Influencing factors of functional recovery of stroke patients☆

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Abstract

BACKGROUND: The rehabilitation outcome varies in stroke patients, and there are differences in the literatures about the influence of factors on the functional recovery in such patients.

OBJECTIVE: To evaluate the pre-rehabilitative and post-rehabilitative effects of stroke patients by functional independence measure (FIM) that is widely used, and analyze the influence of gender, age, motor and cognitive functions at admission, time interval from stroke onset to arrival at rehabilitative admission, comorbidity occurrence, laterality of lesion on the functional recovery of stroke patients.

DESIGN: Before-after control observation

SETTING: Center of Rehabilitation Medicine, Shandong Provincial Hospital; Faculty of Rehabilitation Medicine, Capital University of Medical Sciences

PARTICIPANTS: From March 2000 to December 2002, 55 stroke patients were selected from Shandong Provincial Hospital. They were all first episode, and patients whose bilateral cerebral hemisphere were involved were excluded.

METHODS: After the vital signs were steady, the stroke patients got through risk phase (31-75 days) and were treated with medicine improving microcirculation and providing neurotrophic factor for nerves. In addition, they accepted comprehensive rehabilitation training of Bobath technique, PNF technique and Rood method mainly, with 1-2 hours per day and five times per week.

MAIN OUTCOME MEASURES: The patients were evaluated within 7 days after admission and reassessed 3 days before discharge using FIM, including 18 items of motor and cognitive functions and 126 total scores (108-126 as elementarily or completely independent, 72-107 as mildly dependent, 54-71 as moderately dependent, 36-53 as severely dependent, 18-35 as extremely or completely dependent). Multiple stepwise regression equation was applied to analyze the relation of above factors and functional recovery (increased value of FIM total score).

RESULTS: Totally 55 patients were involved into the result analysis.① FIM total score of patients was significantly higher at discharge than at admission (93.8±12.0, 68.8±11.6, $P < 0.001$), and motor function and cognitive function at discharge also increased compare with at admission ($P < 0.001$). ② Mean value of FIM motor score increased everyday was identical with that of total score (0.56±0.21, 0.59±0.21), and higher than mean value of cognitive score (0.03±0.03).③Multiple stepwise regression analysis showed, scores of motor and cognitive status at admission, age, time interval from stroke onset to arrival at rehabilitative admission all affected the increased value of FIM total scores. No significant association between gender, comorbidity, laterality lesion of paralysis and functional recovery was observed ($P > 0.05$). The most influential factors were orderly motor function, cognitive function at admission, age and time interval from stroke onset to arrival at rehabilitation admission.

CONCLUSION: Motor and cognitive function at admission, age and time interval from stroke onset to arrival at rehabilitative admission have a notable relationship with functional recovery of stroke patients, especially motor function at admission is positively related. Thus we should not neglect the influence of these factors when conducting rehabilitative treatment.

INTRODUCTION

Rehabilitative treatment can markedly reduce the disability level of hemiplegic patients and relieve burdens of family and society. To make patients obtain utmost functional recovery in short time according to their economic status, it is necessary to take several factors influencing functional advancement into account when formulating a reasonable and feasible rehabilitative treatment. This paper aimed to collect the factors closely related with stroke patients and observe the influence of those factors on functional recovery.

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SUBJECTS AND METHODS

Subjects

Totally 55 stroke inpatients were selected from Shandong Provincial Hospital between March 2000 and December 2002. Inclusive criterion: ①In accordance with the diagnosis standard specified by the fourth national congress of cerebrovascular diseases. ②Finally diagnosed with CT or MRI. ③First episode④All the patients were informed and consented. Exclusive criterion: The patients whose bilateral cerebral hemispheres were involved were excluded. There were 55 patients involved in the experiment, 30 males and 25 females; aged 50–89 years and mean (63.6±10.3) years, including 28 cases of 50–65 years old and 27 cases of 66–78 years old; 28 cases of left cerebral hemisphere injury were consisted of 10 cases of aphasia and 27 cases of right cerebral hemisphere injury; Time interval from stroke onset to treatment was 0–75 days, mean (27.8±9.5) days, and 20 patients were accompanied with coronary atherosclerotic heart disease, primary hypertension, high blood lipid disease and diabetes mellitus while 35 cases without any severe comorbidity.

Methods

Medicine treatment

The acute patients at admission were offered with corresponding treatments and medicine of reducing intracranial pressure, ameliorating microcirculation and providing neurotrophic factor for nerves in order to prevent from respiration and urine infection as well as pressed sore occurrence. As for patients transmitted from Department of Neurology, the drugs of ameliorating microcirculation and providing neurotrophic factor for nerves were suitable for them with normal intracranial pressure and stable vital signs after getting through risk phase (31–75 days).

Rehabilitative treatment

Bobath technique, PNF technique and Rood method were applied for patients with stable vital signs. Bobath technique was mainly used to perform bedside training and motor function training of trunk and limbs, such as turn-over, stand-up or moving, etc; Then gradually transited to do balance, coordination, ambulation and stair activity trainings, performance along with ADL training; And the patients with aphasia or cognitive handicap were given related language and cognition training according to aphemic type. All the trainings were conducted for 1–2 hours per day, and 5 times per week.

Evaluated markers

Totally 55 patients were detected within 7 days after admission and 3 days before discharge with functional independence measure (FIM), including 18 items of motor function, cognitive function, age, gender, time interval from stroke onset to arrival at rehabilitation agency, comorbidity and laterality lesion of paralysis, etc. There were totally 126 scores: 108–126 as elementarily or completely independent, 72–107 as mildly dependent, 54–71 as moderately dependent, 36–53 as severely dependent, 18–35 as extremely or completely dependent.

Statistical analysis: Multiple stepwise regression analysis and t test were performed by the first author with SPSS 6.0 software.

RESULTS

Quantitative analysis of participants

All the 55 patients accomplished the treatment and entered into the result analysis.

Statistical inference

FIM comparison of stroke patients at admission and discharge (Table 1)

Table 1　Scores of functional independence measure comparison of 55 stoke patients at admission and discharge　($\bar{x}\pm s$, n=55)

Time	Total score	Motor score	Cognitive score
At admission	68.8±11.6	39.9±8.6	28.9±5.4
At discharge	93.8±12.0[a]	63.3±9.9[a]	30.5±4.4[a]

[a]$P < 0.001$, vs the scores at admission

The FIM total score, motor score and cognitive score of 55 patients at discharge were significantly higher than that of at admission ($P < 0.05$). Mean value of FIM motor score increased everyday was identical with that of total score (0.56±0.21, 0.59±0.21), and higher than mean value of cognitive score (0.03±0.03). Mean increased value=(FIM score at discharge−FIM score at admission)/hospitalization time.

Effects of factors on FIM scores (Table 2)

Differences were significant in the mean values of motor score increased everyday, motor score and FIM total score of patients aged between 50–65 years and 66–78 years at admission and discharge, with insignificant difference in the cognitive scores ($P > 0.05$). The patients whose time interval from stroke onset to arrival at rehabilitative admission was 0–30 days or 31–75 days had a significant relationship with the patients with cognitive handicap in FIM total score, motor score, cognitive score and increased rates of motor score and cognitive score at admission and discharge, which was insignificantly different in the patients with comorbidity or not, left or right hemiplegia, and either gender ($P > 0.05$).

Correlation of factors with functional recovery of patients

The results of multiple stepwise regression equation indicated, FIM total score, cognitive score, age and time interval from stroke onset to arrival at rehabilitative agency were highly associated with increased value of FIM total score, but unrelated with laterality lesion of paralysis, gender and comorbidity occurrence ($P > 0.05$). The most influential factors of functional recovery were orderly motor score, cognitive score, age at admission and time interval from stroke onset to arrival at rehabilitative admission (Table 3).

Table 2　Effects of several factors on functional independence measure scores of stroke patients　($\bar{x}\pm s$)

Item		Total score at admission	Total score at discharge	Motor score at admission	Motor score at discharge	Cognitive score at admission	Cognitive score at discharge	Mean value of motor score increased everyday	Mean value of cognitive score increased everyday	Mean value of total score increased everyday
Age(yr)	50–65	73.4±12.6[a]	98.6±12.8[a]	41.9±9.8[a]	66.1±10.9[a]	31.4±5.4	32.4±4.0	0.66±0.23[a]	0.02±0.03	0.68±0.22[a]
	66–78	63.4±7.3	88.1±8.0	37.5±6.3	59.9±7.3	26.8±3.7	28.2±3.7	0.44±0.12	0.02±0.03	0.46±0.13
Sex	Male	69.2±12.8	94.7±13.7	40.7±9.0	64.4±10.7	28.8±5.7	30.3±4.5	0.57±0.22	0.03±0.03	0.61±0.21
	Female	68.2±9.5	92.4±8.7	39.7±8.0	62.4±8.3	29.3±5.1	30.9±4.2	0.54±0.21	0.03±0.03	0.57±0.20
Comorbidity	Left	71.0±12.1	95.3±11.9	41.5±8.5	64.5±9.1	29.6±6.2	30.7±4.9	0.59±0.21	0.02±0.03	0.61±0.20
	Right	67.1±10.7	92.3±12.1	38.3±8.6	62.0±10.7	28.2±4.5	30.3±3.8	0.52±0.22	0.03±0.03	0.56±0.22
Complication	Without	70.4±11.3	95.3±12.1	41.9±8.3	65.1±9.6	29.4±5.5	31.3±4.4	058±0.19	0.03±0.03	0.61±0.19
	With	66.0±11.7	91.3±11.7	36.6±8.4	60.1±9.8	28.6±5.4	30.1±4.4	0.52±0.25	0.03±0.03	0.55±0.24
Diseased course (d)	0–30	74.5±10.7[a]	99.5±11.0[a]	43.9±8.3[a]	67.8±9.5[a]	30.5±5.0[a]	31.8±3.9[a]	0.67±0.21[a]	0.03±0.04[a]	0.64±0.22[a]
	31–75	59.7±5.6	84.5±6.4	33.4±3.8	56.0±4.8	26.2±5.2	28.5±4.5	0.46±0.11	0.03±0.02	0.42±0.12
Cognitive Function at admission	35	78.3±9.4[a]	102.7±10.1[a]	43.3±9.4[a]	67.7±10.1[a]	35[a]	35[a]	0.71±0.22[①]	0.71±0.22[a]	0[a]
	< 35	63.4±9.0	88.8±10.0	38.0±7.6	60.8±9	25.4±3.5	27.9±3.5	0.52±0.52	0.47±0.16	0.05±0.03

Comparisons of patients between 50–65 years old and 66–78 years old, between 0–30 days and 31–75 days in diseased course, and between 35 scores and less than 35 scores of cognitive scores at admission, [a]$P < 0.05$

Adverse event and side effect

All the patients were cooperative during the rehabilitative treatment without any adverse event.

Table 3   Correlation of influencing factors with functional recovery of stroke patients (expressed as increased value of total score of functional independence measure)

Item	Motor function at admission	Cognitive function at admission	Age	Diseased course	Laterality of paralysis	Gender	Comorbidity occurrence
Beta value	0.398	0.256	−0.248	−0.244	0.068	−0.044	−0.031
t	3.653	2.08	−2.04	−2.02	0.63	−0.41	−0.279
P	< 0.01	< 0.05	< 0.05	< 0.05	> 0.05	> 0.05	> 0.05

DISCUSSION

As part of the uniform data system for medical rehabilitation (UDSMR) in America, FIM is used not only to evaluate motor and cognitive functional impairments, but also widely applied for clinical evaluation of disabled degree as well as predicting the effects of rehabilitative treatment, discharge direction and prognosis, with high reliability and validity identical with Barthel index [1]. Functional advancement was expressed as increased value of FIM score (FIM score at discharge-FIM score at admission). Due to different functional status affect hospitalization time to some degree [2], the patients with low score at admission and severe illness stay longer in hospital, thus the everyday changed value of FIM score (division of increased value of FIM score divided by hospitalization time) was consider as growth rate of FIM to express functional improvement of stroke patients after rehabilitative treatment. In this experiment, the functional status of patients after rehabilitative treatment was strikingly increased at discharge compared with that of the patients at admission ($P < 0.001$), especially the motor functions. The mean value of motor function increased everyday was notably higher than that of cognitive function, which implied functional recovery focused on the rehabilitation of motor function.

The results of this experiment showed, the motor function, cognitive function, age at admission and diseased course were influential for functional recovery, while gender, comorbidity occurrence and laterality of lesion were ineffective, and motor function at admission was the most influential for functional recovery, which was the same as the report of Heinemann et al[3]. Heinemann[3] thought, motor function and cognitive function at admission, time interval from stroke onset to receiving rehabilitative training and age made an impact on rehabilitative result and hospitalization time. And cognitive function at admission was negatively associated with functional recovery, which suggested cognitive function at admission might be well predictive for functional recovery and hospitalization time [4,5]. The patients with uninjured cognitive function at admission were quicker in functional recovery and hospitalized for shorter period, by contraries, the patients were slower in functional advancement and hospitalized for longer period with severe disabled degree after discharge. Owing to cognitive functional impairment being induced by right cerebral hemisphere injury while no cognitive impairment after left cerebral hemisphere, the patients presented cognitive impairments with sensory aphasia or complete aphasia resulted from language center injury, and possessed small rehabilitative potential and unsatisfied curative effects. As result of few cases and right hemiplegic patients included aphasia, the results of present experiment showed there was no correlation between them, however, the research of Heruti et al[4] declared laterality lesion of paralysis was related with functional advancement. So cognitive functional status of patients should be taken into account when designing project of rehabilitative treatment. As displayed in this experiment, comorbiditys were insignificantly effec-

tive for functional advancement, but Heinemann et al[3] considered the patients who were treated in the rehabilitative agency in time without any comorbidity or complication would obtain better rehabilitative effects. Through the analysis of influencing factors of functional recovery in stroke patients,   rehabilitation physician should cooperate closely with clinician in the clinical treatment so as to provide suitable patients with rehabilitative treatment as soon as possible and reduce the disability occurrence.

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126   ，108~126   ，72~107   ；54~71

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（93.8±12.0, 68.8±11.6,$P < 0.001$），

（$P < 0.001$）。②

（0.56±0.21,0.59±0.21），

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