

Monitoring Primary Systemic Therapy of Large and Locally Advanced Breast Cancer by Using Sequential Positron Emission Tomography Imaging With [¹⁸F]Fluorodeoxyglucose

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ABSTRACT

Purpose

To evaluate positron emission tomography (PET) using [¹⁸F]fluorodeoxyglucose (FDG) for prediction of histopathologic response early during primary systemic therapy of large or locally advanced breast cancer.

Patients and Methods

In a prospective multicenter trial, 272 FDG-PET scans were performed in 104 patients at baseline (n = 104) and after the first (n = 87) and second cycle (n = 81) of chemotherapy. The level and relative changes in standardized uptake value (SUV) of FDG uptake were assessed regarding their ability to predict histopathologic response. All patients underwent surgery after chemotherapy, and histopathologic response defined as minimal residual disease or gross residual disease served as the reference standard.

Results

Seventeen (16%) of 104 patients were histopathologic responders and 87 were (84%) nonresponders. All patients for whom baseline SUV was less than 3.0 (n = 24) did not achieve a histopathologic response. SUV decreased by 51% ± 18% after the first cycle of chemotherapy in histopathologic responders (n = 15), compared with 37% ± 21% in nonresponders (n = 54; *P* = .01). A threshold of 45% decrease in SUV correctly identified 11 of 15 responders, and histopathologic nonresponders were identified with a negative predictive value of 90%. Similar results were found after the second cycle when using a threshold of 55% relative decrease in SUV.

Conclusion

FDG-PET allows for prediction of treatment response by the level of FDG uptake in terms of SUV at baseline and after each cycle of chemotherapy. Moreover, relative changes in SUV after the first and second cycle are a strong predictor of response. Thus, FDG-PET may be helpful for individual treatment stratification in breast cancer patients.