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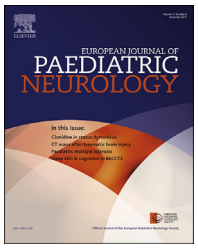

Original article

Influence of epileptic activity during sleep on cognitive performance in benign childhood epilepsy with centrotemporal spikes

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ABSTRACT

Background: Benign childhood epilepsy with centrotemporal spikes is benign childhood epilepsy, presenting between 4 and 10 years of age, characterized by typical clinical and EEG findings. Despite excellent prognosis, there are reports of mild cognitive, language, fine motor and behavioral difficulties. In its atypical form – electrical status epilepticus during slow wave sleep, continuous epileptiform activity during sleep lead to severe neurocognitive deterioration. Our objective was to investigate the influence of abundant sleep epileptiform activity, not fulfilling the criteria for electrical status epilepticus during Slow Wave Sleep, discovered randomly in children without overt intellectual impairment.

Methods: We retrospectively reviewed the charts and EEG's of 34 children with benign childhood epilepsy with centrotemporal spikes, who underwent neurocognitive evaluation. The neurocognitive battery included items in the following domains: attention span, memory, language, fine motor and behavior. Patients were divided into two groups according to the spike wave index on sleep EEG, with a cut-off point of 50%. The groups were compared regarding to neurocognitive performance.

Outcomes: Children with epileptiform activity of more than 50%, were diagnosed at a significantly younger age (5.13 ± 1.94 years vs. 7.17 ± 2.45, p = 0.014 T test), had less controlled seizures and received more antiepileptic drugs. However, there was no difference in neurocognitive performance, except in fine motor tasks (Pegboard), where children

Abbreviations: BECTS, benign childhood epilepsy with centrotemporal spikes; ESES, electrical status epilepticus during slow wave sleep; SWI, spike wave index.

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with more abundant activity were scored lower (−0.79 ± 0.96 vs. 0.20 ± 1.05, p = 0.011, T test).

Conclusion: Our study did not show negative cognitive effect of abundant epileptiform activity discovered randomly in children with benign childhood epilepsy with centrotemporal spikes, warranting aggressive treatment.

1. Introduction

Benign childhood epilepsy with centrotemporal spike (BECTS), or rolandic epilepsy, is a frequent epileptic syndrome in childhood, prevalent between 5 and 10 years of age.[1] Despite relatively abundant epileptiform activity aggravated by sleep, originating from the frontocentrotemporal (rolandic) area, clinical outcome is benign. Seizures are usually controlled with antiepileptic drugs and tend to remit within two years. Cognitive outcome is also considered excellent, since intelligence is within normal range,[2] however formal IQ testing reveals mean lower scores compared to general population.[3,4] Several other studies revealed difficulties in other domains as language,[3,5,6] attention,[3,7] executive and motor function, behavior and social recognition.[8] It is unclear if the cognitive issues are directly related to epilepsy, since they seem to be present already at epilepsy onset,[9] as well as in unaffected siblings,[3] but tend to progress during the first two years of the disease.[9] Cognitive performance is unrelated to seizure control,[5,10] but probably influenced by antiepileptic treatment.

In atypical BECTS evolving to Electrical Status Epilepticus during Slow Wave Sleep (ESES)[7] it is clear that the abundance of continuous epileptiform activity during sleep is causing cognitive, behavior and autistic regression as in CSWS[11–13] and Landau Kleffner syndrome.[14]

In clinical practice, pediatric neurologists frequently encounter by chance abundant sleep epileptiform activity in children with BECTS without overt mental impairment, raising the question if one should treat these patients more aggressively in order to prevent intellectual decline. The aim of our study was to investigate whether abundant epileptiform activity which do not fulfill the criteria for ESES defined by Tassinari (85% spike wave index SWI)[12,13] negatively influences cognitive outcome.

2. Material and methods

We performed a retrospective cross-sectional study on a cohort of 55 patients diagnosed with BECTS who underwent neuropsychological assessment at the Pediatric Neurology Unit at the Safra Children Hospital, Sheba Medical Center, Israel. The study was approved by the local Ethics Committee (IRB 9768-12-SMC).

Patients were eligible for inclusion if they had at least one neuropsychological assessment and one sleep EEG. Since the scope of our work was to assess seemingly intellectually intact children, patients referred for cognitive decline, ESES/CSWS or Landau Kleffner syndrome, were excluded. Children with intellectual disability, within the autistic spectrum or attending special schools were excepted as well. Patients with seizure types other than rolandic, abnormal neurological examination or neuroimaging or known neurogenetic syndromes were not included.

Neurocognitive assessment is done in our Pediatric Neurology Unit by neuropsychologists, according to a battery compiled from items used in validated scales checking the following domains: attention span, memory, language, fine motor skills and behavior (see Table 1). In our clinic we refer routinely every child with epilepsy to neurocognitive evaluation, regardless of intellectual complains (gross, subtle or none). However, the testing is done as a clinical service, and therefore there is no strict correlation between seizure or treatment onset, timing of EEG and the neurocognitive assessment.

The following items were extracted from the charts: age at diagnosis of epilepsy, age at EEG study, gender, seizure control and number of antiepileptic drugs.

Quantification of spike wave index (SWI) was calculated in sleep EEG's as described by Braakman et al., 2012[15]: slow wave sleep was divided into 10 s epochs. In each epoch the seconds in which secondary generalized, hypersynchronized or multifocal activity was present were calculated. Patients were divided into 2 groups: group 1 with ≥50% SWI and group 2 with <50% SWI according to their worst EEG.

2.1. Statistical analysis

Cognitive test results as well as demographic data were compared between the two groups using unpaired t test for numeral parameters and Chi square for nominal parameters. The results of cognitive battery were compared to known results in the general Israeli population using one sample t test.[16,17] All tests were two sided and a $p < 0.05$ was considered significant.

3. Results

From the cohort of 55 patients, 34 children, aged 6.24 ± 2.43, were eligible for enrollment in this study. Sex ratio M:F was 14:20 (41% vs. 58.8%). 13 patients underwent one neuropsychological assessment, 15 patients underwent two and 6 patients underwent 3. The most frequent antiepileptic drug used was sulthiame (15 patients), followed by valproic acid (9 patients), oxcarbazepine (5 patients), clobazam (5 patients), levetiracetam (2 patients), lamotrigine (1 patient) and