

Case Reports

Radiographic "Sun-ray Appearance" in a Case of Mandible Squamous Cell Carcinoma

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Squamous cell carcinoma (SCC) is a common malignant tumor in the oral and maxillofacial regions. The aim of the present report is to describe the features of a case of mandible SCC which reveals radiographic "sun-ray appearance."

The patient was a 46-year-old male. A series of imaging examinations including panoramic and intra-oral radiographs, computed tomography (CT), and magnetic resonance imaging (MRI) were performed. The "sun-ray appearance" was seen in the buccal cortical bone of the right mandibular molar region and in occlusal intra-oral radiograph and CT images. It was difficult for MRI to depict this periosteal reaction. Although the differential diagnoses based on image findings were periosteal osteosarcoma and similar malignant osteoblastic mesenchymal neoplasms, the histopathological diagnosis was SCC.

Key words: oral cancer, mandible, imaging, diagnosis.

INTRODUCTION

Squamous cell carcinoma (SCC) is one of the common malignant tumors in the mucosa (gingiva) of the mandible. Radiographic findings of mandible carcinoma also commonly show mainly destructive (osteolytic) lesions with a "moth-eaten" appearance of the bone¹. Radiographic "sun-ray appearance" is a special sign of periosteal osteosarcoma and similar malignant osteoblastic mesenchymal neoplasms². We present a clinico-radiological case of mandible SCC showing a sun-ray radiographic appearance.

CASE REPORT

Clinical Findings

A 46-year-old man with 5 days had a chief complain of pain and swelling in the right mandible molar region. Since the swelling had been rapidly increasing in size, he was referred to our hospital. He had visited a general dental clinic with same complaint 5 days prior to this initial visit; his second molar and the hemi-sectioned medial root of the first molar were extracted at this time. The patient reported that he had noticed the symptom for three months.

The initial clinical revealed a reddish ulcerated of 30 × 30 mm with an elastic hard texture at the right buccal alveolar ridges of mandible (Figure 1). An ulcer approximately 20 mm in diameter with a grayish pseudomembrane was seen in the superior surface of the swelling. There was no abnormal finding suggesting the presence of lesions in any other regions.



Figure 1. Cancerous mass in the buccal alveolar mandible ridge.

Imaging

Intraoral and panoramic radiography and CT examinations were performed immediately, followed by a biopsy of the ulcerative gingiva, and then an MRI examination.

A panoramic radiography system (Veraviewscope, Morita Co., Kyoto, Japan) and an intraoral radiography system (Xspot, Asahi Roentgen Co., Kyoto Japan) were used to take radiographs. The panoramic view revealed clear osseous defects due to extraction of molars and slight destructive change of the alveolar margin (Figure 2). The occlusal view showed distinct spicular newly formed bones from buccal cortex (Figure 3).

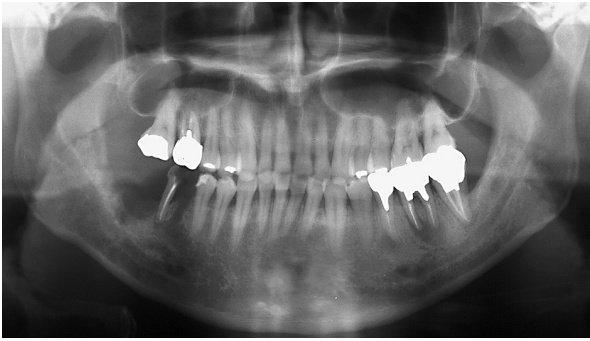


Figure 2. Panoramic radiography shows “moth-eaten” appearance of bone resorption in the right mandibular molar region.

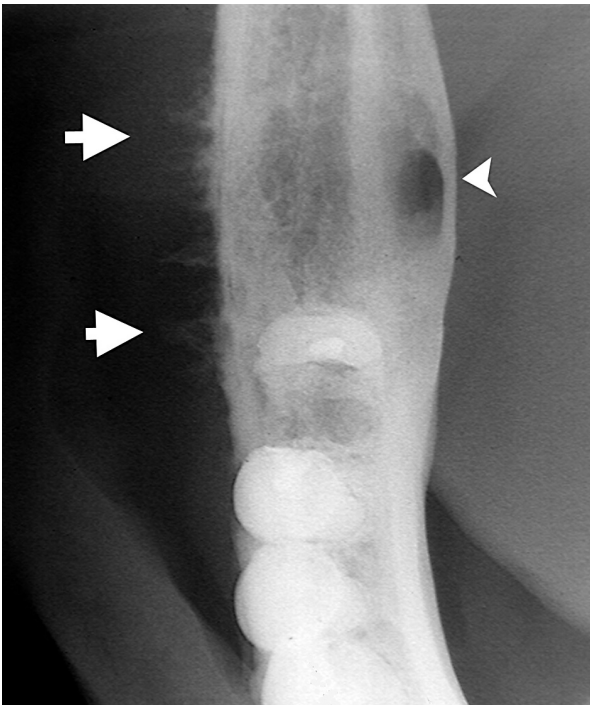


Figure 3. Occlusal intraoral radiograph shows the typical “sun-ray appearance”(arrow). A radiolucent lesion, suggestive of a bone defect, is recognizable as well (arrowhead).

The utilized CT machine was the X-Vision (Toshiba, Japan), which consists of a single-slice helical fan-beam scan with x-ray generator settings at 130 kV and 100 mA, with a tabletop movement of 3 mm/rotation. The axial-slice CT images of the mandibular body level revealed spicular new bone formations concomitant with irregular resorption of the buccal cortex surface (Figure 4). So-called Codman’s triangle was not seen in the periphery of new bone formation. Perforations of the buccal and lingual cortices were seen as well.

A 1.0 Tesla MRI machine (Shimadzu, Japan) with a head coil unit was used for the MRI examinations. T1-and T2-weighted images, short TI inversion recovery (STIR) image and gadolinium-diethylene-triamine penta-acetic acid (Gd-DTPA) -enhanced T1-weighted image were

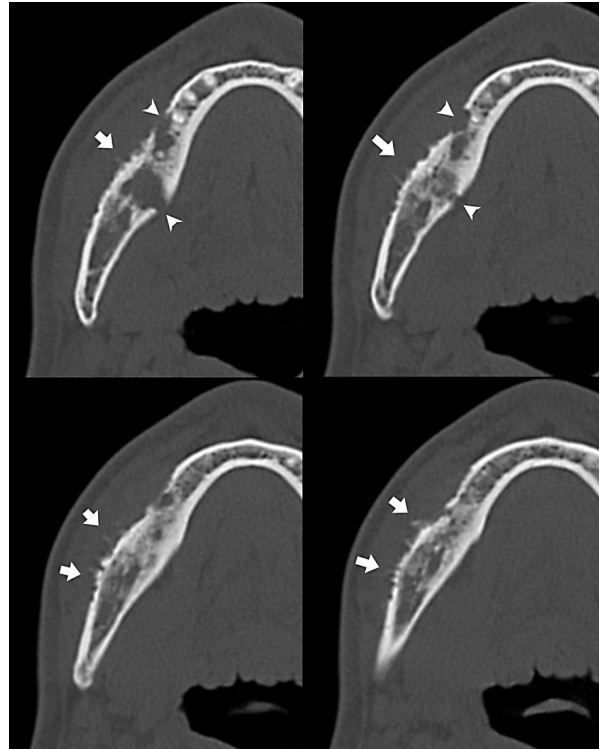


Figure 4. Axial CT images were showing the both spicular new bone formation (arrows) and mandibular invasion (arrowheads).

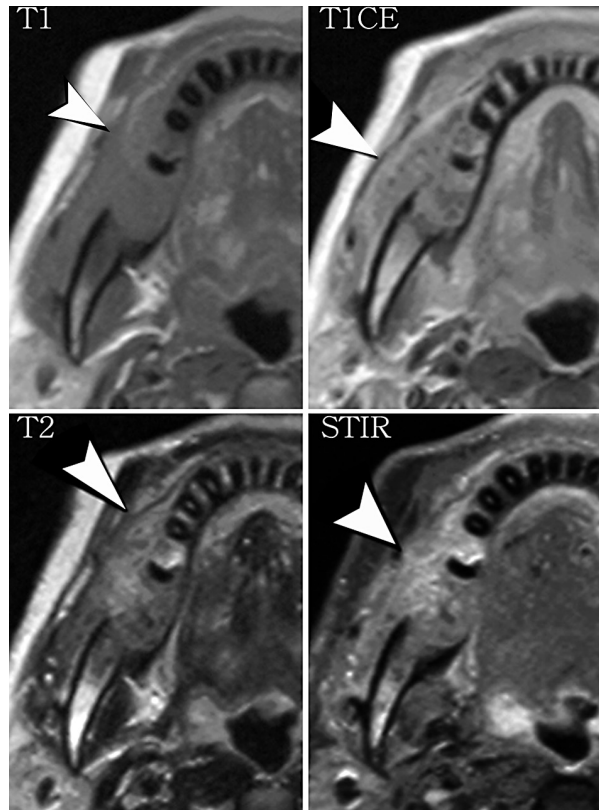


Figure 5. Axial sliced MR images showed tumor mass, which had invaded the mandible (arrowheads). So-called “sun-ray appearance” was not recognized in MRI.

taken. In the axial-slice MRI view, tumor mass was seen as a homogeneous low signal intensity in the T1-weighted image. On the T2-weighted and STIR images, tumor mass showed diffuse high signal intensity. In the Gd-DTPA-enhanced T1-weighted images, the tumor mass showed moderate diffuse enhancement. Findings that were suggestive of periosteal reaction were not recognized in any MR image (Figure 5).

Differential diagnosis

The clinical features of this lesion were highly suggestive of malignant neoplasm. From the findings of the tumor mass, which was covered with a whitish pseudomembrane, squamous cell (epidermoid) carcinoma of the gingivae was the primarily impression based on the clinical presentation. Image findings did not contradict this diagnosis except the existence of radiographic "sun-ray appearance."

DISCUSSION

There are, of course, many other features to be considered in the radiological analysis of a bone lesion. Among these important findings: the presence or absence of mineralization of the tumor matrix; whether the lesion causes bone destruction (osteolytic lesion) or bone production (osteosclerotic lesion); presence of reactive periosteal new bone formation; and destruction of cortex and extracortical tumor extension.

Periosteal new bone formation ("periosteal reaction") can result from any of a large number of causes. Aside from periosteal new bone formation consistent with osteosarcoma and similar pathologies, there were several reports regarding the osteoblastic activities in carcinomas. Katase et al. reported a case of oral spindle-cell carcinoma, also known as a high malignant variant of SCC, in which bone-like calcification was seen histologically³. However, some advanced prostate and breast cancers reportedly cause metastatic bone lesions consistent with osteoblastic activities⁴.

Although several intraosseous SCCs have reportedly arisen from odontogenic cysts⁵, the majority of these lesions arise from the gingival epithelium. In the presenting case, we felt that the SCC was not a variant or a metastatic lesion, but a primary lesion from the gingival epithelium, because a distinct tumor mass was seen in the alveolar ridge. Further, the new bone formation was thought to be due to SCC subperiosteal invasion. Ord et al. studied histopathological findings of mandibular SCCs and found that some cases showed extension of tumor to the periosteum and/or new bone formation in the alveolar region⁶. Brown et al. also studied the histological pattern of tumor spread into the mandible and suggested that subperiosteal new bone formation may be why the periosteum becomes more difficult to strip in the region of invaded bone⁷.

Regarding imaging technique, the radiographic "sun-ray appearance" was seen in the occlusal intraoral radiograph, and CT images. In the buccolingual view of the mandibular body in the occlusal intraoral radiograph, the central X-ray beam is directed from under the mandible so that it is perpendicular to the occlusal plain. As the X-ray beam is directed parallel with the axis of the teeth, this technique is

called "tooth axial projection." This projection is useful to localize impacted teeth in the buccolingual dimension and to observe cortical bone expansions in jaw cysts and benign tumors. Although the occlusal technique is primitive, it is a useful modality to observing periosteal reactions in the mandible.

Mukherji et al.⁸, studied patterns of mandibular invasion in oral SCC and mentioned that a CT reconstructed image with a bone window setting was an accurate way to detect mandibular involvement by SCC of the oral cavity. As the CT has highly density resolution, it should be true that CT can clearly depict new formed bone.

In the present case, MRI was not an effective means of observing the periosteal reaction. This may be due to the new formed spicular bone, which was very small and immature in this case. Katsumata et al.⁹, reported that newly formed cortical bone in the condylar head was visible in MRI in the patients who received mandibular setback osteotomy for prognathism.

CONCLUSION

Diagnostic image findings in a case of mandible SCC which showed radiographic "sun-ray appearance" were reported. We suggest that radiologists ought to interpret the sign of periosteal reaction carefully, because this sign is not specifically related to malignant osteoblastic mesenchymal neoplasms such as osteosarcoma.

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旭日像を認めた下顎扁平上皮癌の一例

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扁平上皮癌（SCC）は、口腔・顎顔面領域に生ずる悪性上皮性腫瘍の大部分を占める。我々は、骨肉腫特有のX線所見とされる「旭日像」を示した下顎のSCCを経験したので報告する。

患者は、46歳の男性。パノラマX線撮影，口内法，コンピュータ断層撮影（CT）と磁気共鳴画像（MRI）で画像診断を行った。「旭日像」は、右側下顎臼歯部の頬側皮質骨に、咬合法とCTにて観察された。MRIでは、この骨膜下骨新性が描出されなかった。画像所見による鑑別診断は、骨膜性骨肉腫あるいは類似した悪性造骨性間葉性腫瘍であったが、病理組織診断はSCCであった。

キーワード：口腔癌，下顎，画像診断