APPLICATION OF FMS AND NIHSS SCORE IN RECOVERY OF LIMB MOTOR FUNCTION OF PATIENTS WITH CEREBRAL INFARCTION

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ABSTRACT

***Objective:** To investigate the application of FMS and NIHSS score in recovery of limb motor function of patients with acute cerebral infarction.*

***Methods:** 90 patients with acute cerebral infarction hospitalized in our department of neurology were continuously collected. All patients were given early rehabilitation and they were divided into a good prognosis group and a poor prognosis group according to the 90d modified Rankin scale (mRS). Patient's limb function was assessed using the simplified Fugl-Meyer scale (FMS) and the National Institutes of Health Stroke Scale (NIHSS). Baseline data, admission, and 90-day NIHSS scores and FMS scores were compared between the two groups. The sensitivity of the two scoring methods to the prediction of limb function recovery was compared according to the postoperative 90-day working characteristic curve (ROC).*

***Results:** A total of 90 patients were included, of which 55 (61.1%) had a good prognosis and 35 (38.9%) had a poor prognosis. The age of the patients in the poor prognosis group (t = 4.450, P = 0.038), diabetes incidence (x 2 = 4.234, P = 0.040), admission NIHSS score (t = 9.173, P = 0.003) and 90d NIHSS score (t = 16.226, P = 0.000) were higher than the prognosis group, 90dFMS score t = 30.792, P = 0.000) lower than the prognosis group. The limb function recovery was predicted using the admission FMS score, admission NIHSS score, 90dFMS score, and 90d NIHSS score.*

***Conclusion:** Early rehabilitation of patients with cerebral infarction has important significance in the recovery of limb motor function. When the NIHSS score was used to predict the recovery of limb function in patients with cerebral infarction, the specificity is significantly better than the FMS score, which has a higher guiding value for the precision assist of patients with cerebral infarction.*

***Keywords:** Acute cerebral infarction, recovery of limb function, NHISS score, FMS score.*

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Introduction

Cerebral infarction has always been one of the main causes of death in our country. According to reports, there are up to 2 million new cases of cerebral infarction in China every year[1]. The high incidence of cerebral infarction, high disability and lethality, cause the patient to suffer physical and mental trauma, and produce serious bad psychology such as anxiety, depression, fear and pessimism, which brings great economic burden to the society and the family[2]. In order to minimize the disability mortality rate, it is necessary to carry out stratified management of patients with cerebral infarction, and to identify high-risk patients early, so as to provide targeted psychological counseling, rehabilitation assistance and continuation assistance, which will have a crucial impact on the long-term prognosis of patients with cerebral infarction.

Previous studies have shown that NIHSS scores and FMS scores are commonly used scoring methods for limb function assessment after cerebral infarction[3], but there are few reports on the effects of the two scores at home and abroad. Therefore, the role of early rehabilitation in the recovery of motor function in patients with cerebral infarction was explore by collecting 90 patients with acute cerebral infarction and according to the patient's 90d prognosis group. The ROC curve was used to evaluate the predictive value of FMS and NIHSS scores in the recovery of limb function in patients with cerebral infarction.

Materials and methods

Research subjects

A total of 90 patients who met the admission criteria of the Department of Neurology, Changzhou Second People's Hospital from January 2014 to January 2018 were enrolled.

According to the patient's 90d modified Rankin Scale (mRS) score, they were divided into two groups for comparative analysis

Inclusion criteria:
- patients with first-episode cerebral infarction aged 18 years or older;
- clear diagnosis of ischemic cerebral infarction with combined limb hemiplegia;
- All patients underwent head MRI after admission, and DWI showed the presence of new-onset lesions, and the new lesions were associated with clinical symptoms;
- Patients enrolled were volunteered to participate in the study.

Exclusion criteria:
- MRI examination revealed old infarction, infarction with hemorrhage or tumor;
- Other central nervous system diseases other than cerebral infarction;
- Patients with missing follow-up or shorter survival after clinical evaluation;
- Others are consistent with the 2001 European Collaborative Exclusion Criteria for Acute Cerebral Infarction.

Methods

General patient data were recorded, including gender, age, hypertension, diabetes, atrial fibrillation, stroke history, and a 90-day modified Rankin Scale (mRS) score. The National Institutes of Health Stroke Scale (NIHSS) score and the simplified Fugl-Meyer Motor Function Rating Scale (FMS) were also recorded at admission and after 90 days.

Assisted intervention methods

Routine assistance includes routine neurological assistance for enrolled patients, including condition support during admission, health education, observation of adverse reactions and complications after treatment, and timely reporting and treatment. After discharge from the hospital, the patient was regularly followed up by telephone, psychological counseling was given, and the knowledge of secondary prevention of cerebral infarction was popularized.

Comprehensive assistance (including rehabilitation assistance+continuation assistance) are as follows[5-7]:
- Help patients and their families correctly understand the process of occurrence, development and prognosis of cerebral infarction, deepen their understanding of cerebral infarction, and help patients to do daily prevention work, such as monitoring blood pressure and blood sugar, controlling blood lipids, quitting smoking and alcohol, light diet and regular medication, strive to reduce the prevalence of cerebral infarction and reduce the economic burden.
- Conduct in-depth communication with patients and their families, observe their inner changes, promptly provide reasonable and scientific psychological counseling, encourage patients to actively cooperate with treatment, and improve their psychological literacy.
- Encourage patients to undergo early rehabilitation, and urge patients to perform simple muscle and joint activity training, language training and swallowing training according to the patient's condition and degree of paralysis, such as suffering from bed surface translation, lifting arms or lifting legs, simple speech dialogue. Then gradually increase the training intensity and duration according to the actual situation of the disease. During the training process, the patient should be actively mobilized to stimulate the recovery of the affected limb, and the patient's confidence and courage need to be increased continuously.
- In the process of rehabilitation treatment, transcranial ultrasound therapy can be further combined to treat hemiplegic limbs, promote the repair of damaged nerves, and observe the recovery of limb function in patients.
- For patients with severe limb function impairment, an effective continuation aid program should be established after discharge. Health education should be conducted through follow-up, and the treatment plan and rehabilitation assistance should be guided to delay the occurrence of complications and reduce the recurrence rate.

Observation index

All patients were assessed for limb function by the National Institutes of Health Stroke Scale (NIHSS) score and the simplified Fugl-Meyer Motor

Function Rating Scale (FMS) score at admission and 90 days after discharge. The 90d modified Rankin scale (mRS) score was used as the prognosis. The prognosis was good: the mRS score was 0~2, and the prognosis was poor: the mRS score was 3-6.

Statistical method

The data were analyzed by SPSS18.0 statistical software. The measurement data were expressed by(x^-±s), and the comparison between groups was performed by independent sample t test. The count data is expressed as a percentage, and the comparison between groups is performed by the x^2 test. The ROC curve was used to evaluate the value of FMS and NIHSS scores in evaluating the long-term prognosis of patients with cerebral infarction. The area under the curve was used to evaluate and compare the prognostic value of the two scoring methods for patients with cerebral infarction. All tests were statistically significant at P< 0.05.

Results

Comparison of prognosis after adjuvant intervention

According to the inclusion criteria and exclusion criteria, 90 patients with acute cerebral infarction were included.

There were 55 patients (61.1%) with a good prognosis group (mRS≤2 points) and 35 patients (38.9%) with a poor prognosis group (mRS>2 points). Patients with poor prognosis were older (t=4.450, P=0.038), more patients with diabetes (x2 =4.234, P=0.040), and NIHSS scores at admission (t=9.173, P=0.003). And 90dNIHSS score (t=16.226, P=0.000) was higher, 90dFMS score t=30.792, P=0.000) was lower. There were no significant differences in gender, hypertension, atrial fibrillation, and stroke history (P > 0.05). The results are shown in table 1.

The value of two scoring methods for prognosis of patients with cerebral infarction

According to the scores of patients at different time points and clinical outcome data, this paper analyzed the ROC curve and the area under the observation curve to analyze the reliability of the two models of FMS and NHISS scores in predicting the prognosis of patients with cerebral infarction within 90 days. At the time of admission, the area under the ROC curve (95% CI) predicting the prognosis of patients with cerebral infarction within 90 days was

FMS score 0.669 (0.552~0.786) and NIHSS score 0.891 (0.810~0.971), both P<0.05. Among them, the largest area under the curve is the baseline NIHSS score. The results are shown in Table 2.

Factor	mRS≤2 (n=55)	mRS>2 (n=35)	Test value	P value
Age (x^-±s, years old)	63.4±8.5	72.9±6.2	4.450[a]	0.038
Male [n (%)]	24 (43.6)	15 (42.9)	0.005	0.942
Hypertension [n (%)]	42 (76.4)	30 (85.7)	1.169	0.280
Diabetes [n (%)]	40 (72.7)	18 (51.4)	4.234	0.040
History of atrial fibrillation [n (%)]	7 (12.7)	8 (22.9)	1.580	0.209
Stroke history [n (%)]	13 (23.6)	10 (28.6)	0.274	0.601
Admission NIHSS score (x^-±s, score)	7.7±2.6	14.1±4.6	9.173[a]	0.003
90dNIHSS score (x^-±s, score)	1.4±2.1	7.8±4.5	16.226[a]	0.000
Admission FMS score (x^-±s, score)	81.0±12.1	71.5±18.9	1.456[a]	0.231
90dFMS score (x^-±s, score)	98.0±4.2	76.2±29.0	30.792[a]	0.000

Table 1: [a]is the value of t and the rest is the value of χ^2.

Scoring method	Area under the curve	95%CI	P value
Admission FMS score	0.669	0.552~0.786	0.007
Baseline NIHSS score	0.891	0.810~0.971	0.000

Table 2: Comparison of two kinds of scoring systems in predicting long-term prognosis of patients with cerebral infarction.

The area under the ROC curve (95% CI) predicting the prognosis of patients with cerebral infarction after 90 days was FMS score 0.910 (0.837~0.983) and NIHSS score 0.914 (0.851~0.978), P<0.05. Among them, the area under the curve is still the baseline NIHSS score. The results are shown in Table 3.

Scoring method	Area under the curve	95%CI	P value
90dFMS score	0.910	0.837~0.983	0.000
90dNIHSS score	0.914	0.851~0.978	0.000

Table 3: Comparison of two kinds of scoring systems after 90d to predict the long-term prognosis of patients with cerebral infarction.

Discussion

Acute cerebral infarction continues to threaten human health, and its high morbidity and disability mortality rate pose a serious economic burden on society and families. Patients with cerebral infarc-

tion are often associated with limb motor dysfunction, if they can be stratified by FMS score or NIHSS score at an early stage, and identify high-risk patients. Then carry out refined management, use different auxiliary interventions, establish a targeted auxiliary mode, extend the auxiliary content, and ensure the continuity of rehabilitation assistance from the hospital to the family. This will certainly help improve the quality of life of patients and improve the long-term prognosis of patients.

In this paper, 90 patients with cerebral infarction were included. According to the prognosis of 90 days, they were divided into a good prognosis group and a poor prognosis group. By comparison, we found that patients with poor prognosis had more diabetic patients and were older, with higher NIHSS scores and 90dNIHSS scores, and lower FMS scores, which is consistent with previous studies[8]. In the acute phase of cerebral infarction, the main purpose is to save the ischemic penumbra and prevent the infarct from expanding. If the patient is older and has higher blood sugar, the collateral circulation compensation is worse, the lactic acid in the ischemic brain tissue will increase, and the infarct size will increase, and the long-term prognosis is poor[9].

Although we could not interfere with the risk factor of age, for diabetic patients, we can improve the prognosis by monitoring blood sugar, conducting health education, and strengthening diet control and drug intervention to lower blood sugar. Previous studies have shown that NIHSS scores and FMS scores are an assessment of neurological impairment in patients with cerebral infarction. The higher the NIHSS score, the lower the FMS score, suggesting that the more severe the neurological impairment, the worse the long-term prognosis[10,11]. Therefore, we should provide rehabilitation exercises for such patients as soon as possible, encourage patients to perform joint and language training in the early stage, and provide psychological counseling, care, and provide a comprehensive continuation aid to patients during hospitalization to ensure patients from the hospital. The coherence of rehabilitation assistance to the home allows the patient to resume limb movement as soon as possible[12-14].

The NIHSS score is often used at home and abroad to evaluate the prognosis of patients with cerebral infarction. It has been reported that a NIHSS score of ≥16 indicates a higher mortality and morbidity rate, and patients with a NIHSS score of ≤6 have a better prognosis[8,15]. The predictive value of FMS score on the prognosis of patients with cerebral infarction is rarely studied at home and abroad, and the comparative study of the two methods is rare. This study compared the sensitivity and specificity of patients with a 90-day prognosis by comparing the two scoring methods.

We found that the area under the ROC curve of the FMS score and the NHISS score were both greater than 0.5, and the difference was statistically significant, suggesting that both methods have value in evaluating the prognosis of patients with cerebral infarction. Comparing the two methods, the area under the ROC curve for admission and 90d NIHSS scores was larger than the admission and 90dFMS scores, indicating that the NIHSS score is superior to the FMS score, which may be related to the assessment of limb motor function with the FMS score. The NIHSS score includes both physical motor function assessment, speech function, swallowing function, and sensory function, which is more comprehensive than the FMS score.

In summary, for the prognosis of patients with acute cerebral infarction, we can use the NIHSS score to stratify and screen out high-risk groups for refined management. The use of routine assisted combined rehabilitation and continuation aids to restore the patient's daily living ability as soon as possible, improve the patient's self-confidence, mobilize the patient's subjective initiative, and ultimately reduce the burden on patients and families.

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