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Research Progress of Lateral Space Neglect after Stroke

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Abstract

Unilateral spatial neglect (USN) is a common cognitive impairment after stroke. Patients cannot respond correctly to spatial stimuli from the opposite side of the damaged hemisphere, resulting in varying degrees of disturbances in their sensory and balance functions. The patient's self-care ability and prognosis have a serious impact, and effective intervention and treatment for USN has become an urgent issue. In recent years, many researchers have studied the rehabilitation measures of USN, but they have not been classified. Therefore, this study takes patients with unilateral spatial neglect after stroke as the research object, and summarizes the related research on the treatment of unilateral spatial neglect after stroke, mainly from an overview of its clinical manifestations, and categorizes rehabilitation interventions according to the theoretical basis of UN , including acupuncture therapy, acupoint massage, cupping therapy, Taijiquan and modern western medicine rehabilitation therapy to review the progress of unilateral spatial neglect treatment after stroke.

Keywords

Stroke, unilateral spatial neglect, therapeutic progress, clinical application

Stroke is a group of acute cerebrovascular diseases with focal neurological deficits as a common feature. Stroke is characterized by high incidence, high mortality, and low quality of patient survival after the disease, and is a major chronic noncommunicable disease affecting human life and health in our time [1]. Unilateral spatial neglect (USN), the most common form of stroke, is the inability to notice auditory, visual, and tactile stimuli on the side of the lesion after brain injury, causing all activities to be skewed to the side of the brain injury, even when the visual field is intact. and the patient will unconsciously compensate by driving the eyes with head rotation [3]; USN patients are not hemianopsia, loss of hearing on one side, loss of sensation on the other side, or hemiparesis, but a special type due to hemispheric injury [4], which is one of the common clinical syndromes in patients with brain injury. It not only seriously affects the quality of life of patients, but also increases the social burden and economic burden. At present, some scholars have conducted research on a variety of modern rehabilitation treatment measures, and in recent years, with the national emphasis on Chinese medicine, the advantages of Chinese medicine treatment are gradually reflected. This paper mainly reviews the research progress of Chinese medicine treatment of unilateral neglect after stroke, and provides reference for clinical work.

1. Awareness of etiology and pathogenesis

Modern medicine usually classifies it as a post-stroke syndrome. In ancient Chinese medicine, unilateral spatial neglect can be classified as "stroke dystrophy" in Chinese medicine. Although the disease is located in the brain, it

is closely related to the dysfunction of heart, spleen, kidney and other internal organs. From the pathogenesis of TCM, unilateral neglect is the result of the disharmony of the relationship between the brain and the internal organs and the limbs, i.e., the gods do not control the shape, cannot hold things, the gods and shapes are not in harmony, the qi and blood are not in harmony, and the key pathological change is "the orifice is closed and the gods are hidden" due to stroke [5]. According to traditional medicine, the brain is known as the "house of the spirit" and the "sea of medulla", and has the functions of dominating the spirit, consciousness and thinking activities, and the brain is connected to all limbs and bones of the body through meridians. After a stroke, the brain is closed to the mind, and the mind does not guide the qi, which leads to the blockage of the meridians and internal organs, and the malfunction of the internal and external organs, resulting in unilateral spatial neglect.

2. Traditional Chinese Medicine

2.1 Acupuncture therapy

By stimulating the cerebral cortex and motor neurons, the excitability of nerve cells is increased, thus achieving the effect of tensing or relaxing the muscles. The basic principle of TCM treatment of diseases is evidence-based treatment, so there is no unified and systematic program of traditional acupuncture therapy for unilateral neglect.

2.1.1 Head acupuncture

Head acupuncture is developed based on the traditional acupuncture theory of visceral meridians and acupoints, combined with the neuroanatomical theory of cortical function localization and biological holographic theory [6]. Several meridians of the human body (especially the Yang meridian) are directly connected to the head, and the meridian qi is injected up to the head through the meridian system, which dominates various vital activities of the human body. Head acupuncture treatment is to stimulate the acupoints or treatment areas of the cerebral cortex in the corresponding projection areas of the scalp through needles, activate peripheral receptors, continuously transmit acupuncture information to the central nerve, excite central nerve cells, and promote the re-establishment of interrupted neural pathways to achieve the purpose of adjusting meridians, opening and awakening, which has good efficacy for some brain-derived diseases, and is currently used in cerebral infarction, insomnia, migraine and other neurological diseases with widely used [7-9]. In the treatment of cognitive disorders in traditional medicine, acupuncture points closely related to cognitive functions (such as attention, memory, and thinking) in the anterior parieto-temporal oblique line (anterior parietal point to hanging point), posterior parieto-temporal oblique line (Baihui point to Qu temporal point), and middle frontal line (Shenting point 1 inch down) are mainly selected for head acupuncture treatment using the three-stage succussion method [10]. Acupuncture of the anterior parietotemporal oblique line and posterior parietotemporal oblique line can alleviate central motor and sensory deficits in the contralateral limb and improve USN, which in turn improves cognitive function [11]. The results of some studies showed [12-14] that cephalometric acupuncture can effectively improve cognitive function and the degree of neglect of the affected space in patients with unilateral spatial neglect.

2.1.2 Body acupuncture

Body acupuncture acts on the skin, muscles, nerves and other tissues, and transmits the stimulation to the brain through the nerve pathways to cause excitation of the corresponding brain tissues, thus restoring the brain function [15]. Body acupuncture points were selected mainly for the Governor's meridian (Baihui and Shuigou), the foot Shaoyang meridian (Fengchi, Hangzhong, Yanglingquan, and Guangming), the foot Yangming meridian (Foot Sanli and Fenglong), and the hand Conjunctive Yin meridian (Neiguan and Quze), with flat tonification and flat diarrhea to increase sensory input and induce muscle tone on the affected side. The two points of Nei Guan and Qu Ze can calm the mind and tranquilize the spirit, which is hidden in the heart, and if the mind and brain are treated together, the spirit will be at home. The point is used to open the orifices, so that the orifices can be cleared, the Shen Qi can be reached, and the inner and outer areas can be cleared [11].

2.2 Acupoint massage

Acupressure in Chinese medicine has the function of warming the meridians, invigorating the blood and helping to dispel the evil. Acupoint massage is to stimulate specific acupuncture points with appropriate techniques, according to the principle of TCM to benefit qi, invigorate blood, and help correctness and dispel evil, and flexibly use complementary and diaphoretic techniques to massage acupuncture points with gentle force along the route of the affected meridians and the direction of qi and blood flow, so as to harmonize the meridians and dredge qi and blood through the conduction of meridians, to achieve the purpose of facilitating the meridians and helping cor-

rectness and improving the motor function of the limbs of patients with stroke hemiplegia [16]. One researcher [17] performed acupressure on patients based on the theory of Chinese medicine Shen Ming. The patient was asked to take a comfortable position, breathe well, relax the muscles of the whole body, and stabilize the emotion; the acupoints of Shenmen, Taixi, and Baihui, which have the effect of awakening the brain and opening the body, were selected and massaged by point pressing or kneading or pushing with one finger meditation. The results showed that this method could better improve the cognitive function and enhance the daily living ability of USN patients.

2.3 Cupping therapy

Cupping is to use the jar as a tool, using combustion, suction, steam and other methods to cause negative pressure in the jar, so that the jar adsorbed in acupuncture points or certain parts of the body surface, in order to produce benign stimulation, to adjust the body function, prevention and treatment of disease purposes. In the early stage of rehabilitation treatment, traditional Chinese medicine meridian stimulation technology through the dredging of meridians, adjusting the internal organs will play a role in both overall and local treatment. Compared with traditional bamboo cans, silicone cans can generate negative pressure by self-pressure, which is safe; moreover, silicone cans are soft, and the limbs can move freely after adsorption and can be applied to various parts, etc. As a physical therapy, it is favored because of its safety and effectiveness. A study [18] showed that colored silicone jars combined with exercise therapy for post-stroke hemianopia could improve the patient's neglect and promote the patient's motor function, thus promoting the patient's ability to perform activities of daily living. The theoretical basis of the colored silicone jar is color visual feedback, complex proprioceptive stimulation and the Chinese medicine theory of "treating impotence by taking only Yangming" [19]. On the one hand, the colored silicone jar improves the patient's recognition of the lateral neglected limb by stimulating the proprioceptive sensation of the affected limb through negative pressure; on the other hand, the colored silicone jar is brightly colored, with red, yellow and blue colors available, and the visual stimulation of bright colors improves the patient's recognition of the lateral neglected limb. This intervention method is beneficial to the rehabilitation process of the neglected limb in USN patients, and the overall effect is significantly better than traditional coercive therapy.

2.4 Taijiquan

Taijiquan is a medium-intensity, mind-body unity training. Taijiquan has the characteristics of light, soft, quiet and slow movement. When exercising, the blood pressure and blood flow of the practitioner are relatively stable, which helps to reduce the peripheral resistance of blood vessels, thus increasing the effective blood perfusion of tissues and organs. In particular, the improvement of microcirculation of brain cells not only accelerates metabolism, but also increases the amount of capillary opening, allowing muscle tissue and brain tissue to take in more nutrients and oxygen, and aging nerve cells to be renewed and repaired. Taijiquan has a positive effect on the body's recuperation and rehabilitation. Taijiquan exerts a good influence on the central nervous system through uniform deep breathing and diaphragmatic movements, as well as the need for mental concentration, mindfulness and guidance with intention [20]. A study [21] combined the movement characteristics of taijiquan to develop a set of taijiquan interventions suitable for patients with unilateral neglect and observed the clinical efficacy, and the results showed that using the 24 simple taijiquan styles of "left and right wild horse splitting mane," "left and right knee brace and stance" The results showed that the rehabilitation treatment was more effective by using five movements of 24 simple taijiquan, namely, "left and right wild horse splitting mane", "left and right knee brace and stance", "cloud hand", "left sparrow tail" and "single whip". The method is simple.

3. Modern rehabilitation therapy

Azouvi, P. et al. [22], in an evidence-based medicine-based unilateral neglect rehabilitation study, proposed that USN rehabilitation methods can be divided into the following categories according to their theoretical basis: (1) Enhancement of rehabilitation through top-down mechanisms Ignore behavioral awareness; (2) bottom-up low-level sensory stimulation; (3) modulate inhibitory processes and increase arousal.

3.1 A top-down approach to recovery

The main purpose is to increase the patient's awareness of spatial neglect behavior and make patients personally aware of their disability, with the goal of changing the underlying cognitive impairment.

3.1.1 Visual Scanning Training (VST)

VST guides visual relocation to the neglected side by giving visual stimuli [23], including visual motion tracking

and scanning reading training. During the eye tracking training, the patient's vision should move left and right and up and down according to the thumb of the rehabilitation therapist. As the difficulty increases, the speed and direction of the movement will also change at any time, thereby exciting the relevant areas of the brain, so the eye tracking training is to a certain extent. It can activate the functions of the cerebellum, brain stem and cerebral cortex, help restore nerve conduction pathways, and improve the cognitive ability of patients [24]. During the scanning reading training, the therapist sits on the neglected side of the patient and gives instructions to encourage the patient to turn the eye to the affected side; during the training, the patient is asked to read the book, and a red underline mark is made on the page on the left side of the book, asking the patient Indicate seeing this markup before reading the content of the page. The difficulty of reading can be gradually increased, and the instruction of visual scanning is repeated during training. VST can help improve the patient's attention and visual perception on the affected side, improve the patient's visual function and motor ability [25], and has a certain value in the treatment of unilateral spatial neglect combined with cognitive dysfunction after stroke.

3.2 A bottom-up approach to recovery

3.2.1 Mirror feedback therapy

The patient sits upside down, and the plane mirror is placed on the center line of the trunk, with the unaffected limb facing the front of the plane mirror, to ensure that the patient can observe the unaffected limb in the mirror, and the affected limb is placed on the back of the plane mirror without reflection. When the healthy limb completes the action, it can produce an illusion and control the affected limb. Mirrors not only transfer visual information from neglected spaces to non-ignored spaces, but also regulate the integration of visual information with proprioception. Mirror therapy is a kind of motor imagery training based on repetitive imagination and mental training. It uses somatosensory input on the basis of visual stimulation to assist the recovery of motor function. It is a new treatment method [26].

3.2.2 Prism Adaptation Technology (PA)

PA is a group of simple visual pointing-to-target tasks, mainly through optical principles to offset the objects in the neglected side visual field to the contralateral side, and patients achieve the purpose of treatment through adaptive training of this process [27]. PA treatment can promote the improvement of visuospatial cognitive function. Compared with other traditional UN rehabilitation treatment methods, the prism adaptation technique has a lasting follow-up effect on unilateral neglect after stroke, which has become a research hotspot at home and abroad, causing clinicians and researchers interest of the reader.

3.3 Regulate brain inhibition and increase arousal

Mainly through Noninvasive Brain Stimulation (NIBS) physical methods for treatment, mainly including transcranial Direct Current Stimulation (t DCS) and repetitive transcranial magnetic stimulation (r TMS).

3.3.1 Transcranial direct current stimulation (t DCS)

Transcranial direct current stimulation technology is a non-invasive neurophysiological stimulation technology. It uses constant and low-intensity direct current to regulate the neural excitability of the cerebral cortex, which plays a role in regulating the activity of nerve cells in the cerebral cortex, and improves the motor ability and cognition of the human body. It has the characteristics of non-invasive, convenient, low-cost, safe and efficient. t DCS has 3 stimulation modes: anodal stimulation (a-t DCS), cathodal stimulation (c-t DCS) and sham stimulation (s-t DCS). Clinical treatment of USN patients often tends to choose cathodal stimulation on the uninjured side. The commonly used stimulation intensity in clinical and research is 1-2 mA. The longer the duration of a single stimulation, the longer the aftereffect. The duration should be less than 40min [28]. Although t-DCS has been clinically used to treat unilateral neglect after stroke, the safety of its use is controversial, and how to use this technology under the premise of ensuring safety is still a key issue.

3.3.2 Repetitive Transcranial Magnetic Stimulation (rTMS)

It uses the induced current generated by the electromagnetic field to act on the central nervous system, thereby regulating the excitability of the cerebral cortex, affecting the metabolism and neural electrical activity in the brain, and has been widely used in the treatment of UN patients in recent years. rTMS is divided into low-repetition transcranial magnetic stimulation (<1Hz) and high-repetition transcranial magnetic stimulation (>5Hz). Among them, the affected cerebral hemisphere mainly uses high-frequency stimulation to increase the local cortical excitability of the affected side, and low-frequency stimulation is used to stimulate the healthy brain. It can reduce the pathologi-

cal excitation of the contralateral cerebral hemisphere, thereby restoring the balance of the excitability of the inter-hemispheric cortex caused by stroke, and improving the symptoms of unilateral neglect. In terms of safety, it is generally believed that the most important adverse effects of r TMS is high frequency stimulation induced epilepsy, Zhang Qing [29] in a systematic evaluation study found that patients have no adverse reactions during r TMS treatment (such as pain, dizziness, headache, sensory abnormalities and seizures, etc.), it can be considered that r TMS in clinical application safety is higher.

4. Summary

In summary, Chinese medicine has achieved some results in unilateral spatial neglect. Through the literature of recent years, modern medical treatments for this disorder include mirror neuron therapy, virtual reality technology, non-invasive brain stimulation, prismatic adaptation technology, and occupational therapy, all of which can have different effects [30]. However, although there are numerous studies on the treatment of unilateral neglect, there is still a lack of professional understanding and clinical guidelines for this disorder, making the evaluation and treatment still lagging behind, and it is difficult to fully recover from USN with a single rehabilitation measure. Therefore, many researchers have added TCM treatment to Western medicine and achieved better results than Western medicine alone, suggesting that the combination of Chinese and Western medicine has a superimposed effect. At present, the clinical efficacy observation is mainly based on accumulation of experience, but there is a lack of large sample control studies and few reports on long-term efficacy. In the future, we should continue to further research in this area to make it more scientific and objective, so that the majority of health care professionals and patients with unilateral spatial neglect can better accept Chinese medicine treatment.

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