Development, Validation, and Application of an Imaging based CVD Scale

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Principal Investigators

VEMURI, PRASHANTHI

Institution

MAYO CLINIC ROCHESTER

Contact information of lead PI
Country

USA

Title of project or programme

Development, Validation, and Application of an Imaging based CVD Scale

Source of funding information

NIH (NIA)

Total sum awarded (Euro)

€ 2,687,880.73

Start date of award

01/09/2016

Total duration of award in years

5

The project/programme is most relevant to:

Alzheimer's disease & other dementias

Keywords

cerebrovascular, AD pathology, White Matter Hyperintensity, tau Proteins, Validation

Research Abstract

PROJECT SUMMARY / ABSTRACT Cerebrovascular Pathologies (CVP) and Alzheimer’s disease (AD) pathologies (ADP) (amyloid and tau) are the two principal processes that drive

cognitive impairment in the elderly. Even though CVP features have been available for decades, there is no scheme that integrates the multiplicity of CVD features into a metric that has predictive power comparable to the AD biomarkers and correlates with cognitive functioning. The primary objective of this grant is to develop and validate an imaging based metric for quantifying CVP which we call the “CVD scale” [CVD – Cerebrovascular Disease]. We will use a stepwise approach to develop several CVD scales based on incremental information going from simple to more complex MRI metrics – FLAIR (white matter hyperintensities (WMH), size and location of infarctions), T2* GRE (subcortical microbleeds), and DTI (Fractional anisotropy and mean diffusivity underlying WMH and surrounding WMH to measure white matter integrity). The models will be developed by weighting each of these imaging features according to their contribution to cognitive performance and the final CVD scale will be analytically selected based on its ability to predict cognition. We will use additional independent datasets to ensure the generalizability of our models and improve them if necessary. Since autopsy based scales for cerebrovascular lesions have not found to be predictive of cognition and/or difficult to evaluate antemortem, pathology outcomes will not be used for the development of the scale, but instead for confirmation. The secondary objective of the grant is to apply the CVD scale to understand a) the impact of sex, APOE4, and resilience measures (intellectual and physical activity lifestyle) on the evolution of CVP after accounting for traditional risk factors (diabetes, hypertension, dyslipidemia, atrial fibrillation, smoking), and b) investigate interactions between CVP and ADP. We will capitalize on the existing population-based and prospective Mayo Clinic Study of Aging (MCSA) cohort and acquire new imaging data (PIB PET, Tau PET, MRI) for the development of the CVD scale. The population- based nature of the MCSA sample is ideally suited for the development and generalizability of the scale because it captures the range of CVP. One of the strengths of the proposal is the planned dissemination of the CVD scale to the scientific community.

Lay Summary

PROJECT NARRATIVE We believe that it is possible to develop a metric based on antemortem imaging features that achieves success by measuring the burden of cerebrovascular disease in a way to reflect its direct impact on cognition. This quantitation will improve our understanding of the role of cerebrovascular disease in the elderly both as a stand-alone etiology as well as its more prevalent role as a secondary “player” to AD and other dementias. Both of these will aid in improving the quality of life of patients by establishing early prevention and treatment plans.

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