



Dentigerous cysts suspected the other odontogenic lesions on panoramic radiography and CT

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Received: 25 May 2023 / Accepted: 26 November 2023 / Published online: 2 January 2024
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Abstract

Dentigerous cysts are known as the second most common type of cyst in the jaws. The cyst is one of the lesions occurred frequently in the posterior body of the mandible and is often related to the unerupted third molar and forms around the crown of the unerupted tooth attaching at the cemento-enamel junction. Such characteristic appearances are the diagnostic points differentiating from ameloblastoma or odontogenic keratocyst. However, it would be hard for us to diagnose it as a dentigerous cyst if the lesion does not show its typical appearance. We experienced two cases of dentigerous cysts which did not form around the crown of the unerupted tooth on radiologically. Both cysts were relatively large and resorbed adjacent teeth roots. Therefore, an ameloblastoma or an odontogenic keratocyst was suspected rather than a dentigerous cyst as the imaging diagnosis. The biopsy revealed that the lesion was a “dentigerous cyst” in one of the cases and “developmental cyst with inflammation” in another case. After the excision, the histopathological diagnosis was a dentigerous cyst with inflammation in both cases. This report shows the two cases of dentigerous cysts focusing on panoramic radiography and CT images. Also, we discuss the differential diagnosis by reconsidering those diagnostic points.

Keywords Dentigerous cyst · Panoramic radiography · Unusual image appearance · Differential diagnosis

Introduction

Dentigerous cysts are known as the second most common type of cyst in the jaws [1, 2]. The cysts are often asymptomatic and found coincidentally on panoramic radiographs taken as a screening test for whole teeth. The dentigerous cyst forms around the crown of an unerupted tooth and attaches to the cemento-enamel junction [1]. Since dentigerous cyst is slowly growing, it is corticated periphery. When it expands, it makes the touched cortical bone thinning. It has a propensity to displace adjacent teeth and the inferior alveolar canal. Tooth resorption might occur for the adjacent

teeth. Though there are various lesions that occur in the jaw, we are able to make a diagnosis with such characteristic findings as a dentigerous cyst on radiography. Contrarily, some articles have shown variations in the imaging appearances of dentigerous cysts in analyzing the features of the dentigerous cyst [3–6]. Also, there have been some reports about dentigerous cysts showing unusual appearances [7–9]. The case reported by Martinelli-Kläy et al. [7] showed multilocular appearance on panoramic radiography. One of the cysts introduced by Perez et al. [8] presented hallmarks of infection and the other cyst showed multilocular radiolucency with septa. Moreover, Vassiliou et al. [9] reported bilateral dentigerous cysts with associated significant root resorption in a healthy 38-year-old female patient. It is sometimes hard for us to suspect a dentigerous cyst without the usual image appearances.

We experienced two cases of dentigerous cysts related to the mandibular third molar. The one case was the relatively large lesion at the posterior body of the mandible and the part of the third molar crown and root were imposed on the upper side of it. Another case was larger than the former one extending to the mandibular ramus and superimposing the

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whole of the third molar. In those two cases, the teeth roots that touched the lesion were resorbed obviously. Since those cysts showed such appearances, a dentigerous cyst was not suspected primarily. This report introduces the cases by paying attention to the imaging appearances and discusses the differential diagnosis considering detailed imaging findings.

Case reports

Case 1

A 44-year-old man was referred to our hospital for diagnosis and treatment of the right mandibular posterior lesion found by his attending dentist incidentally on panoramic radiography. He originally visited the dentist because of his halitosis. The patient was asymptomatic. The oral examination was unremarkable.

The panoramic examination revealed that the radiolucent lesion was located at the body of the mandible (Fig. 1). It was well defined and corticated. The horizontal impacted third molar was superimposed on the upper border of the lesion. The resorption of tooth roots was seen on the first molar as well as the second molar along the border of the lesion. The lesion displaced the inferior alveolar canal caudally, causing a loss of visibility of its wall. Odontogenic tumor like ameloblastoma was suspected with those imaging appearances.

Contrast-enhanced CT showed an expansive lesion extending from the second premolar region to the retro-molar pad region (Fig. 2). On axial bone window-setting images, the expansion of the mandible by the lesion was moderate to buccal side and slight to lingual side, with thinning of both sides of cortical bone. The lateral and occlusal part of the third molar crown was located in the lesion and the tooth root was resorbed along the lesion. The internal density of the lesion was inhomogeneous and mostly lower attenuation than muscle on soft-tissue density window-setting. With CT images, it was diagnosed as an odontogenic cyst rather than an odontogenic tumor.

The biopsy was done by extracting the second and third molars. A dentigerous cyst was suspected.

The lesion was excised surgically and obtained the histopathological specimen. A cystic structure lining non-keratinized squamous epithelium with slight thickening was observed (Fig. 3). The cyst wall was composed of tight fibrous connective tissue, cholesterol crystal, and inflammatory cells. Pathological findings were negative for odontogenic keratocyst or tumor including ameloblastoma. At this point, a dentigerous cyst and a paradental cyst were suspected. However, since the third molar had impacted and was asymptomatic clinically, a paradental cyst was not suspected. These clinical and pathological findings led to a diagnosis of the dentigerous cyst with inflammation.



Fig. 1 Panoramic image shows the radiolucent lesion which is well defined and corticated at the body of the mandible. The right third molar is horizontally impacted superimposing on the upper border of

the lesion. The teeth roots are resorbed at the first molar as well as the second molar along the upper border of the lesion. The inferior alveolar canal is displaced caudally, causing a loss of visibility of its wall

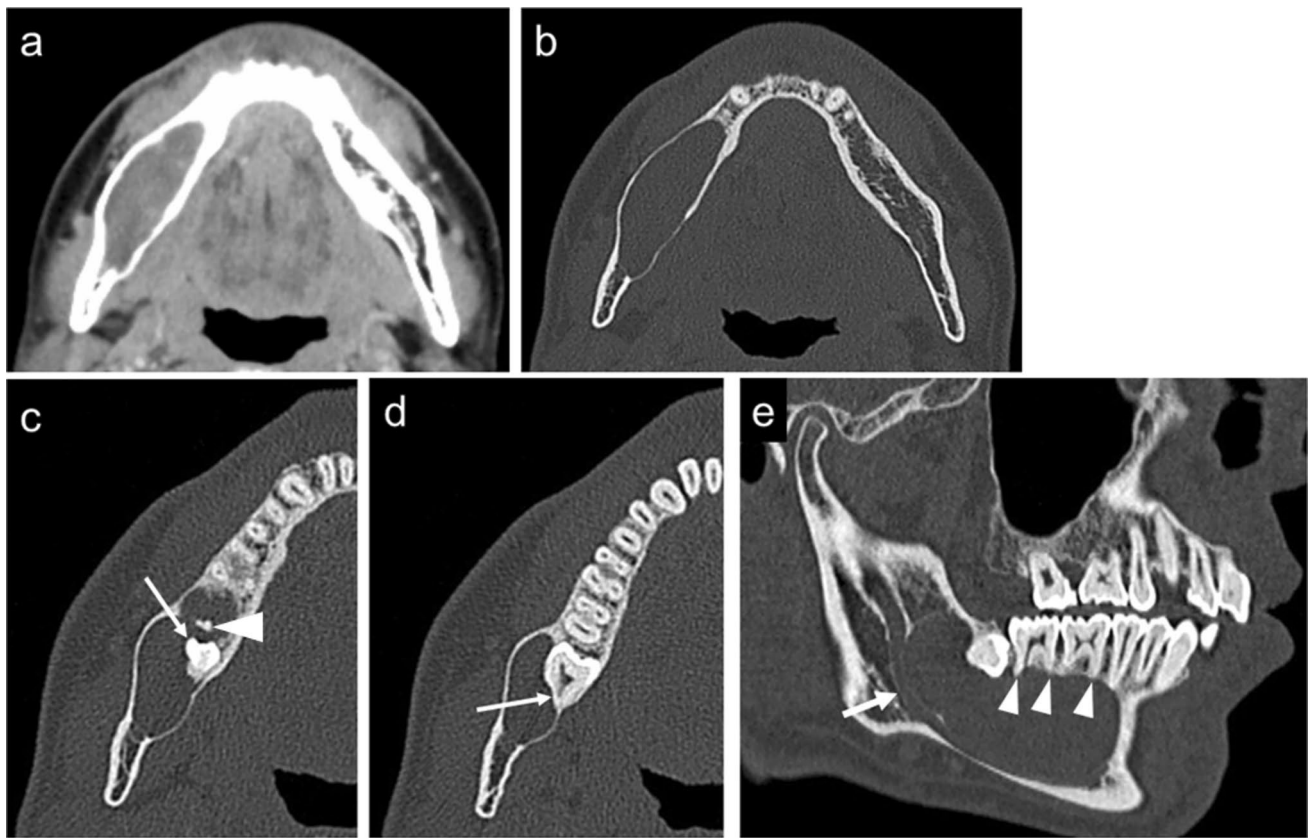


Fig. 2 CT shows a slight expansile lesion extending from the second premolar region to the retromolar pad region. The internal density of the lesion is inhomogeneous and mostly lower attenuation than muscle on soft-tissue density window-setting (a). On axial bone window-setting images, the expansion of the mandible by the lesion is moderate to the buccal side and slight to the lingual side, with thinning of both sides of cortical bone (b). The part of the third molar

crowns (arrow) is located in the lesion (c). A part of the resorbed second molar’s distal root (arrowhead) appears mesial to the third molar crown (c). The root of the third molar is resorbed (arrow) along the border of the lesion (d). The root resorptions (arrowheads) are seen at the first molar and second molar along the border of the lesion (e). The inferior alveolar canal (arrow) is displaced caudally by the lesion (e)

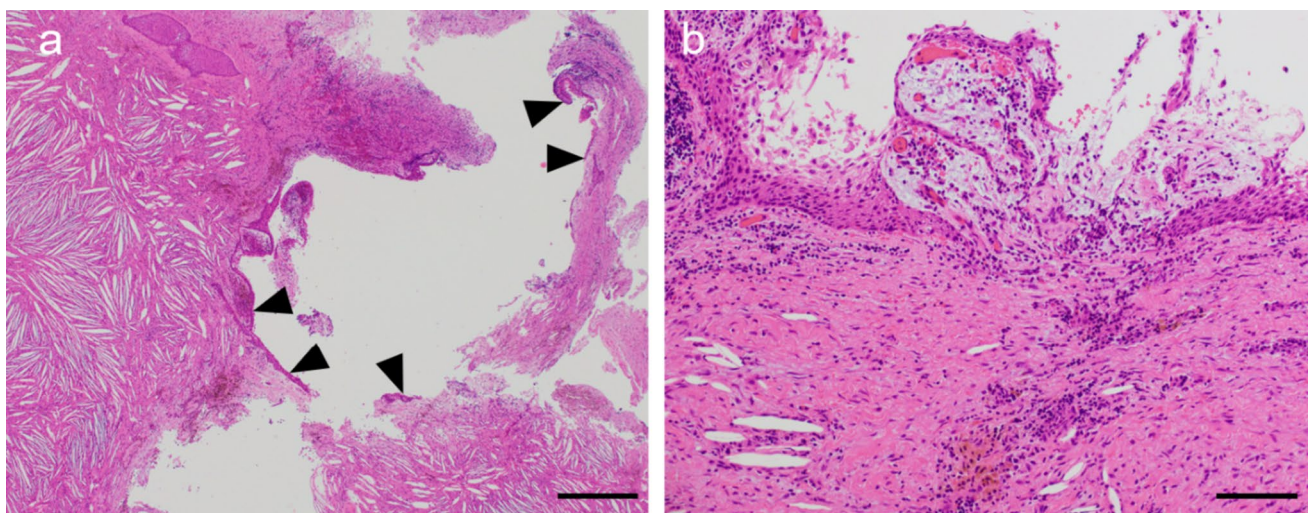


Fig. 3 Histological specimens of case 1 by mandible cystectomy were shown. A cyst structure consisting of cyst cavity and wall was observed. The cyst wall composed of lining epithelium (arrowheads),

fibrous connective tissue, and cholesterol crystals. Scale bar, 500 μ m in the lower magnification (a) and 100 μ m in the higher magnification (b)

Case 2

A 53-year-old man was referred to our hospital with a complaint of left mandibular swelling. The patient had noticed an abnormal bulging of the posterior region of the left mandible for about 1 month. The patient's attending dentist pointed out a radiolucent lesion of the mandible with the X-ray examination and was referred to our hospital. There was no pain in the mandible. The vitality test was negative for the left second molar, and positive on other teeth that touched the lesion. Intra-orally, there was a slight swelling on the molar region of the mandible.

On panoramic radiography, a radiolucent lesion was shown in the body and ramus of the mandible (Fig. 4). The horizontally impacted third molar was superimposed on the upper side of the lesion. There was a septal wall from the bottom of the lesion to the tooth root of the third molar. The tooth root resorption occurred with #33-#37 superimposed on the upper border of the lesion. The mandibular border expands downward with thinning, and the inferior alveolar canal is displaced caudally. The radiological appearances evoked ameloblastoma.

Plain CT was performed. The lesion was expanded slightly from the distal region of the canine to the slight upper level of the mandibular foramen (Fig. 5). The slight expansion of the body of the mandible as well as the mandibular ramus was seen with thinning of cortical bone on bone window-setting. The internal density of the lesion was inhomogeneous and low attenuation with small parts of

slightly higher attenuation on soft-tissue density window-setting. All adjacent tooth roots of #33-#37 were resorbed. The left third molar was horizontally located in the lesion touching the buccal border of the lesion. With the CT appearances, odontogenic keratocyst was suspected.

The biopsy resulted in a “developmental cyst with inflammation.” After marsupialization, the lesion was excised surgically. A cystic structure lining non-keratinized squamous epithelium was observed (Fig. 6). The connective tissue under the epithelium showed hemosiderin deposition and mild inflammatory cell infiltration. Pathological findings were negative for odontogenic keratocyst or tumor. At this point, a dentigerous cyst and paradental cyst were suspected. However, as the third molar did not erupt and had no pain related to the inflammation, a paradental cyst was not suspected.

These clinical and pathological findings led to a diagnosis of the dentigerous cyst with inflammation.

Discussion

There are three diagnostic points suspected to be other odontogenic lesions primarily on panoramic radiography for our two cases. The points are “the lesion involvement for the associated unerupted third molar,” “the extent of the lesion,” and “root resorption of adjacent teeth.”

The dentigerous cysts are mostly located at the mandibular third molar [1]. The radiolucent lesion enclosing the



Fig. 4 Panoramic images show a radiolucent lesion in the body and ramus of the mandible. The third molar was impacted horizontally superimposing on the upper side of the lesion. There is a septal wall (arrow) from the bottom of the lesion to the tooth root of the

third molar. The tooth root resorption occurred with #33-#37 superimposed on the upper border of the lesion. The mandibular border expands downward with thinning and also the inferior alveolar canal is displaced caudally

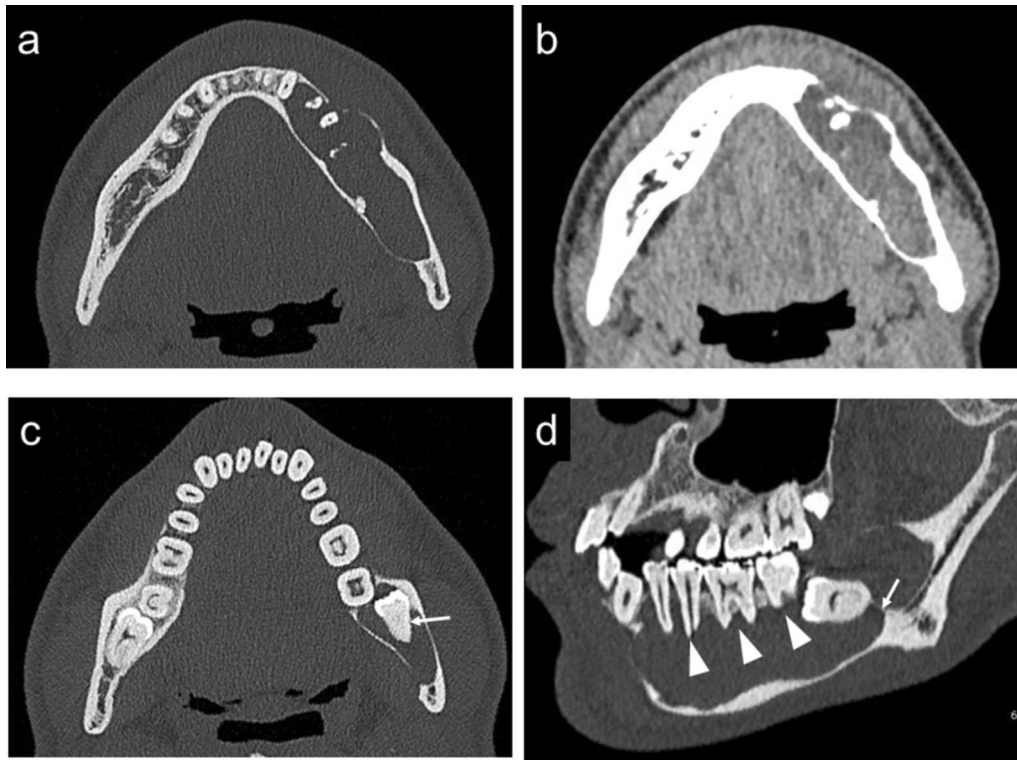


Fig. 5 The lesion was expanded slightly from the distal region of the canine to the mandibular ramus with thinning of cortical bone on bone window-setting (a). The internal density of the lesion was inhomogeneous and low attenuation with small parts of slightly higher attenuation on soft-tissue density window-setting (b). The left third

molar (arrow) was horizontally located in the lesion touching the buccal border of the lesion (c). There is a septa (arrow) from the root apex of the third molar to the bottom of the lesion (d). All adjacent teeth roots of #33–#37 (arrowheads) were resorbed (d)

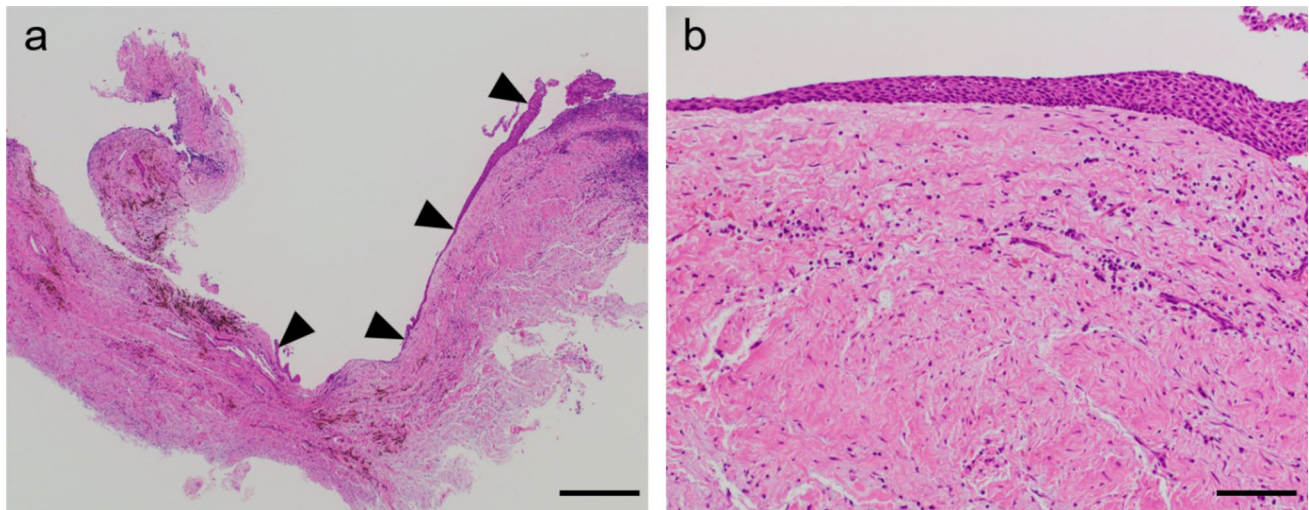


Fig. 6 Histological specimens of case 2 by mandible cystectomy were shown. A cyst wall-like membranous tissue was observed. The cyst wall composed of lining epithelium (arrowheads) and tight fibrous

connective tissue. Scale bar, 500 μm in the lower magnification (a) and 100 μm in the higher magnification (b)

crown of the third molar is the typical appearance on radiography. Caruso et al. [10] evaluated the histopathologic outcomes of pericoronal radiolucencies and identified factors predictive of diagnosis. They concluded that the majority of pericoronal radiolucent lesions were dentigerous cysts. In the two cases of this report, the lesions were typically associated with the unerupted third molar. However, we did not consider the third molar was mainly related to the lesion, since the lesions were relatively large and did not seem to form around only the crown by touching the cemento-enamel junction of the third molar on radiography. The upper border of the lesion across the horizontal third molar and a part of the crown was located upper outside of the lesion on the panoramic image in case 1. A whole of the third molar was superimposing the superior part of the lesion in case 2. Terauchi et al. [6] examined the characteristics of 257 dentigerous cysts developed around a mandibular third molar on panoramic radiographs. They divided the positions of the cyst into “crown side type” and “whole-tooth type” and had a result that the crown side type was significantly seen at a rate of 68.5%. “Whole-tooth type,” in which the cyst surrounds the crown as well as the root of the associated third molar was seen in 31.5%. Our cases are both considered to be the “whole-tooth type” if they are divided by the methods of Terauchi et al. In case 1, CT revealed that the cyst was involved in most of the crown. In case 2, CT revealed that the whole third molar was embedded in the cyst and located buccal side of the cyst.

The extent of the lesion was also one of the diagnostic points that we did not suspect a dentigerous cyst priority. In case 1, the lesion was extending from the posterior region of the root apex of the third molar to the first premolar region. The lesion of case 2 was larger than that of case 1. It was located from the mesial region of the left canine root to the mandibular canal level of the ramus of the mandible. Cardoso et al. [11] determined how the diagnosis of ameloblastoma, odontogenic keratocyst, and dentigerous cyst, may or may not be influenced by cone-beam computed tomography. They concluded that there were no differences between quantitative and qualitative features of odontogenic keratocyst and dentigerous cysts although Cone-beam computed tomography images revealed that the ameloblastomas were greater in size and expansion compared to the odontogenic keratocyst and the dentigerous cysts. Tsukamoto et al. [12] analyzed radiologically the dentigerous cysts and odontogenic keratocyst associated with a mandibular third molar. They found that the area of the odontogenic keratocyst was significantly larger than that of the dentigerous cysts. Caruso et al. [10] described that larger lesions were independent predictors of another pathologic lesions. With Tsukamoto et al.’s and Caruso’s results, it is hard for us to suspect a dentigerous cyst more than an odontogenic keratocyst in our two cases.

Tsukamoto et al. [12] analyzed the radiological features between dentigerous cysts and odontogenic keratocyst. They concluded that a cyst is more likely to be an odontogenic keratocyst rather than a dentigerous cyst if the patient is younger, the cyst has a larger area, and the third molar is not far from an adjacent second molar. In both cases, the patients were older, 40–50 decades, the lesions were larger, and the third molar was in contact with an adjacent second molar. These cases would be considered to be odontogenic keratocyst following the results by Tsukamoto et al.

A dentigerous cyst has the propensity to displace and resorb adjacent teeth [1]. The root resorption was seen with overlapping a couple of teeth in both cases. Such root resorption of the adjacent tooth or the involved teeth in dentigerous cysts were demonstrated on panoramic radiograph and CT in a couple of reports [8, 9, 13]. The frequency of root resorption of adjacent tooth roots for ameloblastomas and jaw cysts were assessed by Struthers and Shear [14]. In the results, ameloblastomas appeared generally to produce a more extensive resorption than cysts. The percent of producing root resorption in dentigerous cyst was 55% and the highest rate among the four kinds of cysts. Teo et al. [15] had similar results with them about the external root resorption in common odontogenic cysts and ameloblastomas of the jaw. Suda [16] assessed the role of reduced enamel epithelium in root resorption for impacted maxillary permanent canines causing root resorption of the neighboring central and lateral incisors in such cases. This root resorption by the lesion is one of the differential diagnostic points between a dentigerous cyst and an odontogenic keratocyst, because an odontogenic keratocyst is less likely to resorb teeth [1]. It is suggested that the root resorption of adjacent tooth appears less likely in the jaw cysts compared to the ameloblastoma; however, the dentigerous cyst has the greatest tendency of adjacent root resorption among the jaw cysts. Retrospectively, a dentigerous cyst should have been suspected as one of the differential diagnosis in our two cases, since an odontogenic keratocyst which is less likely to occur adjacent tooth root resorption had been included.

There is a tendency that unerupted tooth associated with a dentigerous cyst to be displaced in an apical direction [1]. The mandibular third molars related to the dentigerous cyst were not displaced in an apical direction on panoramic radiography in our cases. Instead, CT revealed that the horizontal third molar was pushed and displaced in a lingual direction in case 1 and was located inside the lesion in case 2.

In case 2, there was a septa-like radiopaque line from the root apex of the third molar to the lower border of the lesion; thus, the lesion looked like a double cystic. Generally, dentigerous cysts are unilocular and attach to the neck of the associated tooth. Possibly, the septa-like structure might be the peripheral wall originally touched the cemento-enamel junction of the third molar. As it expands, the

corticated periphery of the lesion could have been displaced to the root apex.

Alves et al. [17] evaluated that mandibular odontogenic keratocyst and ameloblastoma by panoramic radiograph and computed tomography. They concluded that CT provides more precise information on buccolingual expansion, calcification, bone septa, perforation of cortical bones and tooth resorption, features that are frequently underdescribed in the literature, particularly in odontogenic keratocyst. In our report, CT provides an additional information, such as the direction of the extent, the relationship between the lesion and the associated tooth, and the contents of the lesion. In case 1, CT images showed the lateral and occlusal parts of the third molar were located in the lesion and the root of the third molar was resorbed. Also, the lesion had slight buccolingual expansion and was non-enhanced inside the lesion. In the meantime, CT of case 2 revealed that the third molar was entirely enclosed and located at the slight lateral side of the lesion. The lesion showed lower attenuation than muscle and was slightly inhomogeneous. CT also showed the septum-like structure from the root apex of the third molar to the bottom of the lesion seen on the radiography. Even with precise findings for each case, a dentigerous cyst was not suspected primarily.

In our two cases, odontogenic keratocyst or ameloblastoma suspected by imaging findings was excluded by histopathological results. However, the dentigerous cyst was not differentiated from the paradental cyst only with the pathological findings. The paradental cyst is an odontogenic cyst of inflammatory origin, which occurs on either the buccal, distal, or (rarely) mesial aspects of partially erupted mandibular third molars [18, 19]. The paradental cyst was eliminated, since the third molar did not erupt and there is no inflammatory finding in our both cases. Therefore, a final diagnosis was made with pathological results and clinical findings.

The histopathological results in our two cases revealed that both cysts were inflamed. The cause of inflammation was unclear on panoramic radiography as well as CT; however, it is easy to occur inflammatory change between the second molar and the horizontal third molar. It may be suggested in both cases, the lesion was getting large and resorbed the adjacent teeth roots aggressively, since the dentigerous cyst was inflamed.

Two cases of dentigerous cysts suspected the other lesions on panoramic radiography and CT were introduced. Even if a relatively large lesion does not seem to form around the crown of the unerupted tooth on panoramic radiography and CT, a dentigerous cyst should be included as a differential diagnosis when it is located at the posterior body of the mandible related to the impacted third molar and occurs adjacent tooth root resorption on panoramic radiography and CT.

Acknowledgements This study was supported by Well-being Project, Tokyo Dental College.

Data availability The data that support the findings of this case report are available from the corresponding author upon reasonable request.

Declarations

Ethical standards This article does not contain any studies with human or animal subjects performed by the any of the authors.

Informed consent Additional informed consent was obtained from all patients for which identifying information in included in this article.

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