CORRELATION BETWEEN EPILEPTIFORM ACTIVITY AND CEREBROSPINAL FLUID BIOMARKERS IN ALZHEIMER’S DISEASE


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BACKGROUND: Animal experimental data suggest that amyloid β and tau proteins are involved in the genesis of epileptiform activity in Alzheimer’s disease (AD), which may contribute to cognitive decline. Although seizures are an integral part of the phenotype of AD, the relation between CSF biomarkers and electroencephalographic epileptiform abnormalities has not been studied yet in humans.

OBJECTIVE: To investigate the relationship between the qualitative electroencephalographic pattern with tau protein, phosphorylated tau protein and Aβ1−42 amyloid protein values in CSF of AD patients and evaluate if the presence of epileptiform abnormalities influences the phenotype and the severity of AD.

METHODS AND MATERIALS

141 outpatients with AD underwent:
- Neuropsychological examination;
- Conventional EEG recording;
- Lumbar puncture for assessing tau protein, phosphorylated-tau protein (p-tau) and Aβ1−42 amyloid protein values.

According to a visual qualitative EEG analysis, all participants were assigned to the following categories: Type 1: normal; Type 2: slow; Type 3: epileptiform.

RESULTS

<table>
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<tr>
<th>EEG1</th>
<th>EEG2</th>
<th>EEG3</th>
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<tbody>
<tr>
<td>Age (mean ±SD, range)</td>
<td>71.83 ± 7.54 (50 – 84)</td>
<td>71.35 ± 7.88 (47 – 84)</td>
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<tr>
<td>Gender</td>
<td>15 M 84 F</td>
<td>33 M 26 F</td>
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<tr>
<td>MMSE (mean ±SD)</td>
<td>22.32 ± 1.2</td>
<td>15.51 ± 4.1</td>
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<td>Estimated disease duration (years)</td>
<td>1.7 ± 1.2</td>
<td>1.5 ± 1.4</td>
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- The multiple regression analysis, performed using CSF biomarkers as the dependent variables and MMSE as independent variable, revealed a significant correlation between the progressive reduction of MMSE score, the increase of both tau and p-tau values, and the decrease of Aβ1−42, respectively.

Patients with type 3 epileptiform EEG pattern showed a significant correlation between the reduction of Aβ1−42 and the decrease of MMSE.

CONCLUSIONS

- Both higher p-tau and tau/Aβ1−42 ratio and epileptiform EEG abnormalities may predict more severe degenerative changes in the brain and more rapidly progressing AD;
- A combined use of EEG and CSF biomarkers may lead to a better definition of the disease’s phenotype and to further forms of treatment for the debilitating aspects of AD.