Prognostic Evaluation and Rehabilitation Treatment of Intracerebral Hemorrhage and Falls

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Abstract: Intracerebral hemorrhage and falls are common central nervous system injuries that seriously affect the quality of life of patients. Intracerebral hemorrhage can cause an increase in intracerebral pressure, affecting the circulation of brain tissue and cerebrospinal fluid, and even leading to the formation of cerebral herniation. However, falls can cause various neurological impairments such as consciousness disorders, limb movement disorders, and language impairments in patients. Therefore, it is crucial to evaluate the prognosis of patients with intracerebral hemorrhage and falls. Starting from the perspective of falls, through research on the data of fall patients in a certain hospital, it was found that the proportion of fall patients over the age of 50 was as high as 66.7%. As one ages, the damage caused by falls becomes more severe. Therefore, the prognosis evaluation and rehabilitation treatment of falls are increasingly important topics. In the rehabilitation treatment of patients with intracerebral hemorrhage, a univariate analysis of risk factors during the treatment period was conducted. Through analysis and comparison between the patient group and the rehabilitation group, significant differences in gender, history of hypertension, history of ischemic stroke, and collateral circulation (P < 0.05) were found to indirectly or directly affect the stability of the patient's condition. A summary was made on the rehabilitation treatment of patients with intracerebral hemorrhage and falls, including rehabilitation treatment for acute symptoms, physical signs, consciousness status, etc., and recommendations were made for the prevention and improvement of complications.

Keywords: Intracerebral Hemorrhage; Falling Injury; Prognostic Evaluation; Rehabilitation Therapy; Risk Assessment of Complications

1. Introduction

Intracerebral hemorrhage (ICH) refers to arterial bleeding within the brain parenchyma caused by various reasons, accounting for approximately 10% to 20% of all cerebrovascular diseases. After cerebral hemorrhage, the brain tissue is compressed and edematous, and the bleeding and metabolic products directly stimulate the nerve tissue, causing an increase in intracerebral pressure, which affects the circulation of brain tissue and cerebrospinal fluid, leading to severe intracerebral infection, formation of intracerebral hematoma, and formation of cerebral hernia. Its incidence rate is about 5/100000-30/100000 people. It is estimated that there are 100000 ICH patients in China every year, of which about 70% are patients with cerebral hemorrhage. ICH has a higher disability and mortality rate compared to other cerebrovascular diseases. Falling injury refers to injuries caused by various reasons such as falls, falls, etc., as well as injuries caused by car accidents, falls from heights, etc. Falls can lead to serious complications, including fractures, cerebrospinal fluid leakage, intracerebral hematoma formation, and infection, among which intracerebral hematoma formation is the most serious complication of falls.

2. Related Work

A study conducted in the United States on the relationship between falls and intracerebral hemorrhage found that 20% to 40% of ICH patients experience falls. Among people under the age of 30, about 35% to 60% of those who experience ICH would experience falls. Both ICH and fall injury patients have varying degrees of sequelae, and both can have a serious impact on the patient's quality of life.

How to effectively predict the occurrence, prognosis, and mortality of complications in ICH patients and fall injury patients is of great significance for preventing and improving complications in

ICH patients. The commonly used prognostic assessment methods in clinical practice currently include Krause, Patricia's multidisciplinary scoring system for improving clinical nursing in both motor and non motor aspects [1], and Virhammar, Johan's neurological deficit severity scoring system in the study of cerebrospinal fluid and central nervous system injury [2]. Ramspek and Chava L also conducted external validation of the prognostic evaluation model, elaborating on the relevant issues of "what, why, how, when, and where" [3].

3. Prognostic Evaluation of Intracerebral Hemorrhage

Intracerebral hemorrhage is a common neurological disorder with high mortality and disability rates. For the prognosis evaluation of patients with intracerebral hemorrhage, various factors need to be considered, such as bleeding volume, coagulation function, hematoma volume, vascular spasm, infection, etc. [4]. The commonly used prognostic assessment methods in clinical practice currently include CT (Computed Tomography) perfusion imaging, Computed Tomography Angiography (CTA), MRI (Magnetic Resolution Imaging) examination, neurological function assessment, neuroimaging examination, etc. [5].

CT perfusion imaging is a commonly used examination method, which can reflect the edema of brain tissue in patients with intracerebral hemorrhage, and edema can reflect the severity of intracerebral hemorrhage. At present, CT perfusion imaging commonly used in clinical practice is biphasic, namely acute phase and chronic phase. The acute phase examination mainly includes single and multiple CTAs, while the chronic phase mainly includes CTA and MRI examinations. The treatment effect of patients with intracerebral hemorrhage is closely related to their clinical prognosis, so it is necessary to conduct accurate prognostic evaluation of patients in clinical practice [6]. At present, CT perfusion imaging can evaluate the intracerebral hemorrhage of patients from multiple perspectives, including bleeding volume, coagulation function, intracerebral pressure, and vascular spasm [7]. However, these factors cannot fully reflect the severity of the patient's condition and prognosis, as shown in Figure 1, which is the detection device system diagram of CT perfusion imaging. Figure 2 shows CT images at different doses.



Figure 1: System diagram of the detection device for CT perfusion imaging



Figure 2: Images under different doses of CT

In Figure 2, the left side shows CT images at low doses, and the right side shows high-dose CT images. In current CT equipment, low-dose CT may result in low scan image quality and may not meet clinical requirements. Therefore, in specific implementation and use, it is necessary to ensure that high-dose CT is used to produce images that comply with observation standards.

Although CT angiography can visually evaluate the condition of intracerebral hemorrhage in patients, its clinical application is limited due to its high examination cost and susceptibility to patient cooperation [8]. CTA can better evaluate the severity of intracerebral hemorrhage, coagulation function, and degree of vascular spasm in patients during the acute phase; MRI can be used to evaluate lesion volume and cerebral tissue ischemia. Therefore, different methods should be adopted depending on the situation when evaluating the prognosis of specific intracerebral hemorrhage.

4. Rehabilitation Treatment for Intracerebral Hemorrhage

Rehabilitation therapy is a series of comprehensive treatments for patients in the acute phase, aimed at improving their functional impairment, improving their quality of life, preventing complications, and reducing mortality. For patients in the acute phase, rehabilitation treatment should be carried out as early as possible [9]. Patients in the acute phase usually experience various neurological impairments such as consciousness disorders, motor dysfunction, sensory disorders, and cognitive impairment. Therefore, rehabilitation treatment should be selected based on the degree of neurological deficits in patients. The rehabilitation treatment after the acute phase mainly includes exercise training, cognitive training, swallowing training, etc. For patients with motor and cognitive impairments, rehabilitation therapy can include training in upper limb movement, lower limb movement, balance ability, gait, and other aspects. For patients with swallowing disorders, treatment can be achieved through nasal feeding or oral feeding. In addition, efforts should be made to actively carry out hyperbaric oxygen chamber treatment and rehabilitation nursing [10].

This article explores the rehabilitation treatment process of ICH patients, and analyzes the pathological factors during the rehabilitation treatment process of 628 ICH patients. Among them, 80 patients have already recovered, and a univariate analysis of ICH risk factors is obtained as shown in Table 1.

| Variable | Rehabilitation treatment | Rehabilitation group | P (probability) |
|--------------------------|--------------------------|----------------------|-----------------|
| | group (n=548) | (n=80) | |
| Age | 68±6 | 67±8 | 0.546 |
| (years, $x \pm s$) | | | |
| Gender(χ /%) | | | 0.002 |
| Male | 468(85.4) | 56(70) | |
| Female | 80(14.6) | 24(30) | |
| History of | 367(67.0) | 32(40.0) | 0.024 |
| hypertension(χ /%) | | | |
| BMI(kg/ m^2) | | | |
| History of ischemic | 102(18.6) | 17(21.2) | 0.015 |
| stroke | | | |
| Collateral circulation | | | < 0.001 |
| (X /%) | | | |
| Not hava | 249(45.43) | 26(32.5) | |
| Level 1 collateral | 236(43.07) | 35(43.75) | |
| compensation | | | |
| Level 2 collateral | 63(11.5) | 19(23.75) | |
| compensation | | | |

| Table 1: Univariate analysis of risk factors during ICH rehabilitation th | erapy |
|---|-------|
|---|-------|

Univariate analysis shows that there are significant differences in gender (P<0.05), history of hypertension (P<0.05), history of ischemic stroke (P<0.05), and collateral circulation (P<0.05) between the ICH group and the non ICH group, which indirectly or directly affects the stable state of ICH patients. Therefore, it is necessary to develop corresponding rehabilitation treatment plans, as follows:

① Sports training: It includes upper limb movement, lower limb movement, and balance training to reduce contractures and spasms in the upper and lower limb joints. The training methods include

squatting, sitting balance exercises, bed and seat balance training, standing and walking training, etc.

2 Neuromuscular electrical stimulation therapy: It induces neuromuscular excitability through electrical stimulation, thereby promoting the recovery of neurological function in patients.

3 Cognitive rehabilitation: It is mainly targeted at patients with cognitive impairment for rehabilitation treatment, mainly including attention training, memory training, working memory training, etc.

④ Treatment of swallowing disorders: It includes nasal feeding, oral feeding, and hyperbaric oxygen chamber treatment.

⁽⁵⁾ Physical factor therapy: It includes ultrasound therapy, massage therapy, electrotherapy, etc., to promote nerve function recovery and improve joint mobility.

Moreover, patients should receive rehabilitation care within 24 hours after admission and undergo hyperbaric oxygen chamber treatment as early as possible, which is an important rehabilitation measure after intracerebral hemorrhage. During the process of hyperbaric oxygen chamber treatment, medical staff should provide corresponding care to patients. Specifically, it includes:

(1) Correctly evaluating the patient and promptly handling any abnormal situations

(2) Before treatment with a hyperbaric oxygen chamber, the purpose and precautions of the hyperbaric oxygen chamber should be explained to the patient and their family members, and they should be monitored by their family members.

(3) Psychological care and communication for patients are strengthened to alleviate their fear and inform their families to closely observe changes in the patient's condition during hyperbaric oxygen chamber treatment. If there is any discomfort, medical staff should be informed in a timely manner.

(4) The changes in the patient's body temperature, pulse, breathing, blood pressure, pupils, and consciousness state are closely observed.

(5) According to the patient's condition and individual differences, corresponding rehabilitation nursing measures are given. For patients with skin damage, skin care should be given; for patients with osteoporosis or joint stiffness, joint function exercise should be given; for patients with swallowing disorders, nasal feeding or oral feeding should be given for treatment.

5. Prognostic Assessment of Falls

This article explored the data of falls in a certain hospital and collected a total of 1300 trauma patients, including 712 males, accounting for 54.77%, and 588 females, accounting for 45.23%. The age range of the research data was from 0 to 89 years old, with 145 cases under 21 years old (11.15%), 62 cases between 21 and 35 years old (4.77%), 226 cases between 36 and 50 years old (17.38%), 412 cases between 51 and 65 years old (31.7%), and 455 cases over 65 years old (35.0%). Elderly people made up the majority and were at high risk of accidental falls, as shown in Figure 3.





Therefore, based on the collected data, it can be analyzed that the probability and number of falls

among elderly people were much higher than those among young people. The probability of falling injuries increased to some extent with age. Correspondingly, as people age, their bodily functions also decrease accordingly. Therefore, falls can cause higher levels of injury and harm as people age [11].

These injuries often lead to a decrease in the patient's daily living ability, which in turn affects their quality of life [12]. Therefore, in clinical practice, prognostic evaluation of patients is very important. At present, there are several commonly used prognostic evaluation methods in clinical practice:

① Consciousness state: It refers to whether the patient is conscious or unconscious. Most scholars believe that the state of consciousness is a key factor in prognostic assessment, as it can reflect the degree of neurological damage and functional recovery in patients. The commonly used prognostic assessment methods in clinical practice currently include SVR (support vector regression) (that is, Barthel index) and ABI (Ankle Brachial index) (that is, Glasgow score). SVR is currently a commonly used prognostic evaluation method, which can be used to evaluate the patient's consciousness state and functional recovery, but its sensitivity and specificity are not ideal.

⁽²⁾ Encephalopathy score (SE): SE refers to a quantitative indicator of the degree of brainstem dysfunction, usually measured using electroencephalography (EEG) and cranial CT. This scoring method is relatively objective and widely used, but its sensitivity and specificity are not ideal.

③ Glasgow Coma Scale (GCS): This scale is a simple, accurate, and easily accepted prognostic assessment method developed by the University of Glasgow in the United Kingdom. GCTS objectively, quickly, and effectively evaluates the clinical manifestations of patients, and distinguishes their prognosis with a score of 0-4. Although the scale is simple and easy to use, its accuracy and specificity are not ideal.

④ Neurological dysfunction score: This scoring system is an evaluation method based on consciousness and non-invasive neurological function testing results, mainly used to determine the prognosis of patients and the selection of subsequent rehabilitation treatment plans.

6. Rehabilitation Treatment for Falls

Intracerebral hemorrhage and falls are common intracerebral diseases that seriously affect the quality of life of patients. Due to consciousness disorders, limb dysfunction, and language dysfunction being the most common complications, rehabilitation treatment is essential. According to the American Association of Neurosurgeons (AANS) standards, rehabilitation treatment should be initiated as soon as possible after intracerebral hemorrhage and falls. If rehabilitation treatment is not received for more than 12 hours, subsequent rehabilitation treatment should be carried out [13].

① Positioning: First, the correct positioning method is chosen based on the patient's awareness and functional status. Positioning principle: The patient is placed in a supine position; the head is tilted to one side to prevent aspiration; the head is turned to one side to prevent tongue sagging and vomiting; the affected lower limb is straightened and the affected hip is flexed; the normal range of motion of the joints is maintained.

⁽²⁾ Functional exercise: Patients with intracerebral hemorrhage and falls have varying degrees of motor dysfunction. During the acute phase, attention should be paid to strengthening muscle strength, flexibility, and coordination training to promote the recovery of neurological function. The order of upper limb rehabilitation exercise is: fingers shoulder elbow shoulder wrist trunk lower limbs. The order of lower limb rehabilitation exercise is: heel on the ground, foot on the ground, foot sagging, and heel lifting. In addition, personalized training programs should be developed based on the patient's age and physical condition [14].

③ Language rehabilitation: Language is one of the most important communication tools for humans and a key factor in understanding information. Patients with intracerebral hemorrhage and falls may have varying degrees of language dysfunction during the acute phase, which may be related to various complications such as consciousness disorders, limb dysfunction, and swallowing difficulties. Therefore, attention should be paid to training the patient's language function during rehabilitation treatment. In addition to daily life activity training, attention should also be paid to training patients in pronunciation and mouth shape, communication and interpersonal skills, and improving their self-care abilities. Common rehabilitation methods include: imitating mouth shape and changes in mouth shape during pronunciation; learning new vocabulary through text, graphics, and gestures; listening to the command pronunciation. For example, when saying "open the door", it indicates with fingers whether

the door is open or closed.

④ Cognitive function training: In patients with cognitive impairment after cerebral concussion, functional imaging examination results show problems such as motor disorders, perceptual disorders, lack of concentration, and decreased memory. Therefore, the focus of cognitive rehabilitation therapy is to improve the cognitive function of patients. The commonly used cognitive rehabilitation methods currently include: verbal communication: targeted language communication training based on the patient's actual situation. Daily living activity training: Patients' self-care ability is improved through education and training. Memory training: the patient's memory is improved through education and training. Cognitive behavioral therapy: Patients are helped to improve their cognitive behavior through education and training. Rehabilitation engineering technology: Rehabilitation techniques such as electrical stimulation are used to help patients improve their cognitive function. In addition, attention should also be paid to avoiding language dysfunction caused by learning difficulties after brain injury.

⁽⁵⁾ Exercise therapy: For patients with obvious limb dysfunction or severe limb hemiplegia, and obvious symptoms of brain injury, active exercise therapy should be carried out to promote the recovery of limb function.

7. Integration of Prognostic Assessment and Rehabilitation Treatment

The significance of clinical rehabilitation treatment for patients with intracerebral hemorrhage and falls should not only focus on the disease itself, but also pay attention to preventing and improving complications. Firstly, it is important to actively manage intracerebral hemorrhage and control intracerebral pressure during the acute phase to avoid the formation of cerebral hemorrhage and control, it is necessary to actively engage in rehabilitation treatment, including early functional exercise, prevention of complications, and improvement of patients' cognitive and social functions. However, there are shortcomings in current rehabilitation treatment. For example, rehabilitation treatment only focuses on aspects such as consciousness disorders, limb movement disorders, and language dysfunction, and does not involve the recovery of cognitive function and self-care ability. Moreover, current evaluations of patients mostly use a single evaluation indicator, which is difficult to reflect the overall condition of patients [15]. Therefore, it is necessary to conduct a comprehensive evaluation of different indicators.

8. Conclusions

Prognostic assessment is a very important issue in clinical practice, which requires a comprehensive and systematic evaluation of patients to determine the optimal treatment plan. There are many commonly used prognostic assessment methods in clinical practice, such as Glasgow Coma Scale, Activities of Daily Living, and Neurological Deficiency Scale. Among these ratings, the Glasgow Coma Scale is more popular among people. However, compared to the Glasgow Coma Scale, other prognostic assessment methods have certain limitations, such as the inability to accurately reflect the patient's cognitive function. There is currently no recognized standard to distinguish the difference between cognitive function and consciousness disorders. In addition, some commonly used prognostic assessment tools in clinical practice often cannot be used alone, but need to be used comprehensively to achieve better results. Therefore, for patients with intracerebral hemorrhage and falls, a complete, comprehensive, and accurate prognostic evaluation method is very important. In addition to prognostic assessment methods, rehabilitation treatment for patients with intracerebral hemorrhage and falls is also crucial. Rehabilitation therapy is of great significance in improving patients with acute neurological deficits, shortening hospital stay, improving their quality of life, and reducing the incidence of complications. Therefore, rehabilitation treatment should be integrated throughout the entire medical process. In clinical practice, it is necessary to continuously summarize experience, fully consider the different problems faced by patients in different situations, and take effective measures to improve patient prognosis.

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