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Original Article

Multicenter survey of dysphagia and nutritional status of stroke patients in Kaifukuki (convalescent) rehabilitation wards

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ABSTRACT

Takayama M, Nishioka S, Okamoto T, Urushihara M, Kiriya Y, Shintani K, Nakagomi H, Hijioka S, Watanabe M, Sugawara H, Ishikawa M, Miyai I, Sonoda S. Multicenter survey of dysphagia and nutritional status of stroke patients in Kaifukuki (convalescent) rehabilitation wards. Jpn J Compr Rehabil Sci 2018; 9: 11–21.

Objective: This study aimed to identify the current situation of nutritional status and swallowing training in stroke patients with dysphagia in Kaifukuki (convalescent) rehabilitation wards (KRWs).

Methods: We performed a retrospective study in the KRWs of 25 hospitals to investigate the swallowing function and nutritional status of stroke patients who had dysphagia at admission to the KRW. Nutritional status was assessed using the Geriatric Nutritional Risk Index (GNRI) and swallowing function was assessed by Fujishima's swallowing grade (swallowing grade).

Results: A total of 440 subjects were analyzed. Malnutrition (GNRI < 92) was found in 63.4% of the subjects at admission, and the rate was reduced significantly ($p < 0.05$) to 42.7% at discharge. Among the 440 subjects, 94.1% underwent indirect swallowing training while 80.9% underwent direct training. The median swallowing grade improved significantly ($p < 0.05$) from 2 at admission to 7 at discharge. At discharge, 53.4% of the subjects achieved oral intake of three meals.

Conclusion: This multicenter survey revealed the outcome of oral intake and nutritional status in stroke patients with dysphagia in KRWs. These data are expected to be utilized as benchmarks for the goal of further improvement of the quality of nutritional care and dysphagia rehabilitation in the future.

Key words: Kaifukuki rehabilitation ward, stroke, dysphagia, nutritional status, GNRI.

Introduction

Stroke patients are frequently complicated by feeding and swallowing disorders, and 37–78% of them are affected by dysphagia [1]. The mortality [2], incidence of pneumonia [1] and prevalence of malnutrition [3] are higher in stroke patients with

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dysphagia compared to those without dysphagia. Therefore, indirect and direct swallowing training aiming to improve swallowing function is indispensable in these patients. A considerable number of patients have residual dysphagia even after acute phase treatment. In Japan, 5.1% of the patients require nasogastric tube and 1.4% have gastrostomy at the time when they are admitted to Kaifukuki (convalescent) rehabilitation wards (KRWs) [4]. To help these patients acquire oral intake, it is necessary to implement swallowing training in the KRWs, a system which is unique to Japan.

Furthermore, 6.1−62% of stroke patients are complicated by malnutrition [6]. Patients with poor nutritional status after stroke have low survival rate and low rate of independence in everyday activities [7], indicating the need for early nutritional assessment and nutritional intervention. Our previous study showed that among elderly patients admitted to KRWs, 43.5% had malnutrition, and that malnutrition at admission was an independent factor that impeded improvement of activities of daily living and rate of discharge to home [8]. Therefore, for stroke patients in the convalescent stage, it is important to conduct swallowing training simultaneous to nutritional management.

On the other hand, there are few reports on the changes in swallowing function and nutritional status in stroke patients with dysphagia during KRW stay. A single facility study reported that 36.8% of stroke patients on enteral nutrition were capable of oral intake. However, there is no report of multicenter study.

We studied stroke patient who had dysphagia at the time of admission to KRW to investigate the rate of malnutrition at admission and at discharge as well as the situation of swallowing function and training. In this research, data collection was conducted by the Kaifukuki Rehabilitation Ward Association based on a contract research agreement with EN Otsuka Pharmaceutical Co. Ltd., and statistical analysis was conducted by the APPLE (Algorithm for Post-stroke Patients to improve oral intake Level) research team.

Methods

1. Study design and data collection

This research was a retrospective study conducted in 25 affiliated facilities of the directors of Kaifukuki Rehabilitation Ward Association (survey facilities). Among stroke patients who had admission and discharge medical records for the past two years dating back from the time of survey, those in whom oral intake alone was not possible or not adequate for nutritional management at the time of admission were included. In February 2013, survey forms were sent to the 25 survey facilities to collect the data of a maximum of 30 patients per facility. The data from 684 patients were collected. Among the 684 patients, patients with swallowing grade 7 or above or missing swallowing data at the time of admission, patients with a duration between stroke onset and KRW admission longer than 60 days, patients with length of KRW stay longer than 180 days, and patients who were managed nutritionally by oral intake only or intravenous route only were excluded from analysis.

The following clinical data at admission were extracted: (1) patient background data [age, gender, diagnosis, stroke lesion, stroke history, modified Rankin-Scale (mRS), functional independence measure (FIM), and days from stroke onset to KRW admission], (2) nutrition-related data [height, weight, energy and protein intake, route of nutrition administration, serum albumin, total protein, Geriatric Nutritional Risk Index (GNRI)], (3) swallowing-related data (swallowing grade, swallowing assessment and training provided by previous doctor, and status of gastrostomy placed by previous doctor).

The following clinical data at discharge were extracted: (1) nutrition-related data (weight, energy and protein intake, serum albumin, total protein, GNRI), (2) swallowing-related data (swallowing grade, status of indirect and direct swallowing training, status and time to start of oral intake, status and time to start of oral intake of three meals, status of gastrostomy placement and removal during hospital stay, status of onset of pneumonia).

The GNRI which was used as the nutritional indicator in this study was developed for elderly persons [10]. The GNRI has been reported to be related to mortality, rate of complications, and physical indicators such as grip strength [10−13]. The GNRI was calculated from the following equation.

$$\text{GNRI} = [14.89 \times \text{serum albumin (g/dL)}] + [41.7 \times \text{actual body weight (kg)}/\text{ideal body weight (kg)}]$$

Based on the calculated index, patients were classified into four groups: severe malnutrition (GNRI < 82), moderate malnutrition (GNRI 82 to < 92), mild malnutrition (GNRI 92 to ≤ 98), and no malnutrition (GNRI > 98). The cutoff of malnutrition was set at 92 as reported previously [12].

Fujishima's swallowing grade which was used to assess swallowing function in this survey is one of the scales to classify the severity of dysphagia. This tool is a 10-grade scale scored from grade 1 (swallowing difficult or not possible, not indicated for swallowing training) to grade 10 (normal swallowing function) [14]. Grades 1 to 3 were assessed as severe dysphagia, grades 4 to 6 as moderate, 7 to 9 as mild, and grade 10 as normal. Patients capable of oral intake of three meals were grade 7 or above. Therefore, in the present study, patients with grade 7 or above were assessed as capable of oral intake of three meals.

2. Ethical consideration

This research was designed in accordance with Declaration of Helsinki. The study was conducted after being approved by the ethics committee of Hatsudai Rehabilitation Hospital. At the survey facilities, data were anonymized to render them unidentifiable and entered in the survey forms, which were sent back to the study secretariat. The comprehensive consent form during admission included the use of clinical data in research.

3. Statistical analysis

All statistical analyses were performed by the SPSS Statistics, version 21 (IBM Corporation, Tokyo). Normally distributed data were presented as mean ± standard deviation, and non-normally distributed data were expressed as median and 25 and 75 percentile. Admission and discharge data for nutrition-related items and swallowing-related items were compared using paired *t*-test for normally distributed data, by Wilcoxon signed rank test for non-normally distributed data, and by McNemar's test for binomial variables. In stratified analyses, subjects were divided by infarct lesion (supratentorial lesion or infratentorial lesion) and stroke history (first stroke or recurrent stroke) for comparison of admission and discharge data, swallowing grade at admission and at discharge as well as onset of pneumonia, and analyzed by chi-squared test. In all the tests, a p value less than 0.05 was considered significant.

Results

1. Analysis of all subjects

Among 684 patients, 244 who met the exclusion criteria were excluded from analysis. Consequently, 440 subjects constituted the total analysis set (Fig. 1).

The background data of the subjects are shown in Table 1. The mean age was 74.1 ± 11.5 years, and females constituted 38.9%. The median time from stroke onset to admission was 40 days. The most frequent diagnosis was hypertensive cerebral hemorrhage, followed by cardiogenic infarction and other cerebral infarctions. Supratentorial lesions constituted over 70% of the lesions. As for history of previous stroke, the majority of the patients (66.1%) had the first stroke, while approximately 30% of the patients had one or more stroke history in the past. Swallowing function assessment and training were conducted in acute hospitals in approximately 50% of the patients.

Table 2 shows the changes in nutrition-related variables. Body weight at admission was 52.1 ± 10.8 kg, and 23.0% were underweight (BMI < 18.5) while 8.4% were overweight (BMI > 25). At admission, nutrition was managed most frequently by nasogastric tube (55.9%) while the frequencies of gastrostomy and intermittent tube feeding were similar. Sixty-six patients had a gastrostomy placed during the acute phase, 6 of whom had the gastrotomy removed while in the KRWs because there was no longer a need. On the other hand, 76 patients had a gastrotomy placed during stay in KRW.

For nutritional assessment at admission based on GNRI, 63.4% were assessed as showing moderate to severe malnutrition. When comparing the data at admission and at discharge, energy and protein intake increased significantly. Serum albumin level also increased significantly. The proportion of moderate to severe malnutrition decreased significantly to 42.7%. On the other hand, the proportion of underweight patients increased significantly from 23.0% to 27.3%.

Tables 3 and 4 show the swallowing-related variables. Median swallowing grade was 2 at admission and increased significantly to 7 at discharge, and 53.4% of

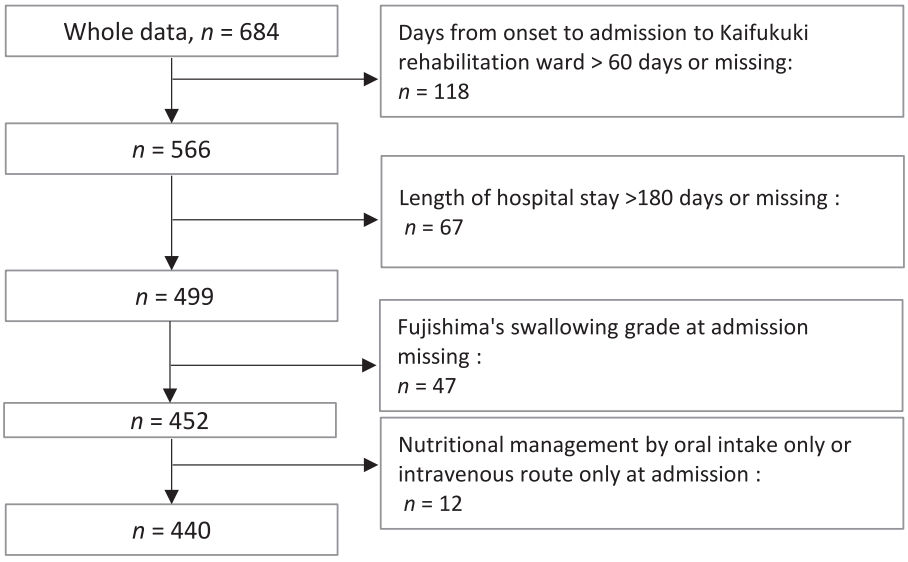

Figure 1. Flowchart of subject selection.

Table 1. Characteristics of subjects.

	n	
Age, years (mean ± SD)	440	74.1±11.5
Gender, *n* (%)		
Male		269(61.1)
Female		171(38.9)
Diagnosis, *n* (%)		
Lacunar infarction		14(3.2)
Atherothrombotic infarction		55(12.5)
Cardiogenic infarction		78(17.7)
Other cerebral infarctions		75(17.0)
Hypertension cerebral hemorrhage		128(29.1)
Other cerebral hemorrhage		49(11.1)
Subarachnoid hemorrhage		31(7.0)
Others / Unknown		9(2.0)
Missing		1(0.2)
Infarct lesion, *n* (%)		
Supratentorial lesion		317(72.0)
Infratentorial lesion		80(18.2)
Supra + infratentorial		8(1.8)
Unknown		31(7.0)
Missing		4(0.9)
Previous stroke, *n* (%)		
None		291(66.1)
Once		101(23.0)
Twice or more		37(8.4)
Unknown		10(2.3)
Missing		1(0.2)
Pre-stroke mRS	407	0(0–2)
median (25-75 percentile)		
mRS at KRW admission	422	5(4–5)
median (25-75 percentile)		
Swallowing function assessment by previous doctor, *n* (%)		
Yes		231(52.5)
No		60(13.6)
Unknown		149(33.9)
Swallowing training by previous doctor, *n* (%)		
None		68(15.5)
Indirect training		84(19.1)
Direct training		20(4.5)
Indirect + direct training		120(27.3)
Unknown		147(33.4)
Missing		1(0.2)
FIM at KRW admission		
median (25-75 percentile)		
Motor	438	13(13–18)
Cognitive	439	9(6–15)
Days from onset to KRW admission	440	40(27–50)
median (25-75 percentile)		
Days of KRW stay	440	135(99–160.75)
median (25-75 percentile)		
Tracheotomy at admission, *n* (%)		
Yes		31(7.0)
No		409(93.0)
Sputum suction at admission, *n* (%)		
Yes		274(62.3)
No		151(34.3)
Missing		15(3.4)

Table 2. Changes in nutrition-related variables.

	n	At admission	At discharge	*p* value
Height, cm (mean ± SD)	432	158.3±9.9	—	—
Body weight, kg (mean ± SD)	400	52.1±10.8	50.8±9.8	<0.001*
Energy intake, kcal median (25-75 percentile)	418	1,200(1,200–1,320)	1,400(1,200–1,600)	<0.001**
Protein intake, g median (25-75 percentile)	399	51.1(48.0–60.0)	59.0(48.0–66.0)	<0.001**
Nutritional indicator, g/dL (mean ± SD)				
Serum albumin	347	3.3±0.5	3.5±0.5	<0.001*
Total protein	311	6.6±0.6	6.6±0.6	0.782*
Severity of malnutrition, *n* (%)				<0.001†1
Severe: GNRI <82		99(22.5)	52(11.8)	
Moderate: GNRI 82 − <92		180(40.9)	136(30.9)	
Mild: GNRI 92 − <98		93(21.1)	100(22.7)	
None: GNRI >98		34(7.7)	39(8.9)	
Missing		34(7.7)	113(25.7)	
BMI category, *n* (%)				0.006†2
Underweight: <18.5		101(23.0)	120(27.3)	
Normal: 18.5 − <25		278(63.2)	258(58.6)	
Overweight: >25		37(8.4)	27(6.1)	
Missing		24(5.5)	35(8.0)	
Nutrition management method, *n* (%)				
Nasogastric tube		246(55.9)	—	—
Gastrostomy		57(13.0)	—	—
Intermittent tube feeding		53(12.0)	—	—
Combination of methods		84(19.1)	—	—
Gastrostomy placement by previous doctor, *n* (%)				
Yes		66(15.0)	—	—
No		372(84.5)	—	—
Missing		2(0.5)		
Gastrostomy removal after admission, *n* (%)				
Yes		6(9.1)	—	—
No		57(86.4)	—	—
Missing		3(4.5)		
Gastrostomy placement after admission (%)				
Yes		76(20.4)	—	—
No		296(79.6)	—	—

*Paired *t*-test
**Wilcoxon signed rank test
†1 GNRI <92 vs. ≥92, McNemar's test (*n* = 312)
†2 BMI <18.5 vs. ≥18.5, McNemar's test (*n* = 393)

the patients achieved oral intake of three meals. Indirect swallowing training was implemented in 94.1% of the patients, and direct training in 80.9%. Food for oral intake was provided to 66.6% of the patients. Median time from admission to start of oral intake was 15 days, and to oral intake of three meals was 34 days. Onset of pneumonia was found in 21.8% of the patients, 90% of these cases were suspected to be aspiration pneumonia by attending doctors because the possibility of aspiration pneumonia could not be excluded.

Table 3. Changes in feeding/swallowing function.

	n	At admission	At discharge	*p* value
Fujishima's swallowing grade median (25-75 percentile)	429	2(2−3)	7(3−8)	<0.001*
Severity of dysphagia, *n* (%)				
Severe: Grades 1−3		359(81.6)	125(28.4)	
Moderate: Grades 4−6		81(18.4)	69(15.7)	
Mild: Grades 7−9		0	197(44.8)	
Normal: Grade 10		0	38(8.6)	
Missing		0	11(2.5)	
Achievement of oral intake of three meals				
Yes: Grades 7−10		—	235(53.4)	
No: Grades 1−6		—	194(44.1)	
Missing		—	11(2.5)	

*At admission vs. at discharge, Wilcoxon signed rank test

Table 4. Contents of swallowing training and complications.

	n	
Indirect training, *n* (%)		
Yes		414(94.1)
No		26(5.9)
Direct training, *n* (%)		
Yes		356(80.9)
No		84(19.1)
Oral intake of food, *n* (%)		
Yes		300(68.2)
No		139(31.6)
Missing		1(0.2)
Days from admission to start of food intake median (25−75 percentile)	293	15(5−31.5)
Days from admission to oral intake of three meals median (25−75 percentile)	249	34(17−61)
Onset of pneumonia during in hospital, *n* (%)		
Yes		96(21.8)
Possibility of aspiration pneumonia could not be excluded		89(92.7)
No		331(75.2)
Missing		13(3.0)

2. Analysis by location of stroke lesion

From the total analysis set of 440 patients, those with unknown lesion location, those with both supra and infratentorial lesions, and those with no entry were excluded. Eventually, 317 patients with supratentorial lesion and 80 patients with infratentorial lesion were analyzed, and the changes of nutritional status and oral intake status during hospital stay are shown in Table 5. When comparing the data at admission and at discharge, energy intake, protein intake and serum albumin increased significantly irrespective of the lesion location being supra or infratentorial. Swallowing grade also improved significantly. On the other hand, the proportion of moderate to severe malnutrition increased significantly and the proportion of underweight patients increased significantly, but only for supratentorial lesion.

Table 6 shows the results comparing the severity of dysphagia at admission, achievement of oral intake of three meals during hospital stay, and status of pneumonia onset during hospital stay between the supratentorial and infratentorial groups. The proportion of severe dyaphagia (swallowing grades 1−3) was significantly higher in the infratentorial group, while there was no difference in the achievement rate of oral intake of three meals. The incidence of pneumonia was also significantly higher in the infratentorial group.

Table 5. Changes in nutritional status and oral intake status in patients with supratentorial and those with infratentorial lesions.

		n	At admission	At discharge	*p* value
Weight, kg (mean ± SD)	Supratentorial	290	51.5±10.3	50.2±9.1	<0.001*
	Infratentorial	71	53.6±12.2	52.5±11.5	0.065*
Energy intake, kcal	Supratentorial	299	1,200(1,200−1,288)	1,324(1,200−1,600)	<0.001**
median (25-75 percentile)	Infratentorial	77	1,200(1,200−1,405)	1,500(1,200−1,800)	<0.001**
Protein intake, g	Supratentorial	287	49.5(45−60)	59(48−65)	<0.001**
median (25-75 percentile)	Infratentorial	71	60(48−60)	60(52−70.1)	0.009**
Serum albumin, g/dL (mean ± SD)	Supratentorial	252	3.3±0.4	3.5±0.5	<0.001*
	Infratentorial	65	3.4±0.6	3.6±0.5	0.009*
Severity of malnutrition: GNRI, *n* (%)	Supratentorial				<0.001†1
			<82 74(23.3)	<82 41(12.9)	
			82−<92 131(41.3)	82−<92 102(32.2)	
			92−<98 69(21.8)	92−<98 71(22.4)	
			>98 18(5.7)	>98 27(8.5)	
			Missing 25(7.9)	Missing 76(24.0)	
	Infratentorial				0.109†1
			<82 18(22.5)	<82 9(11.3)	
			82−<92 27(33.8)	82−<92 22(27.5)	
			92−<98 13(16.3)	92−<98 21(26.3)	
			>98 14(7.5)	>98 7(8.8)	
			Missing 8(10.0)	Missing 21(26.3)	
BMI category, *n* (%)	Supratentorial				0.003†2
			<18.5 75(23.7)	<18.5 92(29.0)	
			18.5−<25 198(62.5)	18.5−<25 187(59.0)	
			>25 27(8.5)	>25 17(5.4)	
			Missing 17(5.4)	Missing 21(6.6)	
	Infratentorial				0.564†2
			<18.5 18(22.5)	<18.5 19(23.8)	
			18.5−<25 50(62.5)	18.5−<25 46(57.5)	
			>25 6(7.5)	>25 6(7.5)	
			Missing 6(7.5)	Missing 9(11.3)	
Fujishima's swallowing grade	Supratentorial	311	2(2−3)	7(3−8)	<0.001**
median (25−75 percentile)	Infratentorial	79	2(2−3)	6(2−8)	<0.001**

* Paired *t*-test

** Wilcoxon signed rank test

†1 GNRI <92 vs. ≥92, McNemar's test (Supratentorial: *n* = 229, Infratentorial: *n* = 56)

†2 BMI<18.5 vs. ≥18.5, McNemar's test (Supratentorial: *n* = 287, Infratentorial: *n* = 68)

Table 6. Comparisons of severity of dysphagia at admission, achievement of oral intake of three meals in hospital, and onset of pneumonia in hospital between subjects with supratentorial lesion and those with infratentorial lesion.

	Supratentorial, *n* (%)	Infratentorial, *n* (%)	*p* value
Severity of dysphagia at admission			0.017†
Severe: Grades 1−3	253(79.8)	73(91.3)	
Moderate: Grades 4−6	64(20.2)	7(8.8)	
Achievement of oral intake of three meals in hospital			0.344†
Yes: Grades 7−10	172(54.3)	39(48.8)	
No: Grades 1−6	139(43.8)	40(50.0)	
Missing	6(1.9)	1(1.3)	
Onset of pneumonia in hospital			0.005†
Yes	61(19.2)	27(33.8)	
No	252(79.5)	52(65.0)	
Missing	4(1.3)	1(1.3)	

†Chi-squared test (excluding missing data)

3. Analysis by history of stroke

From the total analysis set of 440 patients, those with unknown history of stroke or no entry were excluded. Eventually, 291 patients who had the first stroke and 138 who had recurrent stroke (once or more) were analyzed, and the changes of nutritional status and oral intake status during the hospital stay are shown in Table 7. When comparing the data at admission and at discharge, significant increases in energy intake, protein intake and serum albumin level; significant decrease in moderate to severe malnutrition; and significant improvement in swallowing grade were observed irrespective of first or recurrent stroke. A significant increase in underweight patients was observed only in the first stroke group, while a tendency of increase was found in the recurrent stroke group.

Table 8 shows the results comparing the severity of dysphagia at admission, achievement of oral intake of three meals during hospital stay, and onset of pneumonia during hospital stay between the first stroke and recurrent stroke groups. Although there was no significant difference in the severity of dysphagia at admission, achievement rate of oral intake of three meals was significantly higher in the first stroke group. There was no intergroup difference in the incidence of pneumonia.

Discussion

This study is the first multicenter survey revealing the nutritional status and the situation of swallowing training and swallowing function in stroke patients who required tube feeding at admission to KRW. Two major findings were obtained. First, the proportion of moderate to severe malnutrition exceeded 60% at admission, but decreased significantly to approximately 40% at discharge. Second, the achievement rate of oral intake of three meals was over 50%.

According to a systematic review of nutritional disorders in stroke patients, 6.1−62% of stroke patients were under-nourished [6]. Also, stroke patients with dysphagia have a higher malnutrition risk than those with good swallowing function, and this tendency is more pronounced after the subacute phase than in the acute phase [3]. In our previous study including subjects without dysphagia, the prevalence of moderate to severe malnutrition assessed by GNRI at admission to KRW was approximately 42% [8]. In the present study conducted on patients receiving tube feeding, malnutrition was observed at a higher rate (63.4%), reconfirming the importance of nutritional assessment in patients with dysphagia. In stroke patients, the basal metabolic rate increase is not pronounced in the acute phase [15] and subacute phase [15, 16]. Therefore, setting of the amount of energy administered during tube feeding, and the decreased dietary intake during oral intake due to dysphagia and paraplegia, apraxia, hemispatial neglect, post-stroke depression, fatigue, and anxiety [17] are possible factors that influence the development of malnutrition.

Regarding the decrease in prevalence of malnutrition assessed by GNRI, since both energy and protein intake increased significantly from admission to discharge, this finding probably indicated that nutritional management during hospital stay improved the malnutrition state. However, some reports have shown that serum albumin level, which is used in GNRI calculation, does not reflect the nutritional status of elderly people with disability [18]. Because of the increase in number of underweight patients despite increased intake energy, we cannot exclude the possibility that the amount of energy administered was not adequate to maintain or increase body weight. Serum albumin level and body weight fluctuate depending on the water content in the body and the presence or absence of edema [19]. Therefore, establishment of nutritional indicators with proven

Table 7. Changes in nutritional status and oral intake status in patients with the first stroke and those with recurrent stroke.

		n	At admission		At discharge		*p* value
Weight, kg (mean ± SD)	First	261	52.5±10.8		50.9±9.8		<0.001*
	Recurrent	128	51.1±10.9		50.5±9.7		0.078*
Energy intake, kcal	First	277	1,200(1,200–1,334.5)		1,400(1,200–1,600)		<0.001**
median (25-75 percentile)	Recurrent	130	1,200(1,200–1,292.5)		1,250(1,200–1,500)		<0.001**
Protein intake, g	First	262	52.5(45–60)		60(50–67)		<0.001**
median (25-75 percentile)	Recurrent	127	50(48–60)		55(48–60)		0.016**
Serum albumin, g/dL (mean ± SD)	First	227	3.4±0.5		3.6±0.4		<0.001*
	Recurrent	114	3.3±0.5		3.5±0.5		<0.001*
Severity of malnutrition: GNRI, *n* (%)	First						0.004†1
			<82	67(23.0)	<82	33(11.3)	
			82–<92	116(39.9)	82–<92	92(31.6)	
			92–<98	58(19.89)	92–<98	64(22.0)	
			>98	26(8.9)	>98	24(8.2)	
			Missing	24(8.2)	Missing	78(26.3)	
	Recurrent						0.003†1
			<82	30(21.7)	<82	18(13.0)	
			82–<92	60(43.5)	82–<92	43(31.2)	
			92–<98	30(21.7)	92–<98	33(23.9)	
			>98	8(5.8)	>98	14(10.1)	
			Missing	10(7.2)	Missing	30(21.7)	
BMI category, *n* (%)	First						0.048†2
			<18.5	73(25.1)	<18.5	82(28.2)	
			18.5–<25	172(59.1)	18.5–<25	167(57.4)	
			>25	29(10.0)	>25	19(6.5)	
			Missing	17(5.8)	Missing	23(7.9)	
	Recurrent						0.109†2
			<18.5	27(19.6)	<18.5	34(24.6)	
			18.5–<25	97(70.3)	18.5–<25	85(61.6)	
			>25	7(5.1)	>25	7(5.1)	
			Missing	7(5.1)	Missing	12(8.7)	
Fujishima's swallowing grade	First	286	2(2–3)		7(3–9)		<0.001**
median (25-75 percentile)	Recurrent	132	2(2–3)		6(2–8)		<0.001**

* Paired *t*-test

** Wilcoxon signed rank test

†1 GNRI <92 vs. ≥92, McNemar's test, (First: *n* = 201, Recurrent: *n* = 105)

†2 BMI<18.5 vs. ≥18.5, McNemar's test, (First; *n* = 258, Recurrent: *n* = 124)

Table 8. Comparisons of severity of dysphagia at admission, achievement of oral intake of three meals in hospital, and onset of pneumonia in hospital between subjects with the first stroke and those with recurrent stroke.

	First, *n* (%)	Recurrent, *n* (%)	*p* value
Severity of dysphagia at admission			0.575†
Severe: Grades 1−3	236(81.1)	115(83.3)	
Moderate: Grades 4−6	55(18.9)	23(16.7)	
Achievement of oral intake of three meals in hospital			0.049†
Yes: Grades 7−10	166(57.0)	63(45.7)	
No: Grades 1−6	120(41.2)	69(50.0)	
Missing	5(1.7)	6(4.3)	
Onset of pneumonia in hospital			0.602†
Yes	62(21.3)	33(23.9)	
No	220(75.6)	103(74.6)	
Missing	9(3.1)	2(1.4)	

†Chi-squared test (excluding missing data)

validity and reliability for stroke patients is required. In recent years, energy intake corresponding to energy consumed through training and activities is recommended for persons undergoing rehabilitation [20], and it may be necessary to verify the method of setting the required amount of energy.

In the present study, more than 50% of the patients achieved oral intake of three meals at discharge. Many patients with stroke are complicated by dysphagia, and the reported prevalence is as high as 37 to 78% [1], although the prevalence varies depending on the test method. Barer [2] conducted a study on patients with the first stroke who were capable of taking oral medication, and investigated the time course of dysphagia after stroke. According to that study, the prevalence of dysphagia on the day of admission, at 1 week, 1 month and 6 months was 29%, 16%, 2% and 0.4%, respectively, suggesting that mild dysphagia will recover over time. In another report, however, among 47 stroke patients who received tube feeding at 1 month after onset, 36.2% of the patients achieved oral intake of three meals at the time of discharge [9]. The reason why the achievement rate of oral intake of three meals was higher in our present study than in previous study is not clear. It is possible that the implementation rate of indirect and direct swallowing training as well as the involvement of multidisciplinary personnel may have some effects. In addition, considering that another report showed a higher rate of transition to oral intake in patients who received intermittent tube feeding compared to patients receiving nasogastric tube feeding [21], 12% of the patients in the present study were on intermittent tube feeding and this may have also affected the result. In addition, the interquartile range of the time of starting oral intake of three meals in this study was 17 to 61 days, showing that some patients achieved oral intake of three meals more than 2 months after admission to KRW. A previous study showed that dysphagia can be improved up to 3 to 4 months after onset [9]. Therefore, in stroke patients, it is desirable to assess and decide whether transition to oral intake is possible even for patients who have been hospitalized in KRWs for several months.

In the comparisons by lesion location and by history of stroke, some outcomes with significant intergroup differences were observed, such as a high incidence of pneumonia in the infratentorial group and a higher achievement rate of oral intake of three meals in the first stroke group. In the comparison between supratentorial and infratentorial lesions, many patients with infratentorial lesion had severe dysphagia at admission, which may have affected the incidence of pneumonia. However, swallowing grade improved significantly during the period of hospital stay in all groups classified by lesion location or by history of stroke, showing the effectiveness of swallowing training. Therefore, maximum intervention should be given irrespective of the lesion location and stroke history.

This research has the following limitations. First, the research was a retrospective study aiming to survey the current situation, and causal relationship between variables was not analyzed. Second, the validity and reliability of GNRI used as the indicator of nutritional status has not been validated in stroke patients. In addition, a relatively large number of patients had missing GNRI data at discharge. Therefore, there is a possibility that the GNRI may be dissociated from the true malnutrition rate. Third, the method and timing of swallowing training as an intervention, the criteria of transition to oral intake and other measures have not been standardized. Fourth, this research was conducted in affiliated facilities of the directors of Kaifukuki Rehabilitation Ward Association, and there is a possibility that selection bias may have existed.

In conclusion, the present study showed that malnutrition was observed in approximately 60% of stroke patients in the convalescent phase under tube feeding, but the proportion decreased at the time of discharge, and approximately one-half of the patients achieved oral intake of three meals. This is the first report of a multicenter survey showing the actual situation of swallowing function and transition of malnutrition in stroke patients in KRWs. The findings provide a basis for verifying the optimal intervention method to improve dysphagia and nutritional status in convalescent phase stroke patients. In the future, using these indicators as benchmarks, cohort studies and intervention studies may be conducted to verify the effects of intervention provided by speech-language-hearing therapists, registered dietitians, nurses, physiotherapists, and occupational therapists on improving dysphagia and nutritional status.

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