Combined MR measurements of magnetization transfer, tissue diffusion and proton spectroscopy. A feasibility study with neurological cases.

Abstract:
Magnetic resonance imaging (MRI) of diffusion and magnetization transfer was combined with 1H-spectroscopic imaging (CSI) to evaluate the clinical potential of in-vivo profiles of various brain pathologies. Ten patients (multiple sclerosis, cerebrovascular disease, leukodystrophy, Alzheimer dementia) and five healthy volunteers were investigated with diffusion-weighted MRI, magnetization transfer imaging, and CSI. Proton spectra were analyzed as ratios of NAA/Cr and Cho/Cr calculated from the peak areas of N-acetylaspartate (NAA), (phospho)-creatine (Cr) and choline (Cho). The apparent diffusion coefficient (ADC) and the magnetization transfer ratio (MTR) were determined in identical voxels to ensure identical partial volume effects compared to CSI. Compared to MTR and ADC assessments, the lower spatial resolution of CSI clearly indicates a hindrance at 1.5 T. In most demyelinating lesions, NAA/Cr reduction paralleled attenuated MTRs and elevated ADCs. By contrast, in acute stroke and some acute MS lesions the ADC was reduced, while MTR and NAA/Cr were also decreased. In Alzheimer’s dementia, ADC was increased, MTR unchanged and Cho/Cr increased. In a case of leukodystrophy, ADC was pronouncedly increased, MTR and NAA/Cr both reduced, and Cho/Cr normal. Combined measurements of ADC, MTR and CSI are feasible and provide differential in-vivo information.
on various brain pathologies.

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