

Use of automated image registration to generate mean brain SPECT image of Alzheimer's patients

Muhammad Babar IMRAN,* Ryuta KAWASHIMA,* Shuichi AWATA,** Kazunori SATO,* Shigeo KINOMURA,* Hiroshi ITO,* Shuichi ONO,* Seiro YOSHIOKA,* Mitsumoto SATO** and Hiroshi FUKUDA*

*Department of Nuclear Medicine and Radiology, Institute of Development, Aging and Cancer, Tohoku University

**Department of Psychiatry, Tohoku University Hospital

The purpose of this study was to compute and compare the group mean HMPAO brain SPECT images of patients with senile dementia of Alzheimer's type (SDAT) and age matched control subjects after transformation of the individual images to a standard size and shape. *Methods:* Ten patients with Alzheimer's disease (age 71.6 ± 5.0 yr) and ten age matched normal subjects (age 71.0 ± 6.1 yr) participated in this study. Tc-99m HMPAO brain SPECT and X-ray CT scans were acquired for each subject. SPECT images were normalized to an average activity of 100 counts/pixel. Individual brain images were transformed to a standard size and shape with the help of Automated Image Registration (AIR). Realigned brain SPECT images of both groups were used to generate mean and standard deviation images by arithmetic operations on voxel based numerical values. Mean images of both groups were compared by applying the unpaired t-test on a voxel by voxel basis to generate three dimensional T-maps. X-ray CT images of individual subjects were evaluated by means of a computer program for brain atrophy. *Results:* A significant decrease in relative radioisotope (RI) uptake was present in the bilateral superior and inferior parietal lobules ($p < 0.05$), bilateral inferior temporal gyri, and the bilateral superior and middle frontal gyri ($p < 0.001$). The mean brain atrophy indices for patients and normal subjects were 0.853 ± 0.042 and 0.933 ± 0.017 respectively, the difference being statistically significant ($p < 0.001$). *Conclusion:* The use of a brain image standardization procedure increases the accuracy of voxel based group comparisons. Thus, intersubject averaging enhances the capacity for detection of abnormalities in functional brain images by minimizing the influence of individual variation.

Key words: Alzheimer's dementia, Tc-99m HMPAO SPECT, image registration