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Title of Project: Amyloid deposition and cognitive function in Obstructive Sleep Apnoea

Obstructive Sleep Apnoea (OSA) is more prevalent in dementia patients than in the general population, and OSA increases the risk of developing Alzheimer's Disease (AD). AD markers, amyloid and tau, measured in cerebrospinal fluid and serum, have previously been associated with OSA measures in cognitively normal older adults, however, these are relatively indirect measures of amyloid burden. This pilot study aims to evaluate the degree of Pittsburgh Compound B (PiB) retention as a direct measure of amyloid burden in OSA patients and healthy controls using positron emission tomography (PET) and determined its association with clinical and neurocognitive measures.

The aims of this project were to:
1. To compare Alzheimer's disease related pathology, specifically brain beta amyloid (Aβ) burden, in patients with untreated OSA to healthy controls.
2. To evaluate the relationships between Aβ burden, cognitive function, brain volumes, age, OSA variables, medical and lifestyle factors and daytime sleepiness.

It was hypothesised that:
1) patients with OSA will exhibit higher levels of Aβ deposition compared to healthy controls after correction for associated medical and lifestyle factors; and
2) higher degrees of Aβ burden will be associated with worse sleep quality, more severe OSA, greater daytime sleepiness and poorer cognitive performance.

Progress to date: To date we have recruited and assessed N=20 participants with OSA. Participants completed a PiB PET scan, the Hospital Anxiety and Depression Scale and a 90-minute neurocognitive test battery, including the Trail Making Test (TMT) and the Subtle Cognitive Impairment Test (SCIT).

Preliminary results: Data from N=16 individuals with OSA have been analysed (mean±SD age=54.1±8.7 years; AHI mean=48.8±17.4, range=31.4–95.9 events/hr; Epworth Sleepiness Scale (ESS) score=10.8±6.4). Neocortical amyloid burden is expressed as the average standardised uptake value ratios (SUVR). Spearman's rho (ρ) correlations were conducted to assess relationships between SUVR and demographic, neurocognitive, sleep and mood measures.

SUVR was associated with older age (ρ=0.51, p=0.04), poorer TMT B performance (ρ=0.67, p=0.006), and higher error rates for SCIT head (ρ=0.72, p=0.005) and tail (ρ=0.68, p=0.01). There was a trend for a positive association between ESS and SUVR (p=0.11). SUVR was not associated with any sleep or mood variables.

These preliminary data suggest that, contrary to previous reports in healthy controls, some aspects of global cognitive functioning are associated with the degree of amyloid burden in severe OSA patients. The SCIT and TMT B are sensitive to mild deficits in executive functions, suggesting that amyloid burden is correlated with impairments in this domain in severe OSA. Ongoing data collection will allow us to examine whether measures of OSA severity are related to the degree of amyloid burden, and whether there are differences in burden between OSA patients and healthy controls.

Outcomes of the grant: Preliminary data has been presented at the US Associated Professional Sleep Societies (APSS) conference in Baltimore, June 2018, and an abstract has been submitted to the Australasian Sleep Association meeting in Brisbane, October 2018.

As a result of the Brain Foundation gift, we have been able to leverage additional funding for PET scans, which will allow us to scan 50 patients and 20 controls in total. The project is anticipated to complete at the end of 2019.