Utility of FDG-PET scanning in lymphoma by WHO classification


We retrospectively evaluated 18fluoro-2-deoxyglucose positron emission tomography (FDG-PET) scans in 172 patients with lymphoma and correlated results with pathologic diagnosis using the World Health Organization (WHO) classification system. In total, FDG-PET detected disease in at least one site in 161 patients (94%) and failed to detect disease in 11 patients (6%). The most frequent lymphoma diagnoses were diffuse large B-cell lymphoma (LBCL; n = 51), Hodgkin lymphoma (HL; n = 47), follicular lymphoma (FL; n = 42), marginal zone lymphoma (MZL; n = 12), mantle cell lymphoma (MCL; n = 7), and peripheral T-cell lymphoma (PTCL; n = 5). FDG-PET detected disease in 100% of patients with LBCL and MCL and in 98% of patients with HL and FL. In contrast, FDG-PET detected disease in only 67% of MZL and 40% of PTCL. Comparison with bone marrow biopsies showed that FDG-PET was not reliable for detection of bone marrow involvement in any lymphoma subtype. (Blood. 2003;101:3875-3876

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Study design

Patients

All FDG-PET scans performed on patients with a diagnosis of non-Hodgkin lymphoma (NHL) or Hodgkin lymphoma (HL) at the University of Pennsylvania were selected for study. For cases with a confirmed diagnosis of lymphoma using the WHO classification system, FDG-PET scans performed at initial diagnosis or at relapse prior to treatment were included. Pathology specimens were reviewed, and diagnosis was confirmed by a hematopathologist at the Hospital of the University of Pennsylvania. Cases were excluded if patients had received therapy for lymphoma within 6 months of FDG-PET scanning or if all identifiable lesions had been removed surgically. The study was approved by the University of Pennsylvania Institutional Review Board.

FDG-PET scanning

PET imaging was performed using a C-PET scanner (ADACUGM, Philadelphia, PA). Patients fasted for at least 4 hours, and serum glucose levels were within normal range in all cases. The scan was begun 60 minutes after intravenous administration of 2.516 MBq (0.068 mCi/kg) FDG. Sequential overlapping scans were obtained covering the neck, chest, abdomen, and pelvis. Transmission scans using a Cesium 137 point source were interleaved between the multiple emissions to correct for nonuniform attenuation correction. The images were reconstructed using ordered subset expectation maximization algorithm. Scans were considered positive if the specific uptake value (SUV) of a suspicious lesion was more than 2.5. The absolute number and percentage of positive scans overall and by WHO classification were determined.

Bone marrow comparison

Comparison of FDG-PET and iliac crest bone marrow biopsy was performed on all patients with large B-cell lymphoma (LBCL), follicular lymphoma (FL), Hodgkin lymphoma (HL), marginal zone lymphoma (MZL), and mantle cell lymphoma.

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FDG-PET was suboptimal for all pathologic subtypes of lymphoma examined. Bone marrow biopsies were available for 105 of 159 patients with these histologies. As shown in Table 2, PET rarely detected pathologically identifiable marrow involvement by FL, and did not detect marrow involvement by MCL or MZL in any case. This situation may be due to relatively low FDG uptake per cell or to diffuse, low-density marrow involvement by tumor. HL and LBCL, conversely, showed FDG uptake in bone marrow that was not confirmed by iliac crest biopsy in several cases. Although these cases may represent false-positives, patients may alternatively have had patchy bone marrow involvement that was not detected by blind iliac crest biopsy. Whether FDG-PET may in fact improve sensitivity of disease detection in these histologies over blind iliac crest biopsy is an important question that is currently under investigation.

Other groups have reported conflicting results regarding the utility of FDG-PET imaging in indolent lymphomas. However, lymphoma diagnosis by the WHO classification was not reported in these studies. Our data indicate that WHO classification of lymphomas is crucial in determining the utility of FDG-PET to image lymphomas. We suggest that biologic characteristics intrinsic to specific histologic subtypes determine glucose utilization and, therefore, FDG uptake. The fact that FL almost invariably showed high FDG uptake demonstrates that histologic grade is not the most important predictor of FDG avidity. Similarly, the variability of results within MZL and PTCL suggests that the mechanisms of metabolic deregulation during lymphomagenesis are more complex than simply meeting the cellular needs of growth and proliferation.

The identification of lymphomas that are uniformly detected by FDG-PET implies that this imaging modality may be useful in detecting residual active disease for specific lymphomas even in the absence of a baseline scan. Confirmation of our results in prospective studies of larger numbers of patients and in multiple centers is needed before conclusions derived from these results can be adopted into clinical practice.

References