Malignant Transformation in A Case of Multiple Osteochondromas: Role of [18F]-FDG PET/CT Imaging

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1. Clinical Image
We present a 19-year-old man affected by osteochondromatosis since he aged 9. Multiple enchondromas showed asymmetric distribution of osseous and cartilage lesions with major deformities of pelvis and long bones and minor lesions in left scapula and few ribs.

He went to our observation because of size increase of left pelvis and thigh deformities, pain and cortical destruction that gave us a suspicion of malignant transformation.

For these reasons, the patient underwent [18F]-FDG PET/CT scan.

Standardized Uptake Values (SUVmax) were considered for benign and suspected malignant lesions Axial [18F]-FDG PET/CT fusion images (Figure 1) of the right (a) and left (b) humerus, right (c, d) and left iliac bone (e), right (f, g) femur and the proximal end of the tibia and fibula (h) showed cartilage capped bony projections arising on the external bone surface. No significant activity was showed in these certainly being osteochondromas and SUVs were below 1.0.

Axial [18F]-FDG PET/CT fusion images (i, j) and coronal images (k) of left ischio-pubic branch showed a more heterogeneous appearance with cortical erosions, invasion of the surrounding soft tissues and a more disomogenous surface. Significantly higher SUVs were observed at borders of these lesions (4.3, 3.8, 5.2) whereas the core had a lower metabolic activity (2.6, 1.6, 2.8) but still higher than benign lesions.

The patient underwent complete surgical excision of left ischio-pubic branch. Hystology confirmed diagnosis of grade II chondrosarcoma.

A second [18F]-FDG PET/CT scan (Figure 2) was performed eighteen months after surgery. CT images showed showed a mild enlargement of osteochondromas in some skeletal segments, but no increased SUVs, all below 1.0, were found at PET images.

The risk of malignant transformation of osteochondromas, that are benign lesions and do not affect life expectancy, is 1–5%. The prognosis is strictly dependent on histological grade, with 10-year survival rates ranging from 83% for grade I chondrosarcomas to 29% for grade III chondrosarcomas [1, 2].

This case highlights the need for continuous surveillance of the risk of malignant transformation of multiple osteochondromas into chondrosarcomas that usually occur at an earlier age than chondrosarcoma alone [3].

From the diagnostic imaging point of view, anatomical image techniques (CT, RM) assess very well the morphological changes in the bone. [18F]-FDG PET/CT is useful to evaluate metabolic changes suspected for malignant transformation, since 18F-FDG uptake is usually higher in sarcomas than in benign lesions [4, 5].
The Standardized Uptake Value (SUV), a semi-quantitative index of tracer uptake in a region of interest that reflects glucose consumption, correlates with chondrosarcoma grade (higher the grade, higher the SUV), while in benign lesion it is very low [6] and sometimes it can avoid percutaneous biopsy [7].

Moreover, [18F]-FDG PET/CT allows to diagnose local recurrences and distant metastases measuring their metabolic activity [8].

In conclusion, the success of the complete surgical excision of the lesion depends very much on the careful evaluation of the extension and metabolic activity and, for this purpose, [18F]-FDG PET/CT can play a very relevant role.

References