Nutritional Improvement and Energy Intake Are Associated with Functional Recovery in Patients after Cerebrovascular Disorders

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Background: Malnutrition affects the activities of daily living (ADLs) in convalescent patients with cerebrovascular disorders. We investigated the relationship between nutritional improvement, energy intake at admission, and recovery of ADLs. *Methods:* We evaluated 67 patients with cerebrovascular disorders admitted to our rehabilitation hospital between April 2013 and April 2015. These patients received interventions from the rehabilitation nutritional support team according to the following criteria: weight loss of 2 kg or more and body mass index of 19 kg/m^2 or lower. Exclusion criteria included a body mass index of 25 kg/m^2 or higher, duration of intervention of less than 14 days, or transfer to an acute care hospital because of clinical deterioration. We assessed nutritional status using the Geriatric Nutritional Risk Index (GNRI) and ADL using the Functional Independence Measure (FIM) score, FIM gain, and FIM efficiency. *Results:* The mean age of the patients was 78.7 ± 8.0 years. The numbers of patients in each category of cerebrovascular disorder were 39 with cerebral infarction, 16 with intracerebral hemorrhage, 8 with subarachnoid hemorrhage, and 4 others. Compared with the counterpart group, the group with an improvement in GNRI had a greater gain in FIM (median 17 and 20, respectively; $P = .036$) and a higher FIM efficiency (.14 and .22, respectively; $P = .020$). Multivariate stepwise regression analysis showed that an improvement in GNRI, increasing energy intake at admission, and intracerebral hemorrhage were associated independently with greater FIM efficiency. *Conclusions:* This study suggested that nutritional improvement and energy intake at admission are associated with recovery of ADL after cerebrovascular disorders.

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Introduction

The nutritional status of patients is an important parameter during the subacute and recovery stages following a cerebrovascular disorder. Poor nutritional status is associated with increased severity of the disease, mortality, infectious complications, swallowing difficulty, and less improvement in activities of daily living (ADLs).[1-5] The number of patients with protein–energy malnutrition was shown to increase by approximately 60% (16.3%-26.4%) in the first week after a stroke, leading to a higher mortality rate and decline in ADL.[6] Nutritional therapy for patients with cerebrovascular disorders in acute settings is known to result in better clinical outcomes, with studies showing that early enteral feeding improves nutritional status[7] and early nutritional therapy is associated with lower mortality rates.[7] In subacute and rehabilitation settings, an intensive nutritional approach in stroke patients may improve physical function to a greater extent than standard care.[8] Nutritional support may therefore be a potential therapeutic strategy for patients with postcerebrovascular disorder.

Nutritional care in the rehabilitation setting is considered to be important because patients with cerebrovascular disorders in rehabilitation hospitals are more likely to have poor nutrition than patients in acute hospitals.[5,9] Although nutritional support is necessary for patients in this setting, to our knowledge, the association between changes in nutritional parameters and ADL has not been investigated. Recently, Beberashvili et al.[10] reported that changes in the Geriatric Nutritional Risk Index (GNRI), a nutritional screening score, correlated with changes in nutritional status evaluated by body composition. Therefore, it is possible to assess the effects of nutritional care in stroke patients in rehabilitation hospitals using the GNRI.

This study therefore investigated the relationship between changes in nutritional status assessed by the GNRI, energy intake at admission, and ADL in patients with postcerebrovascular disorder in a rehabilitation setting.

Methods

Subjects

This cross-sectional, retrospective, single-center study investigated patients aged 65 years or older who were admitted consecutively to the convalescent rehabilitation ward in Sakurakai Hospital between April 2013 and April 2015 to receive rehabilitation for a cerebrovascular disorder. The mean duration of physical rehabilitation in patients in our rehabilitation hospital was 699 minutes per week. Patients who were treated by our rehabilitation nutrition team (RNT) were included in the study. The criteria for intervention by the RNT were a body mass index (BMI) of 19 kg/m^2 or lower, or weight loss of more than 2 kg from onset. Patients who were either overweight (BMI ≥ 25 kg/m^2), were transferred to another hospital for treatment of comorbidities, died in our hospital, or with missing data were excluded. The present study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of Sakurakai Hospital. Because the study was a retrospective study, written informed consent was not obtained from the patients, and a waiver of consent was obtained from the Ethics Committee.

RNT

In our hospital, the RNT identified malnourished patients using the following screening criteria: BMI of 19 kg/m^2 or lower, or weight loss of more than 2 kg from onset at admission. These criteria were the same as the inclusion criteria in the present study. The RNT consisted of multidisciplinary staff including a dietician, physical therapist, occupational therapist, and a speech language pathologist who treated all patients with malnutrition during hospitalization. The status and intake of nutrition and amount of rehabilitation for each patient were considered by a member of the RNT. Because protein supplementation and exercise can increase muscle mass and strength,[11] the RNT evaluated the amount and load of rehabilitation in patients who needed to be supplied with additional protein supplement. The RNT monitored body weight every 2 weeks and re-evaluated the necessary level of nutritional intake. This intervention was conducted according to the principles of rehabilitation nutrition therapy.[12]

Parameters

The clinical parameters were obtained retrospectively from medical records. The GNRI,[13,14] a nutritional risk index, was calculated from the serum albumin concentration and body weight using the following equation: $GNRI = [1.489 \times \text{albumin concentration (g/dL)}] + [41.7 \times (\text{actual body weight/ideal body weight})]$. The ideal body weight was defined as a BMI of 22.0 kg/m^2[15,16] rather than the Lorentz formula. We divided the patients into 2 groups in accordance with the changes in GNRI from admission to discharge from the hospital. The group with an improvement in GNRI included patients with a higher level of GNRI at discharge than at