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The Effectiveness of Neurological Rehabilitation Therapy in Improving Motor Function and Daily Living Abilities in Stroke Patients with Hemiplegia

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Abstract: *Objective:* To explore the effects of neurological rehabilitation therapy on motor function and daily living abilities in stroke patients with hemiplegia. *Methods:* Fifty stroke patients with hemiplegia admitted to the hospital were randomly divided into an observation group and a control group, with 25 patients in each group. The control group received conventional rehabilitation therapy, while the observation group underwent additional neurological rehabilitation therapy. The therapeutic effects were compared between the two groups. *Results:* Post-treatment results showed that the observation group achieved significantly better recovery in motor function, balance ability, and daily living abilities compared to the control group, with a lower incidence of complications during the rehabilitation period. *Conclusion:* Adding neurological rehabilitation therapy during the rehabilitation period of stroke patients with hemiplegia can effectively enhance recovery outcomes.

Keywords: Stroke hemiplegia; Neurological rehabilitation therapy; Motor function; Daily living abilities; Therapeutic effectiveness

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1. Introduction

Stroke is a cerebrovascular disease that poses a severe threat to human health, characterized by high incidence, disability, and mortality rates [1,2]. With advancements in medical care, the survival rate of stroke patients has significantly improved, but sequelae such as hemiplegia remain a major challenge [3]. Hemiplegia, one of the most common complications of stroke, often leads to motor dysfunction and decreased self-care ability, imposing a heavy burden on families and society [4,5]. Therefore, timely and effective treatment for post-stroke hemiplegia is particularly important.

In recent years, neurological rehabilitation therapy, as a comprehensive treatment method, has gained increasing attention in the rehabilitation of stroke patients with hemiplegia [6]. Based on the theory of

neuroplasticity, neurological rehabilitation therapy employs various approaches, including physical therapy, occupational therapy, speech therapy, and psychological therapy, aiming to promote neural function recovery and reconstruction, thereby improving motor function and daily living abilities [7].

However, systematic, comprehensive, and in-depth research on the efficacy of neurological rehabilitation therapy in improving motor function and daily living abilities in stroke patients with hemiplegia remains limited. This study aims to evaluate the effectiveness of neurological rehabilitation therapy in this context, providing a scientific basis for rehabilitation strategies in stroke patients with hemiplegia, improving their quality of life, and reducing the burden on families and society.

2. Materials and methods

2.1. General information

Fifty stroke patients with hemiplegia admitted to the department between January 2020 and June 2022 were selected as study subjects. The patients were randomly divided into an observation group and a control group, with 25 patients in each group. In the observation group, there were 15 male and 10 female patients, with an average age of (64.00 ± 2.30) years. In the control group, there were 14 male and 11 female patients, with an average age of (64.50 ± 2.40) years.

2.2. Methods

During the rehabilitation period, both groups received tailored treatments for blood pressure regulation, lipid-lowering, neuroprotection, antiplatelet aggregation, and improvement of cerebral circulation. The control group underwent conventional rehabilitation training, which included early passive limb function exercises to promote blood circulation and reduce limb stiffness. Gradual progressions included limb function training, getting out-of-bed activities, and daily living skills training.

The observation group received additional neurological rehabilitation therapy based on the treatments provided to the control group. This therapy involved using a neuromuscular electrical stimulator. Patients were assisted to adopt a seated position, with electrode pads placed on areas such as the upper arm, deltoid, and wrist extensor muscles. The settings included a biphasic pulse waveform with a frequency of 20–30 Hz and a duty cycle of 1 second:5 seconds. Treatment parameters were adjusted in real time based on the patient's tolerance. Therapy was conducted once daily, five times per week, for a total duration of 12 weeks.

2.3. Observation criteria

(1) Evaluation of limb motor function and daily living ability: The Fugl-Meyer Assessment (FMA) scale was used to evaluate motor function, and the Modified Barthel Index (MBI) was employed to assess daily living ability. Both scales have a maximum score of 100, with higher scores indicating better recovery in these functions.

(2) Complication rate comparison: The incidence of complications during the rehabilitation period was recorded and compared between the two groups.

(3) Balance ability assessment: The Berg Balance Scale was used to evaluate balance ability between the two groups.

2.4. Statistical analysis

Data from the two groups were processed using SPSS 20.0 software. Measurement indicators were described as mean ± standard deviation (SD), and *t*-tests were performed. Count indicators were expressed as frequency (*n*) and percentage (%), and chi-squared (χ^2) tests were used. A statistical significance level of $P < 0.05$ was applied for all comparisons.

3. Results

3.1. Comparison of limb motor function and balance ability before and after neurological rehabilitation intervention

Before treatment, there was no significant difference in the indicators between the two groups ($P > 0.05$). After treatment, the observation group demonstrated significantly better recovery of limb motor function and balance ability compared to the control group ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of limb motor function and balance ability between the two groups (mean ± SD)

Group	*n*	Physical movement function (score)		Balance ability (score)	
		Before treatment	After treatment	Before treatment	After treatment
Observation group	25	55.3 ± 6.1	88.2 ± 9.5	21.5 ± 8.6	37.8 ± 8.7
Control group	25	55.5 ± 6.2	79.6 ± 8.3	16.6 ± 10.8	31.2 ± 9.0
t / χ^2 value		0.1149	3.4086	1.718	2.500
P value		0.9089	0.0013	0.0923	0.0159

3.2. Comparison of daily living ability and incidence of complications before and after neurological rehabilitation intervention

Before treatment, there was no significant difference in the indicators between the two groups ($P > 0.05$). After treatment, the observation group exhibited significantly better recovery in daily living ability compared to the control group ($P < 0.05$). Additionally, the incidence of complications was significantly lower in the observation group after rehabilitation, as shown in **Table 2**.

Table 2. Comparison of daily living ability and incidence of complications between the two groups (mean ± SD)

Group	*n*	Daily living ability (score)		Incidence of complications
		Before treatment	After treatment	
Observation group	25	55.4 ± 6.2	89.4 ± 9.7	1 (4.0%)
Control group	25	55.5 ± 6.3	79.2 ± 8.4	6 (24.0%)
t / χ^2 value		0.0565	3.9745	4.1528
P value		0.9551	0.0002	0.0415

4. Discussion

Stroke is one of the most prevalent cerebrovascular diseases significantly impacting human health [1,2]. The condition causes substantial damage to neural functions in the brain, leading to varying degrees of hemiplegia,

speech disorders, and other sequelae [7]. Patients often face increased risks of complications due to prolonged immobility, which exacerbates their suffering and extends recovery periods [8]. Currently, conventional treatments for post-stroke hemiplegia primarily involve symptomatic medication and rehabilitation training to improve motor function, but the results are often suboptimal [8]. To enhance rehabilitation efficiency for such patients, this study implemented neurological rehabilitation interventions, which yielded notable recovery outcomes.

Neuromuscular electrical stimulation (NMES) is a critical component of neurological rehabilitation [9,10]. By delivering low-frequency pulsed currents during treatment, it effectively stimulates local muscles, enhancing their autonomous contraction capabilities. This process alleviates peripheral tissue edema, promotes blood circulation, increases the excitability of muscle tissue, and ultimately improves neural conduction and muscle function [11]. In this study, it was observed that compared to conventional rehabilitation training, neurological rehabilitation significantly enhanced patients' motor and balance abilities. Additionally, this method accelerated venous lymphatic return, improved lower limb blood circulation and joint function, and reduced the formation of deep vein thrombosis during immobilization [12].

The findings of this study further corroborate these benefits, showing that patients' daily living abilities improved significantly after neurological rehabilitation intervention. More importantly, the incidence of complications decreased markedly following the intervention. These results highlight the therapeutic efficacy of neurological rehabilitation for post-stroke hemiplegia.

In summary, integrating neurological rehabilitation into the management of post-stroke hemiplegia plays a critical role in enhancing recovery efficiency, promoting the restoration of motor function, and improving daily living abilities. This approach offers new hope to stroke patients, potentially improving their quality of life and alleviating the burden on families and society.

However, this study has certain limitations, such as a small sample size and a short observation period. Further large-scale, multicenter studies are needed to validate the long-term efficacy and safety of neurological rehabilitation. Moreover, exploring the effects of combining neurological rehabilitation with other therapeutic methods could provide more personalized and comprehensive rehabilitation plans for stroke patients.

In conclusion, neurological rehabilitation shows promising application prospects in the recovery of post-stroke hemiplegia patients. Nevertheless, continued in-depth research and refinement are necessary to better address patients' rehabilitation needs.

Disclosure statement

The author declares no conflict of interest.

References

[1] Saini V, Guada L, Yavagal DR, 2021, Global Epidemiology of Stroke and Access to Acute Ischemic Stroke Interventions. Neurology, 97(20 Suppl 2): S6–S16. https://doi.org/10.1212/WNL.0000000000012781

[2] Feigin VL, Forouzanfar MH, Krishnamurthi R, et al., 2014, Global and Regional Burden of Stroke During 1990–2010: Findings from the Global Burden of Disease Study 2010. Lancet, 383(9913): 245–254. https://doi.org/10.1016/s0140-6736(13)61953-4. Erratum in Lancet, 383(9913): 218.

[3] Cerfoglio S, Ferraris C, Vismara L, et al., 2022, Kinect-Based Assessment of Lower Limbs during Gait in Post-Stroke Hemiplegic Patients: A Narrative Review. Sensors (Basel), 22(13): 4910. https://doi.org/10.3390/s22134910

[4] Takashima R, Murata W, Saeki K, 2016, Movement Changes Due to Hemiplegia in Stroke Survivors: A Hermeneutic Phenomenological Study. Disabil Rehabil, 38(16): 1578–1591. https://doi.org/10.3109/09638288.2015.1107629

[5] Aprile I, Piazzini DB, Bertolini C, et al., 2006, Predictive Variables on Disability and Quality of Life in Stroke Outpatients Undergoing Rehabilitation. Neurol Sci, 27(1): 40–46. https://doi.org/10.1007/s10072-006-0563-5

[6] Chinese Society of Neurology Neurorehabilitation Society, Chinese Society of Neurology Cerebrovascular Disease Society, Chinese Society of Neurology, 2017, Guidelines for Early Rehabilitation of Stroke in China. Chinese Journal of Neurology, 50(6): 405–412.

[7] Lui SK, Nguyen MH, 2018, Elderly Stroke Rehabilitation: Overcoming the Complications and Its Associated Challenges. Curr Gerontol Geriatr Res, 2018: 9853837. https://doi.org/10.1155/2018/9853837

[8] Parola V, Neves H, Duque FM, et al., 2021, Rehabilitation Programs for Bedridden Patients with Prolonged Immobility: A Scoping Review Protocol. Int J Environ Res Public Health, 18(22): 12033. https://doi.org/10.3390/ijerph182212033

[9] Sheffler LR, Chae J, 2007, Neuromuscular Electrical Stimulation in Neurorehabilitation. Muscle Nerve, 35(5): 562–590. https://doi.org/10.1002/mus.20758

[10] Hong Z, Sui M, Zhuang Z, et al., 2018, Effectiveness of Neuromuscular Electrical Stimulation on Lower Limbs of Patients With Hemiplegia After Chronic Stroke: A Systematic Review. Arch Phys Med Rehabil, 99(5): 1011–1022. e1. https://doi.org/10.1016/j.apmr.2017.12.019

[11] Chae J, Sheffler L, Knutson J., 2008, Neuromuscular Electrical Stimulation for Motor Restoration in Hemiplegia. Top Stroke Rehabil, 15(5): 412–426. https://doi.org/10.1310/tsr1505-412

[12] Hajibandeh S, Hajibandeh S, Antoniou GA, et al., 2015, Neuromuscular Electrical Stimulation for Thromboprophylaxis: A Systematic Review. Phlebology, 30(9): 589–602. https://doi.org/10.1177/0268355514567731