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Original Article

Results of rehabilitation for chronic dysphagia due to cerebrovascular disorders in the brainstem

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ABSTRACT

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Objective: To investigate the rehabilitation outcomes of patients with chronic dysphagia due to brainstem lesions.

Methods: Changes in Dysphagia Severity Scale (DSS) score, Eating Status Scale (ESS) score, and activities of daily living (ADL) between hospital admission and discharge were investigated retrospectively in 34 patients (27 males and 7 females; mean age, 63 years) with continuous dysphagia for ≥3 months due to brainstem lesions who underwent inpatient rehabilitation.

Results: DSS scores were unchanged in 6 of the 9 patients with DSS scores of 1 at admission, but improved in 17 of the 25 patients with DSS scores of 2 or above. No improvement in ESS scores was seen in 8 of the 9 patients with ESS and DSS scores of 1, but there were improvements in 20 of the 25 patients with DSS scores of 2 or above.

Conclusion: Improvement was poor in patients with DSS scores of 1 after 3 months or more. However, there is a high likelihood of improvement with intensive rehabilitation in patients with DSS scores of 2 or higher.

Key words: brainstem lesion, cerebrovascular disorder, dysphagia, rehabilitation

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Introduction

Dysphagias caused by stroke due to brainstem lesions, including Wallenberg syndrome and other dysphagias, often become serious. Since the initial account by Wallenberg [1] in 1895, there have been various reports on the outcome of brainstem lesion patients presenting with dysphagia. Kim et al. [2] have reported that oral feeding was possible within 1 month in 22 of 23 patients with medullary infarction, and by day 51 in the remaining patient. Crary et al. [3] administered direct therapy using surface electromyogram biofeedback in 6 patients with brainstem disorders and stated that oral feeding became possible within 1 month in 3 patients, and by 5−7 months in the remaining 3 patients.

Meanwhile, Meng et al. [4] found that oral feeding was possible in 88% of 36 patients with medullary infarction by 4 months, although the remaining patients stayed on tube feeding. Horner et al. [5] followed 13 medullary infarction patients with aspiration for an average of 97 days, and reported that combined tube feeding was ultimately necessary in 3 of them. Teasell et al. [6] found that 4 of 11 patients with dysphagia caused by brainstem lesions still required tube feeding after a mean hospitalization of 55 days.

Regarding dysphagia from chronic brainstem disorders, Hashimoto et al. [7] found that 3 of 10 patients with lateral medullary syndrome still could not swallow after 6 months or more. Huckabee et al. [8] administered 5-day outpatient training to 10 patients 8 or more months after onset, and saw improvement of the severity in 9 of the 10 patients. However, after 1−4 years, they reported that 6 patients

Table 1. Evaluation scales

Dysphagia Severity Scale, DSS		Eating Status Scale, ESS
Without aspiration	7. within normal limits	5. oral feeding
	6. minimal problem	4. modified oral feeding
	5. oral problem	3. oral > tube
Aspiration	4. occasional aspiration	2. oral < tube
	3. water aspiration	1. tube feeding only
	2. food aspiration	
	1. saliva aspiration	

used oral feeding only, 3 used tube feeding only, and 1 used a combination of oral and tube feeding.

Currently, there are no reports on the results of long-term rehabilitation for chronic, severe dysphagia. In a preliminary investigation, we showed that, even in brainstem dysphagia patients who were incapable of oral food intake at the chronic stage, oral feeding later became possible with inpatient rehabilitation for a fair number of them [9]. The aim of the present study was to show the effects and limitations of dysphagia rehabilitation intervention during hospitalization for patients with chronic cerebrovascular disorders of the brainstem, who had continuing dysphagia for ≥3 months.

Methods

The subjects were 34 patients who underwent inpatient rehabilitation at our hospital between July 1997 and February 2011 for dysphagia of ≥3 months due to brainstem lesions. The subjects were 27 men and 7 women with a mean (SD) age of 63 (11.3) years. The primary disease was brainstem infarction in 30 patients, brainstem hemorrhage in 2 patients, and brainstem disorder secondary to subarachnoid hemorrhage in 2 patients. The disease site was the medulla in 24 patients and the pons in 10 patients. The median time from onset to admission to our hospital was 193 days (range, 94−834 days), and the median duration of hospitalization was 89 days (range, 34−265 days).

To understand the detailed pathological status of the dysphagia in these patients, videofluoroscopic examination of swallowing (VF) and videoendoscopic evaluation of swallowing (VE) were performed first. A conference of healthcare workers from different specialties was then held to determine a rehabilitation plan. Indirect therapy consisted mainly of cervical relaxation, cervical range of motion training, pulmonary rehabilitation, thermal-tactile stimulation [10], Shaker's exercise [11, 12], the Mendelsohn maneuver [13, 14], and supraglottic swallow [15]. Additional training in accepting oral tube insertion and balloon catheter dilation was done as needed in patients with insufficient upper esophageal sphincters. Direct training with food was done using food with which aspiration could not be seen on VF or VE. With the patients in various postures, including reclined sitting or a chin down posture, food was actively introduced in accordance with swallowing dynamics. Patients who had a left-right difference in pharyngeal function were instructed in using combination body positions, such as head rotation to the affected side or bending the trunk laterally, for greater effect. Patients who do not aspirate thick liquid but aspirate thin liquid by VF findings were administered oral feeding with the addition of thickening agents to drinks. The difficulty level based on food shape or posture was carefully increased while using VF or VE to ensure safety.

In addition to swallowing training for 40−60 min/day, 6 days/week by speech language hearing therapists or management of eating style by nurses, swallowing rehabilitation was also provided and was coordinated by doctors, dentists, speech language hearing therapists, and nurses. Pulmonary rehabilitation to strengthen bronchial drainage and coughing force and physical and occupational therapy to improve activities of daily living (ADL) were also used.

Rehabilitation outcomes were evaluated retrospectively from the rehabilitation department database and patient records. The severity of swallowing dysfunction was evaluated at hospital admission and discharge using the Dysphagia Severity Scale (DSS) [16] and the Eating Status Scale (ESS) (Table 1). DSS is a 7-point ordinal scale, and ESS is a 5-point ordinal scale, on which lower scores indicate more severe swallowing dysfunction and poorer eating status, respectively. ADL was investigated using the Functional Independence Measure (FIM).

Statistical analysis was done using the Mann−Whitney *U* test and Wilcoxon signed rank test. A P value of <0.05 was considered statistically significant.

Results

DSS and ESS scores of the patients at hospital admission and discharge are shown in Tables 2 and 3, respectively. Both DSS and ESS scores improved significantly (Wilcoxon signed rank test, $P < 0.001$). Supplemental nutrition was necessary in all 34 patients at admission, which was provided by nasogastric tube feeding in 5 patients, gastrostomy tube feeding in 25

Table 2. Changes in DSS scores

	At admission	At discharge
DSS 7	0	0
DSS 6	0	1
DSS 5	0	2
DSS 4	2	6
DSS 3	4	11
DSS 2	19	8
DSS 1	9	6

Table 3. Changes in ESS scores

	At admission	At discharge
ESS 5	0	2
ESS 4	0	8
ESS 3	0	5
ESS 2	4	8
ESS 1	30	11

patients, and intermittent tube feeding in 4 patients. Supplemental nutrition was necessary in 24 patients at discharge, with nasogastric tube feeding in 0 patients, gastrostomy tube feeding in 16 patients, and intermittent tube feeding in 8 patients.

Improvement in DSS and ESS scores was compared between patients with DSS scores of 1 and patients with DSS scores of 2 or higher at admission. Among the DSS 1 patients, DSS scores were unchanged in 6 of the 9 (66.7%) patients, and improved by 1 stage to DSS 2 in 3 patients. In contrast, among the 25 patients with DSS scores of 2 or higher, improvements were seen in 17 (68.0%) patients. At discharge, 5 patients had DSS scores of 2, 11 had DSS scores of 3, 6 had DSS scores of 4, 2 had DSS scores of 5, and 1 had a DSS score of 6. More significant improvements in DSS were seen in patients who had DSS scores of 2 or higher than in patients who had DSS scores of 1 at admission (Mann−Whitney *U* test, P = 0.017) (Table 4). For ESS, no improvement was seen in 8 of the 9 DSS 1 patients (88.9%). The other DSS 1 patient achieved an ESS score of 2, and was able to eat a small amount of paste food. In the 25 patients with DSS scores of 2 or higher at admission, improvement in ESS was seen in 20 patients (80%). Eight of the patients (32.9%) with ESS scores of 1 showed improvement to scores of 3 or higher, and supplemental nutrition was not needed at discharge. Of the 23 patients with ESS scores ≥2 at discharge, who were able to accept some kind of oral feeding, head rotation to the affected side was necessary in 15. More significant improvements in ESS were seen in patients with DSS scores of 2 or higher than in patients with DSS scores of 1 at admission (Mann−Whitney *U* test, P < 0.001) (Table 5). Sixteen of the nineteen patients with DSS scores of 2 at admission were able to orally ingest some kind of food at discharge. Of these 16 patients, 14 used head rotation to the affected side.

Table 4. Improvement in DSS scores

	Improvement in DSS (points)		
	0	1	2
DSS 1 at admission	6	3	0
DSS ≥2 at admission	8	9	8

Mann–Whitney *U* test, P = 0.017

Table 5. Improvement in ESS scores

	Improvement in ESS (points)				
	0	1	2	3	4
DSS 1 at admission	8	1	0	0	0
DSS ≥2 at admission	5	5	7	6	2

Mann–Whitney *U* test, P < 0.001

Oral feeding without the addition of thickening agents to drinks was only possible in 2 of the 19 patients with DSS scores of 2 at admission.

With regard to ADL, the median FIM at admission was 63 points for motor items (range, 13−89 points) and 30 points for cognitive items (range, 5−35 points). The median FIM at discharge was 77.5 points for motor items (range, 13−90 points) and 31 points for cognitive items (range, 5−35 points). Significant improvements were seen in both motor items (P < 0.001) and cognitive items (P = 0.003). FIM gains (FIM at discharge minus FIM at admission) were compared between patients with DSS scores of 1 and patients with DSS scores of 2 or higher at admission. For patients with DSS scores of 1, the mean gain was 12.1 (18.9) on motor items and 2.6 (4.1) on cognitive items. For patients with a scores of 2 or higher, the mean gain was 13.5 (13.9) on motor items and 1.6 (3.4) on cognitive items. No significant improvements were seen in either motor or cognitive items with the Mann−Whitney *U* test. (motor items, P=0.137; cognitive items, P = 0.374)

Discussion

This study demonstrated that patients with DSS scores of 1 at 3 months after the onset of dysphagia due to brainstem lesions showed no improvements; 66.7% showed no improvements in DSS scores and 88.9% showed no improvements in ESS scores even after inpatient rehabilitation for a mean duration of 3 months. In contrast, in patients with DSS scores of 2 or above, improvements were seen; 68.0% showed improvements in DSS scores and 80.0% showed improvements in ESS scores. Both the DSS and ESS scores showed that significant improvement in dysphagia could be obtained with inpatient rehabilitation when a patient's DSS score was 2 or higher at admission. Of the 23 patients with ESS scores ≥2, who could accept some kind of oral feeding, 15 needed to use a combination of head rotation to the affected side, reclining sitting position, chin down

position, or lateral bending of the trunk at discharge. Left-right differences in pharyngeal function are seen in many patients with brainstem lesions, and in general for such patients, the effect of head rotation to the affected side is high. Guiding the route of the food bolus to the healthy side and instructions on strengthening that ability are thought to be effective. However, there are also reported cases in which the risk of aspiration is increased when the food bolus is guided to the affected side by combining body positions [17]. To avoid such risk, it is important to conduct an appropriate evaluation with VF or VE before using body position combinations. In addition, swallowing rehabilitation in patients with severe dysphagia is associated with a high risk of pneumonia or other complications; thus, inpatient rehabilitation in a specialty facility is advisable. Oral feeding without the addition of thickening agents to drinks became possible in only 2 of the 19 patients with DSS scores of 2 at admission. Aspiration of liquid is thought to be due in large part to laryngeal incompetence, and in the case of brainstem disorders, vocal fold adduction disorder is a major cause. Since there are no effective compensation measures for this disorder at the functional disorder level, improvement in the chronic stage is thought to be difficult.

With regard to ADL, significant improvements were seen in both motor and cognitive items; however, no significant difference was seen in FIM gain between patients with DSS scores of 1 and patients with DSS scores of 2 or higher at admission. Therefore, the differences in improvement of DSS and ESS are thought to arise not from ADL improvements, but from improvements in dysphagia itself and compensation by diet modification and/or body positions during eating. ADL improvements can be obtained with inpatient rehabilitation even in patients with chronic cerebrovascular disorders of the brainstem 3 or more months after onset; however, with respect to the severity of dysphagia, outcome differences in patients with DSS scores of 1 or higher are thought to be important.

Conclusion

Inpatient rehabilitation was administered to patients with chronic dysphagia mainly caused by brainstem lesions, 3 months or more after onset. There is a strong possibility of improvement if patients whose DSS score is 2 or higher receive inpatient rehabilitation for a mean duration of 3 months in a specialty facility. In such cases, the utilization of swallowing techniques that employ the effect of body position is thought to be important. In patients with DSS scores of 1, there was either no improvement in oral feeding or improvement only to the level that a small amount of paste food could be consumed; reacquiring practical oral feeding was difficult. The effects and limitations of swallowing rehabilitation for chronic brainstem cerebrovascular disorders shown in this study are thought to be of considerable value.

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