

## The role of 18F-FDG PET/CT for the detection of recurrent Osteosarcoma

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**Background.** Osteosarcoma is the most common primary malignant tumor of bone. Since the routine use of systemic chemotherapy, the 10-year event-free survival rate reaches about 59.8%, but despite effective treatment, local recurrence or distant metastases will occur in up to 60% of patients. 18F-FDG PET/CT is used increasingly to provide complementary information in sarcoma diagnosis and treatment planning, but few studies have assessed its diagnostic accuracy in detecting sarcoma recurrence.

**Purposes.** Aim of this study was to investigate the diagnostic accuracy of 18F-FDG PET/CT in osteosarcoma patients, with suspicious of disease recurrence after radical therapies.

**Patients and Methods:** Inclusion criteria were: a) radical surgical treatment for proven osteosarcoma and documented complete remission after therapy; b) 18F-FDG PET/CT during followup for clinical/diagnostic suspicious of relapse; c) histological validation of 18F-FDG PET/CT findings.

We included 32 patients that performed 37 imaging evaluations with FDG-PET/CT prior to re-surgery for a clinical/imaging suspect of local or distant relapse. There were 20 men and 17 women. Mean age at diagnosis was 20.3 years (median 16 years; range from 7 to 52 years). The femur was the most common anatomic site, with 15 cases (47%), followed by the tibia in 13 cases (41%), humerus (3 cases, 9%), pelvis (2 cases, 6%), ulna (1 case, 3%) and primary soft tissue lesion (3 cases, 9%). Primary surgical treatment consist of resection (29 cases) or amputation (3 cases). 18F-FDG PET/CT performance was assessed with a perpatient and persite evaluation of sensitivity, specificity, accuracy, positive predicting value (PPV) and negative predicting value (NPV). The sites of relapse were classified as local, lung, lymphnodes (LNs) and distant (other skeletal segments and/or distant soft tissue). The disease free survival (DFS) and the overall survival (OS) after 18F-FDG PET/CT were evaluated.

**Results:** 18F-FDG PET/CT was positive in 89.2% (33/37) of patients. Local uptake was observed in 35.1% patients (13/37); lung uptake in 18.9% (7/37); local and lung in 2.7% (1/37); local and LNs in 10.8% (4/37); local, LNs and distant 5.4% (2/37); LNs and distant in 2.7% (1/37); lung, LNs and distant in 2.7% (1/37); local, LNs, lung and distant in 5.4% (2/37); lung and distant in 2.7% (1/37); only distant in 1/37 (2.7%). The persite mean SUVmax analysis resulted in: local=10.2; LNs=8.2; lung=5.6; distant=9.8. Histology resulted positive in 92% (34/37) of patients. A total of 51 pathologic lesions were evaluated (22 local relapse, 11 lung metastasis, 10 metastatic LNs, 8 distant metastatic lesions). On a perpatient analysis 18FFDGPET/CT showed a sensitivity, specificity, accuracy, PPV and NPV of 91%, 75%, 89%, 97%, 50%. On a persite analysis the performance for local recurrence was 96%, 100%, 97%, 100%, 93%, while for lung recurrence detection was 80%, 100%, 92%, 100%, 88%. The mean followup after 18F-FDG PET/CT was 21.5 months (range 182). At the end of followup 19% (7/37) of patients were death, 35% (13/37) were alive with disease and 46% (17/37) had no evidence of disease. At 18 months after 18F-FDG PET/CT the DFS was 46% and the OS was 81%.

**Conclusions:** 18F-FDG PET/CT showed promising results for the recurrence detection in osteosarcoma patients with suspicious of relapse after radical treatment, particularly in the detection of local relapse and lung metastasis.