Prevalence and Length of Recovery of Pusher Syndrome Based on Cerebral Hemispheric Lesion Side in Patients With Acute Stroke

Hiroaki Abe, RPT, MSc; Takeo Kondo, MD, PhD; Yutaka Oouchida, PhD; Yoshimi Suzukamo, PhD; Satoru Fujiwara, MD, PhD; Shin-Ichi Izumi, MD, PhD

Background and Purpose—The aim of this study was to determine if side of cerebral hemisphere lesion affects the prevalence and time course of pushing behavior (PB) after stroke.

Methods—A total of 1660 patients with acute stroke were investigated. PB was assessed using the standardized Scale for Contraversive Pushing. Risk ratios were used to evaluate the differences in the prevalence of PB between right cerebral hemisphere-damaged (RCD) and left cerebral hemisphere-damaged (LCD) patients. The differences in the time course among 35 (27 RCD and 8 LCD) patients were evaluated by analyzing Scale for Contraversive Pushing scores with the Kaplan–Meier method using a log-rank test.

Results—PB was observed in 156 (9.4%) patients. The prevalence of PB was significantly higher in RCD (97 of 556 [17.4%]) than in LCD (57 of 599 [9.5%]) patients; risk ratio was 1.83 (95% CI, 1.35–2.49). The log-rank test indicated that RCD patients exhibited a significantly slower recovery than LCD patients (P=0.027).

Conclusions—The number of RCD patients who exhibited PB was higher than that of LCD patients. The duration of recovery from PB was longer in RCD patients than in LCD patients. (Stroke. 2012;43:1654-1656.)

Key Words: contraversive pushing ■ prevalence ■ prognosis ■ rehabilitation

Patients with unilateral stroke sometimes use their nonparetic limbs to actively push toward their paretic side; this behavior can result in falls and instability. Davies termed this disorder pusher syndrome.1 This syndrome reportedly affects rehabilitation duration and outcome.2–6

Although many studies have been conducted on pusher syndrome, the syndrome is not well understood, particularly with respect to the prevalence and cerebral hemispheric difference of clinical characteristics.1,2,4–9 To clarify the problem, a large sample of patients with stroke must be evaluated from acute stages of the stroke using quantitative scores.

We investigated the prevalence and the time course of recovery from pushing behavior (PB) using a valid assessment scale in a large sample of patients with stroke.

Methods

Subjects

We conducted a retrospective cohort study that included patients with acute stroke admitted to Kohnan Hospital from July 2006 to January 2009. We included 1660 patients undergoing stroke inpatient rehabilitation (age [mean±SD], 69.9±13.1 years). The length of stay for patients with stroke who received rehabilitation was a median of 26 days (range, 3–394 days). Stroke was diagnosed by neurological signs and brain CT scans and/or MRI.

This study was approved by the medical ethics committee of Kohnan Hospital.

Clinical Assessment

Evaluation of PB was performed according to the Scale for Contraversive Pushing (SCP) on the day of the first training session for sitting and/or standing. We used modified criteria wherein the SCP subscale scores in each section of the scale were ≥0. The degree of PB was evaluated daily using physical therapy.

We assessed the lower limb impairments according to Brunnstrom stage and/or Stroke Impairments Assessment Set.10 The presence of sensory deficits and/or neglect was assessed using Stroke Impairments Assessment Set. The degree of consciousness disorder was assessed using the Japan Coma Scale. The Barthel Index was used to evaluate activities of daily living. These tests are administered to all patients with stroke during their initial physical therapy.

For the time course study, we excluded the following patients to evaluate the pure recovery from pushing: (1) those in whom PB could not be detected within 14 days of stroke onset because of complications such as pneumonia, fever, etc; (2) those unable to undergo SCP assessment for >14 days by early discharge; and (3) those with other brain lesions, severe or moderate consciousness disorder as defined by a Japan Coma Scale ≥10 (not spontaneous eye open), or dementia.
deficit in the lower limb. This symptom is perfectly associated with PB. This results was similar to the findings of 2 previous reports that found a prevalence of 10% to 16%.2,9 In those previous reports,2,4,6–9 the prevalence of PB exhibited a large variability due to different sampling and assessment methods. Thus, we used SCP as the most valid and reliable scale. The SCP modified criteria (each subscale $>0$) demonstrated high sensitivity and specificity.9 Thus, using a valid assessment scale, we concluded that the prevalence of PB was 9.4% in the total of all patients with acute stroke and 14.2% in patients with lower limb impairments.

In addition, our results from the time course study demonstrated that RCD took longer to recover from PB than LCD patients. Previous studies have reported that the prevalence of PB in the chronic stage of the stroke is higher in RCD than in LCD patients.6–9 Our study clearly demonstrates that the prevalence of PB was also higher in RCD than in LCD patients in the acute stage of stroke by sampling $>1600$ patients with acute stroke. Slower recovery in RCD than in LCD patients may enhance the difference in the prevalence of PB between chronic6–8 and acute2,6,9 stages. Our finding was consistent with several previous studies.5,6 Lafosse et al6 reported that

### Table 1. Comparison of Demographic and Initial Clinical Characteristics of the Patients With Pushing

<table>
<thead>
<tr>
<th></th>
<th>RCD (n=97)</th>
<th>LCD (n=57)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y*</td>
<td>72.3±10.1</td>
<td>74.3±10.6</td>
<td>0.245</td>
</tr>
<tr>
<td>Brunnstrom stage lower limb, median</td>
<td>2</td>
<td>2</td>
<td>0.316</td>
</tr>
<tr>
<td>Sensory deficit, no. (%)</td>
<td>50/59 (84.7)</td>
<td>11/17 (64.7)</td>
<td>0.689</td>
</tr>
<tr>
<td>Barthel index* (0–100)</td>
<td>9.8±13.8</td>
<td>5.6±11.6</td>
<td>0.019</td>
</tr>
</tbody>
</table>

RCD indicates right cerebral hemisphere damage; LCD, left cerebral hemisphere damage.

*Values are represented as mean±SD.

### Results

According to SCP scores, PB was observed in 156 of 1660 patients (9.4%). Of the 1660 patients, 556 had right cerebral hemisphere damage (RCD), 599 had left cerebral hemisphere damage (LCD), 111 had bilateral and/or multiple lesions, 252 had brain stem and/or cerebellar lesions, and 142 had no lesions but malperfusion were detected by radiological imagings.

Of the 154 patients (2 patients with bilateral lesions were excluded) with hemispheric lesions who demonstrated PB (Table 1), RCD (97 of 556 [17.4%]) showed significantly higher prevalence than LCD (57 of 599 [9.5%]) patients, and the risk ratio was 1.83 (95% CI, 1.35–2.49).

Sixty-six percent (1099 of 1660) of all patients with stroke had lower limb motor deficits. All patients with PB fell into this subgroup with lower limb deficits; the incidence of PB in this subgroup was 14.2% (156 of 154) compared using $t$ tests, Mann-Whitney $U$ tests, or $\chi^2$ tests. The time taken to recover from PB was analyzed by the Kaplan–Meier method using a log-rank test.

Statistical analysis was defined as $\alpha$ levels of <0.05 by using SPSS for Windows (Version 11.0).

### Discussion

In this study, the prevalence of PB was 9.4% in the total 1660 patients with acute stroke and 14.2% in patients with lower limb impairments. Also, all patients with PB had a motor

### Table 2. Comparison of Demographic and Initial Clinical Characteristics of 27 RCD and 8 LCD Patients in the Time Course Study

<table>
<thead>
<tr>
<th></th>
<th>RCD (n=27)</th>
<th>LCD (n=8)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y*</td>
<td>68.0±10.0</td>
<td>75.0±7.6</td>
<td>0.078</td>
</tr>
<tr>
<td>Scale for contraversive pushing*</td>
<td>4.5±1.7</td>
<td>3.8±1.7</td>
<td>0.192</td>
</tr>
<tr>
<td>Brunnstrom stage of lower limb, median</td>
<td>2</td>
<td>2</td>
<td>0.316</td>
</tr>
<tr>
<td>Sensory deficit, no. (%)</td>
<td>21/23 (91.3)</td>
<td>4/5 (80)</td>
<td>0.459</td>
</tr>
<tr>
<td>Neglect, no. (%)</td>
<td>17/25 (68)</td>
<td>2/4 (50)</td>
<td>0.592</td>
</tr>
<tr>
<td>Barthel index* (0–100)</td>
<td>13.3±12.2</td>
<td>15.6±20.1</td>
<td>0.767</td>
</tr>
</tbody>
</table>

RCD indicates right cerebral hemisphere damage; LCD, left cerebral hemisphere damage.

*Values are represented as mean±SD.

The initial clinical tests (Brunnstrom stage, Stroke Impairments Assessment Set, Barthel Index, and Japan Coma Scale) and the initial SCP assessment was performed 7.3±4.8 and 12.5±10.0 days after onset, respectively.

Of the 154 patients with hemispheric lesions who demonstrated PB, we excluded 119 patients from the time course study as per the exclusion criteria described in the “Methods” section (1, delayed intervention, n=34; 2, early discharge, n=22; 3, other brain lesions, coma, or dementia, n=63). The recovery from PB was evaluated in 35 patients (Table 2).

The log-rank test (Figure) indicated that patients with PB and RCD recovered significantly slower from PB than patients with PB and LCD ($P=0.027$).

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**Figure.** A Kaplan–Meier plot of time until resolution of pushing behavior (in days). RCD indicates right cerebral hemisphere damage; LCD, left cerebral hemisphere damage.
PB was highly present in patients with RCD at 12 weeks after the rehabilitation onset compared with the rehabilitation admission. Babyar et al5 mentioned that when lengths of stay were equal, patients with RCD and PB had greater lower extremity weakness and poorer functional recovery than patients with LCD and PB.

Our results indicate that the laterality and prognosis of PB should be considered at the time of goal setting for rehabilitation.

Sources of Funding

Disclosures
None.

References
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