

Age, Body Mass Index, and White Blood Cell Count Predict the Resumption of Oral Intake in Subacute Stroke Patients

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Objective: To identify the predictors for the resumption of oral feeding at discharge among tube feeding-dependent stroke patients admitted to rehabilitation wards. **Materials and methods:** This study was a retrospective analysis of 107 stroke patients (mean age, 72.1 years) dependent on tube feeds at admission to a rehabilitation ward. Data analyzed included demographic information, severity of impairments, functional independence, body mass index, nutritional and inflammatory laboratory markers at admission, and videofluoroscopic examination findings, if conducted. The variables were compared between the groups with and without resumption of oral intake. The predictive factors for resumption of oral intake were analyzed by using a stepwise multiple logistic regression model. **Results:** At discharge, 69.2% (74 of 107) of the patients resumed oral intake. There were significant differences in age, the Functional Independence Measure, body mass index, serum albumin, C-reactive protein, white blood cell count, and duration of stroke onset at admission between the 2 groups. Multiple logistic regression analysis identified age (odds ratio [OR] .55; 95% confidence interval [CI] .31-.95), body mass index (OR 1.34; 95% CI 1.12-1.60), and white blood cell count (OR .76; 95% CI .60-.97) as significant predictors for the resumption of oral intake in these patients. **Conclusion:** Older age, lower body mass index, and higher white blood cell count were significant independent negative predictors for the resumption of oral feeding among stroke patients dependent on tube feeding at admission to rehabilitation wards. **Key Words:** Dysphagia—convalescence—nutrition—gastrostomy—deglutition disorder.
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Introduction

Dysphagia, defined as difficulty in swallowing, is a common manifestation of stroke. Although its incidence varies depending on the method of evaluation, dysphagia occurs in acute stroke patients at high rates ranging from 29% to 78%.¹ Although most patients recover from transient swallowing difficulty, the prevalence of dysphagia in stroke patients in rehabilitation wards ranges from 28% to 59%.²⁻⁵ Dysphagia is associated with pulmonary complications,^{1,5-8} poor functional outcomes,^{7,9,10} malnutrition,^{5,7,11} and even mortality.^{6,7,10,12,13} Oral feeding is preferably started whenever possible by using low-risk feeding strategies following appropriate assessments. When dysphagia is severe and stroke patients fail to meet their nutritional needs orally, enteral tube feeding is necessary.

There is a considerable difference in the prevalence of tube feeding in admitted stroke patients, with a range of 7%-65% in published data.^{5,14-16} About 31%-87% of stroke patients on tube feeding at admission in rehabilitation wards eventually resume oral intake before their discharge.¹⁴⁻¹⁹ Prior knowledge of the possibility of such recovery would enable better nutritional planning and may avoid unnecessary gastrostomy. Studies attempting to investigate this issue^{14-16,18,19} either relied on relatively small samples ($n < 50$)^{18,19} or failed to include important factors related to severe dysphagia such as the presence of malnutrition and inflammation. The aim of this study was to explore the clinical predictors associated with the resumption of oral intake in patients with stroke who were dependent on tube feeding at admission to rehabilitation wards.

Methods

Patients

This study was a retrospective analysis that included patients with stroke admitted to the Tokyo Bay Rehabilitation Hospital, Chiba, Japan, between April 1, 2009, and March 31, 2012. As a policy, all patients were initially treated in an acute care hospital and, after stabilization of their general condition, were transferred to the rehabilitation hospital. At the time of transfer, patients did not have any clinically obvious infectious conditions such as pneumonia. The inclusion criteria for the study were as follows: duration from onset of stroke to admission within 90 days, and dependence on enteral tube feeding at admission. Among the 1042 stroke patients admitted to the rehabilitation hospital during the study period, 122 met the inclusion criteria (11.7%). The following were excluded from the study: 11 patients who discontinued inpatient rehabilitation due to medical conditions unrelated to dysphagia; 1 patient who died during hospitalization; 1 patient who needed enteral feeding for a cause other than dysphagia (severe esophageal hiatal hernia); and 2 patients with incomplete data. Finally, 107 patients were included in the analysis. The study was approved by the Tokyo Bay Rehabilitation Hospital Ethical Committee (#132).

Data Collection

Data collection aimed at factors presumed to be related to the resumption of oral intake in stroke patients dependent on tube feeding,^{14-16,18-21} and those potentially related to the outcomes of the present study. The following information was collected from the medical records: age, sex, history of stroke, type of stroke, lesion location as identified on computed tomography and/or magnetic resonance imaging scan; severity of functional impairments, degree of disability, nutritional status, and inflammatory markers on admission; duration from the onset to

admission; and length of stay in the rehabilitation ward. With regard to the severity of impairments, motor assessment items in the Stroke Impairment Assessment Set, which is known to have good reliability and validity, were recorded.^{22,23} In cases where paresis was bilateral, the score on the worse side was considered for the analysis. Functional Independence Measure (FIM)²⁴ was used to assess their disability. Body mass index (BMI) was calculated from the measured height and weight. Serum albumin and creatinine were measured by a standard blood test performed in the morning following admission. C-reactive protein (CRP) level and white blood cell (WBC) count were obtained from the same blood draw.

The findings of initial videofluoroscopic examination of swallowing (VF), if performed, were collected. VF was performed according to a standardized procedure.²⁵ In particular, data regarding the presence or absence of aspiration (thick liquid aspiration and/or any aspiration) observed during VF with the patients seated in an upright or reclining posture were analyzed. To maximize the safety for patients, the examination initially involved intake of small amounts (1-3 mL) of thick liquid, followed by thinner liquids and/or various textures of foods depending on the patients' response. The examination was stopped if the patient exhibited significant dysfunction (could not swallow) or marked aspiration.

The primary outcome of this study was the resumption of oral intake at discharge. We defined the resumption of oral intake as the use of the oral route alone to meet nutritional requirements, irrespective of the type of diet.

Treatment of Dysphagia

Indirect and direct trainings to treat dysphagia were individually prescribed by psychiatrists based on the appropriate evaluations. Speech-language-hearing therapists and clinical nurses trained the patients in eating and swallowing using indirect strategies such as oral care, oral articulation exercises, pharynx-cooling stimulation, and balloon dilatation of the upper esophageal sphincter, as needed. In conjunction with indirect training, direct training was prescribed whenever possible based on the appropriate assessments. Texture-modified food and thickened fluids were used, and compensatory swallowing methods such as cervical anteflexion and rotation, and multiple swallowing, were used based on individual considerations. Dentists provided dental care including denture adjustments when required.

Analyses

We compared the clinical factors between the group of patients who resumed oral intake at discharge and the group who did not. For continuous variables, unpaired *t*-test or Wilcoxon rank-sum test was used according to the type of scale and distribution. Chi-square test or Fisher's exact test was used to compare categorical variables.

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