Metabolic Alterations in Patients with Levodopa-Treated Parkinson Disease by *In Vivo* ^{1}H MR Spectroscopy

Hyun-Man Baik[1], Bo-Young Choe[1], Byung-Chul Son[2], Moon-Chan Kim[2], Seung-Hoon Ha[1], Bum-Soo Kim[3], Euy-Neyng Kim[3], Tae-Suk Suh[1], Hyoung-Koo Lee[1], Kyung-Sub Shinn[1,3]

Departments of [1]Biomedical Engineering, [2]Neurosurgery and [3]Diagnostic Radiology, College of Medicine, The Catholic University of Korea

Purpose: To evaluate alterations of observable metabolite ratios between the cerebral lesion and the contralateral region related to the clinical symptomatic side in levodopa-treated Parkinsons disease (PD) and to investigate a correlation between age in patients and metabolite ratios of the lesion in PD.

Materials and Method: Patients with levodopa-treated PD (n = 54) and age-matched normal controls (n = 15) underwent MRS examinations using a stimulated echo acquisition mode (STEAM) pulse sequence that provided 2x2x2 cm^3 volume of interest in the selected regions of substantia nigra (SN) and putamen-globus pallidus (PG). To evaluate dependence of metabolite ratios on age, we divided into two groups (i.e., younger and older age). We quantitatively measured N-acetylaspartate (NAA), creatine (Cr), choline-containing compounds (Cho), inositols (Ins), and the sum (Glx) of glutamate and GABA levels and obtained proton metabolite ratios relative to Cr using a Marquart algorithm.

Results: Compared with the contralateral region, a significant neuronal laterality of NAA/Cr ratio in the lesion of SN related to the clinical symptomatic side was established (P = 0.01), but was not established in the lesion of PG (P = 0.24). Also, Cho/Cr ratio tended toward significance in the lesion of SN (P = 0.07) and was statistically significant in the lesion of PG (P = 0.01). Compared with that in the younger age group, NAA/Cr ratio in the older age was decreased in the lesion of SN (P = 0.02), while NAA/Cr ratio was not statistically significant in the lesion of PG (P = 0.21).

Conclusion: Significant metabolic alterations of NAA/Cr and Cho/Cr ratios could be closely related with functional changes of neuropathological processes in SN and PG of levodopa treated PD and could be a valuable finding for evaluation of the PD. A trend of NAA/Cr reduction, being statistically significant in older patients, could be indicative of more pronounced neuronal damage in the SN of the progressive PD.