

## Differentiating between multiple system atrophy and Parkinson's disease by positron emission tomography with $^{18}\text{F}$ -dopa and $^{18}\text{F}$ -FDG

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Both the striatal  $^{18}\text{F}$ -dopa uptake and brain glucose metabolism were studied by PET with 6-L- $^{18}\text{F}$ fluorodopa (FD) and  $^{18}\text{F}$ fluorodeoxyglucose (FDG) in 9 patients with multiple system atrophy (MSA) and 15 patients with idiopathic Parkinson's disease (PD). Five of the 9 MSA patients were diagnosed as having olivopontocerebellar atrophy, whereas 2 had striatonigral degeneration and 2 demonstrated Shy-Drager syndrome. The FD uptake ratios to the occipital cortex in the MSA patients at 120 min after the administration of FD were  $2.07 \pm 0.31$  (mean  $\pm$  SD) and  $1.96 \pm 0.29$  in the caudate and the putamen, respectively, and decreased compared to those in the controls ( $2.72 \pm 0.11$ ,  $2.71 \pm 0.10$ ). The same ratios in the PD patients were  $2.07 \pm 0.36$  and  $1.74 \pm 0.24$ , respectively, which also decreased, but the decreased uptake in the putamen was more prominent. The caudate-putamen index (CPI) (%), which was calculated by a formula based on the difference in the uptakes in the caudate and putamen divided by the caudate uptake, indicated  $5.6 \pm 4.6$  in the MSA patients and  $14.8 \pm 5.4$  in the PD patients. The CPI for all PD patients was more than 7.0, which was the mean + 2SD for the controls, but the CPI for 3 MSA patients was more than 7.0 (accuracy: 88%). The glucose metabolic rates for each region in the PD patients showed no difference from the normal controls. The frontal and the temporal cortical glucose metabolism and the caudate, the putamen, the cerebellar and the brainstem glucose metabolism in the MSA patients decreased significantly in comparison to those in the controls. But, as the glucose metabolic rates in such regions of each patient overlapped in the two groups, the accuracy of the FDG study for differentiation was lower than that of the FD study. The putamenal glucose metabolic rates, for example, in 3 PD patients were less than 6.8 (mg/min/100 ml), which was the mean - 2SD for the controls, while those in 3 MSA patients were more than 6.8 (accuracy: 75%). In addition, the combination of these two methods slightly improved the accuracy. The glucose metabolism is useful for evaluating the regional metabolic activity of the brain, and the FD study, which is specific to the dopamine system, seems to be more useful for differentiating between MSA and PD.

**Key words:** multiple system atrophy; Parkinson's disease;  $^{18}\text{F}$ -dopa uptake; glucose metabolism