

Review Article

Effect of rehabilitation nursing on neurological function of senile cerebral infarction and recovery of hemiplegic limbs

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Abstract: Objective: To explore the effect of rehabilitation nursing on the neurological function of cerebral infarction and the recovery of hemiplegic limbs in the elderly. Methods: From August 2016 to August 2019, a total of 90 patients with cerebral infarction who were admitted to our hospital were taken as research participants. In group A (GA), 40 patients received rehabilitation nursing. In group B (GB), 50 patients received traditional nursing. Muscle strength grade, FMA score and Barthel Index, NIHSS and SSS scores, SAS and SDS scores, arterial pressure and heart rate, compliance, incidence of postoperative adverse reactions were compared between the two groups and postoperative satisfaction was investigated. Results: There were more patients in GA with muscle strength in grade 4 and grade 5 than GB; FMA and Barthel Index were higher in GA, NIHSS, SSS, SAS and SDS scores were lower in GA, arterial pressure and heart rate were lower in GA, total compliance rate and satisfaction degree was higher in GA, and the incidence of adverse reactions was lower in GA. Conclusion: Rehabilitation nursing has better improvement on patients' nerve function and better recovery of limb function, which is worth promoting in clinical practice.

Keywords: Rehabilitation nursing, cerebral infarction, hemiplegia, FMA, Barthel Index, muscle strength grades

Introduction

Cerebral infarction is a very common disease in middle-aged and elderly patients, and it is also an important cause of stroke in middle-aged and elderly patients. Its prognosis is poor and its mortality rate is high [1-4]. Its risk will increase with age [5]. Due to the development of atherosclerosis, intracranial vessels are embolized, which can block the blood flowing to a part of the brain, leading to massive cerebral infarction and stroke [6-8]. For the treatment of cerebral infarction, there are many methods, such as conventional treatments (thrombolysis, blood supply recovery in ischemic areas, etc.) [9, 10] and unconventional treatments (H2 treatment, molecular target treatment, etc.) [11, 12]. Since patients are prone to complications such as epilepsy after treatment [13], patient care is extremely important.

Rehabilitation nursing is a common nursing method in cardiovascular and cerebrovascular diseases, and it has achieved great results in

many diseases [14, 15]. This kind of nursing is thought to stimulate the cellular responses of the injured area in the body through repeated exercise of the body, so that the injured area is better recovered [16]. In contrast, in the traditional nursing model, nurses mainly aim to completing their work and give less professional nursing and care for patients than in rehabilitation nursing. Therefore, the traditional quality of nursing is not as good as rehabilitation nursing in many studies [17]. There are limited studies on the role of rehabilitation nursing in elderly patients with cerebral infarction. This study aimed to explore the effect of rehabilitation nursing on elderly patients with cerebral infarction from the aspects of neurological function and recovery effect of hemiplegic limbs.

Methods

Baseline data

From August 2016 to August 2019, a total of 90 patients with cerebral infarction who received

Influence of rehabilitation nursing on senile cerebral infarction

molecular targeted therapy in Hainan Genergy Hospital were selected as research participants, of which 40 cases were treated with rehabilitation nursing (GA), and the other 50 cases were treated with traditional nursing (GB).

Inclusion criteria: Patients had strong compliance; Patients could correctly understand rehabilitation training skills; Patients could accurately express physical discomfort; patient's symptoms were stable within the latest month and no new stroke developed; Patients and their families were informed of the study and signed a consent form.

Exclusion criteria: Patients suffered from other serious underlying diseases, such as dysfunction of heart, liver and kidney and other internal organs; Patients suffered from more serious mental diseases, such as anxiety, depression and suicide; patient was a pregnant or lactating woman. This study was approved by the Ethics Committees of Hainan Genergy Hospital.

Nursing methods

GA: Patients were treated with rehabilitation nursing. According to the general procedures, patients were treated with basic nursing intervention. The medication guidance and corresponding health education were given to patients and their families, etc. At the same time, the patients were given rehabilitation training related to limb motor function. In the early stage of nursing, the medical staff assisted the patients to understand the healthy limbs, how to position on the bed, and to turn over every 2 hours. In order to prevent or alleviate the problems of upper and lower limbs and hip joints, the patients are instructed to turn over. When the patient's condition was stable, a rehabilitation plan was designed and scientific guidance was given to patients according to the full understanding of the actual physical condition of the patient. The content included flexion, internal rotation, external rotation, upper limb separation exercise with a roller and other equipment, control training and the training followed the principle of gradual improvement. The strength was suitable for patients to comfortably tolerate. The medical staff guided the patients to carry out the correct turning, sitting posture and standing balance training, and assisted the patient to walk and go up and

down stairs. Generally, the time of lower limb rehabilitation training was controlled from 20 minutes to 30 minutes each time, and 2-3 periods of exercise were done every day. Patients needed to correct their bad exercise patterns when they reached the recovery stage. At the same time, they needed to persist in daily life training and increase the number of exercises and training times appropriately. According to the difference of a patients' tolerance, the training intensity was reasonably adjusted. The patient's daily life (holding a pen, dressing, washing face and brushing teeth) was practiced. At the same time, psychological rehabilitation care was given to patients. If the patient is upset, depressed or even afraid, the medical staff give encouragement, comfort and help the patient regain confidence.

GB: Patients were treated with traditional nursing only. According to the general procedures, patients were treated with basic nursing intervention. Medication guidance and corresponding health education were given to patients and their families, etc.

Detection indices

(1) The muscle strength grades were compared between the two groups.

The muscle strength of patients after nursing was taken as an index to judge the effect of limb recovery. Grade 0: Patients cannot feel muscle contractions; Grade 1: Patients had no obvious movement, but muscle contractions were possible; Grade 2: Patients were unable to overcome the limb weight movement, and the horizontal surface of the movement without load; Grade 3: Patients can move against the body's own weight; Grade 4: Patients can exercise to overcome moderate resistance; Grade 5: Patients can move on their own.

(2) FMA score and Barthel Index were compared between the two groups.

Before nursing and after nursing for one month, the limb function (FMA) score [18] and Barthel Index [19] were compared to evaluate the limb recovery of patients. The higher the score, the better the recovery effect of the limb.

(3) The neurological function and mental health of patients were compared in the two groups.

Influence of rehabilitation nursing on senile cerebral infarction

Table 1. Baseline data of patients in both groups

Classification	GA (n=40)	GB (n=50)	t/X ²	P
Gender			1.12	0.380
Male	18 (45.00)	21 (42.00)		
Female	22 (55.00)	29 (58.00)		
Age/years old	66.21±6.97	65.98±7.35	0.15	0.880
BMI (kg/m ²)	24.98±2.74	25.75±2.65	1.28	0.181
Smoking or not			2.50	0.130
Yes	20 (50.00)	27 (54.00)		
No	20 (50.00)	23 (46.00)		
Drinking or not			0.98	0.430
Yes	21 (52.50)	30 (60.00)		
No	19 (47.50)	20 (40.00)		
Hyperlipidemia			1.58	0.255
Yes	23 (57.50)	24 (60.00)		
No	17 (42.50)	26 (40.00)		
Hypertension			2.50	0.130
Yes	22 (55.00)	25 (50.00)		
No	18 (45.00)	25 (50.00)		
Diabetes mellitus			1.58	0.255
Yes	21 (52.50)	22 (44.00)		
No	19 (47.50)	28 (56.00)		

The National Institutes of Health stroke score (NIHSS) and neurological function score (SSS) [20] were used to evaluate the neurological function recovery of patients in the two groups. The better the recovery of patient's neurological function, the lower the score. Self-rating anxiety scale (SAS) [21] and self-rating depression scale (SDS) [22] were used to evaluate the mental health level (20 items, 0-100 points) of patients in GA and GB before nursing and 1 month after nursing. The worse the mental health of the patients, the higher the score was.

(4) The arterial pressure and heart rate were detected in the two groups.

After hospitalization, the arterial pressure and heart rate of patients were detected in real time in the two groups. The arterial pressure and heart rate of patients in the two groups were compared before nursing and after nursing for 14 days.

(5) The compliance of patients was compared in the two groups.

The treatment compliance of patients was evaluated after nursing for 7 days. The criteria were

as follows: full compliance: patients actively and strictly carried out doctor's orders, actively cooperate with clinical examination and nursing, and consciously adhere to long-term standardized treatment. Partial compliance: patients occasionally have irregular compliance behaviors during treatment, but they can follow the doctor's advice after being reminded or explanation. Non compliance: Patients often do not follow doctor's advice or refuse or interrupt treatment halfway through treatment.

(6) The postoperative complications were compared in the two groups.

After operation for 28 days, the adverse reaction indexes (epilepsy, urinary incontinence, pulmonary infection and dementia after stroke) of patients were counted and compared.

(7) The nursing satisfaction was compared in the two groups.

The nursing satisfaction questionnaire was used to test the patients' satisfaction. Then, the nursing satisfaction scores of patients were compared in the two groups. Test content and evaluation criteria were created in house. The total score was 100 points, of which 100-85 points was satisfactory, more than 70 points was basically satisfactory, and less than 70 points was unsatisfactory.

Results

Baseline data

There were no significant differences in baseline data of gender, age, BMI, smoking history, drinking history and obesity status between the two groups ($P>0.05$). More details are shown in **Table 1**.

The recovery of muscle strength in the GA was stronger than that in the GB

In GA, there was 1 case of grade 0, 1 case of grade 1, 1 case of grade 2, 1 case of grade 3, 16 cases of grade 4, and 20 cases of grade 5 according to the muscle strength grades. In GB, there were 9 case of grade 0, 10 cases of grade 1, 10 cases of grade 2, 10 cases of grade 3, 5

Influence of rehabilitation nursing on senile cerebral infarction

Table 2. Comparison of muscle strength grades between the two groups

Classification	GA (n=40)	GB (n=50)	χ^2	P
0	1	9	5.42	0.020
1	1	10	6.34	0.012
2	1	10	6.34	0.012
3	1	10	6.34	0.012
4	16	5	9.60	0.002
5	20	6	15.62	<0.0001

cases of grade 4, and 6 cases of grade 5. The number of patients in GA with grade 0-3 were significantly fewer than in GB, while the number of patients in GA with grade 4-5 were significantly more than those in GB ($P<0.05$) (**Table 2**).

The FMA score and Barthel Index of GA were higher than that of GB

In GA, the FMA score of patients was (51.32 ± 3.89) before nursing and (89.45 ± 6.88) after nursing for one month. In GB, the FMA score of patients was (50.89 ± 3.97) before nursing and (78.32 ± 5.47) after nursing for one month. The FMA scores of both groups improved after nursing for one month, and the FMA score of GA was significantly higher than that of GB after nursing for one month ($P<0.05$). In GA, the Barthel Index of patients was (43.45 ± 2.33) before nursing and (82.64 ± 5.81) after nursing for one month. In GB, the Barthel Index of patients was (43.73 ± 2.54) before nursing and (73.44 ± 4.32) after nursing for one month. The Barthel Index of both groups improved after nursing for one month, and the Barthel Index of GA was significantly higher than that of GB after nursing for one month ($P<0.05$). More details are shown in **Figure 1**.

The neurological function and mental health of patients in GA was better than that in GB

The neurological function in GA was better than that in GB: In GA, the NIHSS score of patients was (67.45 ± 4.32) before nursing and (32.34 ± 2.77) after one month of nursing. In GB, the NIHSS score of patients was (67.73 ± 3.97) before nursing and (47.66 ± 4.43) after one month of nursing. The NIHSS score of both groups decreased after nursing for one month, and the NIHSS score of GA was significantly lower than that of GB after nursing for

one month ($P<0.05$). In GA, the SSS score of patients was (25.12 ± 2.25) before nursing and (12.64 ± 1.31) after one month of nursing. In GB, the SSS score of patients was (25.34 ± 2.04) before nursing and (20.11 ± 1.02) after nursing for one month. The SSS score of both groups decreased after one month of nursing, and the SSS score of

GA was significantly lower than that of GB after one month of nursing ($P<0.05$). More details are shown in **Figure 2**.

The mental health in GA was better than that in GB: In GA, the SAS scores before nursing and after nursing for 1 month were (64.03 ± 9.32) and (40.43 ± 5.53), respectively. In GB, the SAS scores before nursing and after nursing for 1 month were (63.97 ± 9.45) and (53.64 ± 5.75), respectively. After nursing for 1 month, the SAS score of GA was significantly lower than that of GB ($P<0.05$). In GA, the SDS scores before nursing and after nursing for 1 month were (60.09 ± 8.02) and (42.21 ± 5.23), respectively. In GB, the SDS scores before nursing and after nursing for 1 month were (59.88 ± 7.98) and (53.32 ± 5.18), respectively. After nursing for 1 month, the SDS score of GA was significantly lower than that of GB ($P<0.05$). More details are shown in **Figure 3**.

The recovery of arterial pressure and heart rate in GA was better than that in GB

In GA, the arterial pressure was (117.71 ± 4.83) mmHg, (95.09 ± 2.51) kPa before nursing and after nursing for 14 days, respectively. The heart rate was (105.88 ± 4.79) bpm, (87.54 ± 3.67) bpm before nursing and after nursing for 14 days, respectively. In GB, the arterial pressure was (116.88 ± 4.79) mmHg, (104.09 ± 2.89) kPa before nursing and after nursing for 14 days, respectively. The heart rate was (105.81 ± 4.17) bpm, (95.47 ± 3.56) bpm before nursing and after nursing for 14 days, respectively. The arterial pressure and heart rate were compared between the two groups. The arterial pressure and heart rate in GA were significantly higher than those in GB after operation. More details are shown in **Figure 4**.

Influence of rehabilitation nursing on senile cerebral infarction

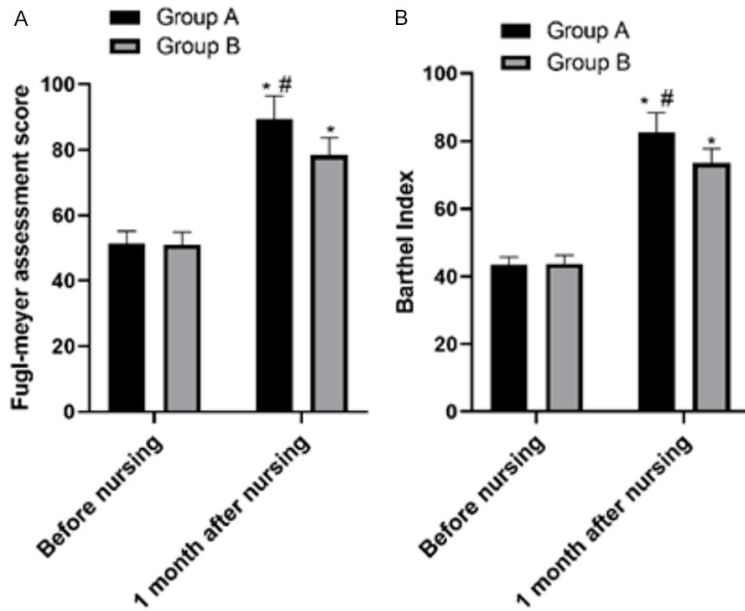


Figure 1. FMA score and Barthel Index of patients in the two groups. A. FMA score of patients in the two groups: The FMA score of both groups improved after nursing for one month, and the FMA score of GA was significantly higher than that of GB after nursing for one month ($P<0.05$). B. Barthel Index of patients in the two groups: The Barthel Index of both groups improved after nursing for one month, and the Barthel Index of GA was significantly higher than that of GB after nursing for one month ($P<0.05$). Note: * means the comparison with before nursing, $P<0.05$; # means the comparison with GB, $P<0.05$.

GA was significantly lower than that of GB after nursing for one month ($P<0.05$). Note: * means the comparison with before nursing, $P<0.05$; # means the comparison with GB, $P<0.05$.

The compliance of GA was higher than that of GB

In GA, there were 32 patients with full compliance, 7 patients with partial compliance and 1 patient with non compliance, with a total compliance rate of 97.5%. In GB, there were 32 cases with full compliance, 5 cases with partial compliance and 13 cases with non compliance, with a total compliance rate of 74%. The total compliance rate in GA was significantly higher than that in GB ($P<0.05$). More details are shown in **Table 3**.

The incidence of adverse reactions in GA was lower than that in GB

In GA, there was 1 case of epilepsy (2.50%), 1 case of urinary incontinence (2.50%), no pulmonary infection and dementia after stroke, and the incidence of adverse reactions was 5%. In GB, there were 5 cases of epilepsy (10.00%), 5 cases of urinary incontinence (38.00%), 3 cases of pulmonary infection (6.00%) and 2 cases of dementia after stroke (4.00%), and the incidence of adverse reactions was 30%. The post-operative complication rate in GB was significantly higher than that in GA ($P<0.05$) (**Table 4**).

The nursing satisfaction of GA was higher than that of GB

In GA, there were 26 cases of satisfaction, 12 cases of basic satisfaction, and 2 cases of dissatisfaction, with a satis-

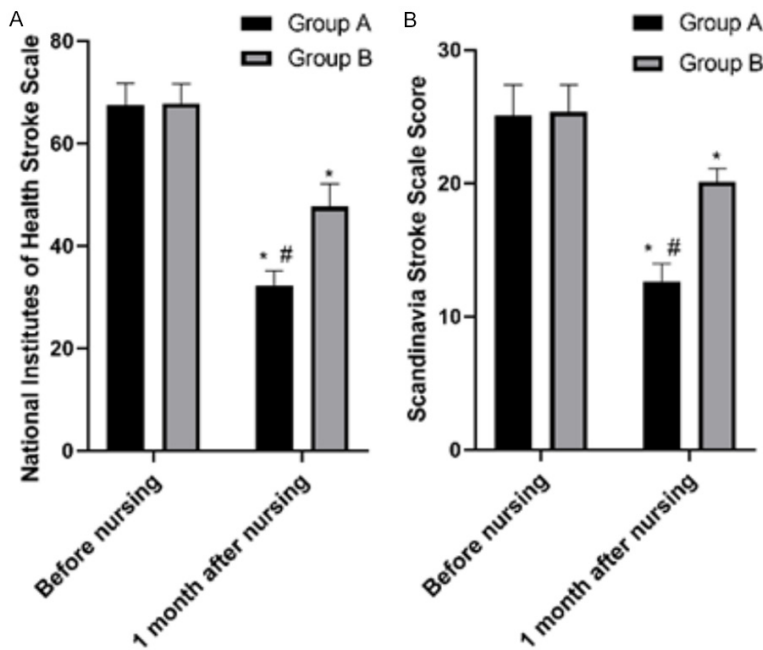


Figure 2. NIHSS score and SSS score of patients in the two groups. A. NIHSS scores in both groups: The NIHSS score of both groups decreased after nursing for one month, and the NIHSS score of GA was significantly lower than that of GB after nursing for one month ($P<0.05$). B. SSS score of both groups: The SSS score of both groups decreased after nursing for one month, and the SSS score of

Influence of rehabilitation nursing on senile cerebral infarction

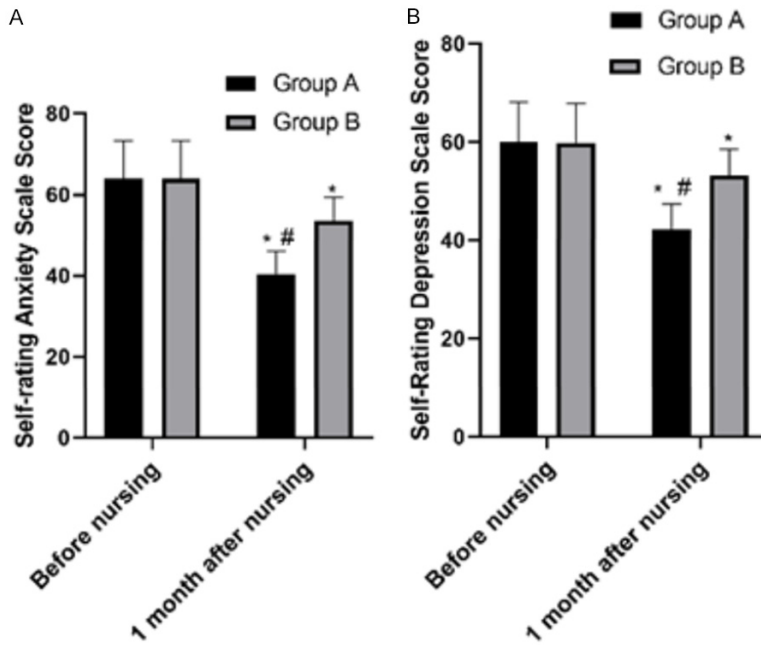


Figure 3. SAS score and SDS score of patients in the two groups. A. SAS score in the two groups: SAS score of the two groups decreased after nursing, and SAS score of GA was significantly lower than that of GB ($P<0.05$); B. SDS score of two groups: SDS score of the two groups decreased after nursing, and SDS score of GA was significantly lower than that of GB ($P<0.05$). Note: * means the comparison with before nursing, $P<0.05$; # means the comparison with GB, $P<0.05$.

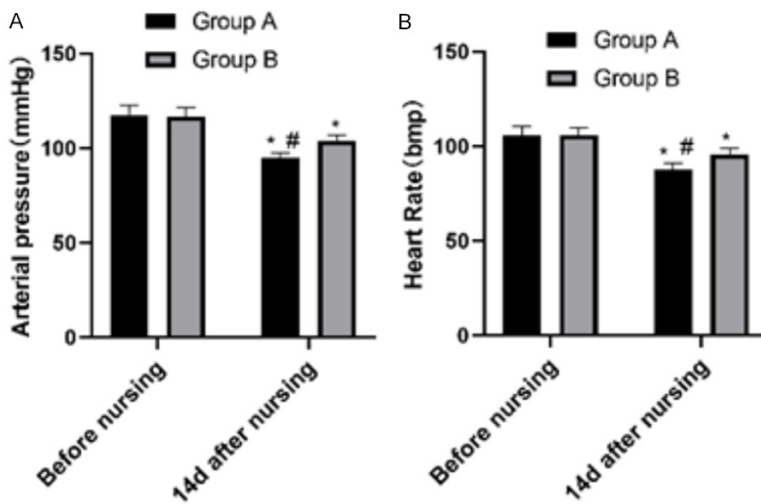


Figure 4. NIHSS score and SSS score of patients in the two groups. A. The arterial pressure before nursing and after nursing for 14 days: The arterial pressure after nursing for 28 days in both groups was significantly lower than that before nursing, and the level of arterial pressure in GA was significantly lower than that in GB ($P<0.05$). B. The heart rate before nursing and after nursing for 14 days: The heart rate after nursing for 14 days in both groups was significantly lower than that before nursing, and the heart rate in GA was significantly lower than that in GB ($P<0.05$). Note: * means the comparison with before nursing, $P<0.05$; # means the comparison with GB, $P<0.05$.

faction rate of 95.00%. In GB, there were 20 cases of satisfaction, 15 cases of basically satisfied and 15 cases of dissatisfaction, with a satisfaction rate of 70.00%. The satisfaction of GA was significantly higher than that of GB ($P<0.05$). More details are shown in **Table 5**.

Discussion

Cerebral infarction easily causes economic and mental burden to patients [23]. Therefore, it is very important to treat cerebral infarction, and molecular therapy is a great method [24]. However, the nursing after treatment is very important for the recovery of patients. This study aimed to explore and compare of the effects of rehabilitation nursing training and traditional nursing training in elderly patients with cerebral infarction.

In this study, the recovery of the patient's limbs was first detected, and the recovery of the patient's limbs was evaluated from the grades of the patient's muscle strength, FMA and Barthel Index. In this study, we found that GA had more patients with grade 4 and grade 5 muscle strength after nursing than GB, and FMA score and Barthel Index were also higher in GA. This research suggested that the recovery effect of hemiplegic limbs in the rehabilitation nursing cohort was better than that of patients receiving general traditional treatment. After cerebral ischemia injury caused by cerebral obstruction, inflammatory factors cause vasoconstriction, decrease of

Influence of rehabilitation nursing on senile cerebral infarction

Table 3. Compliance of patients in the two groups (n=40)

Classification	GA (n=40)	GB (n=50)	χ^2	P
Full compliance	32 (80.00)	32 (64.00)	-	-
Partial compliance	7 (17.50)	5 (10.00)	-	-
Non compliance	1 (2.50)	13 (26.00)	-	-
Total compliance rate (%)	39 (97.50)	37 (74.00)	9.34	0.002

Table 4. The incidence of adverse reactions of patients in the two groups (n=40)

Classification	GA (n=40)	GB (n=50)	χ^2	P
Epilepsy (%)	1 (2.50)	5 (10.00)		
Urinary incontinence (%)	1 (2.50)	5 (10.00)		
Pulmonary infection (%)	0 (0.00)	3 (6.00)		
Dementia after stroke (%)	0 (0.00)	2 (4.00)		
Incidence of adverse reactions (%)	2 (5.00)	15 (30.00)	9.07	0.003

Table 5. Satisfaction of patients in both groups

Classification	GA	GB	χ^2	P
Satisfactory	26 (65.00)	20 (40.00)	-	-
Basically satisfaction	12 (30.00)	15 (30.00)	-	-
Dissatisfaction	2 (5.00)	15 (30.00)	-	-
Satisfaction (%)	38 (95.00)	35 (70.00)	9.07	0.003

blood flow, and damage of endothelial cells in affected brain regions [25], thus causing gradual loss of corresponding limb functions. The methods of rehabilitation nursing are effective for the recovery of upper limb motor dysfunction after stroke [26]. Related studies found that these methods significantly improved the expression of neuro-ischemic factors, relieved the symptoms of cerebral ischemia injury, and significantly helped cerebral blood flow and cerebral vascular regeneration [27]. Based on these results and the results of this study, we conclude that rehabilitation nursing has a better effect on the recovery of hemiplegic limbs of patients.

In this study, we also tested the neurological function of patients in the two groups. We found that rehabilitation nursing was better than traditional nursing in the recovery of patients' neurological function in this study. The conclusion from the previous articles showed that the training used in rehabilitation nursing significantly improved the cerebral blood flow of patients, and had certain effect on the recovery of the brain. At the same time, it had great effect on the improvement of ner-

vous system [27]. In this study, we also tested the mental health of patients. We found that rehabilitation nursing was more effective for the recovery of patients' mental health. After that, we investigated and compared the patient's compliance, nursing satisfaction and the incidence of adverse reactions. We found that the compliance and nursing satisfaction of GA were higher than that of GB, and the incidence of adverse reactions was much lower than in GA. Rehabilitation nursing not only trains patients to recover their limbs, but also pays attention to the psychological counseling of patients. It can relieve anxiety and depression of patients during recovery. Therefore, SAS and SDS scores of patients were higher than those of patients receiving traditional nursing. Patients need to have a good mentality to

face disease, so as to recover from the disease, while negative emotions such as anxiety and depression will only lead to aggravation of the disease and deterioration of various related indicators in the disease [28, 29]. Combined with the previous results of neurological function recovery, the recovery of patients' psychological health had a promoting effect on the recovery of neurological function. The higher the compliance with the doctor's advice, the better the training and the more effective the recovery of the limbs was. We also found that the postoperative complications in GA were less than those in GB. Improper nursing leads to the decrease of patients' compliance with doctor's advice. The decrease of compliance easily leads to the increase of complications.

To sum up, we concluded that due to the training content of rehabilitation training and psychological counseling, the depression and anxiety of patients were less, so their SAS and SDS scores were lower. It had a better recovery of neurological function, better recovery of limb function and fewer postoperative complications. Therefore, patients' satisfaction was higher after nursing.

There are still shortcomings in this study. We only tested some neurological function scores and limb recovery effects, but we did not test related blood indexes and their specific molecular mechanisms on limb function. We will pay attention to this point in future research and study the deeper molecular mechanisms by different nursing methods.

In conclusion, because of the higher compliance rate, patients with rehabilitation nursing have less anxiety and negative emotions, better improvement of neurological function, better recovery of limb function, less incidence of adverse reactions, and higher satisfaction, which is worthy of clinical promotion.

Disclosure of conflict of interest

None.

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Influence of rehabilitation nursing on senile cerebral infarction

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