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Introduction: Computed tomography (CT) and magnetic resonance imaging (MRI) are the standard modalities used to detection local recurrence and distant metastases of musculoskeletal sarcoma\(^{11}\). But, when tumor resection was performed with reconstruction using metallic implants, CT and MRI had unclear images because of noise around metallic implants; prosthesis, plate, intramedullary nail, and screw. Positron emission tomography with fluorine-18-deoxyglucose (FDG-PET) has been highly successful in detecting malignancies. The purpose of our study was to assess the potential roles of FDG-PET in the detection of local recurrence of malignant bone and soft tissue tumors surrounding metallic implant.

Methods: In this retrospective analysis, we included all 31 patients (12 males, 19 females; aged 10-85 years, median 49) and with histologically proven malignant bone or soft tissue tumor (osteosarcoma 13, chondrosarcoma 3, malignant fibrous histiocytoma of bone (MFH) 2, synovial sarcoma 1, liposarcoma 1, leiomyosarcoma 1, clear cell carcinoma 1, giant cell tumor of bone 4, bone metastases of cancer 4, malignant lymphoma 1) who underwent FDG-PET between January 2003 and July 2012. Primary lesions were located in femur (n=18), tibia (n=8), pelvis (n=2), humerus (n=2), spine (n=1), soft tissue of upper arm (n=1). We performed operation using implants with arthroplasty (n=16), hemi-arthroplasty (n=3), plate (n=6), intramedullary nail (n=4) and screw or wire (n=4). FDG-PET was performed 60 min after injection of 5 Mbq/Kg FDG. Patients fasted for at least 6 hours before the injection. Images were acquired on a dedicated PET scanner. We calculated the maximum standardized uptake value (SUVmax) and classified form of uptakes for 3 pattern; a,d) focal, b,e) diffuse and c,f) mixed pattern (Fig.1). One hundred thirty-five FDG-PET scans from 31 patients were obtained. Local recurrence diagnosed by FDG-PET was defined SUVmax was over 3.8 and uptake pattern showed focal or mixed pattern. Clinical local recurrence was proven by histopathology. No recurrence was defined no symptom and no positive examination during three months follow-up after FDG-PET examination. Performance indices of FDG-PET for diagnosis of local recurrent malignant bone and soft tissue tumors, including sensitivity, specificity, accuracy, positive and negative predictive value were calculated.

Results: Local recurrences with histologically proven were observed in 11 patients, 19 FDG-PET scans; 14 scans were diagnosed local recurrence because of SUVmax over 3.8 with focal or mixed uptake pattern, 3 scans were diagnosed no recurrence and 2 scans could not be diagnosed either local recurrence or no recurrence because of high uptake with implant itself. Clear cell sarcoma of upper arm. a) No recurrence diagnosed by FDG-PET. SUVmax was under 3.8 and uptake showed mixed pattern. b) Local recurrence occurred at the right upper arm. SUVmax was 6 and uptake showed focal pattern (Fig.2). Twenty patients resulted in no recurrence. Of the 116 FDG-PET studies from 20 patients, 115 scans showed negative uptake, one scan was misdiagnosed because SUVmax reached at 5.3 with mixed pattern. This patient was suffered from infection (Fig.3). The average SUVmax of local recurrent lesion was 6.5 (range, 3.8-13) whereas the average for no recurrent lesion was 1.8 (range, 0-5.3). FDG-PET examinations had a sensitivity of 73% (14/19), specificity of 99% (115/116), accuracy 95% (129/135), positive predictive value 93% (14/15), negative predictive value 97% (115/118) for diagnosis of local recurrence.

Discussion: The current diagnosis tools for the detection or exclusion of local recurrences are clinical examination, MRI or CT or X-ray. CT and MRI have sensitivities ranging from 58% to 83% in the detection of local recurrence of sarcoma. And Germaine reported FDG-PET detected of local and distant recurrences with 100% sensitivity\(^3\). But there are few reports about FDG-PET detecting local recurrence surrounding metallic implants. As in MRI and CT, artifacts are occurred surrounding metallic implants, it is difficult to distinguish local recurrent lesion from postoperative changes with implant. In the present analysis, FDG-PET demonstrated a high sensitivity, specificity, accuracy, positive predictive value, negative predictive value in the detection of local recurrence surrounding implant of malignant bone or soft tissue tumors. One case suffering infection with no recurrence resulted in false positive. Suffering infection is become risk of misdiagnosis for FDG-PET examination detecting local recurrence. Treatment protocols for sarcoma recommend early detection of recurrence and metastasis because it allows prompt initiation of therapy, thereby improving prognosis. The early detection allows multiple treatment options. Our study has shown utilities of...
FDG-PET might be able to detect local recurrence surrounding implant after operation.

**Significance:**

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**References:**