

Metabolic Changes in Parkinsons Disease after Function Neurosurgery by Follow-up ^1H Magnetic Resonance Spectroscopy

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Purpose: To investigate alterations of observable metabolite ratios between before and after functional neurosurgery in thalamus (TH) and globus pallidus (GP) of Parkinsons disease by follow-up ^1H magnetic resonance spectroscopy (MRS).

Materials and Method: Patients with PD (n = 17) and age-matched normal controls (n = 15) underwent MRS examinations using a stimulated echo acquisition mode (STEAM) pulse sequence that provided $2 \times 2 \times 2 \text{ cm}^3$ volume of interest in the regions of TH and GP. We quantitatively measured N-acetylaspartate (NAA), creatine (Cr), choline-containing compounds (Cho), inositols (Ins), the sum (Glx) of glutamate and GABA, and lactate levels and obtained proton metabolite ratios relative to Cr, and Cho using a Marquart algorithm.

Results: Compared with before the functional neurosurgery, a significant reduction of NAA/Cho ratio in the surgical lesion of TH was established ($P = 0.04$), and was also observed in the surgical lesion of GP ($P = 0.02$). Cho/Cr ratio tended toward significance in the lesion of TH ($P = 0.07$), and was statistically significant in the lesion of GP ($P = 0.04$). Moreover, distinct lactate signals were detected from the surgical lesions of TH and GP in PD patients, but could not be showed in all of the age-matched controls.

Conclusion: Significant metabolic alterations of NAA/Cho and Cho/Cr ratios might reflect functional changes of neuropathological processes in TH and GP and could be a valuable finding for evaluation of PD with the functional neurosurgery. Increase of lactate signals, being remarkable in surgical lesions, could be consistent with local neuronal tissue necrosis due to the functional neurosurgery in the TH and GP of PD. Therefore, ^1H MRS could be a useful modality to evaluate the diagnostic and prognostic implications for PD with the functional neurosurgery.