Ruprecht-Karls-Universität Heidelberg
Medizinische Fakultät Mannheim
Dissertations-Kurzfassung

Characterization of Contrast-Enhancing and Non Contrast-Enhancing Multiple Sclerosis Lesions with Susceptibility-Weighted Imaging

Autor: Katja Fischer
Institut / Klinik: Neurologische Klinik
Doktorvater: Prof. Dr. A. Gass

Susceptibility-weighted imaging (SWI) is an emerging neuroimaging technique that is supposed to be effective in visualizing multiple sclerosis lesions. Although several studies investigated new aspects of this method regarding the research of this disease, an evaluation of contrast-enhanced SWI is still missing. We therefore used contrast-enhanced susceptibility-weighted imaging and investigated characteristics of enhancing and non-enhancing lesions and compared their appearance on SWI to pre-contrast T1-weighted imaging and diffusion weighted imaging. A total of 294 patients were evaluated using a three-tesla MRI system. Furthermore, we examined a possible influence of Gadolinium on post-contrast SWI data quality.

We included 1323 lesions for data analysis. Seventy-seven lesions showed contrast enhancement. In the corresponding SW images three different enhancement patterns were described: thirty-four homogenously, thirty-three ring-shaped and ten peripheral enhancing lesions. An association with veins was found in thirty-eight cases. All but one lesion appeared hyperintense on diffusion-weighted imaging. All lesions were hypointense on pre-contrast T1-weighted imaging. A total of 1246 non-enhancing lesions were analyzed. Five different SWI lesion phenotypes were noted and further analyzed. A large proportion of lesions 436/1246 were not detected with SWI, while 374 appeared homogenously hypointense, 162 ring-shaped, 199 scattered and seventy-five with a central dark dot. Connecting veins were demonstrated in 366/1246 cases. When compared to pre-contrast T1, 915 lesions were hypointense, but only 246 lesions appeared hyperintense on diffusion-weighted images. Furthermore the qualitative evaluation of lesions in pre- and post-contrast susceptibility-weighted images revealed no overt differences in data quality or obscuration of anatomical detail.

This study demonstrates the sensitivity of SWI to contrast enhancement in MS. It confirms different SWI lesion patterns in non-enhancing lesions. The observations suggest in conjunction with the T2 shine-through effect seen mainly in SWI ringlike hypointense lesions an early stage of lesion evolution in this SWI phenotype. Demonstration of veins connected to MS lesions confirms the inflammatory-demyelinating pathology and adds specificity. The use of Gd appears to facilitate the detection of connected veins. One needs to be aware that a fairly high percentage of lesions visible on FLAIR may be missed by SWI.