RESEARCH ARTICLE

Effect of comprehensive rehabilitation nursing intervention on hemiplegia patients in sequela stage of stroke

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Abstract

Objective: To explore the clinical effect of comprehensive rehabilitation nursing intervention on hemiplegia patients in the sequela stage of stroke.

Methods: Patients with knee reflex after stroke were divided into the treatment group and the control group. Patients in the control group received Activities of Daily Living (ADL) training. Patients in the treatment group received comprehensive rehabilitation training in addition to the ADL training of the control group, including joint flexion and extension training, active resistance training, low-frequency electrotherapy, and standing training. The knee reflex angle and ankle dorsiflexion angle of patients in both groups were measured before and after 4 weeks of treatment. Also, the Manual Muscle Testing (MMT) scale, the modified Ashworth scale, the Fugl-Meyer assessment (FMA), and Barthel index (lower limb) rating scale of patients in both groups were compared.

Results: It was found that there was significant difference between the two groups in the changes of knee and ankle joint angles after treatment ($P < 0.05$). In the Ashworth and MMT (Manual Muscle Testing) grading analysis of patients, it was found that the Ashworth grading of quadriceps femoris and triceps leg improved significantly before and after treatment ($P < 0.01$). There was significant difference in MMT grade between the two groups after treatment of quadriceps and hamstring muscles ($P < 0.05$). There was significant difference in satisfaction degree of pain control or relief methods ($P < 0.05$). In the analysis of Fugl-Meyer and Barthel integral effects of lower limbs for the patients with knee reflex before and after treatment, a significant difference ($P < 0.05$) was found in the Fugl-Meyer motor function and Barthel index scores of the two groups.

Conclusion: Therefore, the results suggested that comprehensive rehabilitation nursing could promote the treatment of sequelae of hemiplegia. Although there were some shortcomings in the experimental process, it still provided a reliable basis for the clinical treatment of sequelae of stroke.

Keywords: Comprehensive rehabilitation nursing, Stroke; sequelae hemiplegia, MMT grading evaluation.

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Introduction

In modern society aligned with the improvement of people' s living standards, people are not only concerned about food, clothing and warmth, but also the pursuit of quality. Health had attracted people's attention utmost. Stroke is a common and frequently-encountered disorder in a clinic. Its morbidity, mortality and disability rate are at the forefront of all diseases in China. The incidence of stroke in China was 219/100000, and the disability rate was as high as 83%.[1] Studies showed that stroke occurred above the level of the cerebral cortex, basal ganglia, thalamus and upper pontine. Due to this the cortical excitatory impulses cannot reach the contralateral cerebellar hemisphere's granular cells through the ipsilateral pons, thus resulting in the decrease of the contralateral cerebellar hemisphere activity causing functional inhibition.[2] Hemiplegia is caused by a part of the brain becoming dysfunctional and is characterized by incomplete or complete loss of voluntary movement of one side of the body.

The concept of Fast track surgery (FTS), or Enhanced recovery after surgery (ERAS), is to reduce the psychological trauma of patients in the perioperative period, speed up the recovery after operation, shorten the hospitalization time and expenses.[3] It is a multi-disciplinary collaborative medical care model based on evidence-based medicine and laparoscopic minimally invasive surgery. Rehabilitation nursing is an important part of the therapy. An interactive relationship with patients and their family members can be formed through daily, direct and continuous nursing. This can prevent complications, gradually achieve self-care, and constantly improve the quality of life.[4,5]

Rehabilitation nurses use the theories of simultaneous measurement, domination of the brain, existent relationship between the two hemispheres of the brain, as well as nerve regeneration and brain plasticity in order to

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carry out rehabilitation nursing for stroke patients with hemiplegia. It plays an important role in the prognosis of patients. It could restore the residual limb function, minimize the disability rate, reduce complications, promote the recovery of motor function and improve the daily life activity of patients. Activities of Daily Living (ADL) created conditions for patients to return to normal life in society.[6] In recent years, the comprehensive rehabilitation nursing of stroke hemiplegia has progressed tremendously. Scholars all over the world have discussed the role of rehabilitation nurses [n the development of rehabilitation nursing.

This study was done to observe the results of comprehensive rehabilitation nursing by selecting stroke patients with knee reflex treated at the rehabilitation center of Hebei University of Engineering Affiliated Hospital from February 2017 to December 2018. The patients were divided into treatment group and control group. Relevant rehabilitation training was carried out to verify the effect of comprehensive rehabilitation nursing on hemiplegia patients in the sequela stage of stroke as well as to provide a reliable therapy for clinical treatment for these cases. This study compared the clinical effect of comprehensive rehabilitation nursing intervention on hemiplegia patients with those receiving ADL training.

Patients and Method

This was a comparative study with the sample size of 100, having 50 in the treatment group and 50 in the control group. The sample size was calculated as given below:

Sample size calculation: The calculation equation of the comparative sample content using the average of two samples was as follows:

$$n_1 = n_2 = 2[(z_{\alpha/2} + z_{\beta})x\ \sigma / \delta]^2$$

If test level $\alpha = 0.05$ (bilateral), test efficiency $1-\beta = 0.9$, $z_{\alpha/2} = 1.6449$, $z_{\beta} = 1.2816$, σ was the estimated standard deviation ($\sigma = 9.03$), δ was the difference between the mean values of two consecutive variables ($\delta = 7.95$), 22 samples were obtained. Considering the rate of falling out was 10%, 25 cases in the experimental group and 25 cases in the control group were finally determined, and the total sample size was estimated to be 50 cases.

Patients: From February 2017 to December 2018, 50 patients with knee regurgitation after stroke who were treated in rehabilitation center of Hebei University of Engineering Affiliated Hospital were selected, which includes 28 males and 22 females. CT or MR1 showed 19 cases of unilateral cerebral haemorrhage and 31 cases of cerebral infarction. The ages ranged between 38 to 75 years. All patients met the diagnostic criteria of cerebrovascular diseases approved by the Chinese Society of Neuroscience and were confirmed as the first case by CT or MRI. Fifty patients were randomly divided into control group (25 cases) and treatment group (25 cases). Informed consent was signed by all patients or their families and this study was approved by the Ethics Committee of Affiliated Hospital of Guizhou Medical University.

Inclusion criteria: Patients had to meet the diagnostic criteria for stroke with their ages between 18 to 75 years irrespective of gender. All patients were confirmed by CT or MRI. The course of the disease was less than 4 weeks. Patients showed unilateral limb hemiplegia and they could stand. The quadriceps femoris muscle strength of the patients was greater than or equal to grade 3. The knee joint over-extension angle was greater than 5° when the affected limb was loaded, whereas the knee joint over-extension angle was 0°~10° when the healthy limb was loaded. The patients had no severe cognitive impairment, no sensory aphasia, and they could understand the basic instructions. The condition was basically stable. There was no other serious heart, brain, kidney diseases, severe malnutrition, and thrombophlebitis. They volunteered to participate in this study. Exclusion criteria: Patients had a history of stroke, transient ischaemic attack, reversible ischaemic neurological disorders, excluding cerebral embolism, brainstem infarction, bilateral infarction, and subarachnoid haemorrhage. Before onset, the patients had diseases which were affecting lower limb sensation and movement, such as rheumatoid arthritis, lumbar disc herniation, various skin diseases, lower limb trauma, diabetes mellitus and other peripheral neuropathies. The patients who were over 75 years age were also excluded. Pregnant women and mental disorders who could not cooperate during the treatment were excluded.

The control group: ADL training was performed on the control group given completing basic nursing care. Patients were required to transfer and apply the retained or regained functions in time to their daily lives. With the assistance of family members and escorts, patients were given eating training, personal hygiene training (including face washing, hand washing, and tooth brushing), bathing training, training in wearing clothes, bed transfer training, and toilet training in wheelchairs. The daily routine care was given once a day and 5 times a week.

The treatment group: Comprehensive rehabilitation training was performed in addition to the ADL training of the control group. Firstly, joints were stretched and squeezed to promote the recovery of deep sensation of lower limbs. Secondly, in prone position, the knee joint of hemiplegic side was flexed and stretched at 15°~30° to avoid compensatory movement of hip joint. Thirdly,

quadriceps femoris muscle strength was strengthened by assisted-active-resistance training. Fourthly, low frequency therapy by using the KT-90A type nerve injury therapeutic instrument produced by Beijing Haidian Kangda Medical Instrument Factory. The low frequency modulation wave was square wave, and the frequency was 0.5-5Hz. There were two groups of channels. Patients in supine position: A group of polar plates was placed at the medial femoral muscle and quadriceps femoris abdomen at the knee joint, respectively. The prone position of the patient: The polar film was re-grouped and placed on the abdomen and the lower limb cochineal muscle (the strength of quadriceps femoris is 1/2 of the strength of cochineal muscle) according to the patient's tolerance. Fifthly, quadriceps femoris and cholangiomuscles contracted alternately, rhythmically, stably and resistively. The duration of each contraction was 10 seconds and the relaxation time was 2 seconds. Sixthly, the patients took a standing position. The healthy limbs were placed on the steps. The affected knee was flexed and stretched for 10 seconds at the flexion of about 15°. Then, some straightening exercises were done to keep it in the 0-5° flexion state. Attention was paid to the lower limbs of the affected side, so as to avoid the center of gravity from moving forward. Appropriate assistance could be used to prevent overextension of knee joint. Finally, standing training was conducted on the 20° slope, and attention was paid to knee joint control when standing. The training intensity of both groups was once a day, 50 minutes each time, 6 times a week, and the total course of treatment was 4 weeks.

Observation measurements: The angle of knee reflex was measured with a goniometer before treatment and 4 weeks after treatment. The angle of ankle passive dorsiflexion was measured with a dosimeter before treatment and 4 weeks after treatment. The strength of quadriceps femoris and cochineal rope muscles of the affected side was assessed by the same doctor with MMT scale before treatment and 4 weeks after treatment.[7] The muscle tension of quadriceps femoris and triceps calf was evaluated by modified Ashworth scale before treatment and 4 weeks after treatment.[8] Simplified Fugl-Meyer motor function score (lower limb) (FMA) was used to evaluate the lower limb motor function of the affected side before and after treatment.[5] For FMA, the full score of lower limb function was 34 points. Activity of daily living (ADL) was assessed by Barthel index (lower limbs) before and after treatment. For Barthel index, the full score of lower limbs was 45.[9-20]

Statistical analysis: All data in this study were analyzed by SPSS 22.0 statistical software package. Rank data were analyzed by Ridit analysis. Measurement data were tested by two-sample t-test and paired-sample t-test. The correction rate of knee reflex was tested by X^2 test. The statistical significance of difference was $P < 0.05$.

Results

Comparative analysis of basic data of patients: From Table-1, is be seen that the age, course of disease and

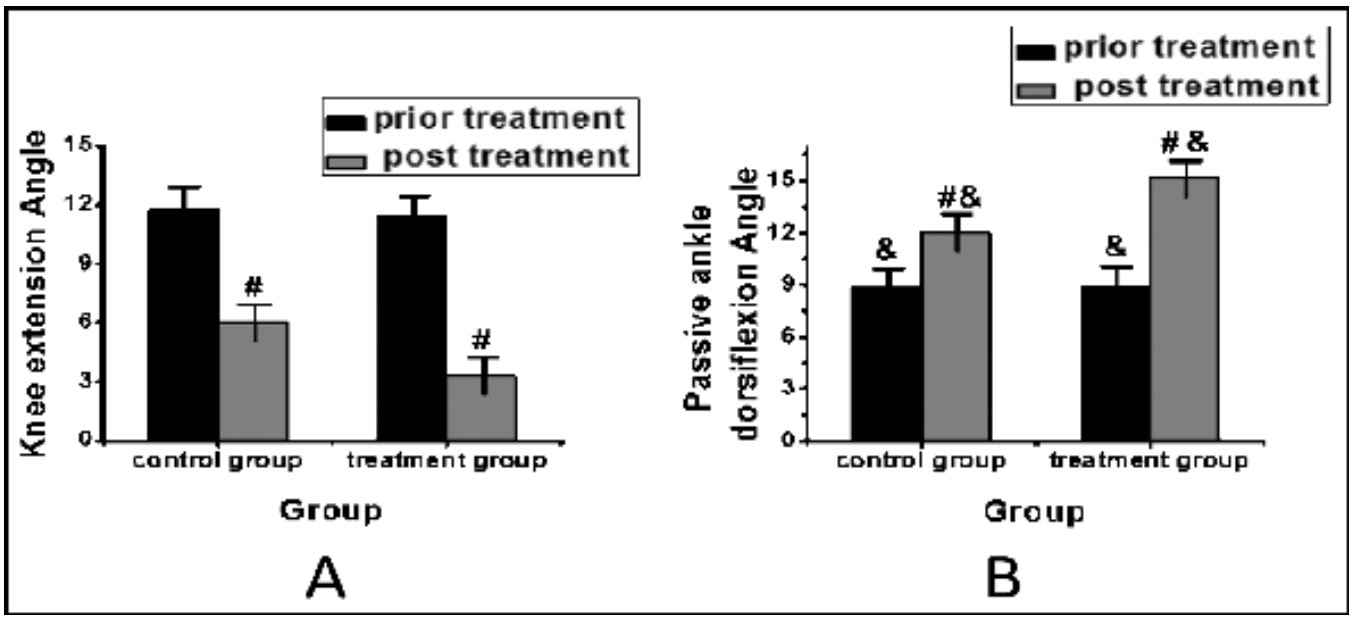

Figure-1: Histogram of correlation analysis of knee and ankle angle before and after treatment in two groups (A. The knee reflex angle; B. Ankle passive dorsiflexion; # indicates the comparison with the control group, and #P<0.05 has statistical significance; & indicates the comparison before and after treatment in the group, and &P<0.01, has statistical significance).

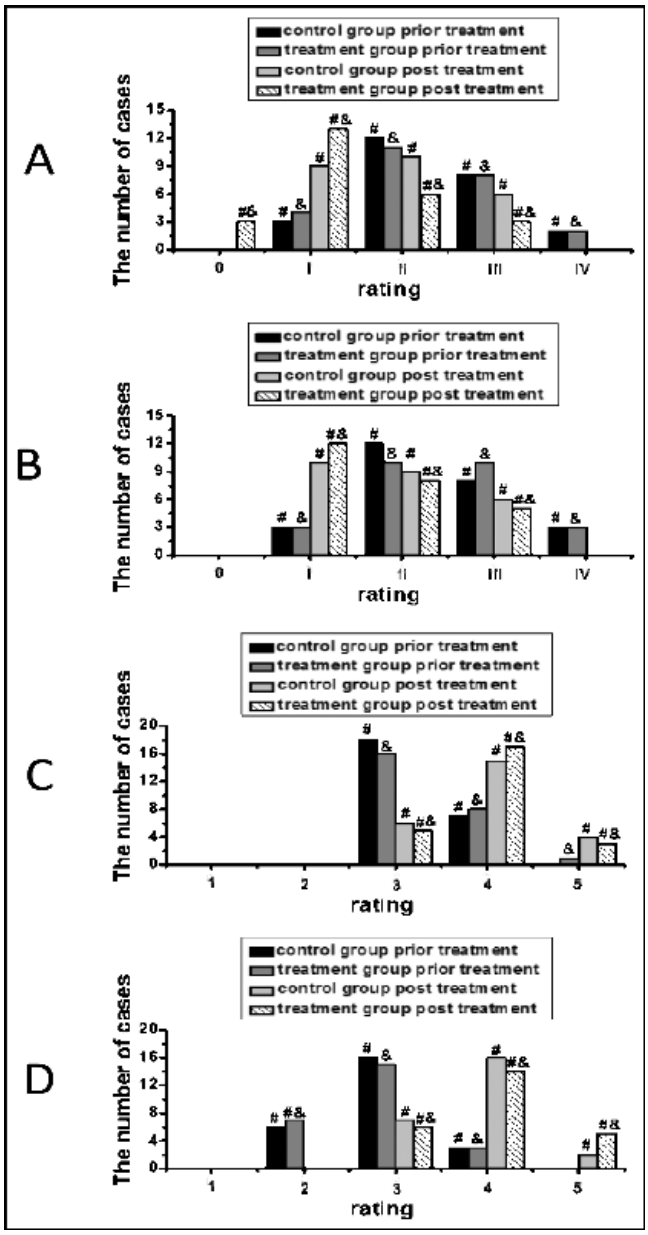

Figure-2: Histogram analysis of correlation between Ashworth and MMT grading before and after treatment in two groups (A. Assessment of Ashworth integral of quadriceps femoris; B. Assessment of Ashworth integral of triceps surae; C. Evaluation of MMT grading of quadriceps muscle; D. Evaluation of MMT grading of hamstring muscle; # indicates the comparison with the control group, and #P<0.05 has statistical significance; & indicates the comparison before and after treatment in the group, and &P<0.01, has statistical significance).

gender of the two groups were statistically compared. The age was tested by t and t = 0.74, P = 0.392 (P > 0.05). The course of disease was examined by t test, and t = 0.74, P = 0.101 (P > 0.05). Gender was tested by exact probability method, and x2 = 0.04, P = 0.751 (P > 0.05). They were comparable, there was no significant difference between them.

Table-1: Comparison of basic data between treatment group and control group.

Observation index		Treatment group	Control group	P value
Gender	Male	19(76.00%)	14(56.00%)	0.751
	Female	6(24.00%)	11(44.00%)	
Age (years)		54.02±8.21	55.98±4.51	0.392
Course of disease		18.17±4.39	19.26±6.96	0.101

Analysis of changes of knee reflex angle and ankle joint angle before and after treatment in two groups: From Figure-1, it could be seen that the collected data were statistically analyzed, and the correlation histogram between the observation indexes of the treatment group and the control group was obtained. From Figure-1A, it could be seen that there was no significant difference in knee reflex angle between the two groups before and after treatment (P > 0.05). Meanwhile, there was significant difference in knee reflex angle before and after treatment (P < 0.01) for the control group. There was significant difference in knee reflex angle before and after treatment for the treatment group (P < 0.01). There was significant difference in knee reflex angle between the two groups after treatment (P < 0.05). From figure 1B, the relationship between the two groups before and after treatment could be seen and there was no significant difference in the angle of passive joint extension (P > 0.05). There was significant difference in the angle of passive ankle extension before and after treatment for the control and treatment group (P < 0.01). There was significant difference in the angle of passive ankle extension after treatment between the two groups (P < 0.05).

Analysis of Ashworth and MMT grading before and after treatment in two groups

Figure-2 shows a histogram of Ashworth and MMT grading of treatment and control groups. It could be seen from Figures-2A and B that there was no significant difference in the improved Ashworth rating of quadriceps femoris and triceps crus before and after treatment between the two groups (P > 0.05). In the control group, the Ashworth rating of quadriceps femoris and triceps crus improved significantly before and after treatment (P < 0.05). The improvement of Ashworth rating of quadriceps femoris and triceps crus before and after treatment for the treatment group was significant (P < 0.01). There was significant difference in the modified Ashworth grade of quadriceps femoris and triceps calf between the two groups after treatment (P < 0.05). Figures-2C and D show no significant difference in MMT grade between the two groups before treatment (P >

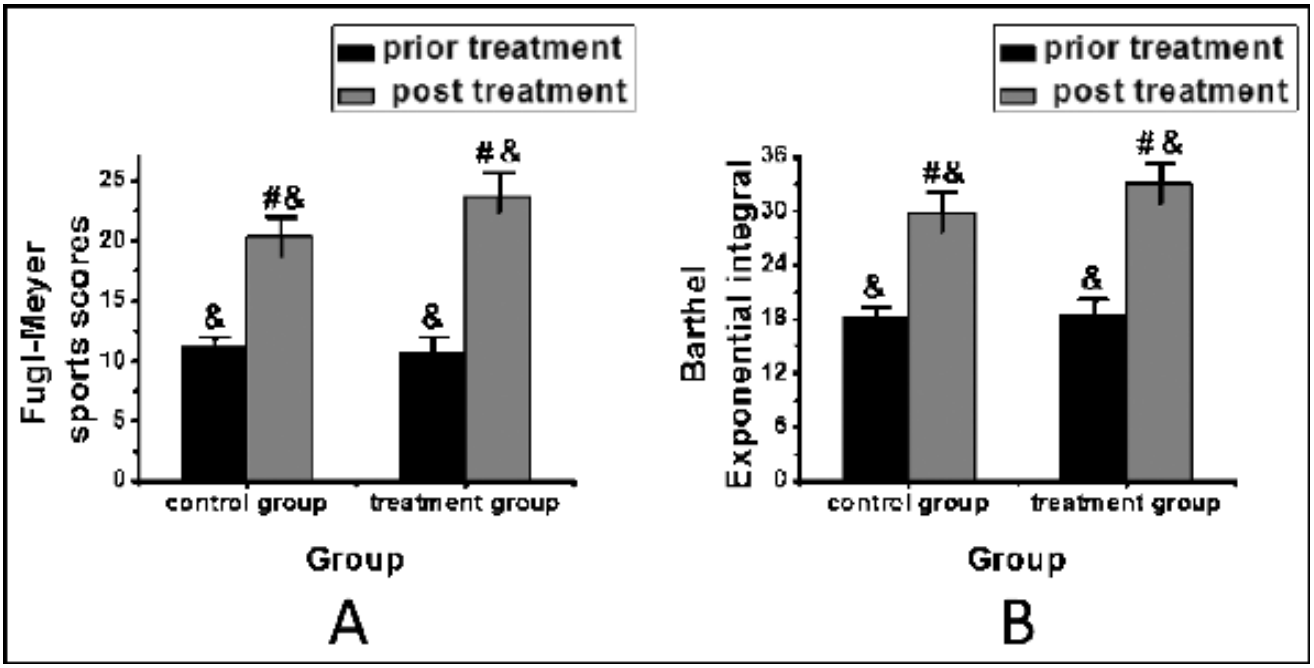

Figure-3: Correlation histogram of Fugl-Meyer and Barthel integrals of lower limbs in patients with knee reflex before and after treatment in two groups (A. Fugl-Meyer motor function score; B. Barthel index score; # indicates the comparison with the control group, and #P<0.05 has statistical significance; & indicates the comparison before and after treatment in the group, and &P<0.01, has statistical significance).

0.05). The MMT grade of quadriceps and hamstrings for the control group was significantly improved before and after treatment (P < 0.01). The MMT grade of quadriceps and hamstrings for the two groups after treatment was significantly different (P < 0.05).

Effect of Fugl-Meyer and Barthel integral on lower limbs of patients with knee reflex before and after treatment in two groups

Figure-3 displays a histogram of Fugl-Meyer and Barthel integrals of treatment and control groups. From the chart, it could be seen that there was no significant difference in Fugl-Meyer motor function and Barthel index score between the two groups before and after treatment (P > 0.05). There were significant differences in the two scores before and after treatment for the control group (P < 0.01). There were significant differences in Fugl-Meyer motor function and Barthel index score between the two groups after treatment (P < 0.01). There was significant difference in index score (P < 0.05). The results of after treatment showed that the Fugl-Meyer motor function and Barthel index scores of hemiplegic lower limbs for the treatment group were better than those for the control group.

Discussion

In recent years, the incidence of stroke has increased significantly. Hemiplegia after stroke is a common complication with long-term adverse consequences. Many studies have shown that comprehensive nursing can be an effective intervention for hemiplegia rehabilitation after stroke. Huang research group explored the effect of comprehensive body position guidance and exercise range training through the educational video of prevention and function improvement of shoulder joint injury in hemiplegia after acute stroke. It is found that in the process of rehabilitation in the hospital of subacute stroke patients, the comprehensive position guidance and exercise through educational video can improve the recovery of hemiplegia patients' movement and limit the shoulder joint injury.[21]

Hemiplegia in the sequelae of stroke belonged to the upper motor neuron paralysis. The patients had abnormal movement patterns such as spasm, abnormal posture, common movement and joint reaction. Because the spinal cord motor cells lost the control of the superior motor center, the reflex activity changed and the muscle tension produced, and the lower primitive reflex reappeared. Therefore, it was necessary not only to treat patients by restoring muscle strength, but also establishing random and coordinated normal movement, breaking the spasm mode, and then promoting the reconstruction of muscle

motor advanced neural control.[22] Otzel et al. proposed that neuromuscular function could be coordinated through rehabilitation training of static and dynamic balance functions of single leg standing position.[23]

In this study, a set of comprehensive rehabilitation training methods for hemiplegia in the sequelae stage of stroke was put forward, which provided a reference for clinical rehabilitation intervention of hemiplegia in the sequelae stage of stroke. There are also studies from other aspects to explore the comprehensive treatment programme,[24,25] such as the impact of psychological intervention and rehabilitation training on patients with acute stroke. In this study, 120 patients with acute stroke were randomly divided into experimental group and control group. Both groups were given corresponding drug treatment, basic medical care and routine care. In addition, the experimental group also increased psychological intervention and comprehensive rehabilitation training. The results showed that early psychological intervention and rehabilitation training could significantly improve the mental health, limb motor function, stress ability and daily life ability of patients with acute stroke.

In the analysis of the changes of knee and ankle angle before and after treatment, it was found that there was a significant difference between the two groups of patients after treatment. This showed that the comprehensive rehabilitation training proposed in this study had a good effect in controlling spasm and improving knee tension. Deschenes et al. proposed that "slope training" was a simple and easy treatment method to improve knee reflexes. It could not only control the spasm of triceps crus for improving contracture, but also train for centripetal contraction, which was consistent with the results of this study.[26]

After treatment, the Ashworth and MMT grading analysis of the patients before and after treatment showed the significant improvement as obtained from Ashworth grading of quadriceps femoris and triceps crus before and after treatment. After treatment of quadriceps and hamstring, there was significant difference in MMT between the two groups. There was significant difference in the satisfaction of pain control or relief methods. Therefore, through this study, it was considered that the exercise of quadriceps, triceps, quadriceps and hamstring muscles had obvious effects on the improvement of knee instability in hemiplegic patients with stroke. Huang et al. pointed out that there was a linear relationship between the improvement of the contraction ability of the cochineal muscle and the recovery of knee joint function, which was consistent with the results of this study.[27] The analysis showed that there were significant differences in the Fugl-Meyer motor function and Barthel Index scores of the two groups after treatment. In which this indicates that the Fugl-Meyer motor function and Barthel Index scores of the lower limbs of the hemiplegic side for the treatment group were better than those for the control group. Poltavskaya et al. proposed that low-frequency electrotherapy could reduce hemiplegic lower extremity spasm and improve lower extremity motor function for the stroke patients.[28] Obviously, this was consistent with the results of this study.

Stroke rehabilitation requires a large team of sustained and coordinated efforts, to achieve the goals. Family, friends, and caregivers as doctors, nurses, physical and occupational therapists, speech pathologists, entertainment therapists, psychologists, camp therapists, social workers and others are helpful who maximize the effectiveness and efficiency of rehabilitation. This may sound expensive but it is an important aspect of stroke care.

Conclusion

In this study, the patients with knee reflexes after stroke were divided into treatment group (comprehensive rehabilitation training) and control group (routine rehabilitation training). The results showed that comprehensive rehabilitation training significantly improved the angle of knee reflexes, the angle of ankle passive back extension, Ashworth and MMT rating of the patients with knee reflexes after stroke, as well as the Fugl-Meyer motor function and Barthel integral index score. The effect of comprehensive rehabilitation nursing on hemiplegia patients after stroke sequelae, the contribution of hemiplegia sequelae treatment by comprehensive rehabilitation nursing after treatment, with reliable clinical treatment of sequelae of stroke is an advantage. However, there are also some shortcomings in the process of this study, such as the small sample size. Therefore, in the later research process, the sample size will be further increased to make the results more valuable for reference.

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