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)3,9 on the day of the first training session for sitting and/or standing. We used modified criteria9 wherein the SCP subscale scores in each section of the scale were ≥0. The degree of PB was evaluated daily during 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.
Patients with PB and LCD (0.027). and RCD recovered significantly slower from PB than pa-

tients with acute stroke and 14.2% in patients with lower

In this study, the prevalence of PB was 9.4% in the total 1660

We calculated the risk ratio for PB. Clinical characteristics were

compared using t tests, Mann-Whitney U tests, or χ² 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 α levels of <0.05 by using

SPSS for Windows (Version 11.0J).

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

imaging.

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 with lower limb deficits; the incidence of PB in

patients with lower limb impairments.

In addition, our results from the time course study demon-

strated 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 is 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>Characteristic</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.

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

deficit in the lower limb. This symptom is perfectly associ-

ated 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) demon-

strated 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 demon-

strated 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 is 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

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
1. Davies PM. Steps to Follow: A Guide to the Treatment of Adult Hemi-
2. Pedersen PM, Wandel A, Jorgensen HS, Nakayama H, Raaschou HO,
Olsen TS. Ipsilateral pushing in stroke: incidence, relation to neurops-
chological symptoms, and impact on rehabilitation. The Copenhagen
3. Karnath HO, Johannsen L, Broetz D, Ferber S, Dichgans J. Prognosis of
4. Danells CJ, Black SE, Gladstone DJ, McIlroy WE. Poststroke ‘pushing’;
natural history and relationship to motor and functional recovery. Stroke.
5. Babyar SR, White H, Shafi N, Reding M. Outcomes with stroke and
lateropulsion: a case-matched controlled study. Neurorehabil Neural
6. Lafosse C, Kerckhofs E, Troch M, Vereeck L, Van Hoydonck G,
Moeremans M, et al. Contraversive pushing and inattention of the con-
7. Premoselli S, Cesana L, Cerri C. Pusher syndrome in stroke: clinical,
8. Bohannon RW, Cook AC, Larkin PA, Dubuc WE, Smith MB, Horton
1986;10:43–44.
9. Baccini M, Paci M, Nannetti L, Briccoli C, Rinaldi LA. Scale for
contraversive pushing: cutoff scores for diagnosing ‘pusher behavior’ and
Assessment Set (SIAS)—a new evaluation instrument for stroke patients.
Prevalence and Length of Recovery of Pusher Syndrome Based on Cerebral Hemispheric Lesion Side in Patients With Acute Stroke

Hiroaki Abe, Takeo Kondo, Yutaka Oouchida, Yoshimi Suzukamo, Satoru Fujiwara and Shin-Ichi Izumi

*Stroke*. 2012;43:1654-1656; originally published online March 1, 2012; doi: 10.1161/STROKEAHA.111.638379

*Stroke* is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231

Copyright © 2012 American Heart Association, Inc. All rights reserved.
Print ISSN: 0039-2499. Online ISSN: 1524-4628

The online version of this article, along with updated information and services, is located on the World Wide Web at:

http://stroke.ahajournals.org/content/43/6/1654