Quantitative EEG (qEEG) as diagnostic tool for Alzheimer's dementia in patients with Down syndrome

Gunhild Waldemar[1], Lise Cronberg Salem[2], Troels Wesenberg Kjær[3], Anne Sabers[4], Christian Musaeus[4], Martin Nøhr Nielsen[5], Anne Grete Nielsen[6], Gunhild Waldemar[7],

[1]Rigshospitalet - Copenhagen University Hospital, Copenhagen, Denmark, Denmark; [2]The Memory Disorders Research Group, Rigshospitalet, Copenhagen, Copenhagen, Denmark, Denmark; [3]Copenhagen University Hospital, Rigshospitalet,, Copenhagen, Denmark, Denmark; [4]Copenhagen University Hospital, Rigshospitalet, Copenhagen, Denmark, Denmark; [5]Copenhagen University Hospital, Copenhagen, Denmark, Denmark; [6]Centre For Seniors With Disabilities, Copenhagen, Denmark, Denmark; [7]Danish Dementia Research Centre, Rigshospitalet, Copenhagen, Denmark.

Background: The assessment of dementia in individuals with intellectual disability is often complex due to large inter-individual variability in cognitive functioning prior to dementia and to lack of standardised measures to detect dementia. Previous studies have indicated that quantitative electroencephalography (qEEG) may be used as a diagnostic marker for AD in the general population. The aim of this study was to examine the value of qEEG in the diagnostic evaluation of dementia in patients with Down syndrome (DS). **Methods:** The study included 21 patients with DS and mild to moderate dementia due to Alzheimer's disease (DS-AD) and 16 age-matched adults with DS > 35 years of age and no cognitive deterioration as assessed by the informant-based questionnaire Dementia Screening Questionnaire in Intellectual Disability (DSQIID). Conventional EEG was performed and the EEG recordings were analysed quantitatively using fast fourier transformation. Seven frequency bands for analysis were determined: Delta (0.5-3.5 Hz), Theta1 (4-7 Hz), Theta2 (5-6 Hz), Theta3 (5-7 Hz), Theta-Alpha1 (5-10 Hz), Theta-Alpha2 (4-13 Hz), Alpha (8-13 Hz), and Beta (> 14 Hz). Outcomes of the qEEG analyses were centroid frequency, peak frequency, absolute power, and relative power. **Results:** A significant decrease was identified for centroid frequency in Theta1 band in several regions of the brain in patients as compared to control subjects. A significant negative correlation was demonstrated between mean of centroid frequency of Theta1 band and the total DSQIID score. **Conclusions:** We found that qEEG can detect a significant decrease in centroid frequency in patients with DS-AD as compared to adults with DS and no cognitive deterioration. This is a unique finding calling for further elaboration and larger studies in order to define possible cut-off values and clinical implications.