Journal of Alzheimer's Disease 36 (2013) 311–320
DOI 10.3233/JAD-122068
IOS Press

Brain [^{18}F]FDDNP Binding and Glucose Metabolism in Advanced Elderly Healthy Subjects and Alzheimer's Disease Patients

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Handling Associate Editor: Gary Small

Accepted 18 March 2013

Abstract.
Background: Positron emission tomography (PET) imaging of brain amyloid (Aβ) and neurofibrillary tangle (NFT) load is a candidate biomarker of Alzheimer's disease (AD).
Objectives: To compare brain Aβ and NFT load and glucose metabolism in advanced elderly (70 years and older) patients with AD and healthy controls (HCs) by PET with [^{18}F]FDDNP and [^{18}F]FDG.
Methods: Seven AD patients (mean ± SD age 79.3 ± 3.6 y, Mini-Mental State Examination (MMSE) score 22.1 ± 2.5) and eight HCs (mean age ± SD, 75.7 ± 3.9 y; MMSE score 29.0 ± 1.2) underwent PET with [^{18}F]FDDNP and [^{18}F]FDG.
Results: Global [^{18}F]FDDNP uptake was significantly higher ($p < 0.05$) in AD patients (1.15 ± 0.04) than in HCs (1.10 ± 0.06), while global brain metabolism was lower in AD patients than in HCs (AD patients 0.96 ± 0.09; HCs 1.13 ± 0.11; $p < 0.05$). In HCs, brain glucose metabolism was correlated with age for both the global [^{18}F]FDG SUVr and in the parietal and posterior cingulate regions, while no correlation was found between age and [^{18}F]FDDNP uptake. In AD patients, global [^{18}F]FDDNP uptake and uptake in the frontal and anterior cingulate regions of interest were correlated with MMSE score, while no correlation was observed with brain glucose metabolism.
Conclusion: Imaging Aβ load and NFT with [^{18}F]FDDNP can distinguish AD patients from HCs in an advanced elderly population. It seems to be less sensitive than [^{18}F]FDG to the brain changes observed with normal aging, but more sensitive to cognitive decline in advanced elderly AD patients.

Keywords: Alzheimer's disease, amyloid, diagnostic, imaging, PET scan

INTRODUCTION

Positron emission tomography (PET) imaging of brain amyloid (Aβ) and neurofibrillary tangles (NFT) is expected to improve the diagnostic accuracy of Alzheimer's disease (AD) at the dementia and prodromal stages [1–3]. The use of PET fluorine-labeled (^{18}F) compounds that ensures wide accessibility for routine clinical use promises to set PET imaging up as a standard biomarker for AD [4]. Fluorine labeled ligands such as the recently approved by the Food and Drug Administration (FDA) Florbetapir [5–8],

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ISSN 1387-2877/13/$27.50