ELSC Special Seminar: Amgad Droby Thu. 31/3, 10:00

March 31, 2016

On the topic of: Quantitative MR methods for studying neuronal compartment damage in multiple sclerosis and as a frame work for multi-centric studies.

ELSC cordially invite you to the lecture given by:

Amgad Droby, Johannes Gutenberg-Universität Mainz, Germany

On the topic of: Quantitative MR methods for studying neuronal compartment damage in multiple sclerosis and as a frame work for multi-centric studies.

The lecture will be held on Thursday, March 31, 2016 at 10:00 a.m., at ELSC - small seminar room (room 3-602)- Silverman Bldg., 3rd Wing, 6th Floor, Edmond J. Safra Campus

Light Refreshments at 09:45

Abstract:

Multiple sclerosis (MS) is a chronic inflammatory disease of the central nervous system (CNS) affecting mainly young adults. Apart from focal demyelination and axonal damage, neuronal compartment pathology plays a key role behind functional impairment. Various studies have documented microscopic diffuse damage in the normal appearing white matter (NAWM) which manifests itself as alterations in neural tissue characteristics and loss of axonal integrity.

Our focus was to investigate the diffuse neural damage caused by MS lesions in vivo in relapsing-remitting MS (RRMS) patients applying multi-modal imaging techniques. Firstly, using diffusion tensor imaging (DTI), tractography, T1 and T2 relaxometry, MTR and PD mapping. Moreover, using resting-state fMRI (rs-fMRI), the changes in functional connectivity (FC) patterns induced by a single MS lesion located at an MS predilection site were studied.
In line with findings of animal studies, our results showed that the individual lesions in MS have not only focal effects but also lead to far-reaching micro-structural damage and functional network alterations. From DTI, a significant decrease in fractional anisotropy (FA) and an increase in radial diffusivity (RD) both at the lesion as well as at distal sites along the affected WM fibers were detected. Additionally, prolongation in T1, T2, and PD relaxation times was observed in various GM regions when comparing MS patients with HCs. Finally, following a chronic MS lesion affecting the left posterior periventricular space, a significant increase in functional connectivity (FC) levels in the contra-lateral cortical brain regions were observed in rs-fMRI.

Based on this, we were able to confirm in vivo in RRMS patients that Wallerian and retrograde degeneration processes play a key role in disease progression and the systematic lesion pattern. In these patients, MS lesions were found to have both local as well as distal impacts along affected WM fibers which extend to functionally interconnected brain regions.

Moreover, qMRI was applied to test the long-term stability of specially-developed MRI phantoms based on human postmortem brains. Here, qMRI sequences were found sensitive to the temporal changes in tissue characteristics post-fixation and help to facilitate overcoming potential artefacts.

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