MULTIMODAL MRI ACCURATELY IDENTIFIES CEREBRAL TISSUE STATE, METABOLISM AND FUNCTION IN 6-OHDA INDUCED RAT MODEL OF PARKINSON'S DISEASE


Cerebricon Ltd/Charles River Laboratories, Kuopio, Finland

Introduction: Selective and progressive degeneration of dopamine neurons in the substantia nigra (SN) is a hallmark of Parkinson’s disease (PD). 6-hydroxydopamine (6-OHDA) induced PD animal model abolishes the SN and striatal dopaminergic terminals and is widely applied for studying symptomatic PD treatments. PET and diffusion weighted imaging are widely used in PD. Non-invasive in vivo MRI provides additional tools to study pathology, function and treatment responses in experimental and clinical PD studies.

Aims: Proton magnetic resonance spectroscopy (1H-MRS), white and gray matter condition by magnetization transfer ratio (MTR), and blood oxygen level dependent (BOLD) based pharmacological MRI were applied to study brain metabolic state and tissue function in rat 6-OHDA model.

Methods: Adult male Wistar rats were unilaterally injected with 6-OHDA into the MFB to induce experimental PD. Multimodal brain MRI (Varian DirectDrive 7 Tesla horizontal magnet) was performed at 8 weeks after lesioning by using sham rats and the contralateral hemisphere as controls.

Results: 1H-MRS revealed increased choline and myoinositol in ipsilateral striatum by 6-OHDA lesioning of MFB when compared to sham rats and contralateral striatum. D-amphetamine (3 mg/kg i.v.) activated cortico-striatum (increased BOLD signal) in sham rats as expected, whereas in 6-OHDA rats the signal was partially lost in the ipsilateral hemisphere. MTR findings remain to be characterized in a more detail.

Conclusions: Non-invasive multimodal MRI techniques can be used to detect changes in metabolism, function and brain tissue state, and that this methodology offers tools to efficiently measure 6-OHDA induced changes in rat brain.