The Comparison of Swallowing in Parkinson’s disease and Dementia with Lewy Body using Propensity Score

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Abstract
Introduction: Patients with Parkinson’s disease (PD) and dementia with Lewy bodies (DLB) experience dysphagia during the course, but the difference in swallowing is unclear. We reported compared the swallowing between PD and DLB. Methods: The subjects were 193 PD and 77 DLB patients who maintained oral intake. We performed videofluoroscopy (VF) in all the patients. PD and DLB patients’ sex, age, and Hoehn & Yahr (H&Y) stage were matched using propensity score methods. In PD and DLB groups which were paired with similar clinical features, the swallowing function was compared. Results: Total of 66 pairs were matched. The loss of tongue-to-palate contact (p = 0.003) and oral transit time (p = 0.048) were significantly poor in DLB group. For aspiration, there was no significant difference. Conclusions: In a comparison between PD and DLB patients after confounding factors were removed, DLB patients showed significantly more disorders in the oral phase than PD patients.

Purpose
Both PD and DLB are a neurodegenerative disease in which Lewy bodies as intracytoplasmic inclusions body are present. Alpha-synuclein accumulation is widely found primarily in the midbrain substantia nigra in PD patients and mainly on the cerebral cortex in DLB patients. Aspiration is an important risk factor of pneumonia and disorientation of oral intake in PD and DLB. Although both patients experience dysphagia in the clinical course, the difference in swallowing between PD patients and DLB patients is unclear. We report a comparison of swallowing between PD patients with PD and DLB who have similar clinical features.

Subjects
- The subjects were 193 PD patients and 77 DLB patients admitted to National Center Hospital of Neurology and Psychiatry from January 2011 to November 2013 and maintained oral intake (Table 1).
- PD was diagnosed clinically.
- Other degenerative diseases or cerebrovascular disorders were ruled out with brain MRI and defined as one whose score of Mini-Mental State Examination was ≥24 points.
- The patients with post-Deep Brain Stimulation were excluded.
- DLB patient was included PDD and DLB.
- DLB was diagnosed based on Third report of the DLB consortium. PD was based on diagnosis criterion by MDS.

Table 1 Patient’s profile

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Sex (M:F)</th>
<th>Age</th>
<th>Hoehn-Yahr stage</th>
<th>Duration of the Illness</th>
<th>Body Mass Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD</td>
<td>193</td>
<td>90:103</td>
<td>69.7±8.0</td>
<td>10</td>
<td>49</td>
<td>33</td>
</tr>
<tr>
<td>DLB</td>
<td>77</td>
<td>20:57</td>
<td>75.0±6.9</td>
<td>1</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>p-value ns</td>
<td>p&lt;0.01 ns</td>
<td>p&lt;0.01 ns</td>
<td>ns</td>
<td>ns</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Methods
All patients underwent VF conducted using 10 mL of double-diluted liquid barium. We measured the following:
- Oral stage
  1) tongue-to-palate contact
  2) tongue root-to-posterior pharyngeal wall contact
  3) premature spillage to pharynx
  4) oral residue
  5) oral transit time (OTT) (Fig.1)
- Pharyngeal stage
  6) aspiration
  7) vallecular residue
  8) residue in pharynx
  9) onset of the swallowing reflex
- <statistical analysis>
  (A) The influential factors on aspiration in Lewy body disease
  To investigate which factor has effect on aspiration, logistic regression analysis was conducted in all subjects. (simultaneous method)
  Objective variable: aspiration
  Explanatory variable: type of disease (PD or DLB), sex, and age and H&Y stage
  (B) The comparison of swallowing function between PD and DLB with similar clinical features
  PD and DLB patients’ sex, age, and H&Y stage were matched using propensity score methods.
  - <category classification> age: <75 years / ≥75 years
  - H&Y stage: I ~ III / IV ~ V
  - In PD group and DLB group who were paired with similar clinical features, the swallowing function was compared

Table 2 Logistic regression analysis

<table>
<thead>
<tr>
<th>Type of Disease</th>
<th>p-value</th>
<th>Odds ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>(DLB)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>age</td>
<td>0.009</td>
<td>2.74</td>
<td>1.28-5.68</td>
</tr>
<tr>
<td>sex (male)</td>
<td>0.008</td>
<td>3.10</td>
<td>1.38-6.98</td>
</tr>
<tr>
<td>H&amp;Y stage</td>
<td>0.009</td>
<td>1.08</td>
<td>0.52-2.14</td>
</tr>
</tbody>
</table>

Results
(A) The influential factors on aspiration in Lewy body disease
In all 270 subjects, logistic regression analysis was conducted. Type of disease, sex and age were significant covariates for aspiration.

Table 3 Patient’s profile matched using propensity score

<oral stage>

<pharyngeal stage>

Discussion
DLB patients often suffered from pharyngeal dysphagia, and showed many eating problems such as difficulty in swallowing food and taking a long time to swallow. In logistic regression analysis, type of disease, sex and age are risk factors for aspiration. So, we compared the swallowing between DLB and PD patients after confounding factors were removed. DLB patients showed significantly more disorders in the oral phase than PD patients. It was suggested that dysphagia tended to develop in patients with DLB in which Lewy bodies appeared more broadly. In DLB patients, careful consideration is required for oral function, food form and time spent eating meals. It is indicated that age and sex have strong effect on aspiration. Sex and age should also be included in assessing risk of aspiration and pneumonia, as well as disease and parkinsonism.

No potential COI to disclose.