

Summary

Longitudinal Evaluation of Early Dementia of Alzheimer Type Using Brain Perfusion SPECT

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Regional cerebral blood flow (rCBF) measurements using a Patlak plot method of ^{99m}Tc-ECD were performed in early dementia of Alzheimer type (DAT) with both HDS-R and MMSE of over 20 to investigate initial abnormality and longitudinal changes of rCBF. A fusion technique of MRI and SPECT images was developed for MRI-guided analysis of regions of interest in hippocampal areas and statistical parametric mapping (SPM) was used for automated and objective approach to analysis of SPECT image data. Seventeen patients with clinically diagnosed early DAT and age-matched 32 normal control subjects were studied.

At the first SPECT studies, the mean cerebral blood flow (mCBF) of 38.6 ± 4.7 ml/100 g/min (mean \pm SD) for early DAT did not show significant reduction as compared with the normal control value of 42.0 ± 3.8 , whereas the rCBF values in the bilateral hippocampi (right; 26.8 ± 4.7 , left; 26.7 ± 5.2) showed significant reduction ($p < 0.05$) as compared with the normal control values (right; 38.3 ± 4.2 , left; 38.4 ± 3.8). The

SPM analysis (voxel height; $p < 0.001$, Bonferroni correction; $p < 0.05$) of the first SPECT images revealed significant selective decrease of relative rCBF in the bilateral posterior cingulate gyri. At the second SPECT studies after 1.4 year on the average from the first studies, mCBF for early DAT showed a slight decrease by 1.7 ± 3.8 ml/100 g/min/year. Bilateral hippocampi showed a greater decrease with slight left-side dominance by 3.8 ± 3.3 on the right and 4.4 ± 3.2 on the left side. The SPM analysis demonstrated significant decrease of relative rCBF in the basal forebrain area, the left hippocampus, the left amygdala, and the left parahippocampal area.

These results suggest that the MRI-guided ROI analysis of rCBF values in the hippocampus and the SPM analysis of SPECT images are quite useful for early diagnosis and follow-up of DAT.

Key words: Dementia of Alzheimer type, SPECT, rCBF, Statistical parametric mapping.