Imaging brain amyloid using the radioligand ^{18}F-AV45 (Florbetapir F 18)

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Abstract

[Purpose] To quantitatively evaluate the fibrillar ß-amyloid (Aß) burden of participants with probable Alzheimer disease (AD), mild cognitive impairment (MCI), cerebral amyloid angiopathy (CAA), and frontotemporal lobar degeneration (FTLD), as well as healthy controls (HCs), by using ^{18}F-AV45 (Florbetapir) positron emission tomographic (PET) measurements.

[Methods] We performed ^{18}F-AV45 PET on 17 patients with AD (men 6, women 11; Revised Hasegawa's Dementia Scale [HDS-R], 18 ± 5.0 points; mean age, 72 years), 6 patients with MCI (men 4, women 2; HDS-R, 27 ± 1.5 points; mean age, 66 years), 5 HCs (men 2, women 3; mean age, 72 years), and 6 patients with FTLD (men 4, women 2; HDS-R, 22 ± 6.3; mean age, 69 years). Dynamic PET was performed over approximately 90 min after tracer injection (370 MBq). Subsequently, we constructed time–activity curves. Standardized uptake values (SUVs) and cortex-to-cerebellum SUV ratios (SUVRs) were calculated with regions of interest at the cortical region (frontal, temporal, parietal, and occipital lobes) and other regions (putamen, thalamus, and pons) for all subjects.

[Results] The SUVRs calculated using the cortex-to-cerebellum ratio in patients with AD and MCI and in HCs plateaued within 40 min after ^{18}F-AV45 administration. The cortical SUVR for 10 min extending from 50 to 60 min after administration was 1.37–1.44 for patients with AD, 1.16–1.24 for patients with MCI, and 1.03–1.24 for HCs. The SUVRs for patients with AD were greater than those for HCs; the SUVRs for patients with MCI were intermediate. The PET images from patients with AD and SUVRs between 0.6 and 2.0 could easily be discriminated from PET images from HCs. The SUVRs were higher for white matter than for gray matter in HCs; however, the SUVRs were higher for gray matter than for white matter in patients with AD. The SUVRs in the frontal, parietal, and temporal regions were significantly higher for patients with AD than for HCs or those with FTLD. The SUVRs in the frontal and parietal regions were significantly higher for patients with AD than those with MCI. The SUVRs in the occipital regions were not significantly different between patients with AD and other subjects. These results were consistent with those of other reports showing that ^{11}C-PIB (^{11}C-labeled Pittsburgh

compound B) retention was relatively lower in the occipital region than other regions, and that amyloid deposits were lower in the occipital region than in other regions at neuropathological examination.
[Conclusion] On the basis of the simplified SUVRs acquired by scanning 50–60 min after ^{18}F-AV45 administration, ^{18}F-AV45 PET showed significant differences between patients with AD and HCs and those with FTLD. The SUVRs were highest for patients with AD and lowest for HCs, and patients with MCI had intermediate SUVRs. These results were consistent with those of previous reports on Aß detection using ^{18}F-AV45 PET. Furthermore, the results suggested that ^{18}F-AV45 PET was probably effective in predicting the risk of onset of AD in patients with MCI, discriminating between AD dementia and non-AD dementia, and selecting objects of targeting therapy for amyloid.