Institutionen för Neurobiologi, Vårdvetenskap och Samhälle,
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Magnetic resonance studies in Alzheimer’s disease

AKADEMISK AVHANDLING

Av

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ABSTRACT

Alzheimer’s disease (AD) is one of the most common forms of neurodegenerative disorders connected with gradual loss of cognitive functions such as episodic memory. The disease is related to pathological amyloid depositions and hyperphosphorylation of structural proteins in the brain which lead to progressive loss of function, metabolic alterations and structural changes in the brain. *In vivo* biomarkers need to be established to be able to set an early diagnosis, monitor disease progression and finally to observe pharmaceutical treatment effects. The aim of this thesis is to investigate the potential use of combining multivariate analysis with magnetic resonance imaging (MRI) and magnetic resonance spectroscopy (MRS) to monitor disease and treatment in AD. Due to the complexity of Alzheimer’s disease, we hypothesized, that considering patterns of disease markers is more useful for the evaluation of patients or a study outcome, than making decisions based on single biomarkers alone.

*Studies I* and *II* combine multivariate analysis with MRS to monitor disease and treatment effects in two different mouse models. *Study III* utilizes multivariate analysis in combination with different MRI measures (regional and global volumetric and cortical thickness measures) to discriminate between three groups, AD patients, MCI patients and healthy controls. *Study IV* investigates the added value of MRS in the early diagnosis of AD. In this study the multivariate models were built combining both MRI and MRS variables.

The methods could successfully be applied in both animals and humans. Metabolic fingerprints of disease and treatment could be identified as well as patterns of atrophy. The combination of multivariate data analysis with different magnetic resonance measures is a powerful tool for identifying treatment effects and distinguishing between different subject groups. The multivariate combination of different measures was clearly more powerful and predictive than focusing only on single measures using traditional analysis.