



Trabajo Original

Nutrición en el anciano

Assessment of the risk of malnutrition due to aspiration pneumonia and oral feeding difficulty

Evaluación del riesgo de desnutrición debido a neumonía por aspiración y dificultad para la alimentación oral

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Abstract

Introduction: many patients with acute-phase swallowing disorders experience malnutrition, which can be caused by oral intake difficulties. Many diseases can cause swallowing difficulties such as aspiration pneumonia, and it is, therefore, necessary to consider the risk of malnutrition during oral feeding therapy in patients with aspiration pneumonia.

Objectives: we aimed to evaluate the risk of malnutrition in patients with aspiration pneumonia and other diseases.

Methods: the participants comprised 62 patients (45 males, 17 females) with acute-phase swallowing disorders who underwent speech therapy (ST) for swallowing rehabilitation. The patients were divided into four groups: 1) oral feeding with pneumonia, 2) parenteral feeding with pneumonia, 3) oral feeding without pneumonia, and 4) parenteral feeding without pneumonia. The serum albumin and total protein levels were measured to evaluate malnutrition, and swallowing ability was assessed using the Fujishima grade.

Results: at the time of ST initiation, serum albumin levels were significantly higher in the oral feeding with pneumonia and oral feeding without pneumonia groups than in the parenteral feeding with pneumonia and parenteral feeding without pneumonia groups. The Fujishima grades differed significantly between the pneumonia/parenteral feeding group and the non-pneumonia/parenteral feeding group.

Conclusions: patients with difficulty in swallowing due to aspiration pneumonia were at higher risk of malnutrition than were those without these difficulties. These findings suggest that the nutritional status of parenterally fed patients who developed pneumonia may be inherently poorer than that of orally fed patients.

Keywords:

Swallowing.
Swallowing disorder.
Aspiration pneumonia.
Malnutrition.
Parenteral nutrition.

Resumen

Introducción: muchos pacientes que padecen trastornos de la deglución en fase aguda experimentan desnutrición, que pueden estar causados por dificultades en la ingesta oral. Muchas enfermedades pueden causar dificultades de la deglución, incluida la neumonía por aspiración, y, por lo tanto, es necesario considerar el riesgo de desnutrición durante la terapia de alimentación oral en los pacientes que padecen neumonía por aspiración.

Objetivos: nuestro objetivo fue evaluar el riesgo de desnutrición en pacientes que padecen neumonía por aspiración y otras enfermedades.

Métodos: los participantes comprendían 62 pacientes (45 hombres, 17 mujeres) con trastornos de la deglución en fase aguda que se sometieron a tratamiento logopédico (speech therapy, ST) por rehabilitación de la deglución. Los pacientes se dividieron en cuatro grupos: 1) alimentación oral con neumonía, 2) alimentación parenteral con neumonía, 3) alimentación oral sin neumonía y 4) alimentación parenteral sin neumonía. La albúmina sérica y los niveles totales de proteínas se calcularon para evaluar la desnutrición, y la capacidad de deglución se evaluó usando el grado de Fujishima.

Resultados: en el momento de iniciar el tratamiento logopédico (speech therapy, ST), los niveles de albúmina en suero fueron significativamente más altos en los grupos de alimentación oral con neumonía y alimentación oral sin neumonía que en los grupos de alimentación parenteral con neumonía y alimentación parenteral sin neumonía. Los grados de Fujishima difieren de forma significativa entre los grupos de alimentación oral/alimentación parenteral con neumonía y los grupos de alimentación oral/alimentación parenteral sin neumonía.

Conclusiones: los pacientes que poseen dificultades de la deglución debido a neumonía por aspiración presentan un riesgo mayor de desnutrición que aquellos que no poseen estas dificultades. Estas conclusiones sugieren que el estado nutricional de los pacientes alimentados parenteralmente que desarrollaron una neumonía puede ser inherentemente más pobre que el de los pacientes alimentados oralmente.

Palabras clave:

Deglución. Trastorno de la deglución.
Neumonía por aspiración.
Desnutrición.
Nutrición parenteral.

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INTRODUCTION

Aspiration pneumonia, a type of pneumonia frequently caused by swallowing disorders, has been increasing in incidence (1). The rate of aspiration pneumonia in patients with pneumonia increases after the age of 50 years, reaching 75.0 % in patients aged ≥ 70 years and 80.1 % in those aged ≥ 80 years (2). Decreased pharyngeal sensation and delayed swallow initiation are more frequently observed in elderly patients than in younger individuals, and swallowing time has also been reported to be prolonged by 30-50 % (3). These findings explain why the age-related increase in the risk of developing pneumonia is believed to be due to swallowing disorders (4-7).

However, the causes of aspiration pneumonia include not only accidental aspiration during the swallowing of food, but also aspiration due to causes other than feeding, such as gastric reflux and the accidental aspiration of saliva during sleep (2). In particular, sarcopenia, which is an age-related decrease in muscle mass, has been one focus of attention (3). Further, the incidence of dysphagia has been reported to increase with age (8), and malnutrition is reportedly more common in patients with swallowing disorders than in those without swallowing disorders (9).

Thus far, patients admitted to acute care hospitals for disuse syndrome have been reported to exhibit signs of malnutrition (10). In addition, patients undergoing rehabilitation may also be malnourished; > 50 % of these patients have serum albumin levels (Alb) of ≤ 3.5 mg/dL and have been reported to be in poor nutritional condition (11). Therefore, the purpose of our study was to examine whether malnutrition, as indicated by Alb levels, during swallowing rehabilitation interventions, could predict improvements in nutritional status after intervention.

MATERIALS AND METHODS

PARTICIPANTS

This retrospective study included 85 patients who were admitted to our hospital between April 2011 and February 2012, and who, at the discretion of the rehabilitation physician, were instructed to consult a speech-language therapist for swallowing rehabilitation therapy. Among the participants, 17 had severe dementia and were unresponsive to instructions during swallowing rehabilitation therapy, and six had a percutaneous endoscopic gastrostomy (PEG) inserted while they were hospitalized. With an indwelling PEG, a patient's nutritional status can be improved within a short period of time using means other than oral feeding; therefore, those with PEGs were excluded from the study. Further, in order to exclude the possibility of functional dysphagia due to paralysis, patients hospitalized for cerebrovascular diseases were excluded from the study. The remaining 62 patients (45 males, 17 females, mean age 76 ± 15 years) were included in the final analysis. Details regarding diagnoses were as follows: 30 patients with aspiration pneumonia, 13 with cardiovascular diseases, 7 with gastrointestinal diseases, 2 with kidney diseases, 2 with

plastic surgery-related diseases, 2 with orthopedic diseases, 2 with otorhinolaryngological diseases, and 4 with other diseases.

The participants consisted of patients diagnosed with aspiration pneumonia as well as not diagnosed with pneumonia at the initiation of speech therapy (referred to hereinafter as "at the initiation of ST"). The participants were categorized into four groups based on whether they were subjected to oral feeding at the time of the completion of ST (referred to hereinafter as "at the completion of ST"); these groups consisted of 1) patients who presented with pneumonia and could be fed orally (the pneumonia/oral feeding group), 2) patients who presented with pneumonia and for whom oral feeding was not possible (the pneumonia/parenteral feeding group), 3) patients without pneumonia who could be fed orally (the non-pneumonia/oral feeding group), and 4) patients without pneumonia but with oral feeding difficulty (the non-pneumonia/parenteral feeding group) (Fig. 1).

The patients were explained the purpose of the study and provided their informed consent. This study has only used existing anonymized data and information, and excluded both clinical and epidemiological research guidelines from the scope of its application. Therefore, approval from the ethics review committee was not required.

SWALLOWING REHABILITATION

The initiation of swallowing rehabilitation with ST was defined as the time when the physiatrist estimated that a patient "had a swallowing disorder," prescribed swallowing rehabilitation with ST, and carried out swallowing rehabilitation. The oral feeding period was defined as the period of time within the ST intervention period during which oral feeding was feasible, stable, and on a continuous basis.

Patients with aspiration pneumonia were prescribed swallowing rehabilitation programs that could be roughly divided into two categories: direct training (12) and indirect training (12-17). The programs predominantly consisted of indirect training, such as training aimed at improving trunk function (13) and oral care (16), but direct training with actual food was prescribed to patients who were able to continue this training for ≥ 3 days, had no frequent choking or fever of ≥ 37.5 °C, and whose continuation of oral intake was promising.

MALNUTRITION EVALUATION

Malnutrition was evaluated in 62 patients by measuring their Alb and total protein (TP) levels at the initiation and at the completion of ST as indices for the assessment of malnutrition.

EVALUATION OF SWALLOWING FUNCTION

To evaluate swallowing function a simplified version of The Evaluation of Eating and Swallowing Disorders was used. Swallowing ability was assessed using Fujishima's Grade of Feeding

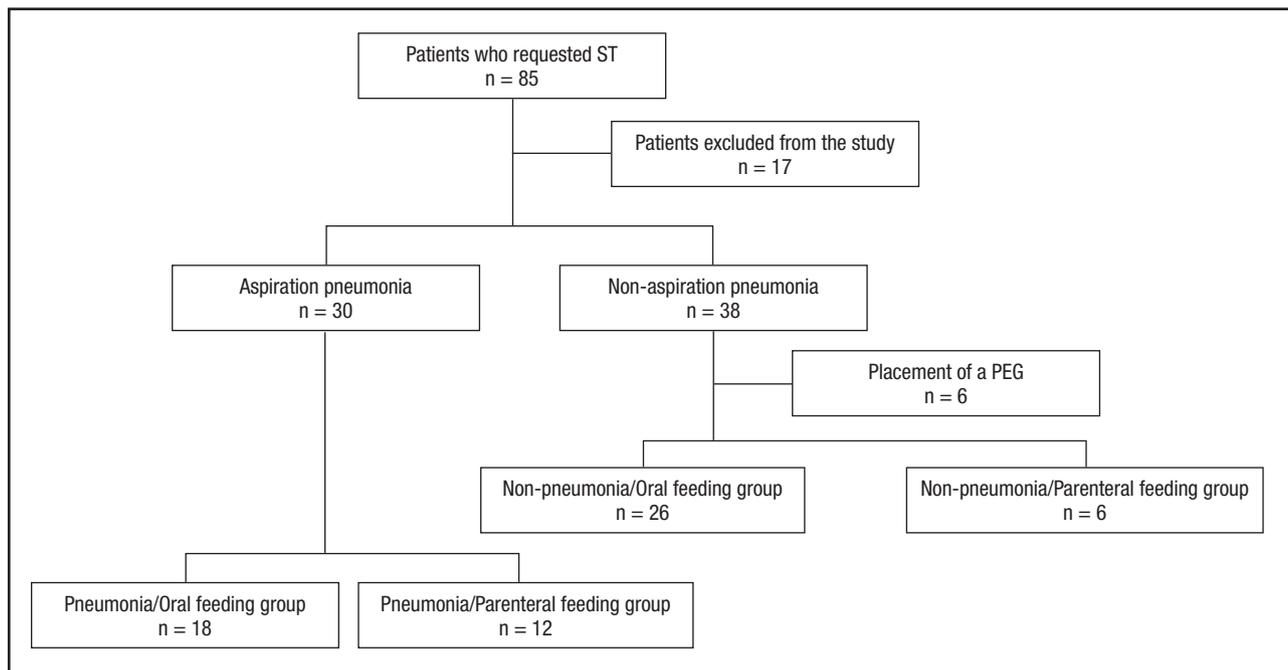


Figure 1.

Flowchart for the classification of participants into the four groups.

and Swallowing Ability (referred to hereinafter as the “Fujishima grade”) (18) as evaluation criteria, and food intake status was assessed using the Food Intake LEVEL Scale (referred to hereinafter as the “food intake level”) (19) as evaluation criteria. These parameters were used for comparison between groups.

FEEDING

With regard to the frequency and content of the meals provided to the pneumonia/oral feeding and non-pneumonia/oral feeding groups, these patients were able to be fed orally with three of the meals offered at our hospital, consisting of paste food, mousse meal, transitional food, whole meal, or regular food. Further, nutrition using nasogastric tubes, total parenteral nutrition, or peripheral parenteral nutrition (20) was prescribed to patients in the pneumonia/parenteral feeding and non-pneumonia/parenteral feeding groups according to the attending physician’s assessment. In addition, because the amount of nutrients administered daily varied depending on each patient’s general condition, an average of 1,200 kilocalories was administered (21) despite marked individual differences.

STATISTICAL ANALYSIS

The analyses were performed using Excel Statcel (Add-in software for Microsoft Excel, 2015). Significance levels of 1 % and

5 % or less were used as rejection values. Comparisons between the four groups in terms of Alb and TP levels at the initiation and completion of ST were performed using the Steel-Dwass test. Comparisons of Fujishima grades and food intake levels at the initiation and completion of ST were carried out using Wilcoxon’s signed rank-sum test.

RESULTS

The mean time from the onset of dysphagia to the intervention was 15 ± 19 days, and the mean intervention period was 18 ± 17 days.

The details of the four groups were as follows: 1) the pneumonia/oral feeding group included 18 patients, with a mean period until the initiation of oral feeding of 7.1 ± 9.4 days; 2) the pneumonia/parenteral feeding group comprised 12 patients; 3) the non-pneumonia/oral feeding group included 26 patients, with a period until the initiation of oral feeding of 5.3 ± 6.6 days; and 4) the non-pneumonia/parenteral feeding group comprised 6 individuals. The details of the non-pneumonia groups were as follows (classified according to disease category): in the non-pneumonia/oral feeding group, 10 patients had cardiovascular diseases, 7 had gastrointestinal diseases, 1 had orthopedic disease, 2 had plastic surgery-related diseases, 2 had diseases of the ear, nose, and throat, and 4 had other diseases. In the non-pneumonia/parenteral feeding group, 3 had cardiovascular diseases, 2 had kidney diseases, and 1 had orthopedic disease.

The Alb levels in the pneumonia/oral feeding group (2.9 ± 0.4 g/dL) were significantly lower than those in the pneumonia/parenteral feeding group (2.3 ± 0.4 g/dL; $p < 0.01$). In addition, the Alb levels in the non-pneumonia/oral feeding group (2.9 ± 0.7 g/dL) were significantly lower than those in the non-pneumonia/parenteral feeding group (2.0 ± 0.6 g/dL; $p < 0.05$) (Fig. 2).

Further, Alb levels at the completion of ST were significantly lower in the pneumonia/parenteral feeding group (2.2 ± 0.4 g/dL) than in the pneumonia/oral feeding group (3.0 ± 0.5 g/dL)

and the non-pneumonia/oral feeding group (2.5 ± 1.2 g/dL; $p < 0.01$) (Fig. 3). In addition, TP levels at the completion of ST were significantly lower in the pneumonia/parenteral feeding group (5.6 ± 0.5 g/dL) (Fig. 4) than in the non-pneumonia/oral feeding group (6.2 ± 0.6 g/dL; $p < 0.05$) (Fig. 5).

The comparison of median Fujishima grades and food intake levels between the initiation of ST and the completion of ST (Tables I and II) revealed significant differences. The pneumonia/parenteral and non-pneumonia/parenteral feeding groups had

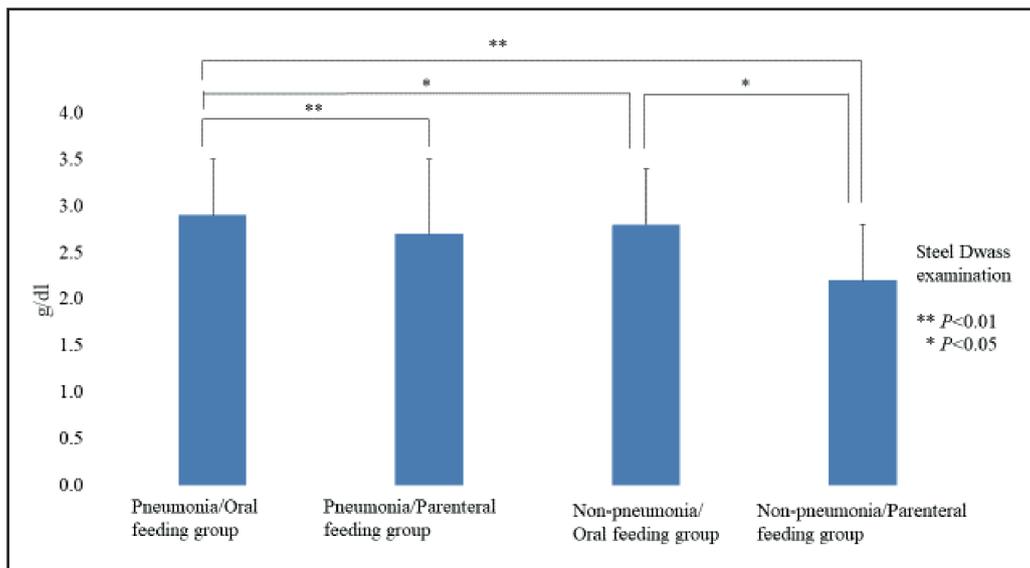


Figure 2.

Serum albumin levels at the initiation of the swallowing rehabilitation therapy in the four groups. The error bars in the graph indicate the standard deviation.

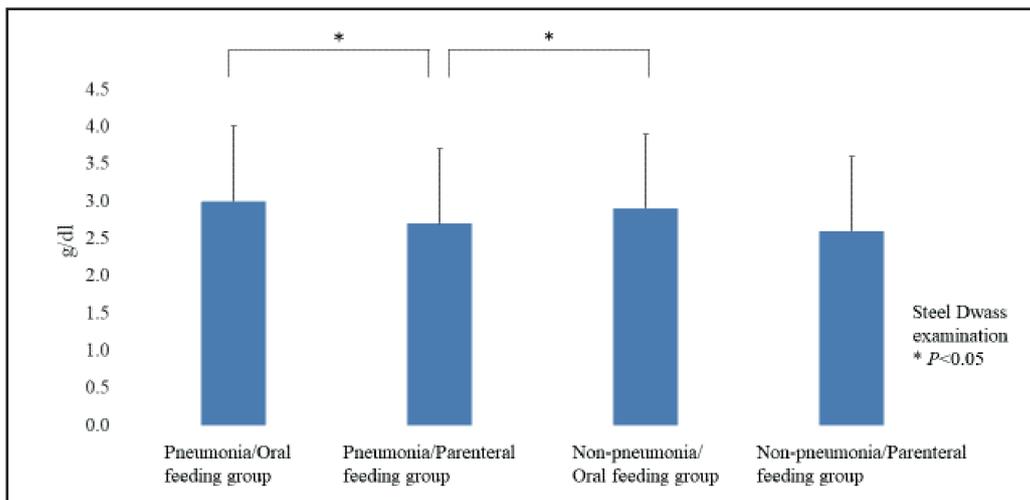


Figure 3.

Serum albumin levels at the completion of the swallowing rehabilitation therapy. The Steel-Dwass test was used for statistical analysis.

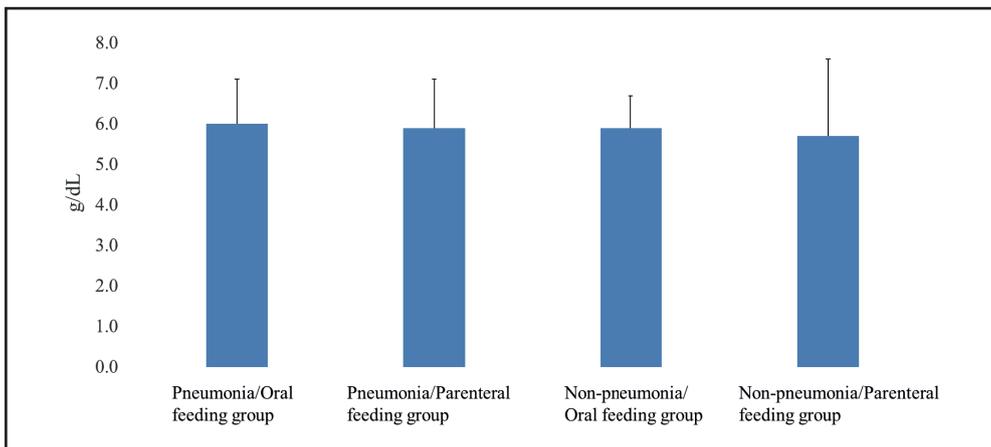


Figure 4.
Total blood protein at the initiation of swallowing rehabilitation.

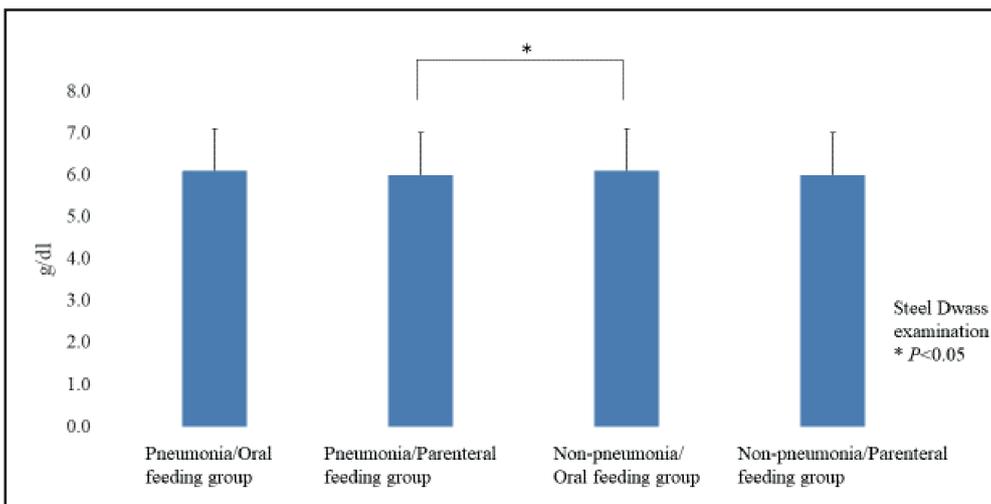


Figure 5.
Total blood protein at the completion of swallowing rehabilitation.

significantly lower Fujishima grades, and the pneumonia/oral and non-pneumonia/oral feeding groups had significantly higher food intake levels at the completion of ST as compared with the start of ST.

Significant differences were found in Fujishima grades between the pneumonia/parenteral feeding group and the non-pneumonia/parenteral feeding group. Further, significant differences in food intake levels were found between the pneumonia/oral feeding group and the non-pneumonia/oral feeding group, but there was no significant difference for that of the non-pneumonia/parenteral feeding group. In addition, in the pneumonia/parenteral feeding group and the non-pneumonia/parenteral feeding group, a marked reduction in Fujishima grades was observed despite the intervention with ST.

DISCUSSION

In this study, Alb levels at initiation of ST were significantly lower in parenterally fed patients than in orally fed patients, regardless of whether they had pneumonia or not. Meanwhile, Alb levels at the completion of ST were significantly lower in the pneumonia/oral feeding group than in the pneumonia/parenteral feeding group; however, among the non-pneumonia groups, no significant difference in Alb levels was found between the oral feeding group and the parenteral feeding group. These findings suggest that the nutritional status of the parenterally fed patients who developed pneumonia may be inherently poorer than that of orally fed patients. Therefore, in patients with dysphagia, correcting malnutrition at an early stage might be the key to whether a patient can

Table I. Fujishima’s Grade of Feeding and Swallowing Ability

Grade	Pneumonia/oral feeding group (n = 18)		Pneumonia/parenteral feeding group (n = 12)		Non-pneumonia/oral feeding group (n = 26)		Non-pneumonia/parenteral feeding group (n = 6)	
	Start	Finish	Start	Finish	Start	Finish	Start	Finish
1				4				3
2				1				
3			2	7	1			3
4	1		1				1	
5			1		2		1	
6	1	1	1		1	1		
7	6	14	6		9	6	2	
8	8	3	1		12	12	2	
9	2				1	7		
10								
Median	8	7	7	3	8	8	7	2

*p < 0.05.

Table II. Food Intake LEVEL Scale

Level	Pneumonia/oral feeding group (n = 18)		Pneumonia/parenteral feeding group (n = 12)		Non-pneumonia/oral feeding group (n = 26)		Non-pneumonia/parenteral feeding group (n = 6)	
	Start	Finish	Start	Finish	Start	Finish	Start	Finish
1				5				3
2			1	1	2		1	
3	17		10	6	17		3	3
4	1						1	
5					1			
6		6	1		2	5	1	
7		9				2		
8		3			3	13		
9					1	6		
10								
Median	3	7	3	3	3	8	3	2

*p < 0.05.

be fed orally. In contrast, individual clinical departments within the hospital may have provided other nutritional support through means other than oral feeding during this study, namely throughout the disease period. Therefore, at the time of hospital admission, and during the course of treatment, the amount of energy provided may have varied according to the disease; thus, this is an issue that may need to be further examined and controlled for in future studies.

Further, although the results were not statistically significant, both the Alb and TP levels in the oral feeding groups (pneumonia and non-pneumonia) increased upon intervention completion as compared to their respective levels during the intervention, whereas in the parenteral feeding groups, the levels of both Alb and TP increased only in the non-pneumonia/parenteral feeding group. This may have been due to the fact that, in patients with pneumonia and oral feeding difficulty, protein consumption may have

increased more than the administered amounts of macronutrients because of respiratory exhaustion due to deteriorated ventilatory function and stress due to pneumonia.

In addition, the Fujishima grade remained consistent in both the pneumonia and non-pneumonia oral feeding groups. This may have been due to the fact that early swallowing rehabilitation intervention with ST helped to prevent swallowing function disuse, and this has allowed for oral feeding to be maintained. Further, in the pneumonia/parenteral feeding group, a detailed evaluation of swallowing was performed at the initiation of ST and, for many patients, oral feeding was determined to be feasible. However, when oral feeding was started, decreased swallowing endurance and silent aspiration resulted in the discontinuation of oral feeding and a return to tube feeding. Accordingly, evaluating the occurrence of silent aspiration by swallowing videofluorography is necessary.

In contrast, the decreased swallowing function in the non-pneumonia/oral feeding group may have been due to an aggravation of the underlying disease (e.g., cardiovascular or kidney disease) that had caused persistently impaired consciousness and decreased endurance, and, in turn, had a great impact on oral feeding difficulty.

In both the pneumonia and non-pneumonia groups, the findings in the oral feeding groups indicated that although the Fujishima grade had been maintained, the food intake level had significantly improved. This may have been due to the fact that maintaining oral feeding had improved swallowing function and allowed for a stepwise shift in food patterns. Conversely, the food intake levels worsened in the pneumonia/parenteral feeding group as well as in the non-pneumonia/parenteral feeding group. This may have been due to an oral feeding difficulty caused by the deterioration of swallowing function, after which it was impossible to carry out direct training. However, verification and comparisons need to be conducted in future studies to determine whether the setting of food intake levels during ST intervention was adequate.

Direct and indirect training were prescribed for swallowing rehabilitation therapy in the patient groups in which oral feeding was feasible, but swallowing rehabilitation therapy alone was not enough to make oral feeding possible. Therefore, for the sake of the maintenance and improvement of oral feeding, swallowing rehabilitation therapy accompanied by consultation with the attending physician and the ward nursing staff during the oral feeding period may facilitate early oral feeding. In patients who were suitable for oral feeding from the time of admission, the continuation of oral feeding may have contributed to maintaining and improving swallowing function.

Based on the above, the findings of our study suggest that when patients with aspiration pneumonia are malnourished at the initiation of ST, the outcome may not allow oral feeding at completion of ST. Thus, we suggest that in patients with aspiration pneumonia, the assessment of malnutrition via Alb levels during the swallowing rehabilitation intervention may be predictive of malnutrition after the completion of the swallowing rehabilitation intervention. Because of the high risk of malnutrition in elderly patients with

aspiration pneumonia and oral feeding difficulty, efforts toward improving oral feeding should be carried out.

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