Psychiatry Research 267 (2018) 228–231

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

Short communication

Impact of acute phase depression on functional outcomes in stroke patients over 1 year

Hee-Ju Kang[a], Kyung-Yeol Bae[a], Sung-Wan Kim[a], Eun-Hye Lee[a], Joon-Tae Kim[b], Man-Seok Park[b], Ki-Hyun Cho[b], Jae-Min Kim[a,*]

[a] Department of Psychiatry, Chonnam National University Medical School,60 Baekseoro, Dong-gu, 501-746 Gwangju, Republic of Korea
[b] Department of Neurology, Chonnam National University Medical School, Gwangju, Republic of Korea

ARTICLE INFO

Keywords:
Stroke
Depression
Disability evaluation

ABSTRACT

This study examined the influence of acute phase post-stroke depression (PSD) on various functional outcomes over 1 year after stroke. PSD was diagnosed at 2 weeks after stroke using the Mini International Neuropsychiatric Interview and functional outcomes were assessed via the National Institutes of Health Stroke Scale, the Barthel Index, and the Mini-Mental State Examination at 2 weeks and 1 year. Acute phase PSD was an independent predictor of poor functional outcomes during both the acute and chronic phases. Considering the negative impact of PSD on stroke outcomes, identification of acute phase PSD is important for improving functional outcomes.

1. Introduction

Stroke is a common disease that endangers human health including disabilities. As a result, an extensive amount of research has been conducted to identify predictors of stroke outcomes (Alonso et al., 2015). Recently, it was shown that post-stroke depression (PSD) is associated with poor outcomes, such as mortality and disability (Ayerbe et al., 2013). However, to date, a majority of studies have assessed the associations between depression and functional outcomes using cross-sectional designs (Turner-Stokes and Hassan, 2002). A recent systemic review of longitudinal studies also found that PSD is associated with poor outcomes (Kutlubaev and Hackett, 2014), but their conclusions were derived from a wide range of outcomes that included disability, depression, quality of life, and mortality. Additionally, if the scope of the outcome measures is limited to longitudinal studies assessing functional disabilities, then it is rare to observe that PSD during the acute phase influenced disability in either the acute phase or chronic phases. Furthermore, these studies often report inconsistent finding, which can be explained by differences and limitations in sample size, follow-up duration, evaluation methods, and assessment timepoints (Donnellan et al., 2010; Wulsin et al., 2012; Parikh et al., 1990; Loong et al., 1995). Therefore, this study investigated the impact of PSD assessed at 2 weeks after stroke on various functional outcomes during both the acute (2 weeks) and chronic (1 year) phases of recovery in a modestly-sized longitudinal stroke cohort.

2. Methods

This was a secondary analysis of data collected as part of a naturalistic prospective investigation of psychiatric disorders in stroke survivors. The participants were consecutively recruited from among all patients hospitalized for a recent ischemic stroke at Chonnam National University Hospital; patients with a life-threatening physical condition, exhibiting communication difficulties, the presence of neuropsychiatric comorbidities, and/or a Mini-Mental State score (MMSE; Folstein et al., 1975) <16 were excluded from the study. The detailed inclusion and exclusion criteria were described in the Supplementary Methods and the recruitment process was illustrated in Supplementary Fig. 1. Written informed consent was obtained and the study was approved by the Chonnam National University Hospital Institutional Review Board.

To estimate the effects of acute phase PSD on functional outcomes during the acute and chronic phases of recovery, depression was assessed at 2 weeks after stroke and functional outcomes were measured at both 2 weeks and 1 year. Depression was determined by study psychiatrists according to DSM-IV criteria using the Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1988) and PSD was defined as a combination of major and minor depression. Baseline functional status was determined using the modified Rankin Scale (mRS), on which scores range from 0–6 (van Swieten et al., 1988). The outcomes were dichotomized into good (mRS ≤ 1; no significant disability) and poor (mRS ≥ 2; slight disability) categories, as previously described (Liou et al., 2010). The following scales were used to estimate

* Corresponding author.
E-mail address: jmkim@chonnam.ac.kr (J.-M. Kim).

https://doi.org/10.1016/j.psychres.2018.06.026
Received 2 November 2017; Received in revised form 23 May 2018; Accepted 11 June 2018
Available online 12 June 2018
0165-1781/

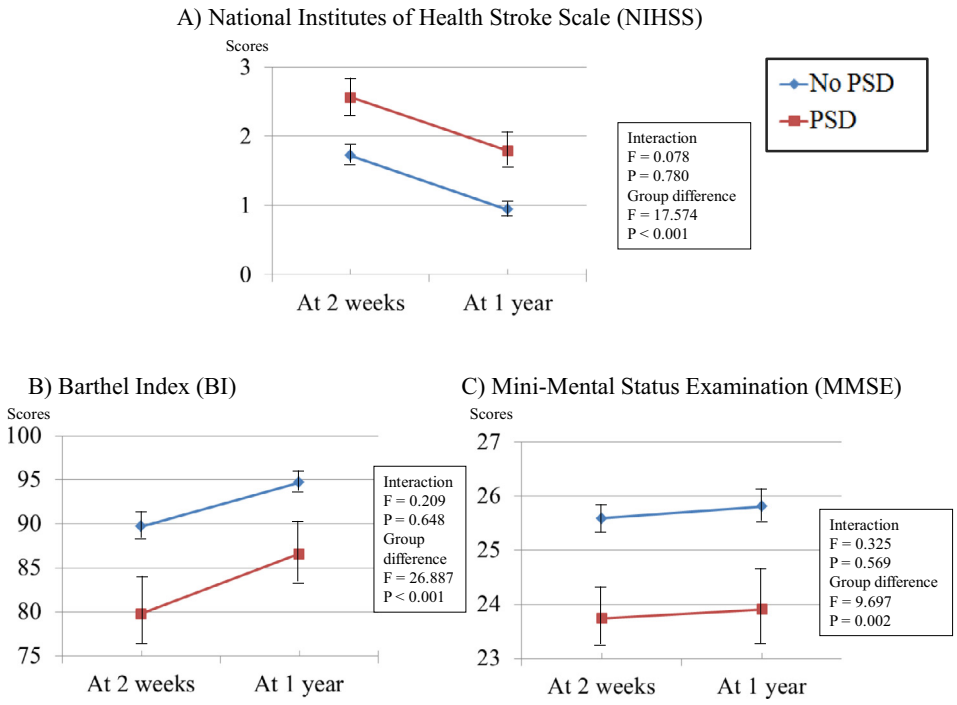

Fig. 1. Longitudinal impact of post-stroke depression (PSD) in the acute phase on functional outcomes at 1 year after stroke.
Analyses of the no PSD and PSD groups were conducted with a repeated-measures analysis of variance (ANOVA) adjusted for age, past histories of depression and stroke, stroke location, and stroke hemisphere; error bars represent the standardized error.

functional outcomes during the acute and chronic phases: the National Institutes of Health Stroke Scale (NIHSS), on which scores range from 0–42 (with higher scores representing more severe pathology), was used to evaluate stroke severity (Kasner et al., 1999); the Barthel Index (BI), on which scores range from 0–100 (with lower scores representing more severe disability), was applied to measure physical disability (Mahoney and Barthel, 1965); and the MMSE, on which scores range from 0–30 (with lower scores representing greater impairment in cognition), was employed to measure cognitive function (Folstein et al., 1975). All baseline functional status (mRS) and functional outcome (NIHSS, BI, and MMSE) assessments were performed by study neurologists who were blind to the PSD diagnosis.

The following characteristics, potentially related to PSD or functional status, were included as covariates: age, gender, years of education, previous histories of depression and stroke, stroke localization by hemisphere (left, right, or bilateral) and location (anterior, posterior, or both), vascular risk factors (hypertension, diabetes, heart disease, and hypercholesterolemia), body mass index (BMI), smoking status, and use of antidepressants. Previous and present health problems including depression, stroke, hypertension, diabetes, and heart disease, were identified using a structured questionnaire completed by the participants and corroborated by the caregiver when possible. Hypercholesterolemia was considered to be a fasting serum total cholesterol level >200 mg/dL or a history of hyperlipidemia with ongoing treatment at admission. The BMI of each baseline participants was calculated using their height and weight.

2.1. Statistical analysis

The baseline characteristics were compared using *t*-tests or chi-square (χ^2) tests as appropriate, according to PSD status and functional status by the mRS at baseline. All variables that were significantly associated ($P < 0.05$) with PSD or functional status were entered as covariates in the multivariate analyses. Cross-sectional associations between PSD and various functional outcomes during the acute phase were analyzed using *t*-tests in an unadjusted model, and then by application of a logistic regression test after adjusting for covariates. The longitudinal influence of acute phase PSD on functional outcomes at 1 year was assessed with a repeated-measures analysis of variance (ANOVA) using the same adjustment model. To estimate the longitudinal effects of individual confounding variables, additional analyses were conducted with a multiple linear regression model using the stepwise method. Furthermore, stroke location (anterior or posterior) and stroke hemisphere (left and right) are thought to be associated with PSD (Bhogal et al., 2004) as well as functional outcomes after stroke (Pan et al., 2006). Therefore, the impact of the interactions between PSD and stroke location or hemisphere on the functional outcomes of stoke were investigated with analysis of covariance (ANCOVA) test using significant covariates identified from baseline comparisons except for stroke location and stroke hemisphere. All statistical analyses were carried out using SPSS 23.0 software [IBM Corp., Armonk, NY].

3. Results

This study initially included 423 patients who consented to participate. Of these patients, 306 (72.3%) completed the follow-up assessment at 1 year after stroke. The participants who did not complete the follow-up assessment were more likely to be older ($p = 0.008$), have a lower BMI ($p = 0.015$), and have poor outcomes ($p = 0.016$) compared to those who did participate in the follow-up. However, there were no significant differences in any other characteristics at baseline, including depression (all *p*-values > 0.05). Of the initial 423 participants, 108 (25.5%) suffered from PSD and 213 (50.4%) were classified as having poor outcomes at 2 weeks after stroke. Participants with PSD were older and more likely to have a previous history of depression and stroke, and an anterior stroke location, whereas participants with poor stroke outcomes were more likely to have had a stroke in the right hemisphere (Supplementary Table 1). Each of these factors was included as a covariate in later analyses.

The cross-sectional association between acute phase PSD and functional outcomes after stroke is described in Supplementary Table 2. Patients with PSD at 2 weeks after stroke were more likely to have more severe disabilities (as measured by the NIHSS and BI) and to have greater cognitive deficits. These associations remained significant after adjusting for the covariates.

The longitudinal association between acute phase PSD and functional outcomes at 1 year after stroke is described in Fig. 1. Significant group effects of PSD during the acute phase were observed after