement of teeth 11-12 and 21-23 (Figure 2). In the coronal view, there was a radiolucent lesion on the periapical side of teeth 11 -21, which extended to touch the inferior border of the right nasal cavity and right maxillary sinus, shaped like a unilocular teardrop, well-defined corticated, measuring ± 20 x 11.1 mm with an average density of -26.8 HU (Figure 3). In the sagittal view, there was a radiolucent lesion on the periapical side of tooth 12, unilocular teardrop shape, well-defined corticated, with a size of ± 11.4 x 9.9 mm with an average density of 24.5 HU (Figure 4). In the axial view, there is a radiolucent lesion on the periapical side of teeth 11-12, which extend palatally, causing a gap between teeth 11

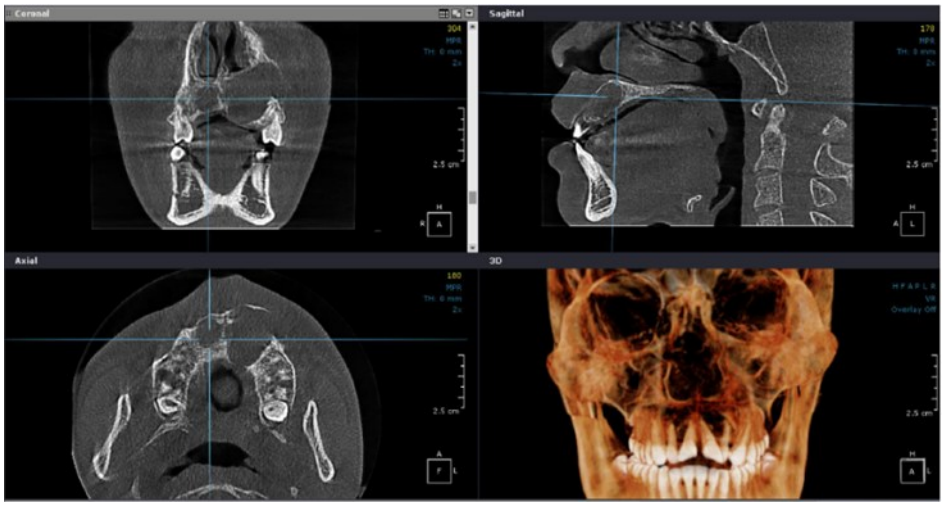

Figure 1. MPR view of tooth 11-12 region

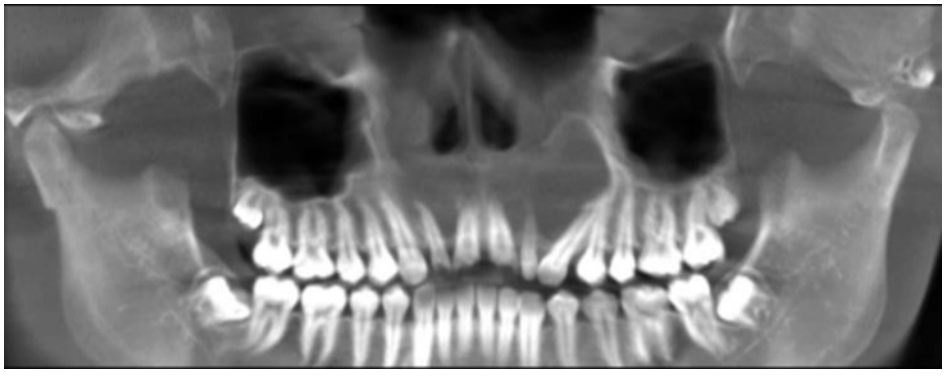

Figure 2. Panoramic view of tooth 11-12 region

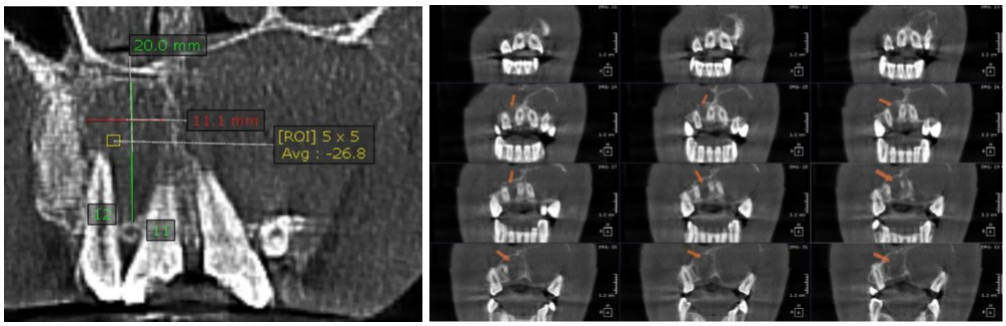

Figure 3. Coronal view (left) and coronal slicing view (right) of tooth 11-12 region

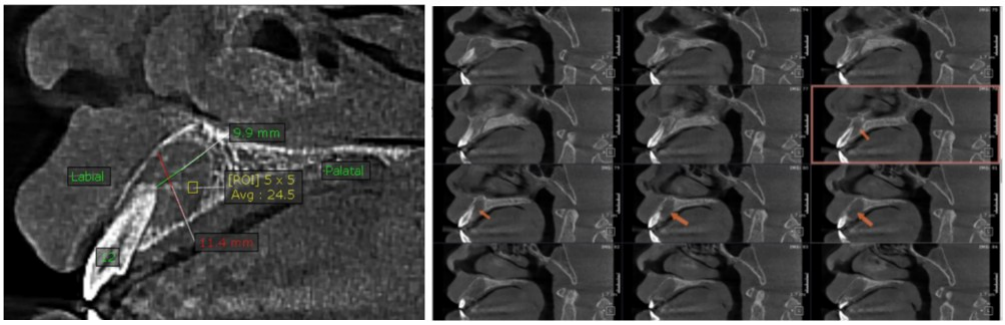

Figure 4. Sagittal view (left) and sagittal slicing view (right) of tooth 11-12 region

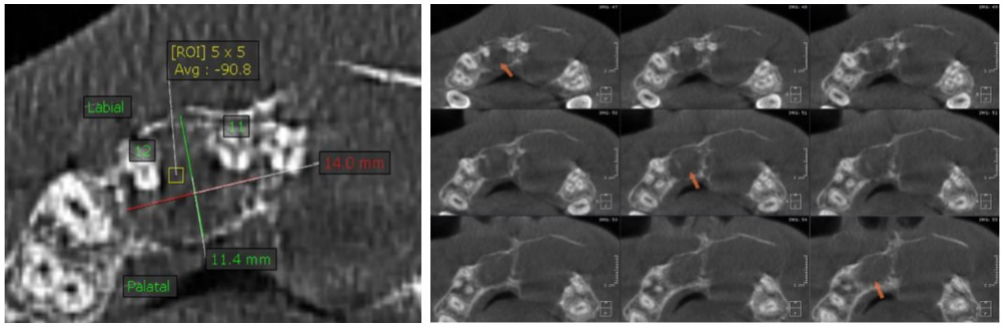

Figure 5. Axial view (left) and axial slicing view (right) of tooth 11-21 region

and 12, unilocular round shape, well-defined corticated, with a size of ± 14 x 11.4 mm In with an In average density of -90.8 HU (Figure 5).

The CBCT examination showed coronal, sagittal, and axial views of the maxillary (Figure 6). In the coronal view, there was a radiolucent lesion on the periapical side of teeth 21-23, which extended to touch the inferior border of the left nasal cavity, causing distal migration of tooth 23, unilocular round shape, well-defined corticated, with a size of ± 30.6 x 27.4 mm with an average density -94.9 HU(Figure 7). In the sagittal view, there appears to be a radiolucent lesion on the periapical side of teeth 21-23, which causes migration of tooth 22 towards the labial, unilocular round shape, well-defined corticated, with a size of ± 25.2 x 24.7 mm In with In an In average density of -26 HU (Figure 8). In the axial view, there appears to be a radiolucent lesion on the periapical side of teeth 21-23, which extends labially and palatally, causing migration of tooth 22 labially and tooth 23 distally, unilocular round shape, well-defined corticated, measuring ± 19 x 17.2 mm In with average density -1.1 HU (Figure 9). Extraoral examination was within normal limits as well as the intraoral examination, swelling was not found (Figure 10).

Anterior maxillary enucleation was done and biopsy specimens showed a cystic wall covered by stratified squamous epithelium which was mostly erosive and ulcerative. The fibrocollagenous connective tissue stroma, some of which have experienced hyaline degeneration, was infiltrated with inflammatory cells, lymphocytes, PMN cells, plasma cells, lymphocytes. No malignant signs were seen.

DISCUSSION

A dentigerous cyst is an odontogenic cyst that generally occurs by partial eruption, expansion, or impaction[11]. These cysts are generally formed from the remnants of the enamel organ that is still on the crown of the tooth by surrounding the crown. It is asymptomatic in the jaw, unless the cyst is inflamed to the point of swelling, cemento-enamel junction of the tooth is attached by the lower end

of the cyst, potentially blocking the eruption of the tooth, and it can increase the size of the dental follicle. If the size of this cyst is very large, it can absorb the roots of other teeth next to it and can also turn into a neoplasm, namely ameloblastoma. Of all possible cysts that can affect the jaw in general, 24% of them are this type of cyst. A dentigerous cyst is defined as the development of an odontogenic epithelial layer due to the accumulation of reduced enamel epithelium fluid and an unerupted tooth crown. This group of cysts often occurs in children, especially in the first and third decades of life.[12,13]

Hydrostatic pressure separates the follicle from

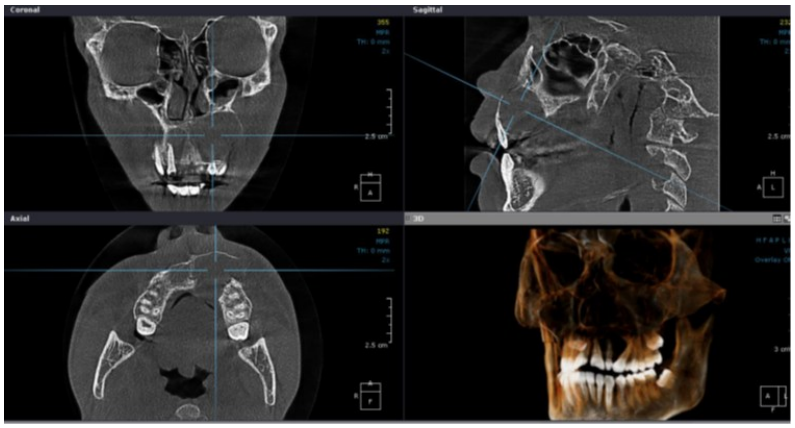

Figure 6. MPR view of tooth 21-23 region

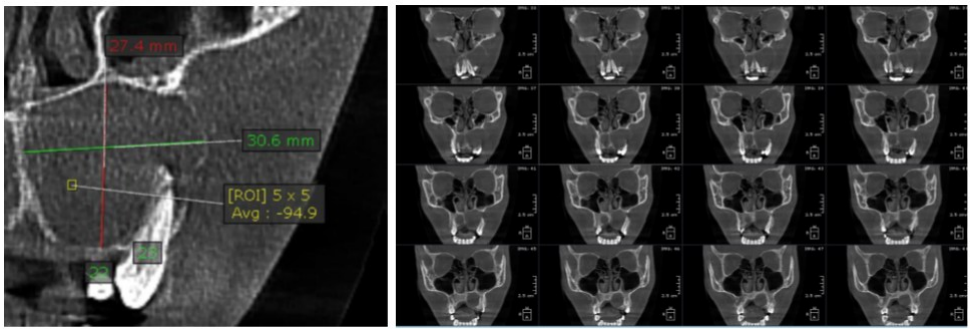

Figure 7. Coronal view (left) and coronal slicing view (right) of tooth 21-23 region

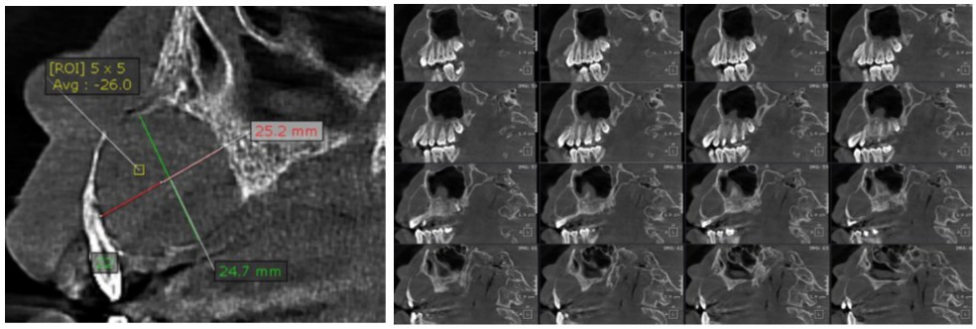

Figure 8. Sagittal view (left) and sagittal slicing view (right) of tooth 21-23 region

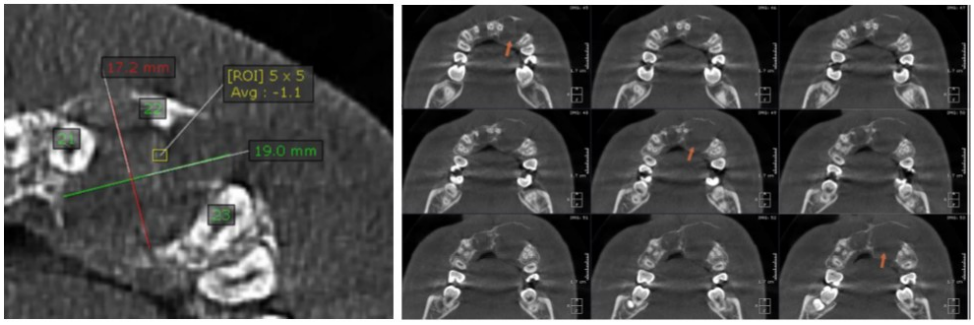

Figure 9. Axial view (left) and axial slicing view (right) of tooth 21-23 region

Figure 10. Extraoral examination (left) and an intraoral examination (right). The patient's overall health was delicate; an intraoral examination revealed no edema, symmetrical, painless facial structure, or clinical signs of periodontal or dental caries.

the crown, causing the cyst to expand. Expansion of this cyst is associated with epithelial proliferation, resorption factors, and increased fluid osmolality of the cyst.[14] In this case, the radiodiagnosis of ameloblastoma was confirmed as a dentigerous cyst by histopathological examination with the characteristic a cavity lined by a non-keratinized stratified epithelium containing between two and three layers of cuboidal and/or flattened cells. The connective tissue wall is usually fibrous and often devoid of inflammatory cells.[15]

A dentigerous cyst is considered a developmental cyst by nature and rarely causes pain unless causing a problem in a nearby structure.[16] In literatures, the radiographic appearance of a dentigerous cyst is a radiolucent, unilocular, well-defined, cortical, and surrounds the crown of an unerupted (impacted) tooth. The radiographic appearance of this cyst needs to be distinguished from the normal appearance of the circum-coronal follicular space surrounding the tooth to erupt. In other cases, a radiolucent area may appear lateral to the crown of the tooth, especially if the cyst is relatively large in size or if there has been a change in the position of the tooth from its place.[17,18] The dentigerous cyst has the potential of expanding causing medullary bone destruction and jaw enlargement. The dentigerous cyst tends to push and resorb the adjacent teeth. The cyst generally develops in one tooth but could also involve a few surrounding teeth if the cyst grows larger. This then might cause a shift of the tooth far from its normal position, especially the cysts that occur in the upper jaw teeth. The shift of the impaction and the dentigerous cyst itself could cause disruption toward the surrounding tissue. When the cyst in the maxillary sinus becomes symptomatic, the patient would experience sinusitis symptoms including swelling, facial, headache, and nasolacrimal duct obstruction.[19]

Dentigerous cysts are lined by odontogenic epithelium consisting of the Epithelial Cell Rest of Serres, the Epithelial Cell Rest of Malassez (ERM), and the Reduced Enamel Epithelium (REE). The developing tooth crown is surrounded by REE. In the sixth week of embryonic development, the degenerating remnants of the dental lamina carry out the formation of teeth which become the remains of Serres Epithelial Cells. Root formation is initiated by ERM in the form of residual cells resulting from the disintegration of Hertwig's epithelial root sheath. Then, these remnants accumulate as a whole and are trapped in the alveolar bone and the maxillary and mandibular gingiva. The appearance of dentigerous cysts begins with a developmental process that can widen the dental follicle due to fluid buildup between the tooth crown and the enamel epithelium. This in turn can inhibit tooth eruption.[20]

A dentigerous cyst has a differential diagnosis feature with ameloblastoma because of the similarity of the radiographic appearance, may be a well-defined unilocular radiolucency with sclerotic borders, multilocular radiolucencies with scalloped borders and involving teeth impaction.[21] An ameloblastoma is a benign and a locally aggressive tumour which arises from the mandible or less commonly, from the maxilla. Unicystic ameloblastomas are variants of ameloblastomas, which were first described by Robinson and Martinez, which refer to those cystic lesions that show clinical and radiological characteristics of odontogenic cyst, but which on histological examination, show typical ameloblastomatous epithelium which lines part of the cyst cavity, with or without a luminal or mural tumour proliferation.[22]

Radiographically, the presence of a dentigerous cyst is characterized by a well-defined and corticated, multilocular radiolucent area indicating the presence of multilocular dentigerous, pericoronal radiolucency and crown of unerupted teeth with sclerotic margins around them starting at the cervical margins. If there are cases with small cyst, routine radiographic examination may be performed to determine the cause of failed tooth eruption, which may be symptomatic or asymptomatic. Meanwhile, for large cyst, there is persistence of trabecular bone so that it looks radiolucent and multilocular.[21,23]

In this case, the first radiodiagnosis was a calcifying odontogenic cyst. This cyst was described by Gorlin (1962) who was impressed by the significant presence of so-called 'ghost cells'. Radiographic features of this lesion includes radiolucent area, with calcification may be presented, with well-circumscribed borders. This lesion mostly occurs in the anterior region. In 20-50% of cases, this lesion is associated with a tooth and displacement tooth may occur[2]. Since the CBCT showed the epicentre of the lesion was not within the crown, the diagnosis of this cyst was proposed instead of a dentigerous cyst.

CBCT radiographically observes a dentigerous cyst as a radiolucent, symmetrical, unilocular, and well-defined entity. The dentigerous cyst grows slowly and steadily, with a clear sclerotic edge, a well-defined cortex, and a thin radiopaque band

around the outside. Under certain conditions, a radiolucent area may manifest laterally to the tooth crown, mainly if the cyst is significantly large or the tooth has shifted from its original position. A peri coronal spacing of 2.5 mm or more may be considered the minimum distance for diagnosing a potential cystic lesion. A dental follicle and a small dentigerous cyst are indistinguishable, however, a radiolucent appearance of 3-4 mm or more indicates the formation of a cyst.[22]

CBCT is a viable option since it delivers sub-millimeter-resolution images of superior diagnostic quality, accompanied by brief scanning durations and a radiation dose up to 15 times lower than multi-slice CT scans. The patients' CBCT assessments revealed the full extent of the substantial lesion, aiding the surgeon in precisely evaluating its size and proximity to adjacent important structures.[23] As in this particular examination, an odontogenic cyst was suspected based on the CBCT analysis, which provided further information about the lesion, such as its position within the tooth-bearing area.

The clinical symptoms and imaging features of CBCT in this case led us to a suspect of calcifying odontogenic cyst as the radiodiagnosis and dentigerous cyst was proposed as the differential diagnosis. However, histopathologic-cytologic analysis of the enucleated biopsy preparation of the maxillary anterior area revealed features of a dentigerous cyst. The radiologist, pathologists, and clinicians must determine whether a dentigerous cyst should be evaluated for potential ameloblastoma transformation, as the CBCT indicates, to ensure accurate diagnosis and treatment planning. Regarding location and radiographic features, histology examinations are required to establish a definitive diagnosis.

CONCLUSION

Clinical and imaging variables play essential roles in determining the diagnosis as well as the differential diagnosis of lesions, specifically odontogenic cysts. CBCT radiography could be a suitable modality for diagnosing odontogenic cysts, although histopathology is the gold standard for a definitive diagnosis.

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None.

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.

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