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ORIGINAL RESEARCH

PREDICTORS OF ORAL INTAKE DIFFICULTY IN OLDER PATIENTS WITH DYSPHAGIA

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Abstract: The aim of this study was to identify the predictors of oral intake difficulty in older patients with dysphagia. The subjects were 133 hospitalized older individuals with dysphagia. They were divided into two groups according to the oral intake ability: the oral intake and non-oral intake groups. Swallowing function was measured with a graded water swallowing test and a food intake level scale. Functional status was evaluated with a physical dependency scale and a comprehension scale. Nutritional status was measured with anthropometric measures and serum albumin levels. The non-oral intake group was significantly impaired in the swallowing measures, physical dependency, and mid-upper arm circumference. Multivariate analysis revealed that impairment in mid-upper arm circumference and graded water swallowing test were independently associated with oral intake difficulty. In conclusion, swallowing impairment, advanced body mass reduction, and physical dependency were the significant predictors of oral intake difficulty in older patients with dysphagia.

Key words: Dysphagia, elderly, malnutrition, oral intake, physical dependency.

Introduction

Dysphagia is a highly prevalent condition in hospitalized older adults. Recent studies have reported a prevalence of 27% in independently-living elderly (1) and 47% in hospitalized elderly (2). One major consequence of dysphagia is reduced oral intake due to swallowing difficulty. A recent large-scale study demonstrated that 41% of older patients admitted with aspiration pneumonia could not achieve sufficient oral intake within 30 days (3). This is a serious issue in current geriatric medicine, because older patients with poor oral intake often become candidates to receive long-term artificial nutrition, which may lead to diminished quality of life. Therefore, it is important to identify the predictors of oral intake difficulty in this clinical population. Given that previous studies demonstrated that dysphagia in the elderly was associated with older age, dementia, impaired activity of daily living, and malnutrition (2, 4, 5), those factors may affect the oral intake. The aim of this study was to identify the predictive factors for poor oral intake in older patients with dysphagia.

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Methods

The subjects of this study were older individuals admitted to St. Francis Hospital for acute care between April 2012 and February 2014. The study inclusion criteria were aged 65 and older and referral to the Speech Pathology Service for assessment of dysphagia. Six patients with malignancy, four patients already being tube-fed, and one patient who had cerebral hemorrhage during the hospitalization were excluded to avoid their influence on the results. A total of 133 patients were enrolled for this study.

Swallowing measures consisted of a graded water swallowing test (GWST) (6) and a food intake level scale (FILS) (7). The GWST uses 2, 3, and 5 ml of plain and thickened water in a graded manner, ranging from 0 (fails in 2 ml thickened water trial) to 6 (passes in 5 ml plain water trial). The FILS is an observer-rating scale for assessing the severity of dysphagia, examining to what degree patients take food orally on a daily basis, ranging from 0 (no oral intake, and no swallowing training) to 10 (normal oral food intake). Functional measures included a physical dependency scale and comprehension scale that are described elsewhere (6). Nutritional measures included mid-upper arm circumference (MUAC), calf

circumference (CC), and serum albumin levels. MUAC was measured at the midpoint between the tip of the acromion process and the tip of the olecranon process of the left arm. CC was measured at the point of maximal circumference of the left leg. In principle, the evaluations were performed in the early days of hospitalization.

The subjects were divided into two groups according to the oral intake ability. The oral intake group (n = 91) were those who achieved sufficient oral intake (FILS of 7 or above) until the end of hospitalization. The non-oral intake group (n = 42) were those who continued to require artificial nutrition (FILS of 6 or below) during the hospitalization. In this study, patients of the non-oral intake group were defined as those with oral intake difficulty. To make the data more readily comparable and to accommodate the logistic regression analysis, ordinal and cardinal variables were converted into the categorical measures using cutoff points. The cutoff points were applied for age (85 years or older), GWST (score <4), FILS (score <5), physical dependency scale (score <1), comprehension scale (score <2), MUAC (<22.5 cm for men and <20.8 cm for women), CC (<31.3 cm for men and <29.9 cm for women), and albumin levels (<2.8 g/dL). The cutoff points of MUAC and CC were 2 standard deviations below the means for a normal population aged 40-44 years for each sex (8), and the other cutoff points were arbitrary chosen close to the mean.

Comparative analyses between the two groups were performed using the Student's t-test, Mann-Whitney test, and chi square test. Multivariate logistic regression analysis was performed using the oral intake difficulty represented by the non-oral intake group as the dependent variable and other dichotomous variables as independent variables. A p-value <0.05 was considered statistically significant. This study was approved by the ethics committee of our hospital.

Results

The basic results are shown in Table 1. The subjects were 53 men and 80 women, with a mean ± SD age of 85.8 ± 6.2 years. Primary diseases on admission were respiratory disease (n = 88), digestive disease (n = 12), urinary infection (n = 6), cardiac disease (n = 5), orthopedic disease (n = 4), cerebrovascular accident (n = 3), and others (n = 15). Of the 133 patients, 88 had dementia, and 58 had a history of other neurological disease (cerebrovascular disease or Parkinson's disease) according to the medical records.

A comparison of the variables between the oral intake and non-oral intake groups is shown in Table 2. There were no significant differences between the two groups in age, sex, or disease conditions. Regarding the swallowing measures, the non-oral intake group showed significantly higher rates of impaired GWST ($p < 0.001$) and impaired FILS ($p < 0.001$) compared with the oral intake group. The non-oral intake group also showed significantly higher rates of physical dependency ($p = 0.005$), but not impaired comprehension ($p = 0.593$). Regarding nutritional status, the non-oral intake group showed significantly higher rates of decreased MUAC ($p < 0.001$), but not decreased CC ($p = 0.231$) or low serum albumin levels ($p = 0.139$).

Table 1
Basic results

Evaluation items	Mean ± SD (range) or number (%)
Age (years)	85.8 ± 6.2 (66-100)
Gender (male)	53 (40%)
Respiratory disease	88 (66%)
Dementia	88 (66%)
History of neurological disease	58 (44%)
Graded water swallowing test (0-6)	3.9 ± 2.1 (0-6)
Food intake level scale (1-10)	5.1 ± 1.8 (2-9)
Physical dependency scale (0-7)	1.0 ± 1.4 (0-7)
Comprehension scale (0-5)	2.4 ± 1.2 (0-5)
Mid-upper arm circumference (cm)	19.9 ± 3.1 (13.6-28.2)
Calf circumference (cm)	24.4 ± 3.6 (15.8-33.2)
Serum albumin level (g/dL)	2.8 ± 0.5 (1.3-4.3)

The result of multivariate regression analysis showed that the significant and independent predictors of oral intake difficulty were decreased MUAC (odds ratio = 4.67; 95% confidence interval: 1.49, 14.70; $p = 0.008$) and impaired GWST (odds ratio = 3.62; 95% confidence interval: 1.63, 8.07; $p = 0.002$).

Discussion

Of the 113 patients, 91 achieved sufficient oral intake until the end of hospitalization whereas 42 did not. No significant differences were observed in demographic variables (age and sex) or disease conditions between the oral intake and non-oral intake groups. Considering that the prevalence of dementia and other neurological conditions was not significantly different between the two groups, it was unlikely that the oral intake difficulty in the present subjects was related to such neurological conditions.

The results showed that impaired GWST, impaired FILS, physical dependency, and decreased MUAC were the significant predictors of poor oral intake. The independent association between decreased MUAC and poor oral intake suggests a non-negligible influence of significant body mass loss on oral intake behavior in older patients with dysphagia. Considering that some authors have suggested that MUAC, more so than CC, reflects end-stage decline (9) and that CC is seemingly

Table 2
Comparison between the oral intake and non-oral intake groups

Variables	Total (n=133)	Oral intake (n=91)	Non-oral intake (n=42)	p-value
Age (85 years or older), n (%)	79 (59%)	53 (58%)	26 (62%)	0.689
Sex (male), n (%)	53 (40%)	33 (36%)	20 (48%)	0.263
Respiratory disease, n (%)	88 (66%)	57 (63%)	31 (74%)	0.206
Dementia, n (%)	88 (66%)	59 (65%)	29 (69%)	0.633
History of neurological disease, n (%)	58 (44%)	43 (47%)	15 (36%)	0.212
Impaired GWST*, n (%)	58 (44%)	30 (33%)	28 (67%)	<0.001
Impaired FILS**, n (%)	38 (29%)	17 (19%)	21 (50%)	<0.001
Physical dependency (<1), n (%)	78 (59%)	46 (51%)	32 (76%)	0.005
Impaired comprehension (<2), n (%)	31 (23%)	20 (22%)	11 (26%)	0.593
Decreased MUAC***, n (%)	96 (72%)	58 (64%)	38 (91%)	0.001
Decreased CC****, n (%)	125 (94%)	84 (92%)	41 (98%)	0.231
Low albumin (<2.8 g/dL), n (%)	73 (55%)	46 (51%)	27 (64%)	0.139

*GWST: graded water swallowing test (impaired: <4, failure with the 3 mL plain water trial); **FILS: food intake level scale (impaired: <5, difficulty in consuming a meal, even with the use of easy-to-swallow foods); ***MUAC: mid-upper arm circumference (decreased: men <22.5 cm, women <20.8 cm); ****CC: calf circumference (decreased: men <31.3 cm, women <29 .9 cm)

affected by ambulatory status, a significant reduction in MUAC may be a better indicator of profound changes in body mass compared with that in CC. Therefore we postulated here that advanced body mass reduction was associated with oral intake difficulty. One hypothesis is that general and profound reduction of muscle mass and function extends into the head and neck region, which leads to the disruption of the swallowing mechanism, resulting in impaired efficiency and safety of swallowing. This hypothesis can be explained based on the concept of sarcopenic dysphagia (10). Another hypothesis is that profound malnutrition represented by decreased MUAC may be associated with adverse conditions including delay in recovery from illness, susceptibility to infections, and increased comorbidity, fatigue, and psychological distress such as apathy and depression (11, 12), all of which may affect oral intake. We consider that these two hypotheses are not mutually exclusive, and further data are needed to support each hypothesis.

The major limitations of the present study are as follows. First, instrumental assessment of muscle mass and function was not conducted, which may limit the discussion. Second, this was a single-institution study, which may limit generalization from the results.

In conclusion, swallowing impairment, advanced body mass reduction, and physical dependency were the significant predictors of poor oral intake in older patients with dysphagia. Further investigations on the underlying mechanism of the condition are required.

Conflicts of interest: The author has no conflict of interest to disclosure, and do not receive any funding for this study

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