Case Report

Pathologies of Impacted Teeth: A Cone-Beam Computed Tomography Diagnosis

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Abstract

An impacted tooth is the one which fails to erupt into its anatomic position due to various factors such as malposition, lack of space, or other impediments. The prevalence of impacted tooth varies with geographic locations and has been estimated to be between 8% and 38%. An impacted tooth can be a nidus for dental caries, infection, destruction of adjacent teeth, periodontal disease, and even oral and maxillofacial cysts or tumors. Therefore, careful evaluation of the history and the clinical and radiographic findings and knowledge about the various maxillofacial cysts and tumors help a clinician to arrive at early diagnosis and render proper treatment to a patient. The recent advancements made in the field of radiology, especially the cone-beam computed tomography (CBCT), is a boon to dentistry. The three-dimensional imaging has made CBCT the preferential imaging modality for the evaluation of unerupted/impacted or supernumerary teeth and also in the evaluation of odontogenic and nonodontogenic cysts/tumors of the jaws. The varied radiographic appearances of cysts/tumors in the maxillofacial region help in precise differentiation of the pathology and prompt the clinicians to arrive at an accurate early diagnosis. This article discusses three case reports of maxillofacial cysts/tumors associated with an impacted tooth where radiology plays an important role in the diagnosis of the lesions.

Keywords: Adenomatoid odontogenic tumor, dentigerous cyst, impacted tooth, radiology

Introduction

In 1954, Mead defined an impacted tooth as a tooth that is prevented from erupting into its anatomic position because of various factors such as malposition, lack of space, or other impediments. According to Farman in 2004, the impacted teeth are those teeth that prevented from eruption due to a physical barrier within the path of eruption.[1] Tooth impaction is a frequent phenomenon, but the prevalence and distribution of these impacted teeth may vary considerably based on their location in the jaws. The mandibular third molars, maxillary canines, maxillary and mandibular premolars, and maxillary central incisors are the most common teeth to get impacted. According to the literature, the prevalence of impacted tooth varies with geographic locations and has been estimated to be between 8% and 38% with a female predilection. An impacted tooth can be a nidus for dental caries, infection, destruction of adjacent teeth, periodontal disease, and even oral and maxillofacial cysts or tumors. According to the literature, it has been found that cystic or neoplastic lesions are seen in proximity to the impacted tooth in 16% of cases, with its peak incidence during the second and third decades of life.[2]

The complete relevant history from the patient and careful consideration of the location of the lesion within the jaw, its borders, internal structure, and effects on surrounding structures generally allow a clinician to narrow down the differential diagnosis.[3]

Oral and maxillofacial radiography remains the first step in the diagnostic approach to jaw lesions, and the panoramic view is employed as the initial imaging technique for the evaluation of impacted teeth and related pathology.[2] The three-dimensional imaging has made the complex craniofacial structures more accessible which helps in early and precise diagnosis of deep-seated lesions.[4] The introduction of cone-beam computed tomography (CBCT) has changed the way oral and maxillofacial radiology is practiced. It has been a boon in the...
field of maxillofacial radiology. It provides three-dimensional images and images of high diagnostic quality as compared to that of two-dimensional imaging and even less radiation dose as compared to that of CT. It has vast applications in the field of dentistry. Its ability to demonstrate the location, three-dimensional extent, anatomical relations, and good resolution is aiding in accurate diagnosis and treatment plan of tumors and cysts affecting the jaws. Certain odontogenic and nonodontogenic cysts/tumors of the maxillofacial region are characteristically associated with impacted teeth and their radiographic appearances aid in precise differentiation of pathologies. Therefore, the use of three-dimensional advanced imaging modality such as CBCT is indispensable in arriving at an accurate diagnosis and treatment planning.

This article deals with three cases of lesions associated with impacted tooth reported to the Department of Oral Medicine and Radiology, Panineeya Mahavidyalaya Institute of Dental Sciences and Research Centre, Hyderabad, where CBCT imaging has unveiled the hidden pathology.

**CASE REPORTS**

**Case 1**

A 9-year-old female patient reported to the outpatient department (OPD), with the chief complaint of painless swelling in the left lower side of the face region which gradually increased in size since 1 month.

On extraoral examination, there was a diffuse swelling on the left mandibular region measuring approximately 3 cm × 3 cm, hard in consistency, and nontender [Figure 1]. The single-submandibular lymph node was palpable bilaterally, which was soft in consistency, mobile, and nontender. On intraoral examination, there was an obliteration of the left lower buccal vestibule extending from 74 to 36 [Figure 2]. On palpation, it was firm in consistency and nontender.

The CBCT scan [Figure 3] revealed well-defined unilocular pericoronal radiolucency with sclerotic border involving the left body of the mandible with impacted 35 seen within the radiolucency, and histopathological examination was suggestive of a dentigerous cyst.

**Case 2**

A 30-year-old male patient reported to the OPD, with the chief complaint of painless swelling in the left lower third region of the face since 6 months.

On extraoral examination, a diffuse swelling on the left mandibular region measuring approximately 3 cm × 2 cm, firm to hard in consistency, and nontender on palpation. A single-submandibular lymph node was palpable bilaterally, which was soft in consistency, mobile, and nontender.

On intraoral examination, there were retained 73,74 and missing 33,34. A swelling was seen in the left lower buccal vestibule measuring approximately 2 cm × 2 cm extending from 32 to 35 with buccal cortical expansion [Figure 4]. On palpation, the swelling was hard in consistency and nontender.

The CBCT scan [Figure 5] revealed well-defined unilocular pericoronal radiolucency with impacted tooth 35 and corticated border involving the left body
of the mandible with impacted and distally displaced 34 and impacted and inferiorly displaced 33 seen within the radiolucency. The resorption of the roots of retained deciduous 73, 74 and the mesial displacement of the root 32 were seen. The axial and coronal sections of CBCT showed buccal cortical expansion [Figure 6]. The histopathological findings were suggestive of odontogenic keratocyst (OKC).

Case 3
A 17-year-old female patient reported to the OPD, with the chief complaint of retained milk tooth in the right upper front tooth region.

On intraoral examination, a diffuse swelling was seen in the right upper buccal vestibule measuring approximately 3.5 cm × 2 cm extending from 11 to 16 [Figure 7]. A diffuse mild swelling was seen on the right palatal aspect extending from 52 to 15. On palpation, the swelling was nontender and firm to hard in consistency. On hard tissue examination, retained deciduous teeth 52, 53, and 63 were seen. The pulp vitality test revealed nonvital teeth in relation to 11, 15, and 16.

The CBCT scan revealed a large well-defined radiolucency involving the right maxillary anterior region with corticated margins with the crown of 12 noticed in the superior-mesial aspect of the radiolucency near the nasal fossa and the tooth 13 seen at the distal aspect of the radiolucency [Figure 8]. The expansion of the buccal and palatal cortical plates and a rim of radiopaque flecks can be appreciated at the periphery [Figure 9], and the histopathological findings were suggestive of adenomatoid odontogenic tumor (AOT).

Discussion
Dentigerous cyst, also known as follicular cyst, is the second most common odontogenic cyst after radicular cysts.[7] It occurs with a frequency of 1.44% for every 100 unerupted teeth.[8] They account for 20%–24% of the entire epithelial-lined jaw cysts with peak incidence during the second and third decades of life.[8] However, it is seen in children and adolescence during mixed dentition period.[8,9] The prevalence of dentigerous cysts is twice as high in male patients as compared to female in contrast to the present case. Dentigerous cysts are usually solitary, slow-growing, and asymptomatic lesions that are seen as incidental finding during
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Figure 8: The cone-beam computed tomography scan reveals a large well-defined radiolucency with impacted tooth 12

Figure 9: The sagittal section of cone-beam computed tomography scan shows the rim of radiopaque flecks at the periphery

the routine radiographic examination for a missing tooth. They can occur at any location of the jaw but frequently associated with the impacted mandibular third molars followed by the maxillary canines and maxillary third molars. Occasionally, these cysts become infected causing swelling and pain. The large cysts cause expansion and thinning of the cortex resulting in pathologic fracture.[8]

Radiograph shows characteristic features of a well-defined radiolucency surrounded by a sclerotic border which is associated with the crown of an impacted or unerupted tooth. However, the infected cysts show ill-defined borders. Although they mimic a normal dental follicle, literature suggests that any follicular space of >4 mm can be categorized as dentigerous cyst. Based on the radiographic features, the dentigerous cysts are classified according to its relationship with the involved impacted tooth crown as central, lateral, and circumferential variants. The central type is the most common and presents encircling the entire crown. The lateral dentigerous cyst partially encircles the crown and extends along the side of the root. The circumferential variant encircles the entire crown and the root of the involved tooth.[9] Differential diagnoses of such radiolucency include radicular cyst, OKC, and odontogenic tumors such as ameloblastoma and pindborg tumor.[7] Similarly in the reported case, CBCT scan revealed displaced, buccolingually oriented impacted 35 with pericoronal radiolucency extending from the cementoenamel junction (CEJ), suggesting dentigerous cyst which was not evident on two-dimensional radiographs.

The term OKC was first used by Philipsen in 1956. It is a developmental odontogenic cyst derived from the dental lamina remnants with a biologic behavior similar to a benign neoplasm. OKC constitutes for about 3%–21.5% of odontogenic cysts. OKCs are more frequently seen in the second and third decades of life with male predilection. Multiple OKCs are unusual, and their occurrence is often associated with various syndromes such as nevoid basal cell carcinoma syndrome (NBCCS), Ehlers–Danlos syndrome, Noonan syndrome, orofacial digital syndrome, and Simpson–Golabi–Behmel syndrome.[10]

However, studies reveal that 5.8% of multiple OKCs are not associated with any syndrome and that approximately 8.1% were associated with NBCCS. Clinically, OKC manifests with swelling, pain, and discharge. Radiographically, these lesions present as well-defined unilocular or multilocular radiolucency similar to ameloblastoma, and when associated with impacted teeth, they often mimic a dentigerous cyst. In the present case, the CBCT sections had not only revealed the anatomic extensions of well-defined radiolucency with the impacted left mandibular canine and the first premolar but also characteristic scalloped margins and lesser extent of buccolingual expansion, suggestive of OKC, which was not clearly evident in the two-dimensional radiography.

AOT is a rare, noninvasive, benign (hamartomatous) epithelial lesion of odontogenic origin, which accounts for approximately 2%–7% of all odontogenic tumors. AOT is seen among young patients, mostly females (male: female ratio = 1:1.9) during their second and third decades of life, with more tendency to occur in the maxillary anterior region.[11] There are three variants of AOT: a follicular variant (73% of all cases), with a central lesion associated with an impacted tooth; an extrafollicular variant (24% of all cases), which is not associated with an impacted tooth; and a peripheral variant (3% of all cases).[12] Radiographically, AOT is usually unilocular although a few multilocular cases have been reported. Radiographically, AOT mimics dentigerous cyst; however, the pericoronal radiolucency of a dentigerous cyst does not extend beyond the CEJ of the tooth. Secondly, AOT has numerous, flecks of radiopaque foci (78% of cases), which also distinguish them from dentigerous cysts. Tumor expansion causes displacement of the adjacent teeth, rather than root resorption.[13] In the present case, CBCT had an immense role in the identification of the superiomesially displaced impacted 12 near the nasal fossa, posteriorly displaced impacted 13 and in delineating the extension of the radiolucent lesion and its anatomic relationship with the crown and root of the involved impacted tooth and extent of encroachment of maxillary sinus.
and adjacent vital structures. The rim of radiopaque flecks seen at the periphery of the radiolucent lesion was characteristic of AOT, thus proving exemplary role of CBCT in the diagnosis and thereby the treatment.

**Conclusion**

When clinicians encounter a lesion with an impacted tooth, apart from dentigerous cyst, OKC, and AOT, other lesions such as calcifying odontogenic cysts, unicystic (mural) ameloblastomas, ameloblastomas, ameloblastic fibromas, calcifying epithelial odontogenic tumors, ameloblastic fibro-odontomas, and odontomas should also be considered, based on other criteria such as their overall prevalence in, age, sex, the predominantly involved jaw and tooth, location, and radiographic features. The striking radiographic features which can be well appreciated with the three-dimensional imaging modality like CBCT will help the dental practitioners to arrive at accurate diagnosis and tailor better treatment plans.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

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