Optimized Arterial Spin Labeling MRI in Mild Cognitive Impairment

https://neurodegenerationresearch.eu/survey/optimized-arterial-spin-labeling-mri-in-mild-cognitive-impairment/

Principal Investigators

WOLK, DAVID A

Institution

UNIVERSITY OF PENNSYLVANIA

Contact information of lead PI
Country

USA

Title of project or programme

Optimized Arterial Spin Labeling MRI in Mild Cognitive Impairment

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NIH (NIA)

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5

The project/programme is most relevant to:

Alzheimer's disease & other dementias

Keywords

Acquired Cognitive Impairment... Aging... Alzheimer's Disease... Alzheimer's Disease including Alzheimer's Disease Related Dementias (AD/ADRD)... Brain Disorders... Cerebrovascular... Clinical Research... Clinical Research - Extramural... Dementia... Diagnostic Radiology... Neurodegenerative... Neurosciences

Research Abstract

DESCRIPTION (provided by applicant): A major goal in Alzheimer's disease (AD) research is to develop biomarkers that are sensitive to early disease, predict decline in those with mild symptoms (e.g. Mild Cognitive Impairment, or MCI), and reflect disease progression. Over the last two decades, a number of candidate neuroimaging, molecular,and psychometric measures have demonstrated variable success in accomplishing these goals. While significant advances have been made with molecular markers (e.g. CSF A?1-42) that are sensitive to specific pathology, these techniques appear relatively insensitive to clinical status or disease progression. On both empirical and theoretical grounds, brain measures that reflect synaptic function are thought to be the most sensitive to the consequences of early AD pathology and predictive of future decline. Fluorodeoyglucose (FDG) PET, a measure of glucose metabolism (CMRGlu), has demonstrated considerable promise in this regard. Arterial spin labeling (ASL) MRI, which is sensitive to cerebral blood flow (CBF) reflective of metabolic activity, may provide overlapping information with FDG-PET, but has several potential advantages: 1) ASL can be acquired in several minutes during routine MR imaging that most patients will obtain as part of their clinical evaluation, and, thus, is less expensive and burdensome~ 2) ASL does not require IV contrast or radiation exposure~ 3) ASL is potentially more accessible than PET~ 4) Short activation or task-related sequences can more easily be implemented with potential for increased sensitivity to early functional change. Further, since ASL is acquired along with other MRI sequences, one can potentially take advantage of orthogonal measures of brain structure and function, the combination of which may offer the fullest characterization of disease state. The central goal of this proposal is to demonstrate that 'state-of-the art' ASL-MRI produces largely equivalent information to FDG-PET in a cohort of amnestic MCI patients. In particular, we will determine the relative capacity of these modalities to determine clinical status [MCI vs healthy control (HC)], disease state (presence/absence of AD CSF profile), and predict future progression. 'Optimized' ASL sequences, leveraging numerous advancements in data acquisition and analysis, will also be compared to a commercially available ASL measure being implemented in the Alzheimer's disease Neuroimaging Initiative renewal (ADNI 2), to determine the relative value of these ASL variants. Additionally, task-related ASL will be explored for its potential to further enhance the predictive value of rest ASL alone. To achieve these aims, MCI patients and HC will undergo a baseline ASL-MRI and FDG-PET scan~ we will also obtain CSF molecular markers (tau/A?). Longitudinal clinical follow-up and a 1-year repeat MRI will allow for assessment of disease progression and determination of the relative predictive value of these imaging biomarkers. Finally, we will utilize the analytic pipeline developed in this project o analyze ASL data from ADNI 2, which will potentially enhance power to address some of the above questions and serve as a replication dataset.

Lay Summary

The development of biomarkers that are sensitive to early Alzheimer's disease (AD), predict rate of decline, and track disease progression is a major focus of AD research. Inexpensive and non-invasive MRI biomarkers are of great potential utility in clinical trials of putative disease modifying interventions, potentially reducing sample sizes and length of trials. These biomarkers will also likely play an important role in clinical practice for screening, prognosis and, with the emergence of disease modifying therapeutic options, disease monitoring. Given our aging population and estimates of future AD prevalence, development of these biomarkers is likely to have significant public health impact.

Further information available at:

Types:

Investments > €500k

Member States:
United States of America

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Alzheimer's disease & other dementias

Years:
2016

Database Categories:
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