Efficacy of early rehabilitation therapy on movement ability of hemiplegic lower extremity in patients with acute cerebrovascular accident

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Abstract

This study aims to investigate the efficacy of early rehabilitation therapy on the movement ability of hemiplegic lower extremity in patients with acute cerebrovascular accident (CVA).

A total of 86 patients who suffered from acute CVA were selected and divided into 2 groups, according to random number tables: control group, and research group. Patients in the control group received routine primary therapy, while patients in the research group received rehabilitation based on the basic therapy. The recovery of hemiplegic limb movement ability and the improvement of daily living ability before and after treatment were evaluated using the simplified Fugl–Meyer assessment (FMA), neurologic deficit scale (NDS), and Barthel index (BI). After treatment, the clinical efficacy and satisfaction degree for treatment were compared.

The FMA, NDS, and BI of patients in these 2 groups were distinctly ameliorated after treatment (P<.05). After treatment, the ameliorated degrees of FMA, NDS, and BI in the research group were obviously superior to those in the control group, and the differences were statistically significant (P<.05). The total efficacy and satisfaction degree in the research group were evidently higher than those in the control group after early rehabilitation therapy, and the differences were statistically significant (P<.05).

Early rehabilitation therapy can significantly ameliorate the movement ability of hemiplegic lower extremity in patients with acute CVA. Its therapeutic effect is remarkable. Hence, it is worthy of popularizing in clinical practice.

Abbreviations: ADL = activity of daily living, BI = Barthel index, CVA = cerebrovascular accident, FMA = Fugl–Meyer assessment, NDS = neurologic deficit scale.

Keywords: athletic ability, cerebrovascular accident, hemiplegia, rehabilitation therapy

1. Introduction

Cerebrovascular accident (CVA), as a common clinical disease, often causes functional disorders in a patient's mind, language, and movement, while movement disorder is mainly presented as hemiplegia.[1] At present, the hot point of clinical research on CVA patients is mainly focused on how to treat hemiplegia, in order to effectively restore limb movement ability in patients.[2–4] Studies have indicated that early rehabilitation therapy in CVA patients can effectively ameliorate movement function and promote the recovery and reconstruction of movement ability, thereby reducing the disability rate, effectively restore the patient's self-care ability, and physical and mental function, and improve the quality of life of patients.[5–7] The key to the success of rehabilitation therapy is to

effectively restore lower limb movement function and ability for daily living activities and effectively restore the walking function of patients.[8,9] Thus, this study aims to comprehensively evaluate the efficacy of systematic early rehabilitation therapy on the movement ability of hemiplegic lower extremity in patients with CVA *via* the simplified Fugl–Meyer motor function score, neurologic deficit score (NDS), Barthel index (BI), therapeutic effect, and satisfaction degree. The significant effect was obtained and reported as follows.

2. Materials and method

2.1. General data

A total of 86 patients with acute CVA treated in the Department of Medicine of our hospital from April 2015 to December 2016 were selected as objects of study. All patients conformed to the related clinical diagnostic criteria[10,11] and confirmed by magnetic resonance imaging (MRI) and head computed tomography (CT). Inclusion criteria are as follows: patients with first onset internal carotid artery CVA; patients who were in a clear state of mind (glasgow coma scale > 9); (c) patients with no severe liver, kidney, heart, endocrine and hematopoietic system, or other primary diseases. Exclusion criteria are as follows: patients with subarachnoid hemorrhage or had a transient ischemic attack; patients with poor compliance; patients with severe coma; patients with severe dementia and mental illness. According to the random number table method, these 86 patients were divided into 2 groups: research group (n = 45) and control group (n = 41). The differences in gender, age, lesion characteristics, and other general data among patients were not statistically significant. Hence, the data were comparable, as shown in Table 1. An informed consent was

Table 1

Statistical analysis of general data of 2 groups of patients.

| Group | n | Gender (n) | | Age, years | Lesion site (n) | | | Pathological characteristics (n) | | | Hemiplegic | Limb (n) |
		Male	Female		Cortex	Basal ganglia region	Cerebellum	Cerebral infarction	Cerebral hemorrhage	Mixing	Right	Left
Research group	45	37	8	62.15±7.9	17	26	2	16	23	6	24	21
Control group	41	34	7	61.89±8.4	15	25	1	14	22	5	22	19

provided by the patient and their families, who were actively cooperated with the study. Furthermore, this study was approved by the hospital and relevant departments.

2.2. Therapeutic methods

Routine drug therapy was provided for patients in these 2 groups, which mainly included the use of antihypertensive drugs to reduce blood pressure, the use of dehydrants to decrease intracranial pressure, the utilization of hemostatic therapy for patients with cerebral hemorrhage, the application of selected medications to promote blood circulation and dissipate blood stasis for patients with cerebral infraction, and corresponding anti-infection and symptomatic therapies.[12,13] The research group received rehabilitation therapy on the basis of routine therapy. The rehabilitation therapy was mainly according to neural development promotion technology, which was implemented by a professional physician or therapist to conduct appropriate rehabilitation training guidance for the families of patients, thereby being conducive to the treatment for patients. The corresponding rehabilitation therapy was taken for patients during the on-bed of acute onset at 30 to 60 min/time for 1 to 2 times per day. During the remaining time, the therapy was performed with the assistance of the families of patients or caregivers, which lasted for 50 days. Then, its therapeutic effects on patients in these 2 groups were evaluated before and after treatment. When the patient's condition improved and could get out of bed, or after medical treatment, patients needed to conduct rehabilitation treatment in the Department of Rehabilitation according to the actual situation every (other) day. The specific implementation points of rehabilitation therapy were as follows: maintaining the correct posture and position transformation during the acute period; conducting induced movement and passive exercise under the state of limb retardation, allowing patients to image their limb movement, and the triggered electrical stimulation,[14] auxiliary electrical stimulation, and other physical treatment methods were adopted for antagonistic muscles; the movement was performed according to the general sequencing motor development, namely, turning over, sitting-up, standing, and walking, among which sitting-up, standing, and walking were completed in accordance with the third-grade balance training; maintaining good limb position, such as the lateral position, prone position, and supine antagonistic limb position, while beating and tendon and joint stretching were performed, in order to prevent and resist muscle spasm; strengthening muscle training, body balance training, up and down stair training, and activity of daily living (ADL), and the training was conducted according to each requirement of the ADL scale, in order to improve the ability of the activities of daily living; psychological counseling was provided to strengthen the patient's confidence in treatment and enhance the enthusiasm of the rehabilitation treatment.

2.3. Evaluation of efficacy

Limb movement ability was evaluated using the simplified Fugl–Meyer assessment (FMA), in order to assess the recovery of the hemiplegic extremity of patients: severe movement disorder (<50 points), obvious movement disorder (50–84 points), moderate movement disorder (85–95 points), mild movement disorder (96–99 points), and normal function (100 points). The improvement in the degree of disability of patients was evaluated using clinical NDS[15]: mild type (0–15 points), moderate type (16–30 points), and severe type (31–45 points). The improvement in ADL in patients was evaluated using BI: excessively serious functional defect (0–20 points), severe functional defect (25–45 points), moderate functional defect (50–70 points), mild functional defect (75–95 points), and complete self-help of ADL (100 points). The clinical therapeutic effect was comprehensively evaluated according to the relevant criteria of The Fourth National Conference on Cerebrovascular Diseases (1995): basic recovery (70–100 points), progress (41–69 points), invalidity (0–40 points), and total efficacy = (basic recovery + progress number of patients) / total number of patients × 100%. The satisfaction for treatment was investigated in patients: the questionnaire options were divided into very satisfied, satisfied, general, unsatisfied, and total satisfaction = (very satisfied + satisfied number)/total number × 100%.

2.4. Statistical methods

The data were counted and statistically analyzed using SPSS 18.0 software. Enumeration data were expressed by percentage (%), and χ^2 test was adopted. Measurement data were expressed as mean±standard deviation ($\bar{x}$ ± SD), and t-test was utilized. $P < .05$ was considered statistically significant.

3. Results

3.1. Statistical analysis of FMA, NDS, and BI scores of patients in the 2 groups before and after treatment

Compared with pretreatment, the FMA, NDS, and BI scores of patients were distinctly ameliorated after treatment, and the differences were statistically significant ($P < .05$). After treatment, the ameliorated degrees of FMA, NDS, and BI in the research group were superior to those in the control group, and the differences were statistically significant ($P < .05$) (Table 2).

3.2. Comparison of the clinical efficacy of patients between the 2 groups after treatment

The total efficacy for patients treated by early rehabilitation therapy in the research group reached as high as 95.56%, which was significantly superior to that in the control group (70.73%); and the difference was statistically significant ($P < .05$) (Table 3).

Table 2
Statistical analysis of FMA, NDS score, and BI index before and after treatment in 2 groups ($\overline{x} \pm s$).

Group	n	FMA score Before treatment	NDS score After treatment	Before treatment	After treatment	BI index Before treatment	After treatment
Research group	45	26.32±8.13	41.26±9.78	25.46±5.78	15.46±4.62	32.45±15.98	62.73±29.12
Control group	41	26.89±8.72	34.35±8.49	26.13±6.33	18.75±5.17	33.51±16.42	46.15±25.79
Statistical value		0.3127	3.5064	0.5109	3.1001	0.3028	2.7999
P value		.7545	.0005	.6094	.0019	.7620	.0051

BI = Barthel index, FMA = Fugl–Meyer assessment, NDS = neurologic deficit scale.

Table 3
Statistical analysis of clinical efficacy in 2 groups of patients, n (%).

Group	n	Basic recovery	Effective	Invalid	Total effective
Research group	45	13 (28.89)	30 (66.67)	2 (4.44)	43 (95.56)
Control group	41	7 (17.07)	22 (53.66)	12 (29.27)	29 (70.73)
Statistical value					2.6444
P value					.0082

3.3. Investigation and analysis of the satisfaction degree for the treatment of patients in the 2 groups

The investigation and analysis through follow-up revealed that the total satisfaction degree was 91.11% in the research group and 68.29% in the control group, and the difference was statistically significant ($P<.05$) (Table 4).

4. Discussion

CVA is often accompanied by movement disorders that reduce limb movement ability and ADL, which seriously affects the quality of life of patients, and causes a significant impact on the families of these patients and their quality of social life. The so-called hemiplegia, that is, injuries to the upper motor neuron, incurs the loss of inhibition and regulation to lower motor neuron activity, while the mutual coordination and constraint of (or between) muscles is lost.[16–18] Thus, the rehabilitation treatment of patients with CVA in restoring lower limb movement ability should focus on muscle control ability-related training (knee, hip, and ankle control ability training), standing balance training, and functional coordination training of the lower limb under the functional position.

Studies have indicated that early rehabilitation can adjust the overall movement ability of patients, reduce muscle spasm and atrophy, recombine correct sport mode, and reduce the occurrence of shoulder hand syndrome, joint contracture and deformity, swelling of the hands, strephenopodia, and other common CVA complications. The basic theoretical basis is the fact that when central nervous injury occurs, it has the ability of recombination in structure and function and plasticity character-

istics. This is the important theoretical basis of early rehabilitation training, which promotes the recovery of hemiplegic lower limb movement ability in patients with CVA. Through repeated, systematic, and specific rehabilitation training, the lost function of the injured part of the central nervous system can be compensated by the central nervous system that did not previously bear the function of this area, which realizes the reappearance of movement response.[19,20] Therefore, the triggered muscle electrical stimulation, auxiliary electrical stimulation, and other physical treatment methods are usually adopted for antagonistic muscles during the rehabilitation process. The relearning training of turning over, sitting-up, standing, and walking were conducted, maintaining good limb position, while beating and tendon and joint stretching are performed. This would prevent and resist muscle spasm. Furthermore, strengthening body balance training, movement coordination training and muscle training, and suitably increasing up and down stair training were also performed. Attention should be given to the quality of the training process, according to the normal mode of movement, in order to not blindly pursue training speed and strength and perform excessive muscle strengthening training. This would thereby effectively prevent the risk caused by muscle spasm, so as to achieve central nervous system reorganization and remodeling and rapidly improve movement ability.

The recovery of hemiplegic limb movement ability and the improvement of daily living ability before and after treatment were evaluated using the simplified FMA, NDS, and BI in the present study. After treatment, the clinical efficacy and satisfaction degree for treatment through follow-up and investigation

Table 4
The statistical comparison of the satisfaction of the 2 groups of patients, n (%).

Group	n	Very satisfied	Satisfied	Ordinary	Dissatisfied	Total satisfaction
Research group	45	18 (40.00)	23 (51.11)	3 (6.67)	1 (2.22)	41 (91.11)
Control group	41	9 (21.95)	19 (46.34)	10 (24.39)	3 (7.32)	28 (68.29)
Statistical value						2.2933
P value						.0218

were statistically analyzed, in order to comprehensively evaluate the clinical effect of early rehabilitation therapy on the movement ability of hemiplegic lower extremity in patients with acute CVA. Hence, FMA, NDS, and BI were distinctly ameliorated after patients were treated by routine primary therapy and early rehabilitation ($P < .05$). After treatment, the ameliorated degrees of FMA, NDS, and BI in patients who underwent early rehabilitation were obviously superior to those who merely received primary therapy. The differences between 2 groups were statistically significant ($P < .05$). The total efficacy and satisfaction degree in patients with early rehabilitation were evidently higher than those with routine therapy. The differences between 2 groups were statistically significant ($P < .05$).

The main limitations of present study is that the numbers of male and female patients are significantly different, the reason is that the incidence of stroke is higher in men than in women.[21]

Therefore, early rehabilitation such as body balance training and movement coordination training can obviously ameliorate the movement ability of hemiplegic lower extremity in patients with acute CVA. Its therapeutic effect is remarkable. Thus, it is worthy of popularizing in clinic practice.

Acknowledgments

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