NeuroMET2

Research Project

Innovative measurements for improved diagnosis and management of neurodegenerative diseases

Project update

for patients and staff

Winter/Spring 2021

What do we know about Alzheimer's disease ?

As the average age of our population increases, we find more people experiencing problems with memory, which impacts on their quality of life. To make sure patients get the right treatment, we need to be able to accurately diagnose early Alzheimer's disease, the most common form of dementia. Until now, no one has carried out a metrology research project to improve the accuracy of available diagnostic methods (e.g., magnetic resonsance imaging, blood tests and memory tests), involving the use of sophisticated mathematical models known as specification equations.

What is metrology and why is it important?

Metrology is the scientific study of how to do a measurement properly to answer a certain question. People who work in metrology are interested in how accurate (close to the true value), comparable (the same results is obtained in different clinics and laboratories across the world), and confident we can be (how variable are the data from the method used).

There are many different types of diagnostic measurement methods for Alzheimer's disease. So, we need to understand how we can make the results comparable across different clinics and laboratories to provide accurate diagnoses. This is important to allow health care professionals choose the appropriate treatment for patients with Alzheimer's disease.

What is the EURAMET NeuroMET research project?

The purpose of the NeuroMET Research Project is to help us improve diagnostic measurement methods for Alzheimer's disease. We are studying data from neuroimaging (known as Magnetic Resonance Imaging; MRI), blood-based and spinal fluid (known as ceberospinal fluid; CSF) biomarkers, and neuropsychological tests. The goals of the project are:

- set up patient groups to better understand which are the best methods for early Alzheimer's disease diagnosis
- improve magnetic resonance approaches for people who have early symptoms of Alzheimer's disease
- more accurate lab-based measures of spinal fluid, blood and saliva test analyses to early detect Alzheimer's disease
- a better understanding of how neuropsychological tests measure decline in memory (and other cognitive functions)

- to develop an app that can deliver memory tests and provide accurate and comparable results

It is particularly important to gather this information so we can better understand how current Alzheimer's disease treatments are working, and identify the sorts of new treatments we need to be developing. So, we are also forming a NeuroMET Stakeholder Network in Europe to help communicate what we find to help the broader Alzheimer's disease community.

Who are the people in the NeuroMET research project?

In 2016, we began inviting patients and caregivers to Charité Hospital

- Since then, 108 patients have agreed to participate in the study and have the first assessment, and 70 patients have had their second assessment. 26 patients have had their third assessment, 3 have had their fourth assessment
- Our group can be split up as follows: 'healthy controls' (HC; 28), 'subjective cognitive decline' (SCD; 26), 'mild cognitive impairment' (MCI; 27) and Alzheimers Disease (AD; 27)
- So far, 51% of study participants are men and 49% are women.
- The average age when first assessed is 71 years

What are some of the early findings?

We are developing a new memory scoring system which very accurately distinguishes between the diagnoses in the NeuroMET cohort. This memory score is based on widely used cognitive tests so that it can be applied in most other clinics or research settings.

Structural MRI scans are being segmented e.g. in grey matter [GM], white matter [WM] and spinal fluid [ceberospinal fluid; CSF] (see Figure) to assess structural changes throughout the course of disease. Even brain tissue thickness are being measured by complex softwares which are used world wide. Furthermore, using an MRI machine, it is possible to obtain information on chemical composition of brain tissue and see how metabolism is changed by the disease (the technique to do this is called magnetic resonance spectroscopy or MRS).

As we continue our research our understanding of each of the areas will improve.

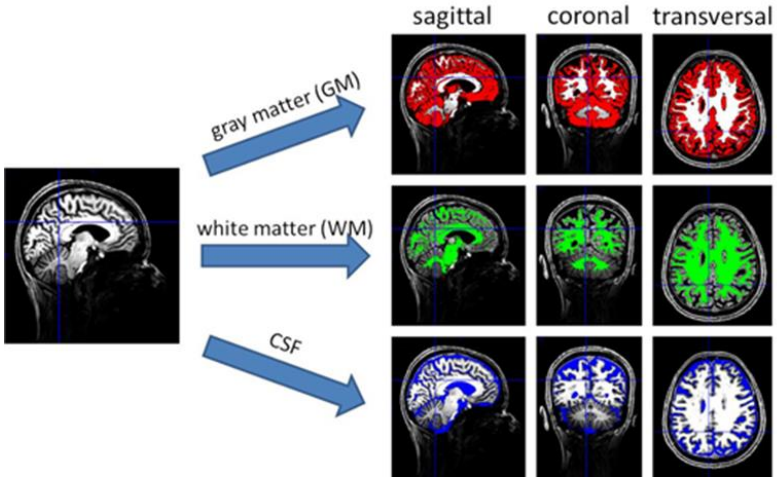

Figure: Anatomical Images segmented into GM, WM, and CSF

We have also analysed blood and saliva samples by using a number of conventional methods. In addition, we are developing methods to be used as reference for biomarkers such as t-tau, neurofilament light chain and α-synuclein, which are proteins known to show changes in their concentration during the course of disease.

Combining the analyses of MR scans, neuropsychological test findings and blood/saliva based biomarkers, we can identify the most important factors for an accurate diagnosis of Alzheimer's disease. We also began developing mathematical models that not only will help researchers but also healthcare professionals to more accurately diagnose their patients.

The project team: Who are we?

You may have already seen or met our researchers, Laura Göschel (Neuroscientist and coordinator at Charité) or Dr. Ariane Fillmer (Biomedical Physicist and MRI coordinator at PTB). The rest of the team is known as the NeuroMET consortium, which is made up by international researchers who are specialists in different aspects of metrology applied to Alzheimer's disease.

If you would like to learn more about the NeuroMET consortium please visit our webpage https://www.lgcgroup.com/our-programmes/empir-neuromet/.

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