H. Lanfermann

Heinrich Lanfermann

1984	M.D. The Aachen University of Technology
1998	Habilitation (Ph.D.), J.W. Goethe-University, Frankfurt a. M.
2004	Professor of Neuroradiology, J.W. Goethe-University, Frankfurt a. M.
2007	Professor and Chair of Neuroradiology, Hannover Medical School

Current research

1. MR methodological development

The development of modern quantitative magnetic resonance imaging (MRI) methods to detect microstructural changes in human brain is one of the specialities of the Institute for Diagnostic and Interventional Neuroradiology, MHH. Among them the MR spectroscopy of different nuclei, such as ^{1}H, ^{31}P, as well as ^{13}C, plays an important role. They allow us to find abnormalities in patients at an earlier stage of the diseases. Different quantitative MR parameter mapping methods, e.g. T2 relaxation time, proton density, are the second focus of our methodological development. For instance an age-related collective (1 month to 60 years) of normative date of T2-relaxation time within the brain has been established, these data can serve as reference for quantitative evaluation of physiological and/or pathological changes of the brain. Moreover an age-related collective of normative data for the diffusion-tensor-imaging parameter "fractional anisotropy" has been established, that allows an assessment of microstructural changes to the brain by measurement of the diffusion of protons. Furthermore the detection of microstructural changes via the utilisation of DTI (FA, MD) and Kurtosis as well as via functional MRI is of particular interest.

2. Clinical research fields

One of our researches focuses on the measurement of neurodegenerative changes in human brain. Pathological changes are detectable in patients who, for example, suffer from hepatic encephalopathy or neurodegenerative diseases like Morbus Alzheimer. The purpose of this research is to allow diagnosis of metabolic variances at an earlier stage, which consequently will push the onset of adequate therapy and improve the outcome. In cooperation with the ZSN and the Clinic of Neurology of the Hannover Medical School the utilisa-

tion of ^{13}C-MRS shall provide the possibility to measure early changes of neuronal and glial metabolism in cases of neurodegeneration as well as to measure therapeutic effects.

The other important research field is the inborn errors of metabolism. With support of the Federal Ministry of Education and Research (BMBF, 01GM0309, German-Leukonet, TP 3) up-to-date findings about the manifold neurometabolic diseases, especially figured out by utilisation of modern quantitative MR methods, are accumulated by Mrs. Dr. rer.nat. Dr. med. X.Q. Ding, head of the section "Experimental Neuroradiology". Additionally specific MRI-protocols are implemented that make measurement of subtle pathologic changes of the brain possible, therefore being helpful to detect pathology at early stages and to control effects of therapy accurately, e.g. after bone marrow transplantation.

Furthermore the detection of microstructural changes before and after cochlear implants or brainstem implants is another research topic (in the framework of the research association "Audioneurotek" in cooperation with the Clinic of Laryngology, Rhinology and Otology of the Hannover Medical School). Hereby imaging parameters will be identified that correlate to a good outcome after these cost-intensive surgery. Therapeutic effects will be measured and optimised individually. In this regard improvements of MRI quality on patients with metallic implants will be worked out by reduction of artefacts.

Selected Publications

[1] Ding XQ, Sun Y, Braaβ H, Illies T, Zeumer H, Lanfermann H, Fiehler J: Evidence of rapid ongoing brain development beyond two years of age detected by fiber tracking. AJNR Am J Neuroradiol 2008 Apr 24. [Epub ahead of print]

[2] Ding XQ, Fiehler J, Kohlschütter B, Wittkugel O, Grzyska U, Zeumer H, Ullrich K: MRI abnormalities in normal-appearing brain tissue of treated adult PKU patients. J Magn Reson Imaging 2008;27:998-1004.

[3] Ding XQ, Wittkugel O, Goebell E, Förster AF, Grzyska U, Zeumer H, Fiehler J:Clinical applications of quantitative T2 determination: A complementary MRI tool for routine diagnosis of suspected myelination disorders. Eur J Paediatr Neurol 2007 Oct 25. [Epub ahead of print]

[4] Ding XQ, Kucinski T, Wittkugel O, Goebell E, Grzyska U, Görg M, Kohlschütter A, Zeumer H: Normal brain maturation characterized with age-related T2 relaxation times: an attempt to develop a quantitative imaging measure for clinical use. Invest Radiol 2004;39:740-6.

[5] Preibisch C, Wallenhorst T, Heidemann R, Zanella FE, Lanfermann H: Comparison of parallel acquisition techniques generalized autocalibrating partially parallel acquisitions (GRAPPA) and modified sensitivity encoding (mSENSE) in functional MRI (fMRI) at 3T. J Magn Reson Imaging 2008;27:590-8.

[6] Oertel BG, Preibisch C, Wallenhorst T, Hummel T, Geisslinger G, Lanfermann H, Lötsch J: Differential opioid action on sensory and affective cerebral pain processing. Clin Pharmacol Ther 2008;83: 577-88.

[7] Hattingen E, Pilatus U, Franz K, Zanella FE, Lanfermann H: Evaluation of optimal echo time for ^{1}H-spectroscopic imaging of brain tumors at 3 Tesla. J Magn Reson Imaging 2007;26: 427-31.

[8] Hattingen E, Raab P, Franz K, Zanella FE, Lanfermann H, Pilatus U. Myo-Inositol: a marker of reactive astrogliosis in glial tumors? NMR Biomed 2008;21:233-41.

[9] Setzer M, Herminghaus S, Marquardt G, Tews DS, Pilatus U, Seifert V, Zanella F, Lanfermann H: Diagnostic impact of proton MR-spectroscopy versus image-guided stereotactic biopsy. Acta Neurochir (Wien) 2007; 149:379-86.

Group Structure

Group leader:	Heinrich Lanfermann
Senior scientists:	Xiaoqi Ding Eva Bültmann Frank Donnerstag Peter Raab
Postdoctoral fellows:	Martin Bokemeyer Anja Giesemann Jan Zajaczek

Contact

Prof. Dr. H. Lanfermann
Institute of Neuroradiology
Hannover Medical School
Carl-Neuberg-Straße 1
30625 Hannover
Germany
Phone: +49-511-532-6654/6655
Fax: +49-511-532-5876
Email: Lanfermann.Heinrich@mh-hannover.de