

Neuromelanin Imaging in Dementia with Lewy Body (DLB)

M. Ida¹, S. Sugawara¹, Y. Kubo¹, K. Hino¹, N. Yorozu¹, T. Suzuki¹, S. Ikuta¹, and Y. Kawaguchi¹

¹Department of Radiology, Tokyo Metropolitan Ebara Hospital, Oota-ku, Tokyo, Japan

INTRODUCTION

Dementia with Lewy bodies (DLB) is one of the most common neurodegenerative diseases resulting in dementia following Alzheimer's disease. Decreases in neuromelanin (NM) containing neurons in the substantia nigra (SN) of the midbrain and the locus ceruleus (LC) of the pons is a pathological feature of PD. Sasaki et al have reported decreased NM signal in the SN and LC in PD patients at 3T. The purpose of this study was to compare the alteration of the NM signal in the SN and LC of DLB patients, one of the alpha-synucleinopathies, with that of PD and AD patients and normal controls (NC) to elucidate the clinical significance using a 3T MR system.

MATERIALS and METHODS

The MR examinations were performed with a whole-body imager operating at 3T (MAGNETOM Trio, A Tim system, Siemens). The array coil we used consists of 32-independent receive elements with 32 integrated preamplifiers. NM images were acquired with a 2D fast spin-echo sequence with the following parameters; TE/TR, 10/600 msec; echo train length, 2; FOV, 220 mm; base matrix, 512; 2.5mm slice thickness; number of acquisitions, 5mm; acquisition time, 7min 51sec. We evaluated 21 patients who were clinically diagnosed with DLB, 60 patients with PD, 9 patients with AD and 17 normal subjects. Signal intensities of the SN (S_{SN}), LC (S_{LC}), medial portion of the temporal lobe (MT; S_{MT}) and the cerebellar vermis (CV; S_{CV}) were measured, and the contrast ratio (CR) of SN-MT and LC-CV were calculated in each patient. CR values of the SN-MT and LC-CV were also compared.

RESULTS

S_{SN} were lower than S_{MT} in DLB patients (CR: $-6.2\pm 6.9\%$) and PD patients (CR: $-3.7\pm 7.0\%$), and were higher than S_{MT} in AD patients (CR: $1.0\pm 8.6\%$) and normal subjects (CR: $5.2\pm 8.0\%$). S_{LC} were lower than S_{CV} in DLB patients (CR: $-3.9\pm 4.6\%$) and PD patients (CR: $-2.8\pm 4.7\%$), and were higher than S_{CV} in AD patients (CR: $2.0\pm 3.0\%$) and normal subjects (CR: $4.6\pm 4.3\%$). CR of SN-MT and LC-CV in DLB patients were significantly lower than that of AD patients and normal subjects ($P<0.001$ and $P=0.001$, respectively). In PD, CR of SN-MT were significantly lower than that of normal subjects ($P<0.001$) and CR of LC-CV were significantly lower than that of AD ($P=0.003$) and normal subjects ($P<0.001$). No statistically significant difference was found between DLB and PD in CR of SN-MT and LC-CV.

CONCLUSION

NM MR imaging at 3T can detect signal changes in the SN and LC which indicate alterations in the NM concentration and catecholaminergic neurons. The NM signals of the SN and LC in DLB were lower than normal subjects and AD. NM signal intensity in DLB was decreased to the same degree as PD patients. NM imaging is a helpful tool to distinguish DLB from AD in diagnosing patients with dementia.

