JBR–BTR, 2012, 95: 315-319.

CT AND MR IMAGING FEATURES OF A CASE OF CALCIFYING EPITHELIAL ODONTOGENIC TUMOR

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Calcifying epithelial odontogenic tumor is a rare lesion. We report the imaging features of a calcifying epithelial odontogenic tumor. The imaging including conventional radiograph, CT and MR imaging revealed a well-defined lesion in the alveolar bone of the left maxilla, which contained an impacted tooth and some small radiopacities. CT and MR imaging demonstrated a contrast enhancement mainly at the central portion of the lesion.

Key-words: Pindborg tumor, CEOT, CT, MRI.

The calcifying epithelial odontogenic tumor (CEOT) was first described by Pindborg as a distinct entity in 1955 and the tumor was designated as Pindborg tumor (1). CEOT is one of the rarest tumor of all odontogenic tumors with a frequency of 0.1-1.8% (2). CEOT occurs mostly in the posterior mandible, with about 25% occurring in the maxilla (3). The tumor grows by infiltration and may produce a cortical expansion (3). The maxillary tumors often involve the maxillary sinus (3). Although some studies of the radiographic features of CEOT have been reported, there are few reports on the characteristics of both CT and MRI of CEOT.

This paper describes the CT and MRI findings of CEOT in the maxilla.

Case report

Patient

A 27-year-old woman presented with a painless swelling of the left upper second molar three years before the initial visit. She visited our hospital because of spontaneous pain in the palate of the left upper second molar. On the clinical examination, there was a gingival expansion of the left upper molars. There was no movement of the left upper molars. Incision of the gingiva in the left upper molars was performed and an anti-inflammatory drug was administered.

Conventional radiograph

Panoramic radiograph showed a unilocular radiolucent lesion in the left maxilla with an impacted tooth

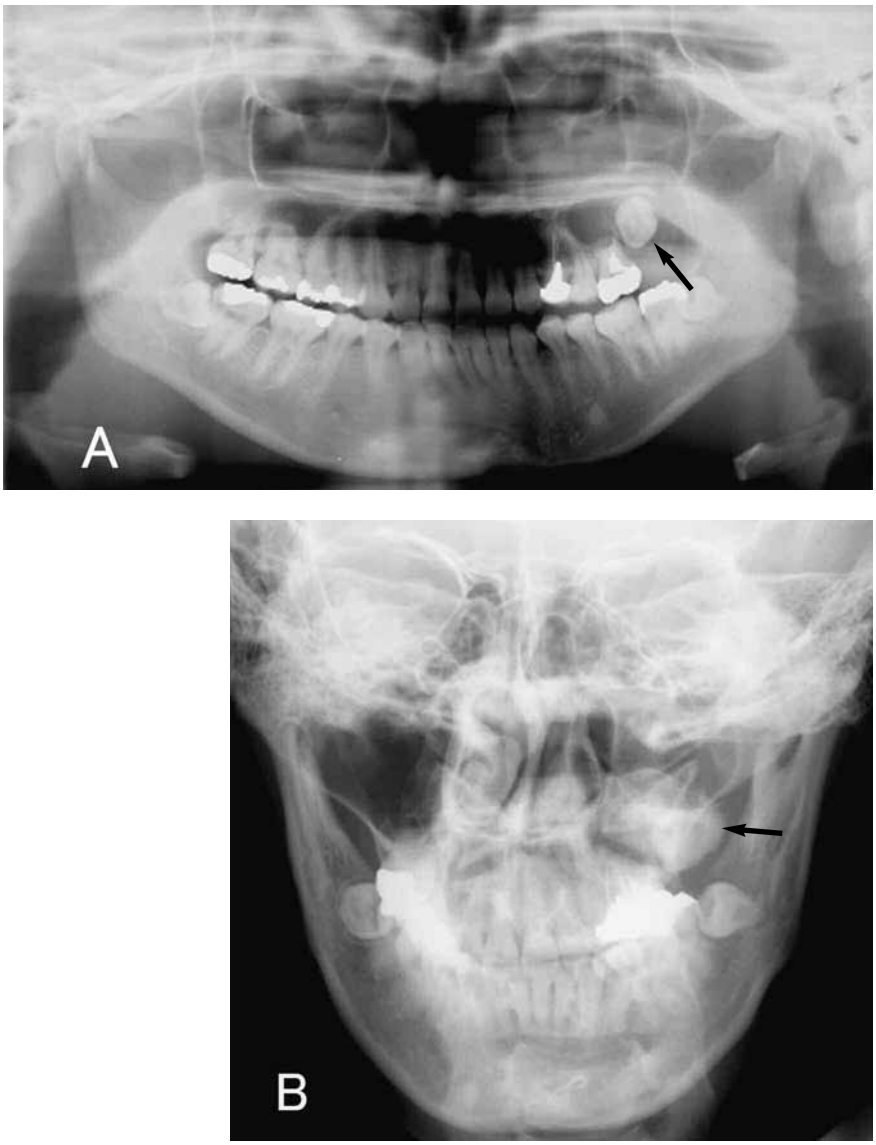

Fig. 1. — A. Panoramic radiograph shows a unilocular radiolucent lesion in the left maxilla with an impacted tooth (arrow) and some radiopacities. B. PA shows a unilocular radiopaque lesion in the left maxilla (arrow). The lesion is expansive.

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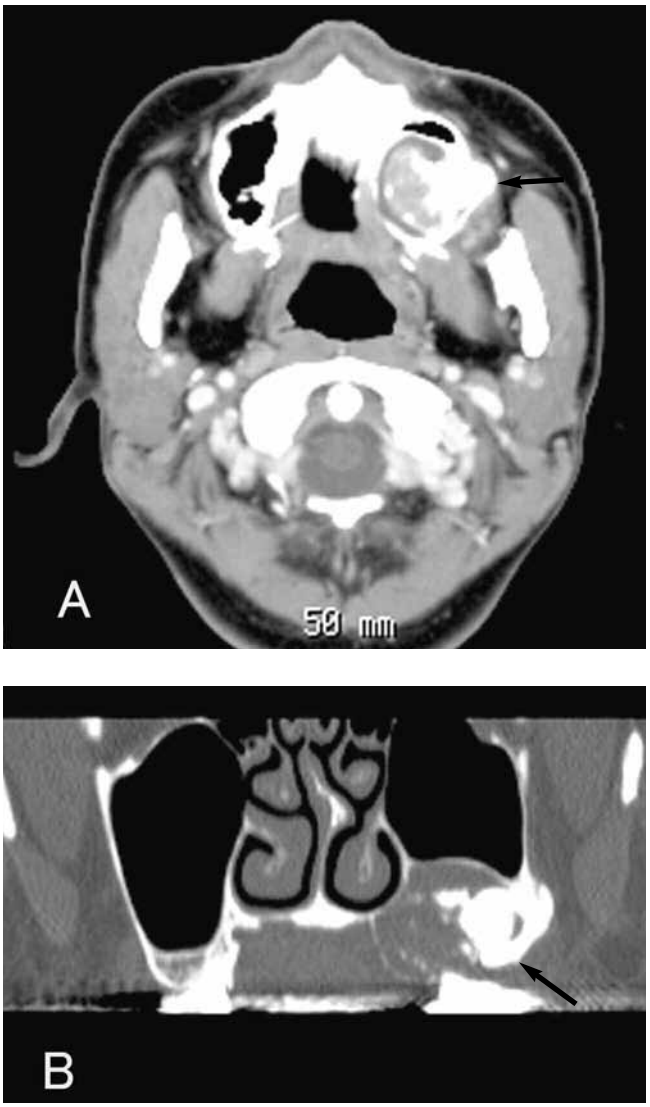

Fig. 2. — CT shows that a lesion in the alveolar bone of the left maxilla contains an impacted tooth and a less dense component with scattered calcification, which is well-defined (arrow).

A. After contrast enhancement the mean CT value is 110 HU (arrow). Enhanced CT image shows an enhancement at the central portion of the lesion and little enhancement on the periphery of the lesion; B. Coronal CT image demonstrates the lesion arising from the maxilla to the maxillary sinus (arrow).

and some radiopacities (Fig. 1A). Posterior-anterior projection (PA) showed a unilocular radiopaque lesion in the left maxilla. PA showed that the lesion was expansive (Fig. 1B).

CT imaging

CT (Light Speed QX/i, GE Healthcare, Milwaukee, WI, U.S.A.) showed a well-defined lesion in the alveolar bone of the left maxilla. The lesion contained an impacted tooth and a less dense component with scattered calcifications around the impacted tooth (Fig. 2). Before contrast enhancement the mean CT value of the lesion was 25 HU and after contrast enhancement the mean CT value of the lesion was 110 HU (Fig. 2A). Enhanced CT showed an enhancement at the central portion of the lesion and little enhancement on the periphery of the lesion (Fig. 2A). Coronal reformatted CT demonstrated that the lesion arose from the maxilla and extended to the maxillary sinus and did not invade the nasal cavity (Fig. 2B). The lesion was expansive and the cortical bone was thin.

MR imaging

MRI (1.5 T, GE Healthcare, Milwaukee, WI, U.S.A.) showed a well-defined lesion in the alveolar bone of the left maxilla (Fig. 3). Most of the lesion demonstrated moderate signal intensity on the T1-weighted image (Fig. 3A) and high intensity on the T2-weighted image with fat-suppression (Fig. 3B). There were some low signal areas on the T1-weighted image and T2-weighted image with fat-suppression within the lesion, consistent with impacted tooth and some calcifications (Fig. 2A, B). The T1-weighted enhanced image with fat-suppression showed a predominantly enhancement (Fig. 3C). T2-weighted images with fat-suppression and T1-weighted enhanced images with fat-suppression revealed discrimination between the surrounding of the lesion and inside of the lesion. Coronal MR images with fat-suppression showed an extension to the maxillary sinus from the maxilla and no invasion to the nasal cavity (Fig. 3C). Dynamic axial MRI showed an enhancement of the central portion of the lesion at 260 seconds after the administration of contrast material (Fig. 3D) and a slight enhancement on the periphery of the lesion at 820 seconds after the administration of contrast material (Fig. 3E).

Histopathology

An incisional biopsy of the lesion revealed benign odontogenic tumor. The tumor was enucleated with extraction of the impacted second molar tooth. No exposure of the tumor out of the cortical bone was found.

Histological sections from paraffin-embedded blocks were stained with hematoxylin and eosin (HE). Microscopic examination showed that polygonal epithelial cells were arranged in sheets or strands containing round nuclei and eosinophilic cytoplasm. The tumor cells showed few mitotic figurers and slight pleomorphism. The homogeneous, pale-staining eosinophilic materials, which revealed amyloid deposition, were detected in the epithelial nests (Fig. 4A). Concentric calcific deposits in the amyloid material and massive calcification were seen in the tumor (Fig. 4B). From these histological findings, the tumor was diagnosed as a CEOT.

Discussion

The radiographic appearance of CEOT is variable: mixed radiolucent-

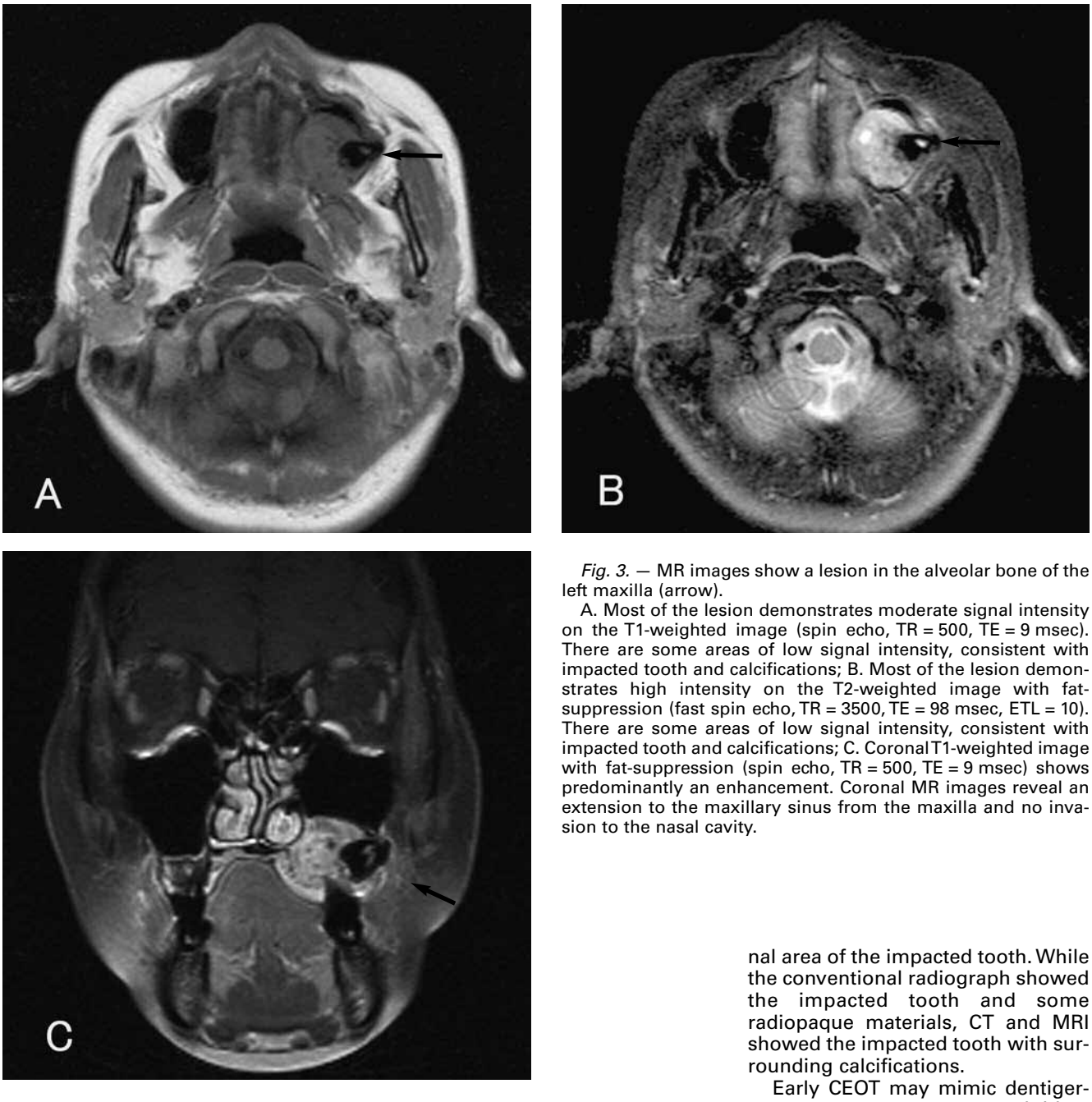

Fig. 3. — MR images show a lesion in the alveolar bone of the left maxilla (arrow).

A. Most of the lesion demonstrates moderate signal intensity on the T1-weighted image (spin echo, TR = 500, TE = 9 msec). There are some areas of low signal intensity, consistent with impacted tooth and calcifications; B. Most of the lesion demonstrates high intensity on the T2-weighted image with fat-suppression (fast spin echo, TR = 3500, TE = 98 msec, ETL = 10). There are some areas of low signal intensity, consistent with impacted tooth and calcifications; C. Coronal T1-weighted image with fat-suppression (spin echo, TR = 500, TE = 9 msec) shows predominantly an enhancement. Coronal MR images reveal an extension to the maxillary sinus from the maxilla and no invasion to the nasal cavity.

radiopaque, radiolucent and radiopaque. The locularity is also variable (4). Kaplan (4) reported that borders were noncorticated or diffuse in conventional radiograph in about 80% of cases and there was an association with an impacted tooth in 60% of the cases. Larger lesions tended to have diffuse borders rather than smaller lesions (4). In our case, panoramic radiograph examination showed a unilocular lesion with an impacted tooth and some radiopacities. The border was defined but noncorticated.

In our case, CT showed a well-defined mass with an impacted tooth and some radiopacities around the impacted tooth. MR imaging showed a lesion with predominantly high signal intensity on the T2-weighted image with fat-suppression and low signal intensity on the T1-weighted image. On the T1-weighted MR image and T2-weighted MR image with fat-suppression, there were some areas of low signal intensity, suggesting calcifications.

As in Cross's report, CT and MRI showed that the lesion in our case contained a central tooth with surrounding calcifications. Pindborg (4) reported that a feature was clustering of radiopaque flecks at the coronal area of the impacted tooth. While the conventional radiograph showed the impacted tooth and some radiopaque materials, CT and MRI showed the impacted tooth with surrounding calcifications.

Early CEOT may mimic dentigerous cysts or even ameloblastomas (5). Dentigerous cyst and ameloblastoma include an impacted tooth but do not include scattered calcifications. In this case, the lesion contained an impacted tooth and scattered calcifications. Dentigerous cyst and ameloblastoma were thought to be ruled out. The radiographic futures of CEOT most closely resemble those of calcifying cystic odontogenic tumor (CCOT), and adenomatoid odontgenic tumor (AOT) (5). CCOT may present a unilocular or multilocular radiolucency with discrete, well-defined margins containing scattered calcifications of irregular size (6). AOT is a radiolucent lesion. The lesion often

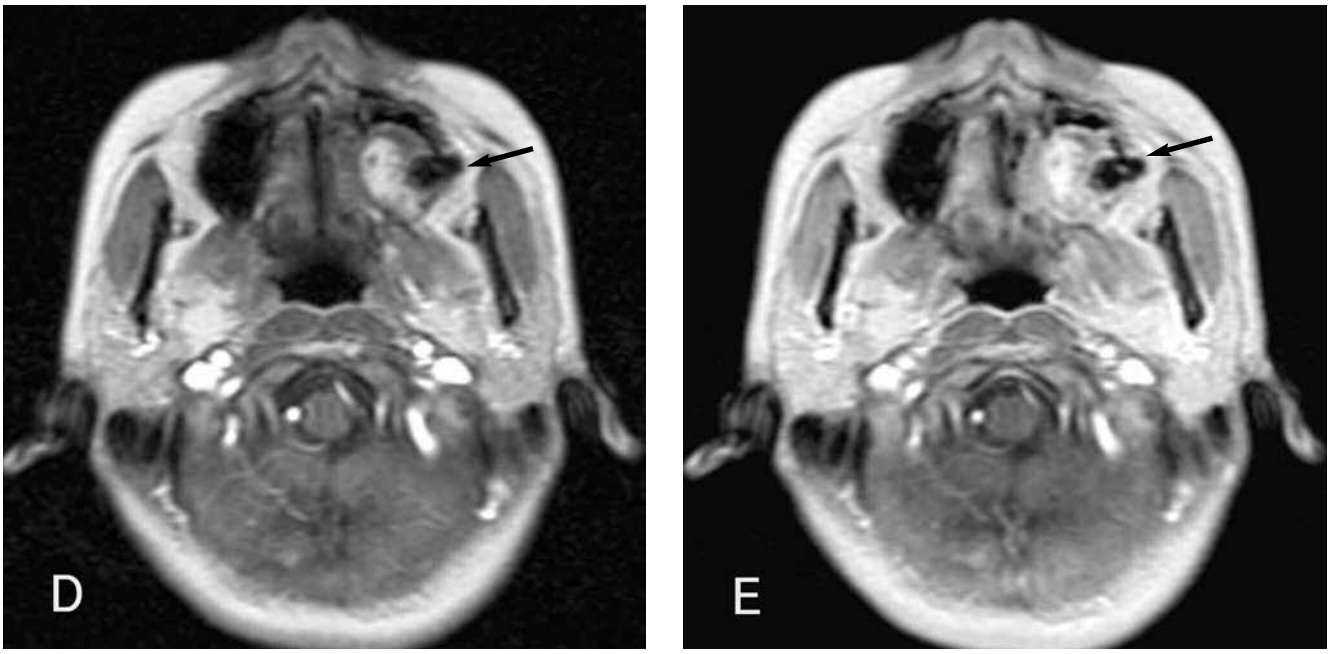

Fig. 3D, E. — Dynamic axial MR images (gradient echo, TR = 75, TE = 4 msec, FA = 60).
D. At 260 seconds after the administration of contrast material, MR image shows an enhancement at the central portion of the lesion (arrow); E. At 820 seconds after the administration of contrast material, MR image shows a slight enhancement of the peripheral of the lesion (arrow).

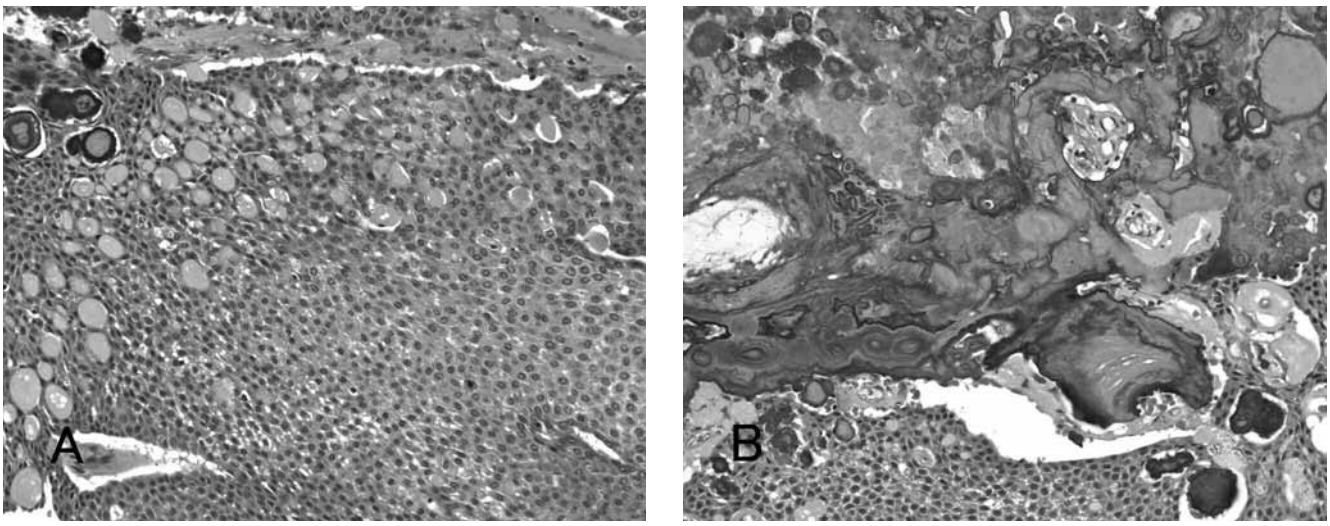

Fig. 4. — A. The tumor is composed of a sheet of polygonal epithelial cells containing amyloid deposits with a concentric calcification; B. Scattered massive calcification is seen. (HE, bar; 100 μm).

includes radiopaque materials. It forms tiny shapes such as circles and groups of dots[6]. CEOT is poorly defined irregular that reflect its aggressive behavior, which is similar to that the ameloblastoma (7). In this case, CT and MRI showed the impacted tooth with surrounding calcifications. CT showed that the lesion was expansive and the cortical bone was thin. The lesion was thought to be relatively aggressive. Thus CCOT and AOT were thought to be ruled out. CT and MRI seem to be useful for differentiating CEOT and the other lesions.

Chin (2) and Cross (8) reported that CT was superior to MRI. CT was suggested to be superior for a bony detail because the bony margin of the lesion was important for surgical planning (8). In our case, MRI (Fig. 3) discriminated between the surrounding of the lesion and inside of the lesion. Thus, MRI and CT might be equally effective in delineating the margin of the lesion.

In our case, contrast enhanced CT showed an enhancement at the central portion of the lesion and little enhancement on the periphery of the lesion. Dynamic MRI showed an enhancement at the central portion of the lesion at 260 seconds after the administration of contrast material and a slight enhancement of the

peripheral of the lesion at 820 seconds after the administration of contrast material. Thus, dynamic MRI in the early period showed the inhomogeneous enhancement of CEOT.

The central portion of the lesion that was enhanced in both CT and MRI, was thought to be tumor cells. On the peripheral of the lesion that was little enhanced in both CT and MRI, the tumor cells were thought to be scarce.

In both CT and MRI, coronal images revealed that the lesion extended to the maxillary sinus from the maxilla, indicating that the lesion might be intraosseous. Coronal CT and MRI revealed that the lesion did not invade the nasal cavity. Thus, both CT and MRI were useful for determining the origin of the lesion and for surgical planning.

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