Abnormal cognitive dysfunction in patients with restless legs syndrome: An event-related potential study

Ki-Young Junga,b, Deokwon Ko,a,b, Gwan-Tae Leea, Yong-Seo Koob

a Department of Neurology, Korea University College of Medicine, Seoul, Korea
b BK21 Program for Biomedical Science, Korea University College of Medicine, Seoul, Korea

Introduction

Recent study reported that patients with restless legs syndrome (RLS) may have cognitive deficit, particularly prefrontal lobe dysfunction (Pearson et al., 2006).

The cognitive dysfunction may be attributed to either secondary to daytime sleepiness and/or attention deficit due to RLS symptoms, or primary to intrinsic brain dysfunction underneath RLS syndrome.

Event-related potential (ERP), which offers high temporal resolution, provides information about the precise timing of dynamic neural mechanisms of different cognitive processes. ERP involved in stimulus categorization, probability sequence, attention resource allocation, and memory processing.

To identify cognitive dysfunction in patients with RLS, event-related potential (ERP) study was performed. Daytime sleepiness and RLS symptoms were checked to delineate underlying mechanism of cognitive dysfunction in RLS.

Methods

Subjects

- Patient: Female who newly primary diagnosed as RLS in Korea University Medical Center.
- Control: Age matched normal healthy female.

Stimuli presentation

- Oddball paradigm with visual stimuli.
- Paradigm consisted of 80% of triangle stimuli (non-target) and 20% of rectangle stimuli (target).
- Inter stimuli Interval (ISI): 1.2 sec
- Subjects were press button when target stimuli were presented

EEG recording

- EEG recorded at 11 am
- 32-channel digital EEG machine with 27 electrode that are placed on the scalp
- International 10-20 system, with extended coverage of the lower temporal region (P9, F10, T9, T10, P9, P10)
- The reference electrode: linked ears (A1, A2)
- Band pass filter: 0.1Hz ~ 100Hz
- Sampling rate: 400Hz

EEG/ERP analysis

EEG recording

EEG/ERP analysis

Power spectral analysis

Non-parametric statistics

Conventional ERP analysis

Repeated measures ANOVA

Results

Table 1. Demographic data

<table>
<thead>
<tr>
<th>Group</th>
<th>RLS</th>
<th>CON</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>Age</td>
<td>53.7±9.6</td>
<td>54.6±7.6</td>
</tr>
<tr>
<td>Education (years)</td>
<td>12.1±3.3</td>
<td>9.8±3.2</td>
</tr>
<tr>
<td>IRLSS score</td>
<td>21.1±7.4</td>
<td></td>
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<tr>
<td>ERP test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stanford sleepiness scale</td>
<td>3.2±1.6</td>
<td>2.2±1.0</td>
</tr>
<tr>
<td>Bothersomeness (VAS)*</td>
<td>6.1±3.2</td>
<td>0.2±0.6</td>
</tr>
<tr>
<td>Response RT (ms)*</td>
<td>425.3±40.1</td>
<td>382.7±32.6</td>
</tr>
<tr>
<td>Hit rate (%)</td>
<td>98.2±2.1</td>
<td>99.1±1.3</td>
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</tbody>
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* P < 0.01

Conclusion

Our study supports that RLS patients have cognitive dysfunction.

The significant correlation found between P300 latency and bothersomeness, the lack of sleepiness observed during the ERP test, and the increased beta activity observed in resting state EEG suggest that a combination of inattention and cortical dysfunction underlie cognitive dysfunction in RLS.