Optimization and Validation of Improved Quantitative I-123 Brain SPECT Imaging

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Country

USA

Title of project or programme

Optimization and Validation of Improved Quantitative I-123 Brain SPECT Imaging

Source of funding information

NIH (NINDS)

Total sum awarded (Euro)

€ 1,023,750.46

Start date of award

15/07/2016

Total duration of award in years

4

The project/programme is most relevant to:

Parkinson's disease & PD-related disorders

Keywords

Tomography, Emission-Computed, Single-Photon, dopamine transporter, Validation, Parkinson Disease, reconstruction

Research Abstract
Abstract: Parkinson’s disease (PD) affects up to one million people in the United States and this

number is expected to increase as the population ages. Medication and surgery can provide relief of the symptoms upon diagnosis. However, it is difficult to detect early stage disease because validated biomarkers do not exist. Dopamine transporter (DAT) imaging with SPECT using I123 FP-CIT has been shown to be a valuable tool for assisting in the diagnosis of PD. When quantitative analysis is used, DAT SPECT can detect subtle changes in DAT binding in the striatal sub-regions that are correlated with the disease severity. To make quantitative measures reliable, there have been substantial efforts to standardize the protocols and analyses. However, the accuracy and precision are still affected by degrading factors inherent to SPECT imaging physics, and patient specific anatomical factors, producing significant inter- and intra-patient bias and variation, potentially leading to inaccurate diagnosis and less effective treatment. We have developed quantitative SPECT reconstruction and compensation methods that can provide very accurate and precise quantification from SPECT images. In this project, we will develop, optimize, and validate these methods on DAT SPECT. The goals are to improve quantitative reliability so normal reference values can be used to improve the diagnosis and differentiation of PD, to monitor disease progression, and to help develop new treatments. Our hypotheses are: 1) Using advanced quantitative reconstruction and compensation techniques of DAT SPECT will reduce bias and imprecision caused by imaging physics, subject specific anatomy, instrumentation and acquisition protocols. 2) The improved images will provide accurate and precise quantitative assessment of disease severity that is closely correlated to the patient's clinical indices. We will determine the intra- and inter-patient quantitative variability of DAT SPECT acquired on different SPECT systems using simulation and phantom studies. We will develop, optimize, and evaluate the reconstruction and compensation methods to produce reliable, reproducible, and robust quantitative results. We will then validate the optimized quantitative SPECT method using existing patient data. The quality of the images will be evaluated using human observers. The accuracy of quantitative SPECT measures and their correlation with clinical indices, such as the Unified Parkinson's Disease Rating Scale (UPDRS), will be statistically validated. Data acquired at different clinical sites using different SPECT systems will be compared. We will investigate the relationship between longitudinal SPECT measures and patient's disease progression. The difference between healthy controls and early stage patients will be studied. Successfully developing improved quantification of brain SPECT tracer uptake provides both, a more sensitive and specific method for the diagnosis and differentiation of PD, and better monitoring of the response to therapy.

Lay Summary
Narrative: The goal is to develop, optimize, and validate methods that can provide accurate and reliable image measures of Parkinson's disease. These quantitatively accurate images can be used to monitor and improve the diagnosis and differentiation of the disease, which may lead to the development of new treatments.

Further information available at:

Types:
Investments > €500k

Member States:
United States of America

Diseases:
Parkinson's disease & PD-related disorders

Years:
2016

Database Categories:
N/A

Database Tags:
N/A