



Original Article

Relationship between psychophysiological factors and prognosis for activities of daily living in patients with stroke in a recovery rehabilitation unit: a preliminary study

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Abstract. [Purpose] The objective of the present study was to examine the factors, including physical and mental functions, that are associated with the prognosis for activities of daily living in patients with stroke in a recovery rehabilitation unit. [Subjects and Methods] The subjects were 13 patients with stroke who were admitted to the recovery rehabilitation unit of Tokai Memorial Hospital between March and October 2014 and followed up for 2 months. Their physical and mental functions were evaluated at the time of admission and the relationship between these functions and activities of daily living was assessed 2 months later. [Results] The activities of daily living at 2 months after admission showed a significant correlation not only with the severity of motor paralysis ($R=-0.80$) but mental function ($R=-0.69$) at the time of admission. No significant correlation was noted between the severity of motor paralysis and the mental function. [Conclusion] It is important to evaluate both mental function and severity of motor paralysis immediately after patients' admission to the recovery rehabilitation unit. Mental health intervention should be considered in the future to effectively improve subsequent activities of daily living.

Key words: Post-stroke depression, Prognosis prediction, Recovery rehabilitation unit

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INTRODUCTION

The incidence of stroke is high in Japan, and is expected to rise as the population ages. In many cases, stroke leads to impairment of physical functions, including motor paralysis and restriction of the range of joint motion, as well as psychological problems, including post-stroke depression (PSD)¹⁻³⁾. These health conditions have various adverse effects: they interfere with activities of daily living (ADLs), increase healthcare costs, lower patients' quality of life (QOL), and increase the burden on family members caring for patients⁴⁾.

To address these issues, recovery rehabilitation units (RRU) were established as the world's first unique rehabilitation system in 2000 in Japan. An RRU was opened to provide intensive physical and mental rehabilitation by a wide range of professionals so that patients can resume their participation in society. In recent years, however, it was observed that ADLs did not necessarily improve with increased units (1 unit: 20 minutes) of rehabilitation in the RRU, and thus the efficacy of this intervention was called into question. Since the quality of rehabilitation interventions must be improved in addition to their quantity, we considered it important to predict the prognosis for ADLs immediately after admission to the RRU and to plan interventions accordingly.

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Various factors have been reported to contribute to a poor prognosis for ADLs in patients with stroke, including advanced age⁵⁻⁷, impaired physical function before rehabilitation⁸, cognitive impairment⁵, and urinary incontinence⁷. However, psychophysiological factors have not been sufficiently examined. A small number of studies in RRUs in Japan⁹ assessed ADLs in the presence or absence of PSD as diagnosed by physicians. However, in order to predict the prognosis for ADLs at the start of rehabilitation, therapists should be able to evaluate associated factors using simple assessment tools. This would enable them, in conjunction with physicians and nurses, to maximally improve the ADLs of patients in RRUs. Thus, the present study was conducted to examine the factors associated with the prognosis for ADLs, including physical and mental functions, in stroke patients in the RRU of our hospital.

SUBJECTS AND METHODS

As is shown in Table 1, the subjects were 13 patients with stroke but no dementia or higher brain dysfunction (including disturbance of consciousness and aphasia) who were admitted to the RRU of Tokai Memorial Hospital between March and October 2014 and followed up for 2 months. The mean age was 68.8 ± 10.1 years. Nine subjects were male and four were female. The mean duration from stroke onset to admission was 39.8 ± 13.9 days. The lower extremity Brunnstrom Stage¹⁰ at the time of admission to the RRU was I in one subject, II in one subject, III in two subjects, IV in one subject, V in one subject, and VI in seven subjects (Table 1). No subjects used antidepressants.

The present study was conducted after the approval of the ethics committee of Seijoh University (approval number, 2013C0025). The subjects received a sufficient explanation of the objectives and details of the study before giving written consent.

For physical function, the severity of motor paralysis, isometric knee extension strength, and ADLs were assessed. Severity of motor paralysis was assessed using the Japan Stroke Scale (Motor Function) (JSS-M). Isometric knee extension strength was measured on the non-paralyzed side using a hand-held dynamometer (μ TasF-1; Anima Corporation, Tokyo); the knee was extended maximally three times for approximately 3 seconds per extension, and the highest measured value was divided by the body weight. ADLs were assessed using the Functional Independence Measure (FIM). For mental function, depressive state was assessed using the Geriatric Depression Scale-Short Version (GDS-S), a 16-point scale (0–15). With this instrument, scores of 6 or higher are considered to indicate a depressive state. The above assessments were performed on the day of admission to the RRU. ADLs were also assessed 2 months after admission.

To identify the factors influencing ADLs at 2 months after admission, Pearson product-moment correlation was used to analyze the association between ADLs at 2 months and patient characteristics and physical and mental functions at the time of admission. The analyses in the present study were performed using SPSS ver. 23.0 at a significance level of 5%.

Table 1. Subject characteristics

Item		
Age (years)		68.8 ± 10.1
Gender	Male	9 (69.2)
	Female	4 (30.8)
Time between onset and admission		39.8 ± 13.9
Disease type	Cerebral infarction	10 (76.9)
	Cerebral hemorrhage	3 (23.1)
Involved site	Supratentorial	10 (76.9)
	Subtentorial	3 (23.1)
Paralyzed side	Right	2 (15.4)
	Left	10 (76.9)
	Both	1 (7.7)
Lower extremity Brunnstrom Stage	I	1 (7.7)
	II	1 (7.7)
	III	2 (15.4)
	IV	1 (7.7)
	V	1 (7.7)
	VI	7 (53.8)

Mean ± SD or n (%).

None of the items were significantly correlated with ADLs at 2 months after admission.

RESULTS

Assessment of the physical functions of the 13 subjects at the time of admission showed that the JSS-M score was 7.2 ± 6.1 points, the isometric knee extension strength was 0.3 ± 0.1 kgf/kg, and the FIM score was 84.5 ± 24.7 points. In the assessment of mental function, the GDS-S score was 5.8 ± 4.3 points. A depressive state, defined as a score of 6 points or higher on the GDS-S, was seen in 46.2% of the subjects (Table 2). The FIM score at 2 months after admission was 95.6 ± 23.2 points, and was significantly correlated with both the JSS-M and GDS-S scores at the time of admission ($R=-0.80$, $p=0.001$ for JSS-M; $R=-0.69$, $p=0.009$ for GDS-S) (Table 3). No significant association was noted between the JSS-M score and the GDS-S score ($R=0.33$, $p=0.266$).

DISCUSSION

The present study investigated the factors associated with patient ADLs at 2 months after RRU admission due to stroke. The results showed significant associations with both mental function and severity of motor paralysis measured at the time of admission. The study highlights the importance of assessing both of these factors as soon as possible after patients are admitted to the RRU.

Overall, 46.2% of subjects showed a depressive state at the time of admission to the RRU. The GDS-S score at admission was related to the FIM score at 2 months after admission. Ramasubbu et al. reported that among patients who had developed stroke 1 week earlier, ADLs were significantly impaired in those with a depressive state¹¹). Saxena et al. reported that a depressive state was related to ADLs and that its alleviation was associated with improved ADLs¹²). These studies, however, were conducted in patients with acute stroke. Our study provided further evidence for the relationship between depressive state and the prognosis for ADL, as our subjects were in the recovery phase after stroke. Moreover, social functioning after stroke is critical, and because it is related to the severity of the depressive state¹³), we consider that it is essential in the future to understand depression during hospitalization and consider interventions for its improvement.

Another factor associated with ADLs assessed at 2 months after admission to the RRU was severity of motor paralysis at the time of admission. Previous studies showed that paralysis contributes to poor ADLs and impaired ability to walk^{14, 15}), findings that were supported by our study. Paralysis of the upper limbs influences eating and dressing, while paralysis of the lower limbs affects basic movements such as standing up or walking. Needless to say, these effects confirm the importance of evaluating and treating motor paralysis in addition to mental function. A previous study suggested that the presence or absence of a depressive state in stroke patients was not associated with neurological findings, including severity of motor paralysis and sensory disturbance¹⁶). Our study also showed no association between mental function and severity of motor paralysis. Thus, mental function and motor paralysis at admission may be independently associated with ADLs at 2 months after admission.

There are two limitations in this study. First, it was performed at a single site with a small number of subjects, and therefore our results may not be representative of other RRUs and should be generalized carefully. Second, the confounding factors in our subject population ($N=13$) that may have affected the prognosis of ADLs were not sufficiently examined in this

Table 2. Physical and mental functions at the time of admission

Item		
ADLs	(points)	84.5 ± 24.7
JSS-M	(points)	7.2 ± 6.1
Isometric knee extension strength (per body weight)	(kgf/kg)	0.3 ± 0.1
GDS-S	(points)	5.8 ± 4.3

Mean \pm SD.

JSS-M: Japan Stroke Scale (Motor Function); GDS-S: Geriatric Depression Scale-Short Version; ADLs: Activities of Daily Living.

Table 3. Correlated with ADLs at 2 months after admission

Item		R	p
JSS-M	(points)	-0.80	0.001
GDS-S	(points)	-0.69	0.009

R: Correlation coefficient; JSS-M: Japan Stroke Scale Motor Function; GDS-S: Geriatric Depression Scale-Short Version; ADLs: Activities of Daily Living

study. We intend to conduct a multicenter study with a larger sample and more detailed analyses in the future.

The present study identified severity of motor paralysis and mental function at admission as factors associated with the medium-term prognosis for ADLs in patients with stroke who were admitted to an RRU. In the rehabilitation of stroke patients in RRUs, sufficient attention should be paid to both physical and mental functions. In order to improve ADLs more effectively, it is important to consider performing mental health interventions early after RRU admission.

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