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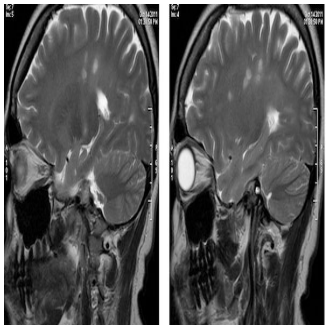
MRI Shows Grey Matter Demyelination in MS



The severity of myelin loss in the brain's grey matter is closely related to disease severity in people with multiple sclerosis (MS), according to researchers in the Department of Radiology at the University of Washington, Seattle. The authors of the study, which has been published online in *Radiology*, used magnetic resonance imaging (MRI) to reveal their findings. The new research will be relevant for future clinical trials, particularly those focused on the protection and restoration of myelin, and could play a role in the monitoring of MS progression and treatment success.

MS and Myelin

MS is a debilitating autoimmune disease characterised by inflammation of the central nervous system, with subsequent neurological symptoms. The loss of protective myelin around nerve fibres is central to the problems associated with MS, since proper brain function relies on the ability of signals to travel along nerve cell bodies. Myelin is abundant in white matter, but the small amount of myelin in grey matter protects the connections with brain cortex.

New Method: MPF Mapping

Post-mortem studies have shown that MS patients lose myelin in both the white and grey matter of the brain. However, previous imaging methods have not allowed for a clear understanding of the clinical significance of the demyelination of grey matter. Associate professor Vasily L. Yarnykh, PhD and colleagues used a novel MRI method called macromolecular proton fraction (MPF) mapping to assess 30 MS patients and 14 control patients.

MPF mapping focuses on the content of biological molecules in the tissue which are composed of many atoms, including carbohydrates, lipids and proteins. The technique permits the generation of 3-D brain maps that show the content of so-called macromolecules within brain tissue. Recent improvements in the method allow for faster data collection and processing times.

According to Dr. Yarnykh, "The method utilises a standard MRI scanner and doesn't require any special hardware — only some software modifications. MPF mapping allows quantitative assessment of microscopic demyelination in brain tissues that look normal on clinical images, and is the only existing method able to evaluate the myelin content in grey matter."

Strongest Correlation Between Disability and Grey Matter

The researchers reconstructed whole-brain maps in order to examine the grey matter, white matter and lesions of MS patients. They then compared the images with the results of clinical tests that characterised neurological dysfunction. MPF was found to be significantly reduced (in both white and grey matter) in the 18 patients with relapsing-remitting MS (RRMS), which is the most common type of initially-diagnosed MS. For the 12 patients with the more advanced MS known as secondary progressive MS (SPMS), MPF was found to be lower in both MS lesion sites and brain tissue which appeared normal, compared to the RRMS patients who had the largest relative grey matter decrease.

There was a significant association between MPF and clinical disability, with the strongest correlation for grey matter. According to Dr. Yarnykh, this is the major finding of the study, that the loss of the relative amount of grey matter in MS is comparable or greater than that of white matter. Additionally, advanced disease such as SPMS is associated with greater grey matter demyelination and greater disability.

“As such, we believe that information about grey matter myelin damage in MS is of primary clinical relevance,” said Dr. Yarnykh.

The research team is continuing its investigations of the new method, supported by the National Institutes of Health and the National Multiple Sclerosis Society. They plan to look at disease progression by following participants over time to study the evolution of myelin content, and by expanding the method to spinal cord imaging.

Reference: RSNA

Image Credit: Google Images

Published on : Wed, 10 Sep 2014