Perfusion and Diffusion MR Imaging of Dementia

Yoshiura, T. · Mihara, F. · Tanaka, A. · Kuwabara, Y. · Ogomori, K. · Kaneko, K. · Masuda, K.
Kyushu University
Fukuoka, JAPAN.

Purpose
The purpose of this exhibit is to illustrate appearances of brains with dementia on perfusion and diffusion MR images, and discuss potential roles of these relatively new techniques in diagnosing and monitoring dementia.

Materials & Methods
Over 100 patients who presented with dementia were studied with perfusion MR imaging and/or diffusion MR imaging in addition to conventional T1- and T2-weighted techniques. The disease spectrum included Alzheimer disease (AD), senile dementia of Alzheimer type (SDAT), frontotemporal dementia (FTD) with and without motor neuron disease, dementia with Lewy bodies (DLB), Creutzfeldt-Jakob disease (CJD) and vascular dementia (VD). Patients with mild cognitive impairment (MCI) were included also. The perfusion MR images were obtained using the dynamic susceptibility contrast technique. Maps of relative cerebral blood flow (CBF) and mean transit time (MTT) were evaluated. Brain perfusion SPECT was performed to validate the MR CBF maps. From the diffusion MR data set, maps of apparent diffusion coefficient (ADC) as well as isotropic diffusion-weighted images were created.

Results
Perfusion MR images showed abnormal CBF reductions in disease-specific patterns. CBF reductions in the temporal and parietal lobes were observed in patients with AD and SDAT. Predominant frontal lobe CBF deficits were shown in patients with FTD. Patients with DLB showed diffuse CBF deficits involving the bilateral occipital lobes. Patients with VD showed various patterns of CBF abnormalities that often were associated with prolonged MTT. The extent of the CBF deficits in perfusion MR images agreed with those seen in SPECT CBF maps. There was a general correlation between the degree of CBF abnormalities and disease severity. Patients with CJD showed characteristic ADC reductions in the affected gray matter.

Conclusion
Perfusion MR imaging can depict CBF abnormalities in various diseases presenting with dementia which are not visible on conventional MR images, and is useful for differential diagnosis and monitoring disease progress. Diffusion MR imaging is extremely useful for diagnosis of CJD. Providing the information on functional abnormalities (i.e., perfusion and ADC abnormalities) as well as structural abnormalities (infarctions, hippocampal atrophy, etc.) in one examination, MR imaging may become the first-choice imaging modality for dementia.