An MRI technique for imaging of pathologies of collagen, myelin and amyloid plaques (Ramot)

code: 8-2007-75

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The Technology

Characterization of pathologies related to macromolecules (MM) can now be carried out in a more comprehensive manner using these new MRI sequences. For example: Collagen in connective tissue and myelin in the nerves of brain and spinal cord are imaged with intensity proportional to the amount of MM. These pulsing sequences emphasize white matter signal. In other body tissues, the new MRI Sequence can also be used to assess blood vessels, joints, tendons, ligaments and cartilage. The dynamics and rigidity of macromolecules can be identified, including proteins and lipid membranes. This is an invaluable tool in the detection of related diseases where degradation of these materials in early stages could not previously be identified.

The Need

Images of connective tissues, such as ligaments, tendons and cartilage which appear in standard MRI based on water characteristics, are with low contrast. Furthermore, currently available MRI methods reflect the water characteristics and only indirectly provide information about the MM. The proposed sequences provide improved visibility of MM related tissues and more direct information on the MM.

Advantages

- This method images the MM and not the amount of water, or water's T1 or T2. Thus, it is a more direct visualization of pathologies related to MM.
- The new MRI sequence is a plug-in software “add-on” to the existing MRI hardware, and therefore does not require installation of supporting hardware or significant training of a technician.

Stage of Development

- The method that selects the MM by selective water suppression is ready to be implemented as is in the clinic while the one that uses double quantum filtering is ready to be used in the laboratory using micro-imagers.
- Human brain images were obtained using the selective water suppression method. Ex vivo experimental data on animal brains and spines were obtained using the double quantum filtering.

Patents

Two granted US patents: US Patent No. 7,795,867 & US Patent No. 7,390,671

Supporting Publications

A. Neufeld, U. Eliav and G. Navon, Magn. Reson. Med., 2003, 50, 229
U. Eliav, M. Komlosh, P. Basser and G. Navon, NMR in Biomed 2012, 25, 1152.
U. Eliav, M. Komlosh, P. Basser and G. Navon, Magn. Reson. Med., (in press).

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