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OSTEOSARCOMA OF THE MANDIBLE, CONVENTIONAL, PANORAMIC, COMPUTED TOMOGRAPHY (CT) AND MAGNETIC RESONANCE IMAGING (MRI) FINDINGS

M. A. Ojo, C. J. Nortje
Department of Oral Maxillofacial Surgery & Pathology, College of Medicine Sciences, University of Benin, P. M. B. 1154 Benin-City, Nigeria.

ABSTRACT

Radiographs remain a key component in the investigation of bone lesions. Radiographs of Osteogenic sarcoma of the maxillofacial region are difficult to interprete because of bony superimposition. This problem posed by conventional and panoramic radiographs can be obviated by using computed tomography and magnetic resonance imaging which give sectional images devoid of superimposition. The latter two have been shown in this study to be superior in showing the apparent size, shape, soft tissue calcification, intramedullary and cortical bone invasion of osteosarcoma of the jaw.

KEYWORDS: ***Osteosarcoma, Mandible, Imaging Features***

INTRODUCTION

Osteosarcoma is usually a primary malignant neoplasm of bone and is the most common malignant mesenchymal tumour of bone after multiple myeloma. It is however, uncommon in the jaws representing only about 4-8% of all bone osteosarcomas[1-4].

Early diagnosis and complete resection of the tumour are important factors that improve prognosis. The pattern of presentation and behaviour of osteosarcoma of the jaws distinguishes it from those at other sites. It is less aggressive, has propensity to spread locally rather than produce distant metastases. It is more common in women than men with the mandible more often affected than themaxilla[5-6].

The most common site in the mandible is the body while maxillary lesions frequently affect the alveolar ridge and body. Maxillary lesions are about half as common as mandibular lesions[7-8]. Patients suffering from osteosarcoma of the maxillofacial bones often give a history of fibrous dysplasia, previous trauma, or previous radiation therapy[9]. Osteosarcoma is also a recognised complication of Paget's disease of bone but hardly in the jaw bones[8]. The mean age at diagnosis is 35 years, 10 years later than for lesions of long bones with the tumour exceedingly rare in children[7,10-11]. Patients with mandibular lesions also tend to be younger than patients with maxillary lesions and it is rare in the temporomandibular joint[1].

Symptoms seem to start with firm swelling with growth increasing within a few months. The average duration of symptoms before diagnosis is reported to be 3-4 months[3]. This can be accompanied by pain or paraesthesia, distortion of facial bones and dental symptoms that include tooth mobility and tooth ache leading to ill-advised tooth extractions. Anterior maxillary lesions often lead to epistaxis, nasal obstruction and visual disturbances including proptosis and partial blindness[3,8]. This lesion can occur centrally in the medullary bone or develop peripherally from the periosteum with variants like parosteal, periosteal and extra-osseous forms. Bone formation in soft tissue mass is usually characteristic.

For malignant mesenchymal lesions involving bone, the most valuable special investigation apart from biochemical analysis and bone biopsy is imaging modalities. These consist of conventional radiography, panoramic radiography, linear and pluridirectional tomography, radionuclide scans, computed tomography (CT) and magnetic resonance imaging (MRI).

Radiographic evaluation is important in diagnosis, as clinical symptoms, such as pain, paraesthesia, swelling and loose teeth are not specific[12]. Diagnosis by conventional radiography is usually difficult in the maxillofacial region due to bone superimposition. This is why advanced imaging modalities should be explored. Again the radiological features are not usually pathognomic as jaw bone neoplasia have highly variable appearances[13].

CASE REPORT

A 15 year old female patient was referred by her Oral/ Maxillofacial surgeon for evaluation of a rapidly progressing swelling of the left mandible with pain and tooth mobility. Her past medical history was non-contributory and detailed questioning could not elicit the length of time the lesion had been present except the recent rapid course.

Physical examination revealed a poorly nourished person with left facial swelling. Oral examination revealed a large swelling extending from the left angle of the mandible crossing the midline to the right canine region. Teeth numbers 35 and 36 had been extracted by her dentist due to gross mobility. Teeth numbers 33, 34, 37 and 38 were floating while numbers 32,31, 41, 42 and 43 were grossly mobile. The lesion was confirmed histologically as osteogenic sarcoma.

Postero-anterior (PA) and panoramic radiographs were obtained which revealed a large cloud-like mixed radiolucency

*Correspondence: Dr. M. A. Ojo

and radiopacity of tumour growth on PA (fig). 1 and a detailed sclerotic or "cotton wool" internal structure of the tumour on panoramic radiograph (fig.2). The PA also showed the periodontal ligament space widening of the lower anterior teeth and the characteristic periosteal bone reaction of the "sunray" appearance in the left angle of the mandible. Anteriorly the radiographic picture is of the Codman's triangle appearance. The extent of bone destruction in the left angle and coronoid process of the mandible are best visualized in the panoramic radiograph.

Two advanced imaging modalities, computed tomogram (CT) and magnetic resonance imaging (MRI) were also obtained for the lesion. The CT view (fig.3) at a level below the alveolar bone shows tumour calcification or ossification in the extraosseous soft tissue mass not seen on PA and panoramic views due to superimposition. The exact boundary of the tumour lingually and bucco-labially with CT cannot be easily delineated but the near obliteration of the left parapharyngeal space is obvious.

Magnetic resonance scanning after administration of gadolinium-diethylene triamine penta acetic acid (Gd-DTPA) shows the isointense tumour in extent, both lingually and bucco-labially better than the CT view (fig 4). Soft tissue calcification could not be picked up from this view as MRI cannot image bone.

Fig 1: **Postero-anterior radiograph of osteosarcoma left mandible showing large cloud-like mixed radiolucency.**

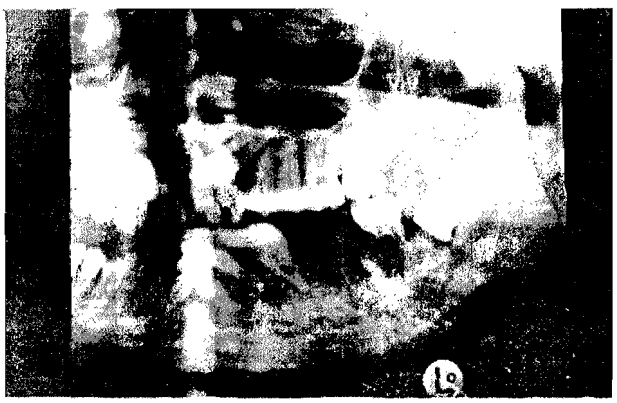

Fig 2: **Panoramic radiograph showing left mandible with sclerotic or 'cotton wool' internal structure of tumour area.**

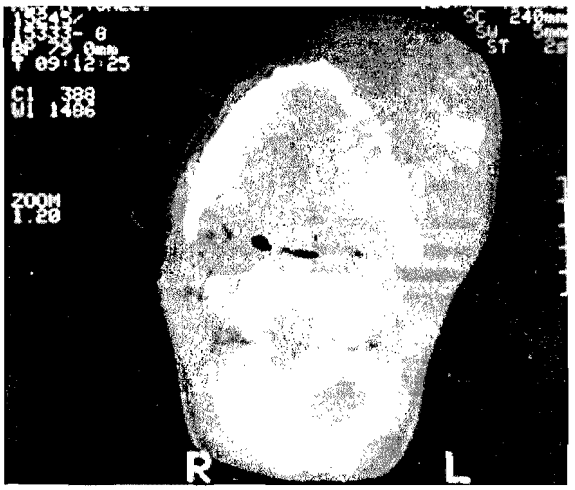

Fig 3: **Computed tomograph below mandibular alveolar bone showing bone destruction and tumour calcification in soft tissue mass.**

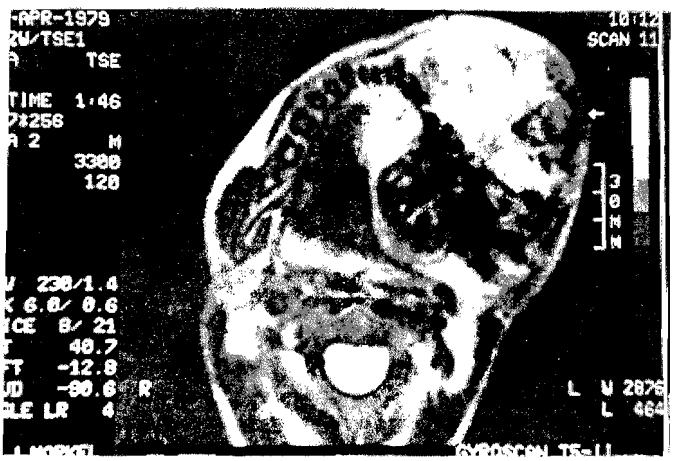

Fig 4: **Magnetic resonance imaging showing extent of tumour mass**

DISCUSSION

There has been increasing interest in the use of advanced imaging modalities in diagnosing lesions of the head and neck in recent times[14-15]. The osteosarcoma of the maxillofacial bones have variable appearances both radiologically and histologically and this may have posed a lot of diagnostic challenges to clinicians especially the aspect of imaging diagnosis. Prognosis of any intervention to the course of this tumour depends on the

extent of the tumour and its distant metastasis. There are no laboratory tests of diagnostic value for osteosarcoma except histopathology. A better knowledge of the imaging characteristics of this tumour will lead to an early diagnosis with improved prognosis.

Image evaluation will therefore require modalities that provide accurate bone and soft tissue delineation[14]. In the case presented here, conventional and panoramic radiographs were used in conjunction with CT and MRI in evaluating this tumour. Little success has been the lot of investigators using conventional and panoramic radiographs to evaluate bone tumours of the maxillofacial region because of bone superimposition[16-18] Givol et al[17], has advocated the use of intra-oral radiographs in depicting the relationship between osteosarcoma of the jaws and the adjacent bone and teeth, especially detecting the symmetrical widening of the periodontal ligament space. Intra-oral radiographs have also been used by these same authors to show the projection of the level of crestal bone higher than normal, due to tumour invasion. In this present case study, the PA was useful in showing the symmetrical widening of periodontal ligament space in the lower incisor and canine region which were blurred in the panoramic radiograph. The panoramic radiograph may not provide high definition of bony lesions as only a cross-section of the lesion will fall in the focal trough. When the lesion is also very large only a small portion of it will be in focus but the study here shows its usefulness in revealing structural details.

The characteristic sunray appearance or Codman s triangle at the bony cortex due to lifting of the periosteum by tumour bone formation was better visualised with PA than the panoramic radiograph. This radiological characteristic is not specific to osteosarcoma as it can be seen in chondrosarcoma of bone[19].

It has been shown that lesions detectable on scintigraphy but inapparent on plain films are often delineated on CT[19]. Bianchi and Boccardi[13] in their study of comparative radiological diagnosis of nine cases of osteosarcoma of the jaws, found CT to be much more superior to conventional and panoramic radiographs in identifying bone erosion, soft tissue infiltration and neoplastic tissue calcification. In this case study, CT was found more useful than conventional and panoramic radiographs in determining the apparent size, shape and soft tissue ossification of the tumour. Periosteal bone reaction of osteogenic sarcoma can also be demonstrated by CT but the characteristic "sunray" appearance was not obvious.

MRI is said to be less useful in examining cortical bone because of low hydrogen composition compared with bone marrow fat and hence its lack of signal intensity[19-20]. However, when fatty marrow is replaced by tumour, infection or haemorrhage, the strength of the fatty marrow signal is diminished changing from bright white to dark on TI - weighted images. Tissue characteristics can also be changed by contrast enhancement using gadolinium - diethylene triamine penta acetic acid (Gd-DTPA) which shortens TI-relaxation time giving a high signal intensity on TI - weighted images.

In the case studied here, MRI showed better delineation of the extent of the lesion especially when enhanced by Gd-DTPA. The apparent size and shape of the lesion and its relationship to the compressed left parapharyngeal space was obvious.

CONCLUSION

Conventional and panoramic radiographs which are easily available are still useful diagnostic tools when the lesion is osteogenic sarcoma of the jaws especially at primary and secondary health care levels. However the importance of CT and MRI in evaluating the extent and ossification of tumour mass in soft tissue, intramedullary and cortical bone invasion cannot be overemphasised. Complete image assessment of lesions including CT and MRI is advocated prior to surgery to show the precise extent of tumour within bone and soft tissue in order to plan complete surgical removal and improve prognosis.

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