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Original article

Attention profiles in childhood absence epilepsy compared with attention-deficit/hyperactivity disorder

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Abstract

Objective: This study aimed to compare the attention profiles of subjects with childhood absence epilepsy (CAE) to those of children with attention-deficit/hyperactivity disorder (ADHD) and controls.

Method: We retrospectively reviewed the medical records of 20 children (age 7.2 ± 1.6 years, 5 boys) in whom CAE was diagnosed at the Department of Pediatric Neurology of Asan Medical Center, Seoul, Korea. ADHD and control subjects were selected from children who visited the Department of Pediatric Psychiatry and were confirmed as having or not having ADHD based on Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and the Schedule for Affective Disorders and Schizophrenia for School-Age Children-Present and Lifetime version (K-SADS-PL). The 20 children with CAE, 20 with ADHD and 20 controls completed the Advanced Test of Attention (ATA), which is a computerized continuous performance task.

Results: The CAE subjects without ADHD showed increased Omission errors ($p = .013$) on the visual ATA and Response time ($p = 0.044$) on the auditory ATA than the controls, although these differences did not remain significant after multiple comparison correction. The CAE subjects without ADHD had significantly decreased Response time variability on the visual ATA than the ADHD group ($p < 0.001$). The CAE subjects with comorbid ADHD showed increased Commission errors ($p = 0.020$) and Response time variability ($p = 0.016$) on the visual ATA and increased Commission errors ($p = 0.022$) on the auditory ATA than the CAE subjects without ADHD, although statistical significance disappeared after multiple comparison adjustments.

Conclusion: These findings suggest that selective attention is impaired in children with CAE and comorbid ADHD contributes to further impairment of sustained attention and response inhibition.

Keywords: Childhood absence epilepsy; Attention-deficit/hyperactivity disorder; Attention; Continuous performance task

1. Introduction

Childhood absence epilepsy (CAE) is a common generalized epilepsy syndrome, characterized by typical absence seizures appearing in otherwise healthy school-aged children [1]. Typical absence seizures manifest as episodes of sudden complete loss of awareness and responsiveness without loss of body tone [2]. Although CAE has been generally considered to be relatively benign [3,4], recent studies suggest that subjects with CAE have comorbid psychiatric disorders, most frequently attention-deficit/hyperactivity disorder (ADHD), and show cognitive deficits even after their seizures are controlled [5].

The relationship between CAE and ADHD is complex [1,6]. First, CAE may be easily misdiagnosed as ADHD, especially the inattentive type, because of the

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overlap in symptoms [7]. Typical absence seizures temporarily impair consciousness which then secondarily affect memory and attention, mimicking ADHD symptoms. Secondly, ADHD is often comorbid with pediatric epilepsy including CAE. Studies in pediatric epilepsy have found a 2.5 to 5.5-fold-increased risk of ADHD compared to healthy controls [8]. Moreover, the prevalence of ADHD is reported to be 30 ~ 61% in CAE, which is much higher than in the normal population [6]. Thirdly, antiepileptic drugs (AED) can cause adverse effects mediated by the central nervous system, such as psychomotor slowing, processing inefficiency, decreased memory recall, and impairment of visual attention [9,10]. Fourthly, children with CAE have a high rate of pretreatment difficulties in the area of visual attention and visuospatial skills, verbal learning and memory and language abilities [11–13].

Some recent studies have investigated the neuropsychological profiles of children with CAE. The children are reported to show marked impairment in some measures of alertness, divided attention, selective attention, and impulsivity as well as difficulties in verbal learning and memory [12], visuospatial skills [14], and language abilities [15]. However, the substantial variation in methodological approach and neuropsychological tests, the heterogeneity of the groups in terms of age range and gender, and the absence of appropriate controls for the effects of AED treatment and comorbidity for ADHD, do not allow the identification of the selective areas and degrees of cognitive deficit in this population [16]. Thus, we aimed to compare the attention profiles of children with CAE to those of children with ADHD and controls.

2. Methods

2.1. Subjects

We retrospectively reviewed the medical records of 20 children and adolescents who were diagnosed as having CAE at the Department of Pediatric Neurology of Asan Medical Center, Seoul, Korea from March 2012 to February 2014.

The CAE subjects had to meet the following inclusion criteria: 1) age between 5 and 12 years; 2) EEG showing bilateral symmetrical and synchronous spike-and-wave discharges, occurring regularly at 3 Hz, with normal background activity; and 3) newly diagnosed and drug-naïve. Subjects were excluded if they had one or more of the following: 1) intelligence disability which is IQ < 70 on the Wechsler Intelligence Scale for Children, Third or Fourth edition [17,18]; 2) a history of taking any psychotropic drugs include antiepileptic drugs, psychostimulant, and atomoxetine; 3) a past and/or current history of schizophrenia, or other psychotic or pervasive developmental disorder; and 4) a current diagnosis of depressive or anxiety disorder which need psychotropic medications.

The ADHD were retrospectively recruited among the children who were diagnosed as ADHD based on the Diagnostic DSM-IV and the K-SADS-PL which is a semi-structured diagnostic interview used to assess a child's current and lifetime diagnoses through parent and child interviews [19,20]. They completed neuropsychological assessment at the Department of Pediatric Psychiatry of Asan Medical Center during the same period above. The control subjects also recruited from children who visited the Department of Pediatric Psychiatry of Asan Medical Center during the same period, and confirmed as not having ADHD based on DSM-IV and K-SADS-PL as well. These ADHD and control subjects were matched for age and gender to the CAE subjects. The exclusion criteria were the same as for the CAE group. Therefore, ADHD and control group were drug naive. Comorbid disorders, such as tic and anxiety disorder, which do not need pharmacological treatment, were allowed.

2.2. Diagnosis

Diagnosis of CAE was established by experienced pediatric neurologists (M.S.Y, E.H.K and T.S.K) based on clinical features and electroencephalograms. Board-certified child psychiatrists (H.W.K and H.J.L) interviewed CAE subjects to confirm ADHD and rule out other diagnoses. The psychiatric diagnoses of ADHD and control subjects were based on the DSM-IV and K-SADS-PL.

2.3. Procedure

All subjects completed the Advanced Test of Attention (ATA), and parents of the subjects completed the ADHD rating scale (ARS), which is an 18-item questionnaire on inattention and hyperactivity/impulsivity. The ATA is a computerized continuous performance task designed to evaluate attention and response inhibition. The variables measured were Omission errors (number of targets that were missed), Commission errors (number of responses to non-targets), Response time (mean response latency in milliseconds), and Response time variability (the standard deviation of response time). The Korean version was developed and standardized by Shin et al. [21]. The reliability coefficient of ATA (Cronbach's α) was 0.85 and percentage of correct classification by ATA was 96.7% [21]. A licensed clinical psychologist observed the subjects during the task and there was no CAE subject who experienced absence seizure during the task.

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