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PET and MRI measurements of neuroinflammation and brain plasticity after a stroke

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PET and MRI measurements of neuroinflammation and brain plasticity after a stroke

Background

Prolonged inflammation of brain tissue can result in degeneration and dysfunction of white matter (the tissue that allows messages to pass between neurons in grey matter), the loss of synapses (the structures that allow each neuron to communicate) and eventually the death of neurons.

Inflammation of white matter often coincides with the kind of cognitive impairment seen in aging, schizophrenia, as a result of traumatic brain injury, post-stroke impairment and Alzheimer's disease.

The Problem

Currently, there is limited understanding of the connection between white matter inflammation, the degrading of white matter and the loss of synapses over time. We would like to know more about their relationship and the timing of these processes.

The Project

We are going to assess brain structure and function using magnetic resonance imaging (MRI) and positron emission tomography (PET) to study white matter inflammation and the density of synapses over time, alongside a behavioural assessment of motor and executive function. This kind of comprehensive assessment, especially using PET to measure synaptic density, has not been done before.

By doing this, we will demonstrate the interaction of inflammation, synaptic density and white matter integrity in the brain. With the behavioural assessment integrated as well, we will be able to explore real time correlation between behavioural testing and changes in the brain. This will open up new avenues of research in the understanding of the changes in the brain that accompany a stroke, for example. As groundwork for future research, it will help us explore the use of anti-inflammatories to prevent the brain from deteriorating after a stroke by enabling the measurement of inflammation and synaptic density.

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