Original Article
Effects of early rehabilitation nursing intervention on nerve function and daily living in patients with stroke hemiplegia

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Abstract: Objective: To explore the effects of early rehabilitation nursing on the rehabilitation of stroke hemiplegia patients. Methods: A total of 80 patients with stroke admitted to Ningxiang People's Hospital were selected as the research subjects for analysis. Among them, 40 patients received early rehabilitation nursing intervention after admission and were enrolled in the observation group. The other 40 patients received only general nursing intervention who were enrolled in the control group. National Institutes of Health Stroke Scale (NIHSS) and Ruminative responses scale (RRS) were used to evaluate the nerve function of the two groups of patients before and after treatment. Fugl-Meyer motor function assessment (FMA) was applied to evaluate their athletic ability, and activity of daily living (ADL) score and Barthel index were utilized to evaluate their living ability. The adverse reactions and nursing satisfaction were compared between the two groups. Results: After treatment, NIHSS score and RRS score in the observation group were lower than those in the control group (P<0.05). FMA score, ADL score and Barthel index were higher in the observation group than those of the control group (P<0.05). After treatment, NIHSS score and RRS score were both lower than those before treatment (P<0.05), while FMA score, ADL score and Barthel index were higher than those before treatment (P<0.05). There was no difference in the incidence of adverse reactions between the two groups (P>0.05). The nursing satisfaction of the observation group was higher than that of the control group (P<0.05). Conclusion: Early rehabilitation nursing can effectively improve the nerve function, athletic ability and living ability of stroke hemiplegia patients, which is worth popularizing in clinic.

Keywords: Early rehabilitation nursing, stroke hemiplegia, nerve function, living ability, athletic ability

Introduction

Stroke is an acute injury caused by various cerebrovascular diseases, which has a high incidence in clinical practice [1]. According to statistics, the incidence of stroke in the world has reached 2%-3% of the total population, and it is increasing annually with the increase of global aging [2]. Moreover, stroke has become the second leading cause of death worldwide, which is second only to heart disease [3]. Due to the increasing severity of stroke, there is an urgent need for a breakthrough in its diagnosis and treatment in clinical practice. Hemiplegia caused by stroke is characterized by a long rehabilitation period and poor curative effect. Statistics show that more than 30% of stroke patients have a certain degree of physical

motor impairment [4], which not only seriously affects patients' living conditions, but also brings great pressure to patients' families and society.

A review of previous studies shows that nursing interventions are extremely effective in improving patient recovery for patients with cerebral nervous system diseases of the brain [5, 6]. Among them, the early rehabilitation nursing model has been proven to have extremely high application value in oral cancer, tracheotomies after long-term mechanical ventilation and other diseases [7, 8], and the research of Imura T et al. [9] shows that early rehabilitation nursing can train and stimulate brain synaptic regeneration, and restore brain function. The application of early rehabilitation nursing can

ensure the standardization, continuity and effectiveness of rehabilitation nursing, help to improve the quality of life of patients, and enable patients to achieve the ultimate goal of returning to family and society as soon as possible [10]. Although it has become a common clinical method to improve the treatment for better prognosis of patients through nursing intervention, the application effect of early rehabilitation nursing in stroke hemiplegia has not been confirmed. If it can be demonstrated that early rehabilitation nursing can be applied to the recovery of stroke hemiplegia patients, a solid theoretical basis can be provided for the clinical treatment of many neurological disorders, thus greatly reducing the risk of the disease. In the face of increasingly high incidence of stroke hemiplegia, finding reliable intervention measures as soon as possible is also an extremely urgent clinical research hotspot. Hence, this study analyzed the impact of early intervention nursing on the rehabilitation level and quality of life of stroke patients with hemiplegia, hoping to provide reliable clinical guidance for future clinical treatment.

Materials and methods

Data of patients

This study was conducted with the approval of the ethics Committee of our hospital. A total of 80 stroke patients admitted to Ningxiang People's Hospital were selected as the research subjects for analysis. Among them, 40 patients received early rehabilitation nursing intervention after admission that were enrolled in the observation group. The other 40 patients received only general nursing intervention who were enrolled in the control group. All patients who were eventually enrolled in the study signed an informed consent.

Inclusion and exclusion criteria

Inclusion criteria: patients diagnosed with stroke hemiplegia by transcranial brain CT or MRI diagnosis; patients with mild to moderate stroke, showing no progression 24 hours after onset; patients with severe stroke who showed stable vital signs, and their neurological impairment was no longer advanced. Exclusion criteria: pathients that did not meet the diagnostic criteria and inclusion criteria; patients who had cognitive, mental or language disorders, severe

diabetes, serious infection, serious heart disease, malignant hypertension, liver or kidney insufficiency, hematopoietic system diseases, psychosis, acquired immunodeficiency syndrome, infectious diseases such as hepatitis and tuberculosis, acute abdominal issues, acute peritonitis, abdominal cavity tumors and extensive metastasis, or umbilical vein dilatation caused by hepatosplenomegaly, patients who had motor dysfunction in the past, such as rheumatoid arthritis, joint deformity and neuromuscular diseases which had a direct impact on limb motor function; patients who were complicated with serious heart, liver or kidney system diseases, malignant tumor or deep venous thrombosis of lower limbs. Criteria for patients being later excluded: After inclusion, patients that did not meet the inclusion criteria would be removed. Patients that did not meet the inclusion criteria due to various reasons or dropped out of the treatment were considered as lost from study cases. Termination criteria: In case of a sudden change or deterioration of the disease, serious complications or adverse reactions, or intolerance, the trial was terminated immediately. Patients whose treatment exceeded three quarters of the total treatment duration were included in the statistical analysis of treatment efficacy.

Methods

Observation group: 1. Establishment of multidisciplinary cooperation team: led by the Nursing Department, a collaborative rehabilitation nursing team consisting of a rehabilitation nurse practitioner, charge nurse, charge attending physician, rehabilitation therapist, psychological counselor and dietary nutritionist, was set up in the inpatient ward of the stroke unit of the hospital. Among them, a rehabilitation nurse practitioner was the team leader, and was responsible for the formulation of the team work system, members' responsibilities, communication, coordination and team management. 2. Early intervention time window of rehabilitation: Patients with mild to moderate stroke received rehabilitation intervention 24 hours after onset. Patients with severe cerebral stroke received rehabilitation intervention on the first day after their vital signs were stable and their neurological impairment no longer progressed. 3. Establishment of early rehabilitation nursing path and implementation of

rehabilitation intervention: A. on the first day of early rehabilitation intervention, an assessment was necessary. The department rehabilitation nurse practitioner, charge nurse, psychological counselor, nutritionist and charge attending physician participated in ward rounds, and jointly participated in disease assessment, motor function assessment, self-care ability assessment and psychological nutrition status assessment. The second thing the medical staff did was to make a plan: the rehabilitation nurse practitioner led the coordination; the team jointly formulated the early rehabilitation plan for patients to guide the charge nurses in the department to implement the plan. The third thing was to record the evaluation results and improve the medical records. The fourth task was to communicate with family members, explain rehabilitation plans and precautions, and encourage and guide family members to participate. Fifth, the implementation of the rehabilitation plan: medical staff cared for the patient's skin, diet, defecation and bed related complications with education and routine care. They ensured that the pillow was placed high and tought the patient about the best position for limbs. The patient is placed in a recumbent position, sitting position, and underwent position conversion every 2 hours. The affected joint needs passive movement, and the healthy side also needs passive rollover. The patient would undergo imagination training, mirror image training, booster-passive hand function training physical agent therapy, and limb pressure pump treatment. The intensity of the above training was 45 min per day, twice a day, and it was advisable to carry it out 2 hours after meals. The sixth task was to pay attention to psychological condition; timely psychological intervention was given to patients to prevent emotional disorders after stroke. B. Early rehabilitation intervention on day 2-12; firstly, correct evaluation was required. The department rehabilitation nurse practitioner and the charge nurse participated in the ward rounds of the charge attending doctor, so that the doctor could timely understand the disease observed by the nurses and the rehabilitation training situation, to adjust the treatment plan in time, and the nurse could grasp the patient's condition in time, providing safety guarantee for guiding the patient's progressive rehabilitation plan. The second task was the record of evaluation results. The third thing was the

implementation of rehabilitation plan: health education, recumbent position nursing and passive exercise were all performed the same as the first day. Bed position transfer training, including bed side movement, passive rollover of the healthy side, training for back and forth movement on the affected side in order to turn over and sit up, auxiliary and active turning over and sitting up, imagination training, mirror image training, booster-passive hand function training physical agent therapy, and limb pressure pump treatment were all performed. The intensity of the above training was 45 min a day, twice a day, and it was advisable to carry it out 2 hours after meals. Sixth, timely psychological intervention was given to patients according to their needs. C. The 13th day of early rehabilitation intervention was the day before discharge. Firstly, evaluation: the department rehabilitation nurse practitioner, rehabilitation therapists, charge nurses, psychological counselors, nutritionists and charge attending physicians participated in ward rounds, and jointly assessed disease, motor function, self-care ability, and psychological nutrition status. Second, the rehabilitation nurse practitioner led and coordinated the team to jointly determine the rehabilitation plan of the next stage. The third thing medical staff did was to record the evaluation results and improve the medical records. The fourth thing was to communicate with family members, explain the discharge rehabilitation plan and precautions. The patients and their family members were assessed for their understanding of rehabilitation treatment methods, and personalized guidance was given. The fifth task was the implementation of a rehabilitation plan: the same as the implementation of rehabilitation plan from the 2nd to the 12th day. Sixth, timely psychological intervention was given to patients according to their emotional state to prevent post-stroke affective disorder. The course of disease variation was recorded in time. D. The 14th day of early rehabilitation intervention was discharge day. First, patient's condition was observed. Second, the charge nurses carried out discharge nursing routines. Third, the rehabilitation assessment of discharged patients, individualized guidance, contact with a community hospital or rehabilitation hospital was conducted by rehabilitation nurses. For patients who were referred to other departments, nurses contacted the hospital

rehabilitation center. The fourth task was for medical staff needed to do was to handover the patient. The fifth task was to complete the summary of discharge treatment. The sixth tasl was to make a record of course variation. During the implementation of clinical rehabilitation nursing path, the patient's tolerance, progressive resistance training of muscles and intensive training of interactive flexion and extension muscles was paid attention to in order to avoid overuse and misuse syndrome. Control group: 1. Treatment mode: Charge nurses followed the doctor's advice to implement various treatment and nursing measures. 2. Rehabilitation intervention time window: During the convalescence period of patients with stable vital signs and no further progress. 3. General rehabilitation nursing: Nurses followed the doctor's advice to monitor their consciousness, pupils and vital signs of stroke hemiplegic patients, with diet guidance, medication, skin condition management and related complications management.

Outcome measures

Nerve function: Before and after treatment, the National Institutes of Health Stroke Scale (NIHSS) and Ruminative responses scale (RRS, 22-88 points in total, the results were divided into four different grades according to the total score, with low level of 22-43 points, medium level of 44-65 points, and high level of 66-88 points) were used for the evaluation of nerve function of the two groups of patients. Higher NIHSS score indicated more serious neurological deficit of patients, and higher RRS score indicated more serious rumination of patients. Motor function: Before and after treatment, the simplified Fugl-Meyer motor function assessment (FMA) was applied for the evaluation of motor ability of the patients in the two groups. The higher the FMA score was, the better the patient's motor state was. Activity of Daily Living (ADL) score and Barthel index were utilized for patients' living ability assessment before and after treatment. The ADL score was positively correlated with the self-care ability of patients, and Barthel index was negatively correlated with self-care ability of patients. Adverse reactions: adverse events such as joint pain, tendon joint injury, muscle spasms and elevated blood pressure caused by drugs and rehabilitation training during rehabilitation treatment were recorded, and the

incidence of adverse reactions = number of adverse reactions/total number × 100%. Nursing satisfaction: After treatment, a self-made questionnaire of our hospital was utilized for evaluation, and the patients or their families were allowed to score the nursing work. The total score of the questionnaire was 100 points, which were divided into four different grades according to the total score: greatly satisfied (not less than 90 points), satisfied (75-89 points), generally satisfied (60-74 points) and dissatisfied (less than 60 points). Nursing satisfaction = (number of satisfied + number of great satisfied)/total number of cases × 100%.

Statistical methods

SPSS 22.0 statistical software was used to analyze the data, and the difference was statistically significant when $P<0.05$. Chi-square test was used to compare the counting data such as gender and incidence of adverse reactions. The measurement data such as age and NIHSS score were compared by independent sample t test. Paired t test was used for comparison before and after treatment in the same group.

Results

Baseline data

The general data of the two groups was compared, such as age, BMI, fasting blood glucose, serum creatinine, total cholesterol, triglycerides, gender, living environment, smoking and drinking, and there was no statistical difference ($P>0.05$), suggesting that the two groups were comparable (**Table 1**).

Comparison of nerve function

Comparison of nerve function between the two groups showed no difference in NIHSS score and RRS score before treatment, and the two scores in the observation group were lower than those in the control group after treatment ($P<0.05$). Besides, the two scores after treatment were both lower than those before treatment ($P<0.05$), as shown in **Figure 1**.

Comparison of motor function

By comparing the motor function between the two groups, it was seen that there was no difference in FMA score between the two groups before treatment, and the FMA score in the

Table 1. Comparison of general data [n (%)]

	Observation group (n=40)	Control group (n=40)	t or χ²	P
Age (years)	62.5±8.4	61.9±9.2	0.305	0.762
BMI(kg/m²)	22.84±3.84	23.14±4.06	0.340	0.735
Fasting blood-glucose (mmol/L)	4.82±1.24	4.71±1.35	0.380	0.705
Serum creatinine (μmol)	84.63±17.62	87.42±16.54	0.730	0.468
Total cholesterol (mmol/L)	3.75±0.84	3.68±0.74	0.396	0.694
Triglyceride (mmol/L)	1.14±0.34	1.18±0.29	0.566	0.573
Gender			0.524	0.469
Male	29 (72.50)	26 (65.00)		
Female	11 (27.50)	14 (35.00)		
Living environment			1.127	0.289
Town	34 (85.00)	37 (92.50)		
Countryside	6 (15.00)	3 (7.50)		
Smoking			0.524	0.469
Present	26 (65.00)	29 (72.50)		
Absent	14 (35.00)	11 (27.50)		
Drinking			0.205	0.651
Present	24 (60.00)	22 (55.00)		
Absent	16 (40.00)	18 (45.00)		

observation group was higher than that in the control group after treatment (P<0.05). Besides, the FMA scores of both groups were higher after treatment than those before treatment (P<0.050), as shown in **Figure 2**.

Comparison of living ability

By comparing the living ability between the two groups, we could see that there was no difference in ADL score and Barthel index between the two groups before treatment, and the two scores in the observation group were higher than those in the control group after treatment (P<0.05). Besides, ADL score and Barthel index in both groups were higher after treatment than those before treatment (P<0.05), as shown in **Figure 3**.

Comparison of adverse reactions

The incidence of adverse reactions in the observation group was 10.00%, which was not remarkably different from the control group at 17.50% (P>0.05), as shown in **Table 2**.

Comparison of nursing satisfaction

Comparison of nursing satisfaction showed that the score of the observation group was higher than that of the control group (P<0.05), as shown in **Figure 4**. The nursing satisfaction of the observation group was 95.00%, which was higher than of the control group at 75.00% (P=0.012), as shown in **Table 3**.

Discussion

Most previous studies on the rehabilitation of stroke hemiplegia patients have not focused on rehabilitation intervention in the early stages of stroke [11]. Current treatment for stroke hemiplegia is relatively simple [12], and reliable rehabilitation training is one of the key aspects to improve patients' prognosis. Under the guidance of early rehabilitation guidelines for stroke, this study integrated various treatment methods to further improve the clinical efficacy and reduce the burden on patients' families and society. In the face of the increasing harm caused by stroke hemiplegia, we believe that this study can provide reliable guidance for future clinical practice, which is of great significance for stroke hemiplegia care.

First of all, we evaluated the nerve function of the two groups before and after treatment by NIHSS score and RRS score. The two scores of the observation group were lower than those of the control group after treatment, suggesting that the application of early rehabilitation nursing could effectively improve the nerve function of patients, which was consistent with the evaluation effect of early rehabilitation nursing in previous studies [13, 14], and could support our experimental results. Early clinical treatment of stroke patients pays more attention to rescue and drug treatment, but ignores the importance of neurological rehabilitation [15]. The human cerebral cortex is plastic and reversible, and when a patient's cerebral cortex is injured, the function of the injured part can be rebuilt through functional nursing [16]. Ruminative thinking is one of the key points,
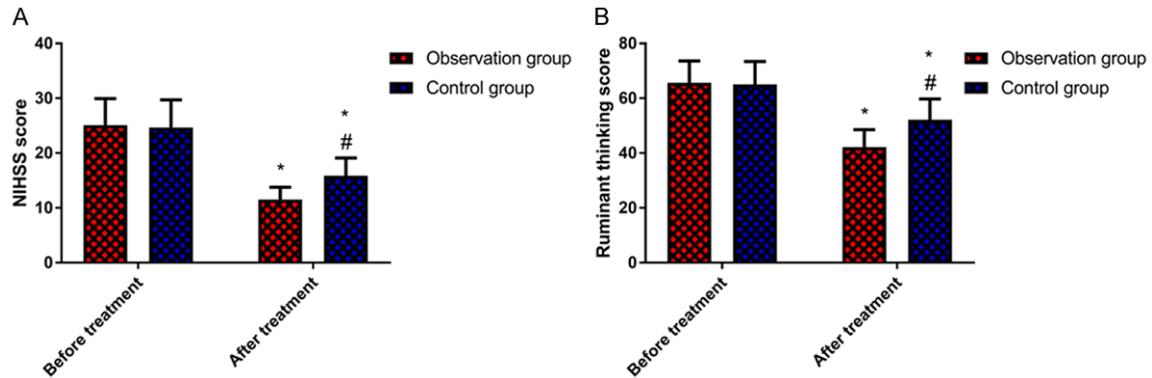
Figure 1. Comparison of NIHSS score and RRS score before and after treatment. A. Comparison of NIHSS scores before and after treatment between the two groups. B. Comparison of rumination scores before and after treatment between the two groups. *represents the comparison with that of the same group before treatment, #represents comparison with the observation group after treatment, P<0.05.
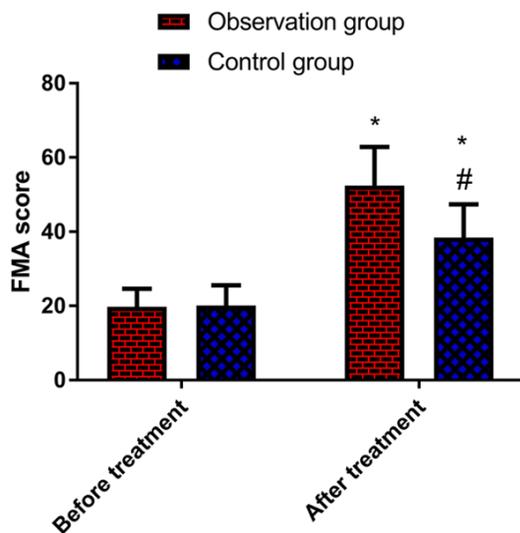

Figure 2. Comparison of FMA scores before and after treatment between the two groups. *represents the comparison with that of the same group before treatment, #represents comparison with the observation group after treatment, P<0.05.

which causes patients to repeatedly think about and review negative events after encountering them [17]. To a certain extent, this kind of thinking is not only an abnormal manifestation of neurological dysfunction, but also one of the main causes of negative psychology and emotions [18]. A study pointed out that a good mental state is important for the treatment of any disease [19], but even more so for stroke with certain neurological impairment. Early rehabilitation nursing not only strengthens patients' functional exercise, it promotes the plasticity

development of the cerebral cortex, thus improving patients' neurological rehabilitation, but it also reduces patients' negative emotional burden, improves their' treatment compliance and enables them to cooperate with treatment. Then, we evaluated the motor function of patients in the two groups by FMA score. The results showed that FMA of patients in the observation group was higher than that in the control group after treatment, which also suggested that early rehabilitation nursing could effectively improve the motor ability of patients. Moreover, we evaluated the living ability of the two groups by ADL score and Barthel index, which indicated that the living ability of the observation group was higher than that of the control group. We speculate that this is because early rehabilitation nursing focuses on individual condition, psychological evaluation and communication between nurses and patients. Therefore, it can improve the psychological and social adaptation of patients, improve their confidence in rehabilitation and their enthusiasm for participating in rehabilitation training, and promote the recovery of plasticity of injured brain cells [20]. We believe that the rehabilitation of patients is an integrated whole, and that the establishment of an early rehabilitation care routine through multi-faceted, multi-angle, all-round and whole-process precision rehabilitation therapy can guide multidisciplinary cooperation and patients' joint participation in the rehabilitation of stroke hemiplegic patients, and avoid the limitations of the previous clinical treatment of stroke hemiplegia in which a single department was
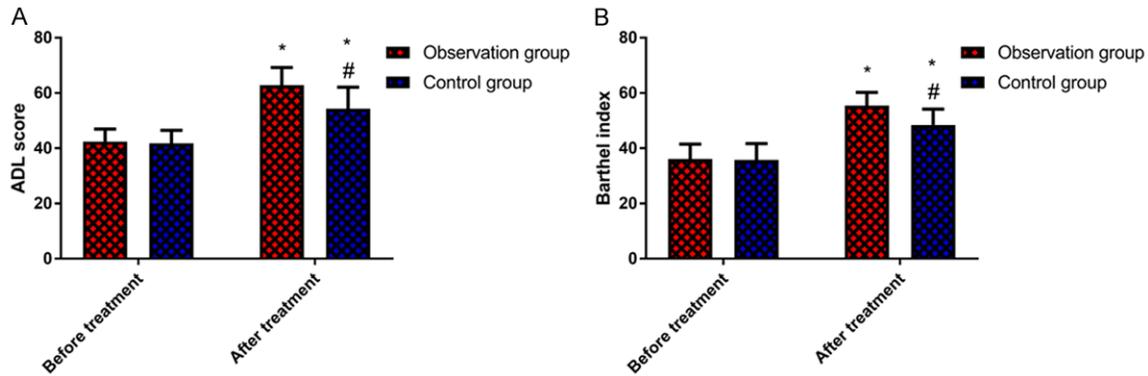
Figure 3. Comparison of living ability between two groups before and after treatment. A. Comparison of ADL scores before and after treatment between the two groups. B. Comparison of Barthel index before and after treatment between the two groups. *represents the comparison with that of the same group before treatment, #represents comparison with the observation group after treatment, P<0.05.

Table 2. Comparison of adverse reactions between the two groups [n (%)]

	Observation group (n=40)	Control group (n=40)	χ^2	p
Joint pain	2 (5.00)	0 (0.00)		
Muscle spasm	0 (0.00)	0 (0.00)		
Elevation of blood pressure	1 (2.50)	3 (7.50)		
Drug allergy	1 (2.50)	1 (2.50)		
Infectious diseases	0 (0.00)	3 (7.50)	0.949	0.330
Total incidence rate	10.00%	17.50%		

Figure 4. Comparison of nursing satisfaction scores between the two groups. *P<0.05.

their families can ensure the continuity and effectiveness of rehabilitation nursing and better meet the needs of patients. In addition, we found no difference between the two groups in the adverse reactions during the intervention, suggesting the feasibility of early rehabilitation nursing for stroke hemiplegia patients. However, it might also result from the sma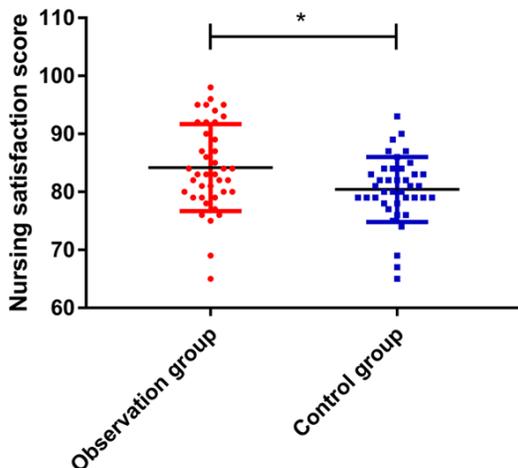ll number of subjects included in this study and the contingency in statistical analysis. Finally, we investigated the nursing satisfaction of the two groups of patients, and found that the nursing satisfaction of the observation group was significantly higher than that of the control group. On the one hand, the patient's condition was better improved after early rehabilitation nursing, and on the other hand, early rehabilitation nursing paid more attention to the communication between doctors and patients, which reduced patients' fear and resistance to hospitals and medical staff, and improved the doctor-patient relationship and patients' trust in hospitals.

To sum up, early rehabilitation nursing can effectively improve nerve function, athletic ability and living ability of stroke hemiplegia patients, which is worth popularizing in clinic. However, there are still many shortcomings in this experiment, which deserve our improvement. For example, the number of subjects we included in the study was too small, and there may be some statistical calculation contingen-

the main treatment subject, and inter-departmental coordination and homogenization were not strong [21]. On the basis of a comprehensive and in-depth understanding of the patient's situation, more interaction with patients and

Table 3. Comparison of nursing satisfaction [n (%)]

	Observation group (n=40)	Control group (n=40)	χ^2	p
Great satisfied	11 (27.50)	3 (7.50)		
Generally satisfied	27 (67.50)	27 (67.50)		
Dissatisfied	2 (5.00)	10 (25.00)		
Satisfaction rate	95.00%	75.00%	6.275	0.012

cy when comparing partial results. However, our subjects were screened by strict exclusion criteria to minimize other factors that could have influenced the results. Therefore, the number of random cases is small, but the results in this paper are highly accurate and can be used as a simple clinical reference. Also because of the short experimental period, we could not evaluate the long-term prognosis of patients. We will carry out more in-depth and comprehensive experimental analysis for the above limitations as soon as possible.

Disclosure of conflict of interest

None.

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