

Determination of Iron in the Human Brain In Vivo
(Project number:56P22)

Final Report

In order to assess the iron concentration and its form in the brain of pantothenate kinase associated neurodegeneration (PKAN) patients we aimed to implement and perform MR examination of the deep brain structures on three whole body systems working at different magnetic fields. Eight patients were found from the whole Czech Republic based on the list of patients with genetically proved PKAN (Molecular Genetics Unit, University Hospital Motol, Prague, Czech Republic); only three of them were available. MR measurements at 1.5 and 3T were performed at the MR Unit of Institute for Clinical and Experimental Medicine (IKEM) and the MR measurements at 7T were done at the MR Centre of Excellence, Medical University of Vienna.

Following the approval of the ethics committees in Prague and Vienna, first visit of Dr. Dezortova, Dr. Herynek and Dr. Hajek in Vienna (08.–09.03.2010) served for adjustment of measurement protocols at 7T, pilot measurement on phantom ferritin solutions and measurement of the brain of healthy volunteers (n=3) serving as a control group. T1- and T2-MR relaxometry protocols at 7T were adapted to be comparable with those used at 1.5 and 3T in Prague.

From March 2010 to May 2010, volunteers and patients were examined at 1.5 and 3T at IKEM. The second visit to Vienna (27.05.2010) served for the examination of patients involved (n=3) and one volunteer (n=1) at 7T MR System. Due to the patient limited mobility and on the request from ethics committee patients were transported by official medical transport from Czech Republic and accompanied by their relatives as well as medical supervisor.

Data acquired during these measurements were processed by Drs. Dezortova and Herynek, and the analysis showed the need for further phantom and volunteer calibration measurements. These were performed during the third visit of partners from Prague to Vienna (16.-17.09.2010). The project was concluded with the final data analysis during the visit of Dr. Krssak to Prague (20.-23.09.2010). This visit also served for the intensive discussion and preparation of the manuscript, which is planned for the submission to scientific journal (European Radiology) this year. Further on, the preliminary results of the study were already presented at joint international workshop “MR Studies” in Oberjoch, Germany, 14.-17.06.2010, and are to be presented at further MR related international conferences (International Society of Magnetic Resonance in Medicine, European Society for Magnetic Resonance in Medicine and Biology) in 2011.

Besides the scientific output with possible diagnostic implications for PKAN patients and patients with other neurodegenerative diseases, our project proved the possibility to share very expensive mid-size instrumentation (acc. to Eur. Res. Area Instruments funding proposal) in bilateral international projects.

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Scientific output (List of presentations at local and international conferences)

1. Dezortová M, Krššák M, Herynek V, Hájek M. Iroin determination in the human brain in vivo. International Workshop „Magnetic Resonance Studies“. Oberjoch, June 14.-17, 2010
2. Dezortova M, Herynek V, Hajek M. MR Relaxometry and 1H MR Spectroscopy of Metal-based Neurodegenerative Disorders. BIT's 1st Annual World Congress of NeuroTalk: From Nervous Functions to Treatment. Singapore, June 25-28, 2010
3. Dezortová M Krššák M, Herynek V, Hájek M. Vyšetřování pacientů při 7T. semináře Základny radiodiagnostiky a intervenční radiologie, IKEM, 15.9.2010
4. Dezortová M, et al. 1.5T, 3T and 7T MR relaxometry in PKAN patients. Manuscript in preparation to Eur Radiology
5. ISMRM 19th Annual Meeting, Montreal, 2011 (abstract in preparation)

List of Participants of respective project visits:

Prague to Vienna (08.-09.03.2010)

1. Monika Dezortová
2. Milan Hájek
3. Vít Herynek

Prague to Vienna (27.05.2010)

1. Monika Dezortová
2. Milan Hájek
3. Pavla Francová (master student)
4. PKAN 1 (patient)
5. PKAN 1+ (mother of PKAN1)
6. PKAN 2 (patient)
7. PKAN 2+ (mother of PKAN2)
8. PKAN 3
9. medical transport driver
10. medical supervisor

Prague to Vienna (16.-17.09.2010)

1. Monika Dezortová
2. Milan Hájek
3. Vít Herynek

Vienna to Prague (20.-23.09.2010)

1. Martin Krššák



Figure 1. Participants of the project in front of MR Centre of Excellence of Medical University in Vienna.

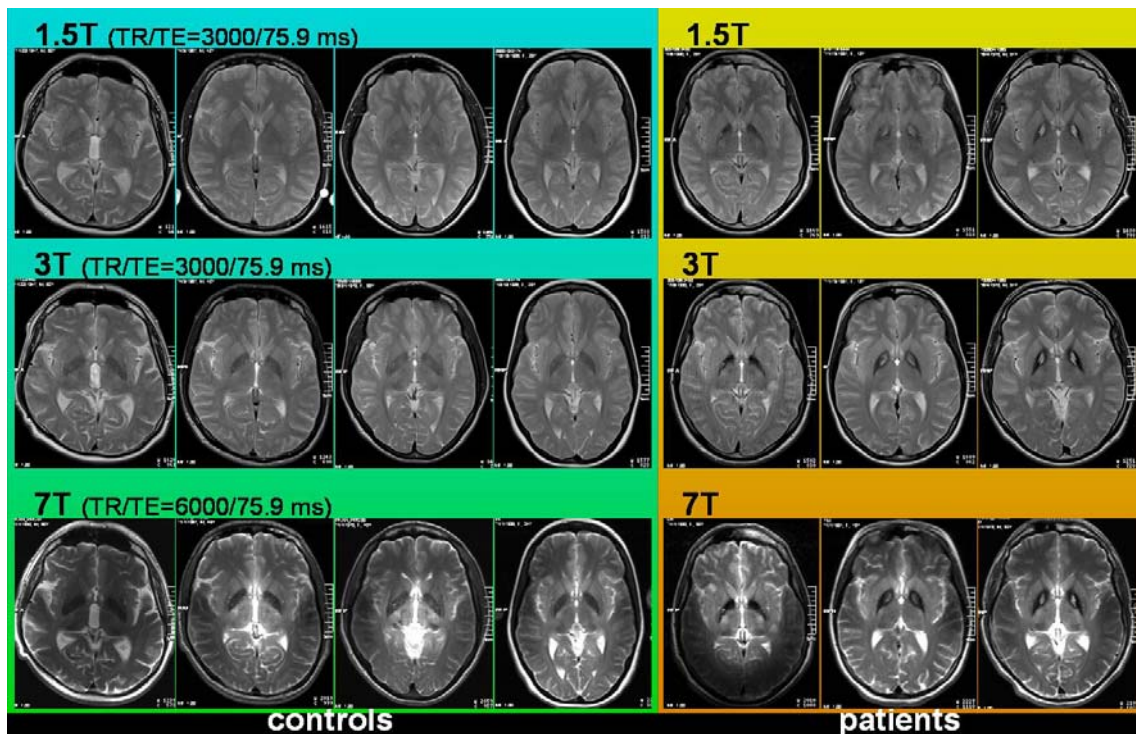


Figure 2. T2 weighted MR Images depicting the main differences between healthy controls and PKAN patients in the deep brain structures.