

# Aggressive Calcifying Epithelial Odontogenic Tumor of the Maxillary Sinus with Extraosseous Oral Mucosal Involvement: A Case Report

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## What's Known

- CEOT is a benign tumor. The intraosseous variants are common, whereas extraosseous variants are rare.

## What's New

- The new finding in the present study was the presence of the intraosseous tumor with the extraosseous involvement, indicating the aggressive behavior and higher chances of recurrence.
- Our results highlighted the importance of the histopathological examination of the complete specimen even in benign tumors.

## Abstract

Calcifying epithelial odontogenic tumors are benign odontogenic neoplasms whose occurrence in the maxillary sinus is rare. Maxillary tumors tend to be locally aggressive and may rapidly involve the surrounding vital structures. We report a case of a large calcifying epithelial odontogenic tumor of the maxilla, involving the maxillary sinus in a 48-year-old woman. The tumor was largely intraosseous. In the canine and first premolar regions, the loss of bone could be palpated but the oral mucosa appeared normal. Histologically, the tumor tissue could be seen in the connective tissue below the oral epithelium. The most significant finding was the presence of an intraosseous tumor with an extraosseous involvement in a single tumor, indicating aggressive behavior and warranting aggressive treatment. In this article, we discuss the rare presentation of the tumor and its radiological appearance and histological features. We also highlight the importance of a detailed histopathological examination of the excised specimen.

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**Keywords** • Calcifying epithelial odontogenic tumor • Maxillary sinus • Epithelium

## Introduction

The calcifying epithelial odontogenic tumor (CEOT) is an uncommon benign odontogenic tumor usually occurring in the jaw bones. Thoma and Goldman<sup>1</sup> identified it as a neoplasm arising from the odontogenic epithelium. Later in 1955, Dutch pathologist Jens Jorgen Pindborg recognized it as a distinct entity. In honor of the distinguished pathologist, this lesion was named the Pindborg tumor.<sup>2</sup>

The CEOT is a rare odontogenic tumor, with an occurrence frequency of 0.1 to 1.8%. No gender predilection has been noticed. It is most common in the mandible, and the ratio of the occurrence in mandible to maxilla is 2:1. The most favored site is the mandibular posterior region, and 60% of these tumors are associated with an unerupted third molar. Age at the time of diagnosis is usually between the second and sixth decades, with a mean age of 40 years. The vast majority of cases are intraosseous, and approximately 6% of them arise in extraosseous locations.<sup>3</sup>

The posterior region is the most common site of occurrence in the maxilla. The prevalence in the molar region is 3 times that in

the premolar region. The maxillary CEOT with the involvement of the maxillary sinus is very rare.<sup>4,5</sup> We report a case of an aggressive CEOT of the maxilla involving the entire left maxillary sinus with oral mucosal involvement.

### Case Report

An incision biopsy of the lesion from the maxillary sinus was submitted to the Department of Oral Pathology at Sree Balaji Dental College and Hospital. The patient was a 48-year-old woman with a chief complaint of swelling in the region of the right upper jaw of 1 year's duration. The clinical data provided by the referring dental surgeon was a swelling, 5×4 cm in size and irregular in shape, extending from the right maxillary canine region to the second molar region. Medially, it extended from the lateral aspect of the nose to 1 cm anterior to the tragus of the ear. The swelling was painless and bony hard. The loss of bone could be palpated at the periapical region of the canine and the first premolar tooth. The lateral incisor to the first molar tooth on the involved side of the maxilla was mobile (grade I). The oral mucosa at the involved region appeared normal. The patient did not have any associated pain or difficulty in chewing.

A computed tomography scan showed a well-defined mixed radiolucent-radiopaque lesion involving the right maxillary sinus. Destruction of the buccal cortical plate was noticed in 1 area. No invasion into the other vital structures was noted. Accordingly, a provisional diagnosis of an ossifying fibroma was made (Figure 1).

The histopathology of the incision biopsy demonstrated sheets of polyhedral epithelial cells in a moderately collagenous connective tissue. The epithelial cells of the tumor had well-defined cell borders. They had bright eosinophilic cytoplasm and large hematoxyphilic nuclei. Mild cellular and nuclear pleomorphism was noticed. Homogenous eosinophilic material representing amyloid-like material was noticed. Calcifications in the form of Liesegang's rings were also seen. Inflammation was minimal. A histopathological diagnosis of a CEOT was, therefore, given.

An enucleated specimen was submitted for histopathological examination. The formalin-fixed tissue was a single mass, pearly white in color and firm in consistency. On sectioning, numerous irregular calcifications were seen in association with the soft tissue (Figure 2).

The histopathology of the excision biopsy yielded the same picture as did the incisional biopsy. However, at 1 area, the tumor was seen in the connective tissue, adjacent to the

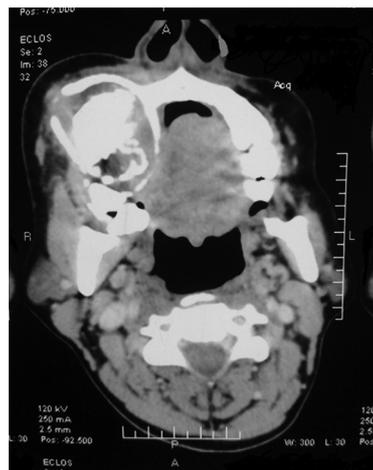


Figure 1: Computed tomography shows a mixed radiolucent-radiopaque lesion involving the maxillary sinus. The peripheral bone appears to be discontinuous in a few areas.

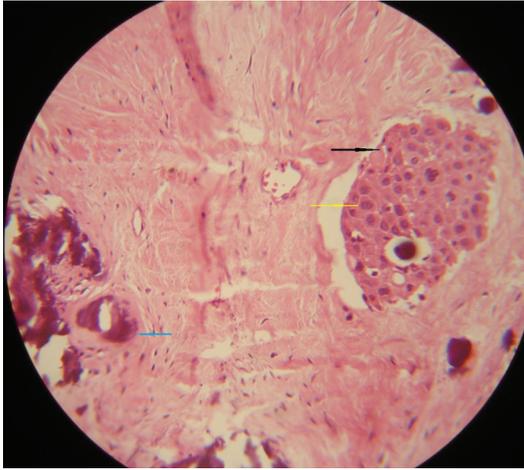


Figure 2: The formalin-fixed specimen is firm, and the cut surface shows numerous irregular calcifications associated with the soft tissue.

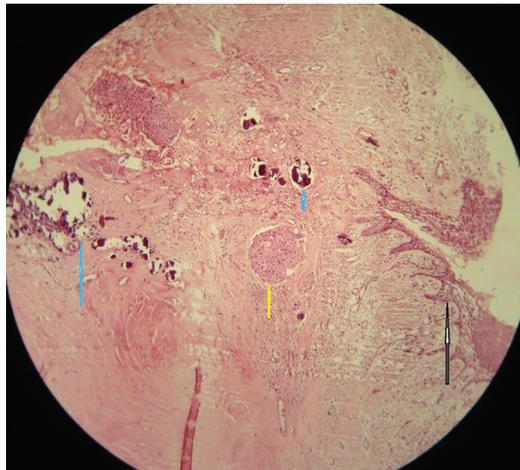
oral mucosal epithelium (Figures 3 and 4). No features of malignant transformation were noticed. A 3 to 4 mm of the soft tissue surface shaving from the whole of the enucleated specimen was examined; it showed only a dense fibrous connective tissue without any tumor tissue. A histopathological diagnosis of a CEOT with extraosseous involvement was made. Given the aggressive nature of the lesion, regular clinical follow-up was advised. The postoperative period was uneventful. The patient provided consent for this case report. No features of the recurrence were present for 1 year postoperatively, after which time we lost the follow-up.

### Discussion

The origin of the tumor cells is hypothesized to be from the stratum intermedium of the enamel



**Figure 3:** Hematoxylin and eosin-stained sections show a sheet of polyhedral epithelial cells (yellow arrow), associated with homogenous eosinophilic amyloid-like material (black arrow). Numerous Liesegang's rings (blue arrow) are seen in a moderately collagenous connective tissue (magnification, -40x).



**Figure 4:** Hematoxylin and eosin-stained sections show parakeratinized stratified squamous oral mucosal epithelium (black arrow) with the connective tissue revealing sheets of polyhedral epithelial cells with homogenous eosinophilic amyloid-like material (yellow arrow) and Liesegang's rings (blue arrow) (magnification, 10x).

organ. Another hypothesis favors the origin of the tumor cells from the cells of the dental lamina found in the initial stage of odontogenesis and the remnants of the dental lamina.<sup>3</sup>

The CEOT usually presents as an asymptomatic slow-growing bony-hard swelling. The presence of symptoms is usually due to the mechanical compression of the tumor on the vital structures. When the lesion involves the maxillary sinus, the patient may complain of nasal stuffiness, nasal obstruction, headache, and epistaxis.<sup>5</sup>

In the Asian population, the CEOT shows a predilection for the maxilla, whereas in the Western population it shows a higher mandibular

prevalence.<sup>6</sup> Ninety-five percent of the tumors are intraosseous, and the extraosseous type is the rarest (5%) of all CEOTs.<sup>6</sup> A similar case, where an intraosseous tumor involved the oral epithelium in a CEOT of the mandible and exhibited an aggressive behavior, was reported by Vinayakrishna et al.<sup>7</sup>

The radiographic appearance of the CEOT is variable, depending on the stage of the development. Mixed radiolucent-radiopaque lesions are seen in 65% of the cases. Thirty-two percent of the tumors are completely radiolucent, and only 3% of the tumors are completely radiopaque with a “wind-driven snow” pattern. The association between the CEOT and the impacted tooth producing pericoronal radiolucency can mimic dentigerous cysts. The radiographic borders of the lesion may be noncorticated or diffuse on conventional radiography in about 80% of cases. Radiographically, it may be difficult to differentiate the CEOT from the ameloblastoma and the adenomatoid odontogenic tumor. On magnetic resonance imaging, the CEOT is seen as a hypointense tumor on T1-weighted images and as a mixed hyper intense tumor on T2-weighted images.<sup>8,9</sup>

Fine-needle-aspiration cytology smears are characterized by clusters, sheets, and rarely isolated pleomorphic polygonal epithelial cells. The cells have well-defined borders. Blocks of amorphous material encircled by fibroblasts and occasional calcifications can be seen.

The histopathological hallmark of the classic pattern is sheets of polyhedral epithelial cells with well-defined borders and prominent intercellular bridges. Amyloid-like substances and calcified concentric Liesegang's rings are the most classic findings.<sup>10,11</sup> Our patient had a classic pattern histologically. Other histological patterns<sup>3,12</sup> are listed in Table 1.

Five histological variants reported in the literature are as follows: 1) A CEOT with stromal cementum-like components, 2) a clear-cell CEOT, 3) CEOT-containing Langerhans cells, 4) a combined epithelial odontogenic tumor, and 5) a CEOT with myoepithelial cells.<sup>3,11</sup>

Immunohistochemically, the tumor cells show positivity for CK5/6, p63, and epithelial membrane antigen. Moderate reaction for vimentin and strong membranous positivity for podoplanin have been previously noted in the basal cells.<sup>13</sup>

The histological differential diagnosis to be considered is squamous cell carcinoma because of the cytological pleomorphism. The malignant transformation in the CEOT is indicated by high mitotic activity, increased nuclear pleomorphism,

**Table 1:** Five histopathological patterns of the calcifying epithelial odontogenic tumor (CEOT)

H/P pattern	Histopathological details
Pattern 1	-Polyhedral epithelial cells are arranged in the form of sheet nests or masses -Cellular outline and inter-cellular bridges are distinct -Cytoplasm is deeply eosinophilic and the nuclei are prominent -Cellular and nuclear abnormalities are common. Mitotic figures are rare -Calcifications are seen as concentric Liesegang's rings in the connective tissue stroma
Pattern 2	-Tumor cells are arranged in the cribriform pattern -Cellular outline is distinct, but the intercellular bridges are not prominent -Nuclear pleomorphism and cellular abnormalities are rare -Liesegang's ring-like calcification is seen in between the tumor cells
Pattern 3	-Tumor epithelial cells are pleomorphic and are scattered or arranged as a dense mass -It is common to find multinucleated giant cells -Mucoïd material can be present in the stroma
Pattern 4	-Tumor cells are arranged as nests and cords -Cytoplasm may be eosinophilic, vacuolated, or clear -Connective tissue stroma may contain eosinophilic homogenous material or calcifications -This is a clear cell variant of the CEOT
Pattern 5	-Nests of tumor epithelial cells are similar to the salivary gland neoplasm

increased proliferative activity measured with the MIB-1 index, and vascular invasion.<sup>3</sup>

The extraosseous variant of the CEOT usually presents as a painless hyperplastic tissue at the gingival region without any specific clinical-radiological features. It is usually diagnosed during a routine dental checkup.<sup>2,14</sup> Nonetheless, our case cannot be qualified as a peripheral CEOT, instead it is an intraosseous tumor with extraosseous involvement.

The method of treatment depends on the size as well as the anatomical location of the tumor. Small tumors with well-defined borders present either in the maxilla or the mandible can be treated surgically by enucleation or by conservative en-block resection with a thin margin of the healthy bone. When the tumor is >4 cm, radical resection followed by reconstruction is necessary. The most important point is to obtain tumor-free hard and soft tissue surgical margins, which should be confirmed histopathologically. A CEOT involving the maxilla or the maxillary sinus tends to grow rapidly. Moreover, it can infiltrate the proximal vital structures such as the base of the skull and the orbit, suggesting that more aggressive surgery is required.<sup>10</sup> Our case was an aggressive lesion with the destruction of the buccal cortical plate.

Following conservative treatment, a local recurrence rate of 10 to 20% is observed in most studies. Malignant transformation and lymph node metastasis is rare and is reported in cases of multiple recurrence.<sup>10</sup>

## Conclusion

The CEOT of the maxilla with the involvement of the maxillary sinus is an aggressive lesion. It requires aggressive treatment and regular long-term follow-up.

**Conflict of Interest:** None declared.

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