Pitfalls in $^{18}$F-FDG-PET of Bone Malignancy in the Craniofacial Skeleton

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Purpose
Positron emission tomography (PET) with $^{18}$F-FDG is an imaging modality that is being used increasingly to evaluate head and neck primary cancers and recurrences. The purpose of this case report is to describe a patient with a maxillofacial fibrous dysplasia and osteosarcoma in which the PET SUVs of the fibrous dysplasia far exceeded that of the mandibular osteosarcoma. This case demonstrates the advantage of PET/CT over PET imaging alone for distinguishing a primary malignancy from surrounding benign fibrous dysplasia and the need for further PET experience in regards to malignant and benign lesions of the maxillofacial complex.

Materials & Methods
A 41-year-old Dominican female with history of left maxillofacial fibrous dysplasia since age 9 presented to our institution for evaluation of a new left mandibular mass. Fibrous dysplasia of the mandible had been documented previously by biopsies obtained at ages 9, 25, and 35 years. Conventional CT imaging and PET/CT with the administration of 16.1 mCi of $^{18}$F-FDG were obtained.

Results
CT imaging demonstrated an expansile predominantly blastic (ground glass) tumor involving the left maxilla, left sphenoid bone, and left hemimandible with the classic appearance of fibrous dysplasia. A well defined lytic component of fibrous dysplasia was present in the left aspect of the sphenoid bone and in the left maxillary sinus. An additional 6 cm soft tissue mass with spiculated osseous borders was present in the left ramus and posterior body of the mandible. PET/CT showed the SUV in the left mandibular osteosarcoma to be 6.0 g/ml and the SUV in the left maxillary fibrous dysplasia to be 13.0 g/ml.

Conclusion
Although CT imaging clearly demarcated the left maxillary, sphenoidal and mandibular fibrous dysplasia from the left mandibular superimposed osteosarcoma, the surgeons desired a PET scan to definitely differentiate malignant tumor from lytic portion of the benign fibrous dysplasia. Recent literature notes that fibrous dysplasia tends to have similar SUVs as osteosarcoma (SUV 1-5) (1, 2, 4), therefore the PET findings were not
expected to be helpful. The finding of an SUV of 13.0 g/ml in the fibrous dysplasia was substantially greater than that reported in the literature for fibrous dysplasia or osteosarcoma (1, 2, 4). Had the PET scan not been combined with CT imaging, the PET results would have been confusing if not misleading. The increased SUV likely reflects fibroblastic activity. A number of bone lesions involving the maxillofacial complex share a similar biology including fibroblastic proliferation. Thus PET imaging provides limited value in distinguishing across the spectrum of benign and malignant lesions, or for the detection of metastases. This case illustrates the continued need for correlative anatomical imaging accompanying the PET scan and suggests that further studies of $^{18}$F-FDG PET in different lesions of the maxilla and mandible are warranted.

References