# Osteosarcoma of the Mandible: a Case Report with CT, MRI and Scintigraphy

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*Osteosarcomas are especially rare in the mandible and maxilla, representing 1.6% of all bony malignant tumours. In this article, we described a case of osteosarcoma of the mandible. Computed tomography (CT) image showed a well-circumscribed homogeneous mass, with nonhomogeneous contrast enhancement. T1-weighted magnetic resonance imaging (MR) image showed intermediate signal intensity on, and after administration the lesion showed signal intensity lower than muscle. T2-weighted MR image showed heterogeneous high signal intensity. Bone scintigraphy revealed monostatic involvement of the mandible with a homogenous intense uptake pattern. Ga-67 citrate scintigraphy revealed significantly increased uptake. Histopathological examination confirmed the diagnosis of osteosarcoma.*

**Key words:** *CT, MRI, osteosarcoma, scintigraphy*
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Osteosarcoma is a mesenchymal malignancy of bone tissue. It accounts for 20% of all sarcomas and about 5% of all osteogenic sarcomas that arise in the head and neck region. It is the most common primary bone malignancy of the skeleton, other than craniofacial region[1,2]. Primary osteosarcoma in the head and neck region is a rare occurrence and presents with distinct biological behaviour, compared with osteosarcoma of the long bones[3-5].

In this article, we describe a case of osteosarcoma of the mandible with computed tomography (CT), magnetic resonance imaging (MRI) and scintigraphic findings. Characteristic CT, MRI and scintigraphic findings could be helpful for differentiating osteosarcoma from other tumours.

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## Case report

A 66-year-old male presented with a 2-month history of swelling on the left side of the mandible in the molar region. His symptoms had started 8 months earlier, when he initially noted pain in the molar region. On examination, the swelling was hard on palpation and measured 3 cm × 3 cm. There was no pain on palpation and no ulceration was noted.

An axial CT image showed a well-circumscribed homogeneous mass (Fig 1a), with nonhomogeneous contrast enhancement (Fig 1b). The tumour had existed outside the cortex of the bone. No evidence was found of cortical destruction, but bone absorption was admitted in a centrifugal alveolus bone of the jaw, left side second molar (Fig 1c). In aT1-weighted MR image, the lesion showed signal intensity similar to that of muscle (Fig 1d). In T1-weighted MR images obtained after administration of intravenous gadolinium chelate, the lesion showed signal intensity lower than muscle (Fig 1e). The T2-weighted MR image revealed heterogeneous high signal intensity in the soft-tissue mass (Fig 1f). Bone scintigraphy showed no increase in blood flow (Fig 2a). The delayed phase revealed monostatic involvement of the mandible with a homogenous

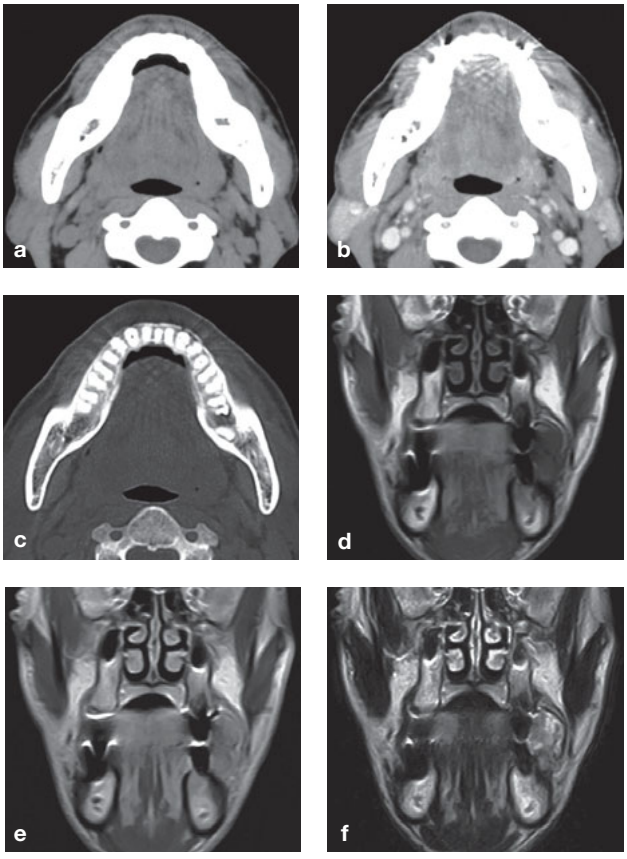


**Fig 1** a) Axial soft tissue algorithm CT showed a well-circumscribed homogeneous mass along the left side of the mandible in the molar region. b) Contrast-enhanced CT of mass lesion showed inhomogeneous interior enhancement in the mass. c) The bone tissue algorithm CT did not show cortical destruction. However, bone absorption was admitted in a centrifugal alveolus bone of the jaw, left side second molar (arrowhead). d) On the T1-weighted axial image (T1WI), the mass lesion showed intermediate signal intensity. e) On the post-contrast T1WI, the mass showed well-defined juxtacortical soft-tissue mass and low signal intensity. f) On the T2-weighted axial image (T2WI), the mass showed heterogeneous high signal intensity.

intense uptake pattern (Figs 2b and 2c). Ga-67 citrate scintigraphy revealed significantly increased uptake in the left mandible (Figs 2d and 2e).

Most of the mass lesion existed outside the bone. From CT and MRI images, we could not observe destruction or any periosteum reaction of the cortical bone touching the lesion. Strong accumulation was admitted in a considerable part of the lesion by bone scintigraphy and Ga scintigraphy. Therefore, we thought a lesion came from from an edge around the jawbone. Our radiographic diagnosis was a non-epithelial malignant tumour.

A biopsy was performed, and a histopathological examination of the biopsy specimen revealed irregular spindle or angular shaped cells with atypia and mitoses, neoplastic osteoid matrix, and fibrous stroma (Fig 3). Histopathological diagnosis was osteosarcoma. There was progress of the tumour to the root apex of the mandibular left second molar and third molar in the jawbone.

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration. Informed consent was obtained from the patient included in the study.

## Discussion

Osteosarcoma is a malignant tumour that forms osteoid, fibrous and chondroid tissues. Its radiographic features depend largely on the degree of ossification and mineralisation of the tumour, which can range from completely lytic to totally sclerotic[1,6]. Radiographic evaluation is important for making the diagnosis, because the clinical symptoms, such as pain, paresthesia, swelling, and loose teeth, are not specific[1,7]. CT allows excellent detection of tumour calcification, cortical involvement and, in most instances, soft-tissue and intramedullary extension[1,8]. MRI essentially helps to determine the extent of tumour invasion and the involvement of any soft-tissue mass[2].


**Fig 2** a) On bone scintigraphy, blood flow did not show any increase in mass. b and c) The delayed phase showed monostatic involvement of the mandible with a homogenous intense uptake pattern. d and e) Ga-67 citrate scintigraphy revealed significantly increased uptake in the left mandible.

Scintigraphy is useful to confirm the solitary nature of the tumour and the absence of metastatic disease[9]. In this article, we describe a case of osteosarcoma of the mandible with CT, MRI and scintigraphy.

In the present case, CT and MRI evaluated bone erosion, soft tissue infiltrations and the size and extent of the tumour. MRI showed better delineation of the extent of the lesion. The bone scintigraphy showed the permeation in the jawbone of the tumour.

Scintigraphy showed the solitary nature of the tumour. Regarding imaging of maxillofacial osteosarcoma, we recommend CT for demonstrating osseous destruction, osteoid matrix, MRI for soft tissue and intramedullary extent, and scintigraphy for useful for staging, detection of metastases and/or skip lesions. Osteosarcoma typically show an increased uptake of radioisotope on bone scans obtained by use of bone scintigraphy.

The diagnosis of osteosarcoma is typically suspected by the radiographic appearance of the affected bone. However, the more typical "sun-burst" or "sun-ray" reaction of osteosarcoma involving the peripheral bone is almost always absent in osteosarcoma of the jawbone. Samraj L et al[4] reported that due to the rapid progression of the lesion in soft tissue such as the periodontal ligament (PDL), osteosarcoma involving the alveolus might present with typical radiographic signs of symmetrical widening of the periodontal ligament space. Arora P et al[2] reported that symmetric widening of PDL space on panoramic radiograph is an important early feature of bone malignancies, as in osteosarcoma, chondrosarcoma and Ewing's sarcoma. In the present case, we could not find "sun-ray" reaction or widening of the PDL space, but the CT image allowed us to observe the bone resorption around the tooth root in the mandibular left second molar.

Differentiating between osteosarcoma and chondrosarcoma can be difficult radiographically and even histopathologically in some cases. Generally, chondrosarcoma is rare in the head and neck region. These lesions appear less aggressive radiographically, with less bone destruction and more bone erosion. It is conceivable that distant metastasis from a prostatic carcinoma might closely simulate sclerosing osteosarcoma, but metastatic disease is generally widespread by the time of jaw involvement. Osteomyelitis occasionally resembles the lytic form of osteosarcoma radiographically[1]. Therefore, pathological confirmation is always necessary.

In conclusion, we described a case of osteosarcoma of the mandible with CT, MRI and scintigraphy. CT images showed a well-circumscribed homogeneous mass, with nonhomogeneous contrast enhancement.

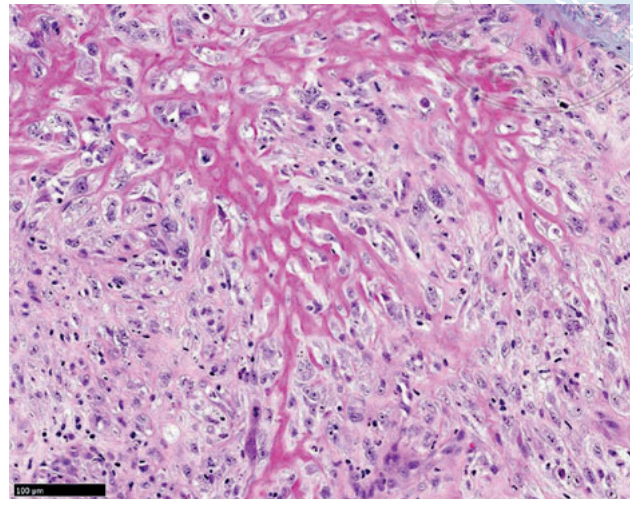

**Fig 3** Microscopic findings of the biopsy specimen of the case. Irregular spindle or angular shaped cells with atypia and neoplastic osteoid matrix were observed. Bar: 100μm.

The lesion showed intermediate signal intensity on the T1-weighted MR image, and low signal intensity and well-defined juxtacortical soft-tissue mass after administration. The case showed heterogeneous high signal intensity on the T2-weighted MR image. It must be distinguished from other benign lesions and several differential diagnoses can be considered. These findings could be helpful for differentiating osteosarcoma from other tumours of the mandible.

## Conflicts of interest

The authors reported no conflicts of interest related to this study.

## Author contribution

Dr Mikiko SUE designed and prepared the manuscript; Dr Takaaki ODA, Dr Yoshihiko SASAKI, Ayako KAMETA and Dr Yasuo OKADA collected data and the patient information; Dr Ichiro OGURA revised the manuscript.

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## References


1. Shimamoto H, Ozono K, Nakamura T, Akiyama H, Gamoh S, Tamaki J, Kishino M, Uchiyama Y, Kato K, Murakami S, Furukawa S. Osteosarcoma in the maxilla: a case report. Oral Radiol 2006;22:37–40.
2. Arora P, Rehman F, Girish KL, Kalra M. Osteosarcoma of mandible: Detailed radiographic assessment of a case. Contemp Clin Dent 2013;4:382–385.
3. Amini Shakib P, Foroughi R, Seyedmajidi M. Osteosarcoma of the maxilla: a rare case with unusual clinical presentation. J Dent Res Dent Clin Dent Prospects 2013;7:177–181.
4. Samraj L, Kaliamoorthy S, Venkatapathy R, Oza N. Osteosarcoma of the mandible: A case report with an early radiographic manifestation. Imaging Sci Dent 2014;44:85–88.
5. Jia S, Li B. Osteosarcoma of the jaws: case report on synchronous multicentric osteosarcomas. J Clin Diagn Res 2014;8:ZD01–ZD03.
6. Baker CG, Tishler JM. "Malignant disease in the jaws". J Can Assoc Radiol 1977;28:129–141.
7. Bianchi SD, Boccardi A. Radiological aspects of osteosarcoma of the jaws. Dentomaxillofac Radiol 1999;28:42-47.
8. Lee YY, Van Tassel P, Nauert C, Raymond AK, Edeiken J. Craniofacial osteosarcomas: plain film, CT, and MR findings in 46 cases. AJR Am J Roentgenol 1988;150:1397–1402.
9. Puranik SR, Puranik RS, Ramdurg PK, Choudhary GR. Parosteal osteosarcoma: Report of a rare juxtacortical variant of osteosarcoma affecting the maxilla. J Oral Maxillofac Pathol 2014;18:432–436.