Imaging Cerebral and Retinal Microvasculature in Cerebral Small Vessel Disease

https://neurodegenerationresearch.eu/survey/imaging-cerebral-and-retinal-microvasculature-in-cerebral-small-vessel-disease/

Principal Investigators

WANG, DANNY JJ

Institution

UNIVERSITY OF SOUTHERN CALIFORNIA

Contact information of lead PI
Country

USA

Title of project or programme

Imaging Cerebral and Retinal Microvasculature in Cerebral Small Vessel Disease

Source of funding information

NIH (NIA)

Total sum awarded (Euro)

€ 3,265,468.81

Start date of award

30/09/2016

Total duration of award in years

5

The project/programme is most relevant to:

Alzheimer's disease & other dementias

Keywords
Research Abstract

Project Summary/Abstract While Alzheimer’s disease (AD) is the most common cause of dementia, the contribution of vascular factors to cognitive impairment and dementia is becoming increasingly recognized. Vascular cognitive impairment and dementia (VCID) is most commonly caused by cerebral small vessel disease (SVD). To date, cerebral small vessels including arterioles, capillaries and venules are inaccessible to existing imaging technologies.

Characteristic parenchymal lesions on MRI, such as lacunar infarcts, white matter lesions, and microbleeds, have been adopted as markers of SVD. However, these parenchymal lesions are the consequences of SVD rather than the surrogate markers of microvascular changes, and are unsuitable for early interventions to change the course of VCID. During the past few years, our group has spearheaded the development of a suite of cutting edge MRI technologies for in vivo and noninvasive assessment of microvascular structure and function, including (1) high-resolution black blood MRI for direct imaging of perforating arteries; (2) arterial spin labeling (ASL) techniques for mapping microvascular perfusion, arterial stiffness or vascular compliance (VC) of small arteries/arterioles, and water exchange rate across the blood-brain barrier (BBB). Furthermore, we recently developed quantitative metrics for retinal capillary density and morphology using an FDA approved optical coherence tomography angiography (OCTA) platform. This method allows clinically feasible, in vivo and completely noninvasive imaging of retinal arterioles and capillaries with a spatial resolution of ~10 microns. Capitalizing on our extensive technical expertise and longstanding track record of clinical studies on VCID, we propose this UH2/UH3 project to further develop and evaluate a suite of MRI and OCTA markers for assessing the structure and function of cerebral and retinal microvasculature, in a cohort of Latino subjects enrolled in the Los Angeles Latino Eye Study (LALES) and in the study of autosomal dominant AD in persons of Mexican origin (Estudio de Enfermedad de Alzheimer en Jalisciences, or EEAJ). During the UH2 phase, we will further develop and evaluate the proposed MRI and OCTA imaging markers of SVD, establish their test-retest repeatability and clinical utility. We will work with the other participating sites and with the Coordinating Center to establish collaborative parameters and agreements of the consortium. During the UH3 phase, we will contribute to and execute cross-site research studies as designed by the consortium. We will perform unified and comprehensive clinical, cognitive, imaging, genetic and biochemical assessments on the cohort of LALES and EEAJ participants locally and perform data analyses as required by the consortium. At the closing of this project, we expect to develop the suite of microvascular imaging markers to readiness to enter into large-scale multi-site clinical validation studies toward FDA qualification for phase II and phase III clinical trials on small vessel disease to prevent and treat VCID.

Lay Summary

Relevance to Public Health Cerebral small vessel disease (SVD) is the most common vascular cause of dementia, a major contributor to mixed Alzheimer’s disease and vascular dementia, and the cause of about one fifth of all strokes worldwide. This project will develop and evaluate a suite of noninvasive magnetic resonance imaging (MRI) and optical coherence tomography angiography (OCTA) techniques for in vivo imaging of cerebral and retinal small vessels. In conjunction with parallel efforts at the participating sites of the consortium, this project is expected to lead to biomarkers of SVD that can be applied for phase II and phase III clinical trials to prevent and treat vascular dementia.

Further information available at:

Types:
Investments > €500k

Member States:
United States of America

Diseases:
Alzheimer's disease & other dementias

Years:
2016

Database Categories:
N/A

Database Tags:
N/A