Received Date : 08-Sep-2015

Accepted Date : 25-Oct-2015

Article type : case report (ADJ)

Title Page:

Central Calcifying Epithelial Odontogenic Tumour in the Posterior Maxilla: A Case Report

Authors: Dr Alyssa Zhang,# Dr Sarah Y Chaw,# Dr Anna A Talacko, Dr William J Besly, Associate Professor Neil W Savage, and Professor Paul A Monsour

# The first two authors contributed equally to this work.

Authors' affiliation:

School of Dentistry

The University of Queensland

288 Herston Road

Corner Bramston Terrace & Herston Road

Herston QLD 4006

Address for correspondence:

Dr Alyssa Zhang and Dr Sarah Y Chaw

School of Dentistry

The University of Queensland

288 Herston Road

Corner Bramston Terrace & Herston Road

Herston QLD 4006

Emails: alyssa.zhang@uqconnect.edu.au and sarah.chaw@uqconnect.edu.au

Phone: (07) 3365 8121 and (07) 3365 8129

Short running title: Central CEOT presenting in the posterior maxilla

Abbreviations and acronyms:

AOT = adenomatoid odontogenic tumour; CBCT = cone beam computed tomography; CCOT = calcifying cystic odontogenic tumour; CEOT = calcifying epithelial odontogenic tumour; COF = central ossifying fibroma; CT = conventional computed tomography; FOV = field of view

ABSTRACT:

The calcifying epithelial odontogenic tumour (CEOT) or Pindborg tumour is a rare, benign odontogenic tumour. CEOT is usually asymptomatic and an incidental radiological finding, often presenting as a mandibular radiolucency with flecks of calcific material. We report an unusual case of CEOT in the left posterior maxilla of a 46-year-old male that was associated with an unerupted tooth. The tumour in this case caused non-specific sinus symptoms and appeared radiographically similar to an odontoma or ossifying fibroma due to its dense calcific contents. Diagnosis was confirmed histologically following surgical removal of the lesion, which showed classic CEOT histomorphology. We report this case to highlight the unusual clinico-radiologic presentation and illustrate the diagnostic difficulties that can occur with radiolucent and/or radiopaque lesions in the jaws.

Introduction:

The calcifying epithelial odontogenic tumour (CEOT), or Pindborg tumour, is an uncommon slowly-growing, expansile tumour composed of odontogenic epithelium without odontogenic mesenchyme.[1, 2] It was first classified as a separate entity by J. J. Pindborg in 1955, but had been reported previously under other pseudonyms.[3] CEOT accounts for roughly one per cent of all odontogenic tumours, has a wide age distribution with a mean of 43.5 years, and has no gender or ethnic predilection.[1, 4, 5] CEOT usually presents as an asymptomatic benign tumour; however, there may be swelling and non-specific pain depending on lesion size and relationship with neighbouring structures, such as the maxillary sinuses. Limited cases of malignant transformation have also been reported.[5-8]

CEOT may be classified as intra-osseous (central) or extra-osseous (peripheral).[1] Most commonly, it presents as an intra-osseous lesion in the mandibular premolar/molar region. The central lesions are larger and more aggressive than the peripheral lesions, and can grow up to four centimetres in diameter.[2, 9] Peripheral CEOT is comparatively smaller (less than two centimetres in diameter), more localised, and often involves the anterior gingiva, which may lead to misdiagnosis as other epulides.[2, 9] Additionally, peripheral CEOTs have lower recurrence rates due to their less aggressive nature and also their clinical visibility that allows for earlier diagnosis.[2, 9]

Radiologically, central CEOT is often described as a pericoronal lesion with the classical feature of radiopaque flecks around the crown of an embedded tooth.[5] However, the radiological features of CEOT can vary greatly and range from a uniform radiolucency to a mixed radiopaque lesion, with either poorly-defined or distinct margins, and may be associated with an unerupted tooth.[2, 5] As the lesion enlarges, it may change from a unilocular to a more multilocular appearance with honey-comb features.[4] As an adjunct to conventional radiology, important three-dimensional information about the lesion can be attained from conventional computed tomography (CT) and cone beam computed tomography (CBCT) scans regarding the true lesion size, the pattern of growth, the presence of calcifications, and the relationship to adjacent structures.[10]

Definitive diagnosis of CEOT is based on histological assessment, which in most cases is very distinctive of the tumour. The histopathological features include:[1, 11]

1) Sheets, cords or nests of polyhedral epithelial tumour cells displaying nuclear pleomorphism and eosinophilic cytoplasm, without abnormal mitoses, in mature fibrous connective tissue;

2) Acellular homogenous eosinophilic hyaline material containing amyloid, confirmed by Congo Red positivity;

3) Dystrophic calcification within the hyaline material, often arranged in concentric rings (Liesegang rings).

We report a case of a large central CEOT occurring in the left posterior maxilla showing an atypical radiologic presentation but with classic CEOT histology.

Case Report:

A 46-year-old male presented to a dental practitioner reporting non-specific, mild left sinus symptoms. The patient also reported an awareness of left jaw expansion and restriction in jaw movements over the previous 12 month period. A panoramic radiograph (Fig 1) revealed large mixed radiopaque lesion in the left posterior maxilla, measuring approximately 5 x 4 cm. The margins were well-defined and corticated, extending antero-posteriorly from the region of the tooth 25 to the distal margin of the maxillary tuberosity, and infero-superiorly from the apices of the upper left molars to the orbital floor.

Further assessment with CBCT (Fig 2) revealed a large, heterogeneous, expansile lesion in the left maxilla, with displacement and elevation of the intact sinus floor. An unerupted molar was displaced superiorly by the mass, but was not grossly eroded. The radiological presentation suggested a benign and non-aggressive process, and an initial differential diagnosis of a complex odontoma or possibly a central ossifying fibroma was made.

An excisional biopsy of the lesion was undertaken via an intra-oral approach, and closure of the resultant oro-antral communication was achieved with a buccal mucosal and fat advancement flap. The specimen, comprising of the excised lesion along with the upper left second molar and the embedded tooth, was sent for histopathological assessment.

The macroscopic specimen comprised an aggregate of yellow and dark tan, gritty and bony tissue measuring 80 x 60 mm by up to 10 mm, along with two molar teeth. Microscopic examination (Fig 3) showed masses of irregular dystrophic calcification with areas of concentric ring arrangement which were associated with sheets of epithelium with hyperchromatic and mildly pleomorphic nuclei; there was no evidence of atypical mitotic activity. Some dystrophic calcification and epithelium lay within mature fibrous connective tissue. Sheets of acellular eosinophilic material consistent with amyloid, confirmed by Congo Red staining, were present in areas. Besides the molar teeth, no convincing evidence of dental hard material, such as cementum, dentine or enamel matrix was identified. The fragmented nature of the specimen did not allow assessment of the excision margins.

The histopathological features, taken in conjunction with the radiological features, were consistent with a diagnosis of calcifying epithelial odontogenic tumour (CEOT).

The six-month post-operative panoramic radiograph (Fig 4) and CBCT (Fig 5) showed sinus wall bone repair at the surgical site. A non-homogenous radiopaque mass with what appeared to be retained tooth structure was noted in the left posterior maxilla in the CBCT dataset – indicative of remnants of the primary CEOT – which was not clear on the conventional panoramic radiograph.

The rate of residual tumour growth is currently under review to determine the timing of further surgery via a LeFort I osteotomy approach to the posterior maxilla.

Discussion:

Due to its asymptomatic nature, CEOT is often an incidental radiologic finding with widely varying radiological features that can cause diagnostic confusion. Radiologically, it may appear similar to a dentigerous cyst, adenomatoid odontogenic tumour (AOT), calcifying cystic odontogenic tumour (CCOT), variants of ameloblastoma, odontoma, or a central ossifying fibroma.

From a radiological perspective, the dentigerous cyst, AOT, CCOT, and ameloblastoma were excluded as differential diagnoses as these lesions were not consistent with the radiographic presentation of the current CEOT. Approximately 60% of central CEOTs are associated with the crown of an unerupted tooth or odontoma and may at times resemble a dentigerous cyst; however this is only in the early stages where the CEOT appears more radiolucent, unlike the densely radiopaque lesion presented here.[2, 4, 5] AOTs and CCOTs can both appear as mixed density lesions, but typically present as radiolucencies with scattered radiopaque foci in the anterior jaws. AOTs are often found in the anterior maxilla of females in the second decade, and CCOTs can occur in the anterior maxilla or mandible and are usually associated with root resorption.[12-14] Similarly, early CEOTs that are radiolucent can also be mistaken for ameloblastomas, although ameloblastomas are commonly located in the posterior mandible, and are associated with root resorption and cortical destruction.[15, 16] Due to the intense radiopacity exhibited in the current lesion, an AOT, CCOT and ameloblastoma were radiologically excluded from the differential diagnosis. Importantly though, CEOT can occur in conjunction with a dentigerous cyst, AOT, or an

ameloblastoma as a hybrid lesion, which may be noted incidentally on histological examination.[2, 17-19]

Our differential diagnoses for the current case comprised a complex odontoma and central ossifying fibroma (COF). The complex odontoma classically presents as a haphazard radiopaque mass surrounded by a radiolucent halo.[20] Additionally, it may be associated with impacted teeth (often in the molar regions), can cause mild expansion, and is often detected in the second decade.[20, 21] The COF, on the other hand, often presents as a well-defined mixed density lesion in the mandibular molar regions. It causes expansion, and is often diagnosed in females in the third to fourth decades.[22] In the current case, due to the high level of tumour maturity, there was considerable expansion and extensive calcification in the lesion that gave it a densely radiopaque appearance, which exceeded that usually seen in a CEOT and was more suggestive of a complex odontoma or mature central ossifying fibroma.[3-5]

Despite the atypical radiological presentation, the lesion was histopathologically diagnostic of CEOT, displaying the distinctive histological features as described earlier in this report. CEOTs are thought to originate from the stratum intermedium or reduced enamel epithelium of odontogenic epithelium; hence their association with embedded teeth.[3, 4, 17, 23] Early histologic lesions resembling odontogenic cysts and tumours, including CEOT, have been found within dental follicles of third molars, and have potential to develop into true odontogenic cysts and tumours.[17, 23, 24] It is therefore possible that the CEOT presented here has developed from the follicle of the unerupted upper left third molar.

Both CT and CBCT are useful modalities for three-dimensional assessment of lesions in the dentomaxillofacial region; however there are a number of determining factors for these modalities that affect the imaging choice. CBCT is the modality of choice when optimised assessment of osseous structures is required in the dentomaxillofacial region.[25] Specific design features for the dentomaxillofacial region allow the field of view (FOV) in CBCT machines to be limited.[25] Consequently, for a similar FOV, CBCT produces images of higher resolution while generally using a much lower radiation dose than CT.[25] Many CBCT machines also offer the functional benefit for patients to be orientated in a sitting or standing position in the machine, whilst for all CTs, patients must lie supine within the gantry.[25] On other occasions, CT may be favoured over CBCT, such as for assessment of lesions with suspected soft tissue involvement and CT has the added advantage of much faster scanning times.[25, 26] Based on the factors discussed above, use of CBCT was most appropriate for the current case, as initial presentation of the lesion on the panoramic radiograph warranted assessment of hard tissue pathology in a localised region of the jaw.

Treatment for CEOT can range from less aggressive enucleation or curettage to more aggressive hemimandibulectomy or hemimaxillectomy, and is largely dependent on the size and location of the lesion.[2] It has been recommended to treat maxillary lesions more aggressively as they tend to grow faster and are less likely to remain confined.[2] Overall, recurrence rates following surgery range up to 14%, and are usually due to incomplete removal of the tumour.[2] Given the recurrence rate and location of the residual tumour in this case, the area is under close review, with a view to excise the lesion once sufficient healing at the site has occurred to allow for further surgery. To monitor for CEOT recurrence following surgery, a follow-up period of a minimum of 5 years has been recommended.[2]

Conclusion:

CEOT is a rare odontogenic tumour that can attain significant growth in the jaws and is often asymptomatic; however, it may also cause symptoms that mimic dental or sinus pain. It may be confused with radiologically similar lesions such as a dentigerous cyst in its early phases, or an odontoma and central ossifying fibroma in mature lesions. These atypical presentations may lead to CEOT being initially excluded as a differential diagnosis, as seen in this current case. Radiolucent and radiopaque jaw lesions can appear deceptively bland, and be misdiagnosed as less aggressive or less sinister pathology. Three-dimensional imaging can provide valuable clinical information regarding the nature of the lesion and guide its management. Clinicians should be aware of the range of differential diagnoses for odontogenic jaw lesions, and refer as appropriate for diagnosis and management.

References:

1. Kramer IRH, Pindborg JJ, Shear M. Histological Classification of Odontogenic Tumours. In: Histological Typing of Odontogenic Tumours. Springer Berlin Heidelberg, 1992:7-9.

2. Philipsen HP, Reichart PA. Calcifying epithelial odontogenic tumour: biological profile based on 181 cases from the literature. Oral Oncol 2000;36:17-26.

3. Pindborg JJ. The Calcifying Epithelial Odontogenic Tumor. Review of Literature and Report of An Extra-Osseous Case. Acta Odontologica 1966;24:419-430.

4. Franklin CD, Pindborg JJ. The calcifying epithelial odontogenic tumor. A review and analysis of 113 cases. Oral Surg Oral Med Oral Pathol 1976;42:753-765.

5. Kaplan I, Buchner A, Calderon S, Kaffe I. Radiological and clinical features of calcifying epithelial odontogenic tumour. Dentomaxillofac Radiol 2001;30:22-28.

6. Bousdras VA, Bousdras KA, Newman L. Nasal obstruction as the first symptom in a patient with a calcifying epithelial odontogenic tumour (CEOT). Dental update 2009;36:350.

7. Bridle C, Visram K, Piper K, Ali N. Maxillary calcifying epithelial odontogenic (Pindborg) tumor presenting with abnormal eye signs: case report and literature review. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006;102:e12-15.

8. Kamath G, Abraham R. Recurrent CEOT of the maxilla. Dent Res J (Isfahan) 2012;9:233-236.

9. Patino B, Fernandez-Alba J, Garcia-Rozado A, Martin R, Lopez-Cedrun JL, Sanroman B. Calcifying epithelial odontogenic (pindborg) tumor: a series of 4 distinctive cases and a review of the literature. J Oral Maxillofac Surg 2005;63:1361-1368.

10. Venkateswarlu M, Geetha P, Lakshmi Kavitha N. CT imaging findings of a calcifying epithelial odontogenic tumour. Br J Radiol 2012;85:e14-16.

11. Ching AS, Pak MW, Kew J, Metreweli C. CT and MR imaging appearances of an extraosseous calcifying epithelial odontogenic tumor (Pindborg tumor). AJNR Am J Neuroradiol 2000;21:343-345.

12. Prakasam M, Tiwari S, Satpathy M, Banda VR. Adenomatoid odontogenic tumour. BMJ Case Rep 2013;2013:

13. Zornosa X, Muller S. Calcifying cystic odontogenic tumor. Head Neck Pathol 2010;4:292-294.

14. de Matos FR, Nonaka CFW, Pinto LP, de Souza LB, de Almeida Freitas R. Adenomatoid Odontogenic Tumor: Retrospective Study of 15 Cases with Emphasis on Histopathologic Features. Head and Neck Pathology 2012;6:430-437.

15. Bachmann AM, Linfesty RL. Ameloblastoma, Solid/Multicystic Type. Head and Neck Pathology 2009;3:307-309.

16. Hsu M-H, Chiang M-L, Chen J-K. Unicystic ameloblastoma. Journal of Dental Sciences 2014;9:407-411.

17. Azevedo RS, Mosqueda-Taylor A, Carlos R, et al. Calcifying epithelial odontogenic tumor (CEOT): a clinicopathologic and immunohistochemical study and comparison with dental follicles containing CEOT-like areas. Oral Surg Oral Med Oral Pathol Oral Radiol 2013;116:759-768.

18. Ismail IM, Al-Talabani NG. Calcifying epithelial odontogenic tumour associated with dentigerous cyst. Int J Oral Maxillofac Surg 1986;15:108-111.

19. Seim P, Regezi JA, O'Ryan F. Hybrid ameloblastoma and calcifying epithelial odontogenic tumor: case report. J Oral Maxillofac Surg 2005;63:852-855.

20. Amado Cuesta S, Gargallo Albiol J, Berini Aytés L, Gay Escoda C. Review of 61 cases of odontoma. Presentation of an erupted complex odontoma. Medicina oral : órgano oficial de la Sociedad Española de Medicina Oral y de la Academia Iberoamericana de Patología y Medicina Bucal 2003;8:366.

21. Angiero F, Benedicenti S, Parker S, et al. Clinical and Surgical Management of Odontoma. PHOTOMEDICINE AND LASER SURGERY 2014;32:47-53.

22. Chang C-C, Chang JY-F, Hung H-Y, et al. Central Ossifying Fibroma: A Clinicopathologic Study of 28 Cases. Journal of the Formosan Medical Association 2008;107:288-294.

23. Mopsik ER, Gabriel SA. Calcifying epithelial odontogenic tumor (Pindborg tumor). Report of two cases. Oral Surg Oral Med Oral Pathol 1971;32:15-21.

24. Ficarra G, Hansen LS, Stiesmeyer EH. Intramural calcifying epithelial odontogenic tumor. Int J Oral Maxillofac Surg 1987;16:217-221.

25. Scarfe WC, Farman AG. What is Cone-Beam CT and How Does it Work? Dental Clinics of North America 2008;52:707-730.

26. Hofmann E, Schmid M, Lell M, Hirschfelder U. Cone beam computed tomography and low-dose multislice computed tomography in orthodontics and dentistry: A comparative evaluation on image quality and radiation exposure. Journal of Orofacial Orthopedics / Fortschritte der Kieferorthopädie 2014;75:384-398.