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Positron Emission Tomography Using FDG for Monitoring Primary Chemotherapy in Breast Cancer

Purpose: To address the role of positron emission tomography (PET) using [18F] fluorodeoxyglucose (FDG) to monitor primary (neoadjuvant) chemotherapy in patients with locally advanced breast cancer.

Patients and Methods: Quantification of regional FDG uptake of the breast acquired after the first and second courses of chemotherapy was compared with the baseline scan in 22 patients with a total of 24 breast carcinomas. To evaluate the predictive value of PET imaging, histopathologic response after completion of chemotherapy classified as gross residual disease (GRD) or minimal residual disease (MRD) served as the gold standard.

Results: Significant differences in tracer uptake between nonresponding tumors (GRD) and responding lesions (MRD) were observed ($P < .05$) as early as after the first course of chemotherapy. Tracer uptake showed little change in tumors with GRD found later in pathologic analysis but decreased sharply to the background level in most tumors with MRD. After the first course, all responders were correctly identified (sensitivity 100%, specificity 85%) by a standardized uptake value decrease below 55% of the baseline scan. At this threshold, histopathologic response could be predicted with an accuracy of 88% and 91% after the first and second courses of therapy, respectively.

Conclusion: This study demonstrates that in patients with advanced breast cancer undergoing primary chemotherapy, FDG-PET differentiates responders from nonresponders early in the course of therapy. This may help improve patient management by avoiding ineffective chemotherapy and supporting the decision to continue dose-intensive preoperative chemotherapy in responding patients.



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