Research report

Neuro-anatomical differences among epileptic and non-epileptic déjà-vu

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Abstract
Objective: Déjà-vu (DV) can occur as a seizure of mesial temporal lobe epilepsy (MTLE) and in almost 80% of healthy individuals. The remarkable similarity between epileptic DV and DV in healthy individuals raises the possibility that DV might sometimes be an ictal phenomenon in apparently normal individuals. Thus, we studied a group of healthy subjects versus individuals with benign MTLE (bMTLE) both experiencing DV.

Methods: 63 individuals with epilepsy patients with bMTLE and 39 healthy controls at Catanzaro University were recruited. Participants completed the Inventory for Déjà Vu (DV) Experiences Assessment (IDEA) test, underwent awake and asleep electroencephalogram, MRI of the brain using a 3T scanner and whole brain voxel-based morphometry (VBM). bMTLE patients with DV and without DV were also matched for the presence of hippocampal sclerosis.

Results: Our controls had no history of neurological or psychiatric illness, epilepsy or history of febrile convulsions. Neurological and cognitive examinations were normal. Electroencephalographic procedures were unremarkable in all controls. In bMTLE group, the direct comparison of VBM between individuals with epilepsy with DV versus those without DV revealed abnormal anatomical changes in the left hippocampus, parahippocampal gyrus and visual cortex. The VBM of healthy controls with DV showed abnormal anatomical changes only in the left insular cortex.

Conclusions: Our VBM results demonstrated different morphologic patterns in individuals with epilepsy and control subjects experiencing DV, involving the memory circuit in bMTLE patients and cerebral regions in the emotional network in healthy controls.

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1. Introduction

Déjà vu (DV) is a transitory mental state of incongruous impression of familiarity of present experience with an undefined past. Although almost 80% of healthy individuals have experienced DV at once in their lives (Brázil et al., 2012), this fascinating phenomenon is also very often present in patients with mesial temporal lobe epilepsy (MTLE) mainly with familial trend (Gambardella et al., 2000). To date, it is already very well known that epileptic illusions of DV are ictal manifestations arising from discharge within either mesial or lateral temporal cortex (Bancaud, Brunet-Bourgin, Chauvel, & Halgren, 1994) whereas anatomical basis for DV in healthy subjects is less delineated and interpreted.

Very recently, Brázil and coworkers (Brázil et al., 2012) described for the first time the anatomical correlates associated with DV in healthy population, illustrating volumetric differences in several brain regions involving predominantly mesio-temporal regions where the loss of gray matter was significant. Very interestingly, the present author found the same well-known epileptic network (Hippocampus-Thalamus-Basal Ganglia) involved in the genesis of refractory MTLE (Labate et al., 2010; Labate, Cerasa, Gambardella, Aguglia, & Quattrone, 2008; Labate et al., 2011). These epileptic networks have also been extensively described in patients with milder form of sporadic MTLE called benign MTLE (bMTLE), which is characterized by seizure onset in adulthood, frequent familial history and simple partial epileptic DV that often represents the only predominant ictal symptom (Labate et al., 2010; Labate, Cerasa, Gambardella, Aguglia, & Quattrone, 2008; Labate et al., 2011).

Fascinatingly, the remarkable similarity between DV as an epileptic phenomenon and DV observed in healthy individuals, and the observation in patients with bMTLE that DV itself might sometimes be an ictal phenomenon in apparently normal individuals, and could represent the mildest manifestation on the TLE phenotype as proposed by Brazdil et al. (Brázil et al., 2012). Thus, we thought and proposed (Labate & Gambardella, 2013) an attempt to clarify whether there are some structural/morphologic differences between healthy subjects and individuals with bMTLE both suffering from DV.

Table 1 – Features of bMTLE DV and non-DV compared to healthy control.

<table>
<thead>
<tr>
<th>Features</th>
<th>bMTLE DV</th>
<th>bMTLE non-DV</th>
<th>Healthy controls DV</th>
<th>Healthy controls non-DV</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>32</td>
<td>31</td>
<td>22</td>
<td>17</td>
<td>.674</td>
</tr>
<tr>
<td>Sex (%)</td>
<td>62% Female</td>
<td>62% Female</td>
<td>63% Female</td>
<td>47% Female</td>
<td>.92</td>
</tr>
<tr>
<td>Age (y)</td>
<td>37.0 ± 10.9 yr (20–57)</td>
<td>38.6 ± 10.3 yr (23–60)</td>
<td>35.0 ± 7.9 yr (20–49)</td>
<td>34.8 ± 7.94 yr (27–49)</td>
<td>.34</td>
</tr>
<tr>
<td>Age at onset of epilepsy (y)</td>
<td>21 ± 13.7 yr (2–49)</td>
<td>22.8 ± 13.8 yr (1–55)</td>
<td>/</td>
<td>/</td>
<td>.59</td>
</tr>
<tr>
<td>Duration of epilepsy (y)</td>
<td>15 ± 12.4 yr (1–42)</td>
<td>15.2 ± 11.6 yr (1–42)</td>
<td>/</td>
<td>/</td>
<td>.92</td>
</tr>
<tr>
<td>Family history of FC/epilepsy</td>
<td>14 (43.7%)</td>
<td>11 (35.4%)</td>
<td>0</td>
<td>0</td>
<td>.6</td>
</tr>
<tr>
<td>Antecedent Fcs</td>
<td>6 (18.7%)</td>
<td>6 (19.3%)</td>
<td>0</td>
<td>0</td>
<td>.79</td>
</tr>
<tr>
<td>Hippocampal sclerosis on MRI (%)</td>
<td>10 (33%)</td>
<td>10 (32%)</td>
<td>0</td>
<td>0</td>
<td>.85</td>
</tr>
<tr>
<td>Ictal EEG %</td>
<td>4 (12.5%)</td>
<td>4 (12.9%)</td>
<td>0</td>
<td>0</td>
<td>.74</td>
</tr>
<tr>
<td>Intercital Pathological EEG (%)</td>
<td>22 (68.7%)</td>
<td>21 (67.7%)</td>
<td>0</td>
<td>0</td>
<td>.85</td>
</tr>
</tbody>
</table>

bMTLE: benign medial-temporal lobe epilepsy; DV: déjà vu; FC: febrile convulsions.

Table 2. Test.

Table 3. ANOVA.

Table 4. T test.
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