

ABSTRACT

The following thesis contains four clinical studies. Study I, II and IV were based on a cross sectional investigation on subjects with type 1 diabetes (T1DM) studying the effect of the disease on CNS function through electrophysiological parameters coupled with neuropsychological tests. Study III was an interventional study investigating the effect of strict glycaemic control on subjects with type 2 diabetes (T2DM). Several new techniques were applied to the study of EEG in both studies giving a deeper understanding of the effect of diabetes on the brain.

Paper I, II & IV: A cross-sectional study was performed in adult patients (N=150) with T1DM. Factors that are important for cognitive impairment in T1DM were identified. Furthermore, the effects of T1DM on auditory event-related potentials (ERP), spectral properties of resting EEG, connectivity between cortical regions and flow of information across the scalp of resting EEG were studied on a subgroup of 119 patients and compared to healthy controls (N=61). The strongest predictor of cognitive decline was found to be long diabetes duration and young age of diabetes onset, however, body mass index (BMI), height, age and compound muscle action potential (CMAP) were also found to predict cognitive decline. Moreover, patients had a significant decrease in auditory N100 amplitude, which correlated with a decrease in psychomotor speed. Furthermore, connectivity and information flow were reduced for patients as was EEG power. There were no significant correlations between the spectral, connectivity and information flow parameters and cognition. The influence of diabetes duration, BMI, height, age and CMAP may suggest that loss of the neuroprotective effects of insulin or insulin-like growth factors plays a role in the decline of cognitive function. Furthermore, the decline in ERP, connectivity and information flow may suggest conduction defects in the white matter and in the cortex. As the above mentioned parameters only had a partial relationship with each other we conclude that the tests measure different functions and are complementary to the cognitive tests and that several tests need to be performed to monitor the effect of T1DM on brain function.

Paper III: The mild cognitive decline associated with T2DM has been suggested to be reversible with improved glycaemic control. In order to characterise this cognitive decline and study the effects of improved glycaemic control patients with T2DM (N=28) and healthy control subjects (N=21) were studied. One group of patients with diabetes (N=15) were given a 2-month treatment of intensified glycaemic control, whereas the other group (N=13) maintained their regular treatment. Cognitive function and electrophysiological variables were studied in the two groups of patients and in healthy control subjects before and after the 2-month trial period. There were significant differences at baseline and the change between 1st and 2nd investigation was significantly different in the three groups where patients receiving intensified treatment had an improvement of HbA1c and cerebral function. In conclusion, T2DM had a similar type of effect on brain function as T1DM and intensified therapy improved the function, suggesting that the negative effect of T2DM on the brain is partly reversible.

Key words: diabetes mellitus, brain, cognition, EEG, ERP, encephalopathy, human