Detecting, tracking & modelling structural and functional brain imaging changes in Alzheimer's disease

https://neurodegenerationresearch.eu/survey/detecting-tracking-modelling-structural-and-functional-brain-imaging-changes-in-alzheimers-disease/

Name of Fellow

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Institution
Funder

MRC

Contact information of fellow
Country

United Kingdom

Title of project/programme

Detecting, tracking & modelling structural and functional brain imaging changes in Alzheimer's disease

Source of funding information

MRC

Total sum awarded (Euro)

€ 314,099

Start date of award

22/04/14

Total duration of award in years

2.5

The project/programme is most relevant to:

Alzheimer's disease & other dementias

Keywords

Bayesian Analysis | Computer-Assisted Image Analysis | Data Interpretation | Statistical | fMRI |

Magnetic Resonance Imaging | Medical Imaging | Probabilistic Models | Statistical Computing

Research Abstract

This proposal aims to assess cerebral structural and functional changes in Alzheimer's disease (AD). I will develop models for structural and functional changes and structure-function relationships using magnetic resonance imaging (MRI). Novel modelling approaches have the potential to yield scientific insights into the disease process and to provide improved biomarkers with impact on clinical studies and trials of candidate disease-modifying therapies. Specifically, I first propose to enhance the widely used statistical parametric mapping framework with a new spatio-temporal Bayesian model for serial MRI data, which will enable efficient modelling of the trajectories of volume change at every voxel in the brain, allowing direct localisation of regions with significant group differences or associations with clinical measurements, in terms of local volumes, rates of change of volume, and acceleration or deceleration. Secondly, I will investigate the application to AD of a recently developed method for Bayesian estimation and comparison of dynamical system models of brain connectivity (dynamic causal modelling; DCM) using functional MRI acquired at rest. Finally, I will explore the inter-relations of structural and functional changes, developing and evaluating biomarkers that combine their unique strengths. The methods will be widely applicable to imaging of dementia, but are particularly motivated by data from the Dominantly Inherited Alzheimer Network, available at the Dementia Research Centre, which includes longitudinal structural MRI and resting-state functional MRI in subjects at risk of familial AD, including presymptomatic mutation-carriers.

Types:
Fellowships

Member States:
United Kingdom

Diseases:
Alzheimer's disease & other dementias

Years:
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N/A

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