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Diagnostic Value of FDG PET-CT for Detecting Primary Breast Malignancy: Comparison with Other Image Modalities and Histopathologic Correlation

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Purpose: To compare the diagnostic value of 18F-FDG PET-CT in detecting the primary breast malignancy with other imaging modalities and to determine whether detectability of PET-CT depends on any factors such as size, differentiation, or nuclear grade of tumor. **Methods:** We evaluated pathologically proven 66 lesions in 61 patients (26-74 years, mean 46.9) who underwent preoperative PET-CT. Other imaging modalities were also evaluated: mammography in 58, US in 49 and MRI in 16. PET-CT images were visually evaluated and peak & mean SUV of mass were measured. For mammography and US, category 4 & 5 lesions as positive, and category 0-3 lesions as negative. For MRI, we used morphology and dynamic kinetic curve data based scoring system; sum of the scores higher than 10 as positive. Sensitivities of each modality were obtained. We analyzed PET-CT positive and negative groups in relation to size, SUV, differentiation and nuclear grade of tumors using paired t-test and Fisher's exact test. **Results:** 65 among 66 were malignant lesions: invasive ductal carcinoma (n=56), ductal carcinoma in situ (n=3), tubular carcinoma (n=1), medullary carcinoma(n=3), mucinous carcinoma(n=1) and malignant fibrous histiocytoma (n=1). One lesion was benign lesion. Sensitivities of PET-CT, mammography, US, and MRI for detecting malignant mass were 86.2%, 80.7%, 100% and 94.1% respectively. SUV(P) & SUV(M) in PET-CT positive group (5.28±3.24 & 3.56±2.24) was significantly higher than that of PET CT negative group (1.96±0.35 & 1.46±0.44) [$p<0.0001$ for both]. The size of the primary mass in PET-CT positive group (2.66±1.47) was significantly larger than that in PET-CT negative group (1.52±0.57) ($p=0.0002$). The nuclear grade and tumor differentiation were not significantly different between two groups. **Conclusion:** The sensitivity of the FDG PET-CT in detecting primary breast cancer is lower than those of other imaging modalities. The detectability of the FDG PET-CT might be degraded when the tumor is small in size.

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Efficacy of Compound CE-355,621 in a U87 MG subcutaneous tumor xenograft model using F-18 FDG microPET imaging

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Purpose: The anti-cancer drug compound CE-355,621 (Pfizer Inc.) blocks HGF binding to a human c-Met extracellular domain fusion protein. This study focused on the evaluation of the tumor's response to the treatment of U87 MG glioblastoma cells in a mouse xenograft model with compound CE-355,621 using F-18 FDG PET scans. **Methods:** Thirty nude mice were innoculated with U87 MG human glioblastoma cells sub-cutaneously on Day 0. Baseline FDG PET scans using microPET R4 were done at Day 6. We injected 200 ug of compound CE-355,621 or control vehicle into the mice intra-peritoneally at Day 7. The follow-up days of scanning were fixed as Day 8, 10, 14, 16, 21 for treated group and Day 8, 10, 14, 16 for control group. The tumor volumes were measured using a vernier caliper on the follow-up days. Ellipsoidal volumes of interest (VOI) were drawn manually on both tumors and backgrounds. The PET units Ci/ml by the scale factor calibrated using cylinder phantomwere converted to of known activities. For the values from PET, we measured maximum %ID/g, mean %ID/g, maximum SUV, mean SUV, mean %ID/g from 20% upper subset of VOI, and tumor to background ratio. **Results:** The tumor volume of the control group continued to increase. For the treatment group, the tumor growth significantly inhibited and delayed after dosing of each compound. Both maximum %ID/g and SUV demonstrate the steady state after dosing with CE-355,621 in the treatment group, while increase for the control group. Mean %ID/g and SUV showed the same trend but the values on Day 14 and 16 from the control decreased. Mean %ID/g from 20% upper subset in VOI was similar pattern to maximum %ID/g and SUV. Both maximum %ID/g and SUV increased for control group at Day 8, when no differences were still found in the tumor volume between groups. **Conclusion:** Compound CE-355,621 is an effective drug for the treatment of U87 MG tumors. FDG uptakes advanced the increase of tumor volume, so it could predict the response to this compound.