

## A simple method for the detection of abnormal brain regions in Alzheimer's disease patients using [ $^{11}\text{C}$ ]MP4A: Comparison with [ $^{123}\text{I}$ ]IMP SPECT

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We have developed a radiolabeled lipophilic acetylcholine analogue, *N*-[ $^{11}\text{C}$ ]methylpiperidin-4-yl acetate ([ $^{11}\text{C}$ ]MP4A) to measure brain acetylcholinesterase (AChE) activity by positron emission tomography (PET) *in vivo*. Aiming to develop a new SPECT tracer similar to MP4A, we first proposed a simple method for diagnosing Alzheimer's disease (AD) using [ $^{11}\text{C}$ ]MP4A PET. We performed [ $^{11}\text{C}$ ]MP4A PET and *N*-isopropyl [ $^{123}\text{I}$ ]iodoamphetamine ([ $^{123}\text{I}$ ]IMP) SPECT in 13 patients with AD and in 17 normal controls (NC). We calculated the ratio of radioactivity of the cortical region of interest (ROI) to that of the cerebellum measured with [ $^{11}\text{C}$ ]MP4A PET (MP4A ratio) and the ratio of regional cerebral blood flow (rCBF) to that of the cerebellum measured with [ $^{123}\text{I}$ ]IMP SPECT (IMP ratio). Eleven cortical ROIs were placed in the frontal, sensorimotor, temporal, parietal, and occipital cortices in both hemispheres and in the posterior cingulate cortex, and *z*-score was calculated in each ROI in patients with AD compared with NC. When the *z*-score was 2 or more in a ROI, it was defined as a positive ROI. When a patient had 3 or more positive ROIs, the patient was diagnosed as having AD. The reduction in the MP4A ratio was greater than that in the IMP ratio in all cortical ROIs except for in the right parietal cortex and cingulate cortex in patients with AD. MP4A ratio method showed 92% sensitivity and the IMP ratio method 69% sensitivity for the diagnosis of AD. These results encourage us to develop a new SPECT tracer similar to MP4A for the diagnosis of AD.

**Key words:** [ $^{11}\text{C}$ ]MP4A PET, [ $^{123}\text{I}$ ]IMP SPECT, comparison, Alzheimer's disease, simple ratio analysis