Assessment Of Cognitive Functions And Neurochemical Changes In Thalamus In Idiopathic Generalized Epilepsy Patients Using Magnetic Resonance Spectroscopy

A thesis submitted for partial fulfillment

Of MD degree in Neurology

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Summary

Idiopathic generalized epilepsy (IGE) had specific profiles of cognitive impairment across multiple domains in IGE patients such as verbal memory, verbal fluency , processing speed, executive functions, visuospatial functions, General intelligence, and attention.

The Multivoxel Magnetic resonance spectroscopy (MRS) enables simulatanous investigation of the metabolic abnormalities in many small volume units within the structure, and show the extension of metabolic abnormalities**.** The neurochemical abnormalities are considered to reflect thalamocortical dysfunction which are considered as a pathophysiologic foundation for IGE.

This study aimed to evaluate the metabolite changes in thalamus in IGE patients compared to healthy individuals using magnetic resonance spectroscopy (MRS) technique, assess the cognitive profile of IGE patients, and explore if the metabolic changes in thalamus could contribute to cognitive dysfunction in IGE patients.

This is a case control cross-sectional study that was was conducted on thirty patients with diagnosis of IGE, patients were divided into four subgroups. Thirty age and sex and educational level matched healthy volunteers were selected as a control group for comparison of the psychometric and neuroradiological data.

All patients were subjected to the following:

- History taking from patient relatives, and Full neurological examination.
- Electroencephalogram (EEG) was done for the all included patients in the neurology department, Fayoum University Hospital.

Neuropsychological evaluation

- Intelligence quotient (IQ) was used to assess general cognitive ability .

- Digit Span test (DST) was used to assess Attention.
- Cube drawing test (CDT) or cube coping test was used to assess Visuo-spatial functions.
- Verbal fluency task was performed to assess the language domain of executive function, assessed by COWAT test, and semantic fluency
- Weschler memory scale –Revised (WMS-R) was used to assess verbal memory
- The Trail Making Test A,B (TMT) was used for assessment of executive functions

Neuroimaging evaluation

- All patients with IGE underwent 1.5 TESLA conventional MRI of the brain to exclude structural lesions
- All patients with IGE and healthy control underwent multivoxel MR spectroscopy to detect neurochemical changes of right and left thalamus , different spectroscopic measurements as NAA, Choline, Creatine values was acquired and different spectroscopic ratios as NAA/Cr, NAA/Cho, and Cho/Cr ratios for thalamus was calculated.

The results of this study revealed the following:

The epileptic patients showed a significant worse performance in general cognitive abilities, attention, executive functions ,verbal memory, and visuospatial functions, otherwise, there was no significant difference between patients and controls as regards phenomic and semantic fluency. The epileptic patients with childhood absence epilepsy syndrome showed a significant worse performance in attention than the other IGE syndromes, Otherwise, there with no significant difference between the different IGE syndromes as regards as regards other neuropsychological performance.

The epileptic patients with history of status epilepticus showed a significant worse performance of general cognitive abilities and attention, with no significant difference in other psychometric tests compared to epileptic patients with no status epilepticus .The epileptic patients who were treated with poly antiepileptic therapy had a significant worse performance of

executive functions compared to epileptic patients on mono therapy, with no significant difference in other psychometric tests as regards antiepileptic drugs.

Comparison of the NAA level between the epileptic patients and the control group showed that the epileptic patients has a significant lower level of NAA in right thalamus, while no significant difference as regards level of NAA in the left thalamus. Comparison of the NAA/Creatine ratio between the epileptic patients and control group showed that there was a significant lower level in the left thalamus, on the other hand there was no significant difference in the NAA/Creatine ratio as regards the right thalamus.

Comparison of the choline level, creatine level, NAA/Choline ratio, and Choline /Creatine ratio between the epileptic patients and the control group showed that there was no significant difference in the level of these neuroradiological parameters in right, and left thalamus.

It was found that the epileptic patients with child hood absence epilepsy had the lowest level of choline in the right thalamus than other IGE syndromes, otherwise, no significant difference was found between the different syndromes as regards MRS parameters.

It was shown that there was a significant positive correlation between NAA level of thalamus and CDT, and WMS-R , and a significant negative correlation between NAA level of thalamus and trail making A test.

There was a significant positive correlation between creatine level of thalamus , and CDT. There was a significant positive correlation between (NAA/choline) ratio of thalamus and CDT.

There was a significant positive correlation between (Choline/ Creatine) ratio of thalamus and CDT, otherwise, there was no significant correlation was found between neuro radiological parameters and psychometric tests among epileptic patient group.