

Press release

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Basic information

Name: Andrey Chuhutin Email: andrey@cfin.au.dk Phone: 42837117

Department of: Clinical Medicine

Main supervisor: Sune Nørhøj Jespersen

Title of dissertation: Characterisation of Microstructural Neurodegeneration with Diffusion MRI

Date for defence: 25.01.19 at (time of day): 13:00 Place: Aarhus University

Press release (Danish)

PhD- forsvar: Andrey Chuhutin

”Karakterisering af mikrostrukturel degeneration med diffusion MR” et nyt ph.d.-projekt fra Aarhus Universitet, Health. Projektet er gennemført af Andrey Chuhutin, der forsvare det d. 25/01

Fredag den 25. januar forsvare Andrey Chuhutin sin afhandling med titlen "Karakterisering af mikrostrukturel degeneration med diffusion MR". I sin afhandling har Andrey udforsket mikrostrukturelle biomarkører frembragt ved diffusion MRI og biofysisk modellering og vurderet specificiteten og følsomheden af disse biomarkører ved hjælp af dyremodeller af stress og multipel sklerose (MS).

Diffusions-MR er en billeddannelsesmodalitet, som er følsom over for vandmolekylerne bevægelser i vævet. En række studier har vist at en særlig diffusionsteknik kaldet diffusion kurtosis imaging (DKI) er meget følsom for hjernevævs mikroskopiske opbygning. DKI må derfor forventes at kunne danne grundlag for forbedrede diagnostiske teknikker.

Afhandlingen undersøger sammenhængen mellem DKI-baserede biomarkører, mikrostrukturelle modelleringsparametre og vævets mikrostruktur. Et studie undersøger faktorer, som påvirker DKI-målingernes følsomhed og specificitet med henblik på at bruge metoderne optimalt i undersøgelser af hjernen. Metoderne blev efterfølgende brugt til undersøgelse af dyremodeller af stress og MS.

Resultaterne viser at DKI har stort anvendelsespotentiale til undersøgelse af hjernevæv og dermed kan åbne nye veje for diagnose og ikke-invasiv overvågning af sygdomsprogression og behandlingseffekt i MS og en række andre hjernesygdomme.

Forsvaret er offentligt og foregår i Palle Juul-Jensen Auditorium, Aarhus Universitetshospital, Bygning 10G, Nørrebrogade 44, 8000 Aarhus C. For yderligere oplysninger kontakt venligst Andrey på andrey@cfin.au.dk eller +4542837117. En elektronisk version af afhandlingen kan fås ved henvendelse.

Bedømmelsesudvalg: Claudia Wheeler-Kingshott, Professor, University College London, London, Storbritannien, Markus Nilsson, Lektor, Lunds Universitet, Lund, Sverige, Steffen Ringgaard, Lektor, Aarhus University

Press release (English)

PhD dissertation defence: Andrey Chuhutin

"Characterisation of microstructural degeneration with diffusion MRI".

The project was carried out by Andrey Chuhutin, who is defending his dissertation on 25/01.

In his thesis Andrey has explored microstructural biomarkers yielded by diffusion MRI and biophysical modelling and assessed the specificity and sensitivity of these biomarkers using animal models of stress and multiple sclerosis (MS).

Diffusion tensor imaging (DTI) and its expansion diffusion kurtosis imaging (DKI) are imaging modalities that are sensitive to the displacement of water molecules in the tissue and share the ability to provide contrast based on microstructural anatomy of neural tissue. While DTI assumes Gaussian distribution of the displacements, which is valid only in the limited regime of low diffusion weighting, DKI provides non-Gaussian metrics.

In his thesis Andrey examined the interconnection between DKI-based biomarkers, microstructural modelling parameters and neural tissue microstructure, and explored factors that influence the sensitivity and specificity of parameter estimation. Applicability of related metrics was evaluated using the animal models of stress and MS. He discussed microstructural models, their area of applicability and added value as well as relationship to data models of MRI signal.

The results have shown a high potential and applicability of DKI for a quantitative assessment of neural tissue. The uncovered relationship of the microstructural biomarkers to the modelled pathology can open new avenues in diagnosis and non-invasive monitoring of disease progression and treatment effect in MS and a range of other brain diseases.

The defence is public and will take place in the Palle Juul-Jensen Auditorium, Aarhus Universitetshospital, Bygning 10G, Nørrebrogade 44, 8000 Aarhus C. For more details please contact Andrey at andrey@cfin.au.dk or +4542837117. An electronic version of the thesis is available on request.

Assessment committee: Claudia Wheeler-Kingshott, Professor, University College London, London, United Kingdom, Markus Nilsson, Associate Professor, Lund University, Lund, Sweden, Steffen Ringgaard, Associate Professor, Aarhus University

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