Study on the Value of Magnetic Resonance Imaging in the Treatment of Patients with Disturbance of Consciousness in Traditional Chinese and Western Medicine

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Abstract: Stroke has gradually become a common and serious cerebrovascular disease in the current social environment. The incidence rate is increasing year by year. The sequelae caused by stroke pose a great threat to the quality of life of patients. The most serious sequelae is disturbance of consciousness. As a profound neurological disease state, disturbance of consciousness is manifested as a significant decline or complete loss of patients ' perception of the surrounding environment and their own state. This state not only brings great physical and mental pain to patients, but also brings heavy economic and psychological burden to their families and society. As an advanced neuroimaging technology, magnetic resonance imaging (MRI) has the advantages of high resolution, multi-parameter imaging, non-invasiveness and good soft tissue contrast, which provides a powerful tool for the diagnosis, evaluation and research of consciousness disorders. The purpose of this paper is to explore the application value of MRI in the evaluation of patients with consciousness disorder after stroke, including its significance in lesion location, disease evaluation and prognosis judgment.

1. Introduction

Disorders of consciousness (DOC) is an abnormal state of consciousness caused by a variety of traumatic brain injury, hypoxic ischemic encephalopathy, hemorrhage and ischemic stroke caused by severe brain injury[1]. It is manifested as patients without eye opening or eye opening activity under stimulation, no limb movement, no muscle contraction under pain stimulation and other symptoms. In clinical practice, according to the degree of consciousness response of patients from light to heavy, it is divided into coma, lethargy and lethargy. In clinical patients, DOC patients with a course of more than 28 days are called prolonged disorders of consciousness (pDoC), including coma, vegetative state, and minimum conscious state[2].Patients with pDOC have a long course of treatment, need to invest a lot of personnel and economic support, and the prognosis is worse than

other diseases. The pathogenesis of chronic disturbance of consciousness is complex, and there is no unified conclusion at present. Modern medicine believes that human consciousness is the result of the cooperation of the ascending reticular activation system of the brainstem and the cerebral cortex, which is defined as the cognitive ability of human beings to the outside world and their own environment. At present, it is clinically believed that the cerebral cortex is related to the content of consciousness, and the brainstem reticular ascending activation system is related to excitability. When both structural and functional damage occur at the same time, patients will become conscious disorders[3]. The current clinical diagnosis and evaluation of patients with disturbance of consciousness are difficult, mainly relying on clinical observation and scale evaluation. There are problems such as strong subjectivity and low accuracy, and the prognosis of patients is also very uncertain[4].

According to the theory of traditional Chinese medicine, the brain is the house of Qiheng, the highest position, and the place where the original spirit lives; the brain is the house of the original spirit and the spirit is easy to hurt, the brain is the orifice of the clear spirit and the orifice is easy to close, the brain is the sea of the marrow and the marrow is easy to empty. When the body's lack of righteousness, evil invasion, emotional disorders, improper diet, overwork, trauma and other factors, damage the brain, resulting in meridian block, qi and blood is not smooth, and then develop into confusion. The disturbance of consciousness after craniocerebral trauma can be attributed to the damage of brain vessels caused by brain trauma, the overflow of blood from the veins, the stasis of blood from the meridians, the stagnation of qi and blood stasis, the obstruction of clear orifices, the disturbance of the spirit, the disorder of qi movement, and the lack of attachment of the original spirit, so the spirit is unconscious[5].The causes of disturbance of consciousness after cerebral infarction are mostly related to internal injury, emotional excess, improper diet, excessive labor and so on. Hyperactivity of liver yang, coupled with improper diet, overwork, emotional stimulation or sudden climate change and other incentives, qi and blood rushed to the brain, brain vein obstruction, orifices closed, sudden fainting, unconscious personnel[6]. Consciousness disorder after cerebral hemorrhage, is on the basis of deficiency of vital qi, induced by complex emotions, external evils, such as imbalance of yin and yang, disorder of qi activity, aster of qi and blood, obstruction of brain collaterals, collateral damage and blood overflow, damage of mental mechanism, coma[7]. To sum up, various reasons lead to deficiency of zang-fu organs, such as deficiency of kidney essence, deficiency of spleen and stomach, which lead to deficiency of qi, blood and body fluid, loss of brain marrow, depletion of marrow sea, formation of ' marrow damage ', or trauma, which lead to blood stasis blocking brain collaterals, damage of marrow sea, formation of ' marrow damage '.

2. Traditional Chinese and Western medicine treatment of consciousness disorder

The root of the injury of the marrow is the direct injury of the brain marrow caused by various reasons, such as the deficiency of the viscera, the loss of the brain marrow, or trauma, which leads to the loss of the gods, the damage of the gods, and even the obstruction of the brain by phlegm and blood stasis, which aggravates the damage of the mind. Therefore, if there is no timely treatment for marrow damage, there is no improvement in consciousness, which is also the reason why there is no significant improvement in the state of consciousness during the development of chronic disorders of consciousness. Therefore, in view of the pathogenesis characteristics of chronic consciousness disorder and ' marrow damage and mental injury ', we take regulating the marrow and awakening the mind as the treatment principle, and select acupoints with the effects of tonifying the brain and benefiting the marrow, opening the orifices and awakening the mind, so that the brain marrow can be filled and the brain orifices can be opened, and the qi and blood supply of the brain can be restored, so that the mind can be relied on and the mind can be used. The main acupoints of Tiaosui Xingshen acupuncture are composed of Shuigou, Neiguan, Shenting, Baihui, Sishencong, Shendao,

Taixi, Shenmen and Benshen acupoints. The above acupoints have the effect of awakening the mind and improving the state of consciousness.

Neuroinflammation refers to the inflammatory response that occurs in the nervous system. Its main features include the activation of glial cells and the release of inflammatory mediators. Severe brain injury and persistent immune response will lead to the imbalance of neurochemical processes in the central nervous system, which will turn into a chronic inflammatory response, leading to the progressive death of neurons and impaired brain function. Severe brain injury, such as traumatic brain injury, ischemic stroke or hypoxic encephalopathy, can cause acute inflammatory response. If inflammation is not controlled in a timely and effective manner, it may turn into a chronic inflammatory state. Chronic neuroinflammation can lead to continuous damage and death of nerve cells, affecting brain function ; persistent neuroinflammation may lead to increased permeability of the blood-brain barrier[8], making it easier for harmful substances to enter the brain tissue and further aggravate neuronal damage. On the other hand, neuroinflammation activates glial cells such as microglia and astrocytes, releases a variety of inflammatory mediators, and then destroys the normal signal transmission between neurons, interferes with the normal operation of the neural circuit, destroys the integrity of the neural circuit, and affects the brain's information processing and integration capabilities, resulting in the persistence of consciousness disorders. Therefore, inhibiting neuroinflammation may be an important direction for the treatment of chronic disturbance of consciousness.

3. The application of magnetic resonance imaging in disturbance of consciousness

The theoretical basis of MRI is derived from the nuclear magnetic resonance (NMR) phenomenon, which was first discovered by physicists in the 1930 s. NMR reveals the specific behavior of the nucleus in the magnetic field, which provides a scientific basis for the birth of MRI technology. With the deepening of research, scientists have gradually realized the potential of using this phenomenon for medical imaging.

In 1946, American physicists Felix Bloch and Edward Purcell discovered the phenomenon of magnetic resonance imaging. In 1980, the first human head MRI image was successfully obtained, and then it was widely used in the field of clinical medicine. It shows great value in the diagnosis of neurological diseases, can clearly show the brain structure, and is of great significance for the diagnosis of brain tumors, cerebrovascular diseases, brain trauma, epilepsy, Parkinson's disease and other diseases. MRI also performs well in the diagnosis of musculoskeletal diseases. Its high-resolution imaging capability can clearly display soft tissue structures such as muscles, joints, and ligaments, and has unique advantages in the diagnosis of arthritis, soft tissue tumors, fractures, and intervertebral disc herniation[9].Through multi-sequence imaging technology, the morphology and functional status of liver, pancreas, kidney, uterus, ovary and other organs can be clearly displayed, which provides an important basis for the diagnosis and treatment of related diseases. With the advancement of technology, the application of MRI in cardiovascular system imaging is becoming more and more extensive. It can noninvasively evaluate the shape and function of the heart, perform coronary artery imaging and the diagnosis of heart valve disease, and provide strong support for the diagnosis and treatment of cardiovascular diseases. In the field of oncology, through multi-parameter imaging and functional imaging technology, the location, size, morphology and relationship with surrounding tissues of tumors can be accurately evaluated, providing important information for tumor location, staging and efficacy evaluation [10].

MRI examination is characterized by multi-parameter, multi-sequence and multi-directional imaging. The resolution of soft tissue is higher than that of CT and X-ray, and there is no ionizing radiation. There are many imaging methods, such as structural magnetic resonance imaging (sMRI), functional magnetic resonance imaging (fMRI) and diffusion tensor imaging (DTI). It can be

widely used in the examination and diagnosis of various diseases and multiple sites. It is more sensitive and accurate in the detection of lesions in brain, spinal cord, cartilage and other tissues. The gray level on the MRI image represents the signal intensity of the tissue and the lesion, reflecting the length of the relaxation time. On the MRI images obtained by different imaging sequences, different signal intensities represent different tissues and lesions. In the diagnosis and treatment of diseases, it not only helps to detect the lesion site, but also helps to clarify the histological type of the lesion. It can also reflect the functional information of the human brain and the functional changes caused by the disease.

sMRI can provide high-resolution brain structure images for detecting morphological changes in the brain. Commonly used sMRI sequences include T1-weighted imaging, T2-weighted imaging, FLAIR imaging, etc.[11]. Morphological changes such as brain atrophy, brain edema, and brain injury can be detected by sMRI, which are closely related to the etiology and severity of consciousness disorders. fMRI can detect the functional activity of the brain and reflect the activity of neurons by measuring the changes of blood oxygen level dependent (BOLD) signals. fMRI can be divided into resting-state fMRI and task-state fMRI. Resting-state fMRI can detect the functional connectivity of the brain in the resting state, and task-state fMRI can detect the functional activity of the brain by allowing patients to perform specific tasks. The application of fMRI in disturbance of consciousness mainly includes detecting the changes of brain functional network, evaluating the level of consciousness and cognitive function[12].DTI can measure the structure and integrity of white matter fiber bundles, and reflect the structure and integrity of white matter fiber bundles by measuring the diffusion direction and degree of water molecules in white matter fiber bundles. The application of DTI in disturbance of consciousness mainly includes detecting the damage of white matter fiber bundles, evaluating the severity of disturbance of consciousness and predicting prognosis. DTI indicators are closely related to the degree of disturbance of consciousness and can be used as one of the indicators to evaluate the severity of disturbance of consciousness[13].

4. The application of magnetic resonance imaging in the diagnosis of disturbance of consciousness

With the continuous improvement of modern medical standards, the identification and diagnosis of patients with different levels of disturbance of consciousness in clinical practice is not so accurate only based on previous experience, including the patient's motor function and state of consciousness[14]. The misdiagnosis rate of vegetative state and minimally conscious state has been as high as 40 % for a period of time[15]. The time of diagnosis of DOC patients often directly determines their prognosis. After the clinical use of magnetic resonance imaging in cerebrovascular diseases has gradually matured, many doctors have found that MRI has higher advantages than previous examination methods in judging the vegetative state of patients. By detecting the structure and function of the brain, MRI can help doctors distinguish different types of consciousness disorders, such as coma, vegetative state, and minimal state of consciousness. Different types of disturbance of consciousness have some differences in brain structure and function. MRI can detect these differences and provide a basis for diagnosis. MRI can detect morphological changes and functional abnormalities in the brain, which may be related to the etiology of disturbance of consciousness. For example, patients with traumatic brain injury may have morphological changes such as brain contusion and intracranial hematoma, patients with cerebrovascular disease may have morphological changes such as cerebral infarction and cerebral hemorrhage, and patients with hypoxic-ischemic encephalopathy may have morphological changes such as brain edema and brain atrophy. Through the detection of these changes, clinicians can help determine the cause of disturbance of consciousness and formulate the corresponding diagnosis and treatment plan at the fastest speed. Related studies have shown that in cerebrovascular diseases, MRI can be more

sensitive to the early diagnosis of patients with cerebral infarction, that is, timely and accurate detection of infarct lesions within 24 hours of onset and identification of the location, size and number of lesions, so as to win more rescue time for patients with cerebral infarction[16].

In clinical application, MRI indicators were combined with clinical scales to establish a system for assessing the severity of consciousness disorders. For example, indicators such as the degree of brain atrophy and the degree of white matter fiber bundle damage can reflect the severity of disturbance of consciousness. In addition, changes in brain functional networks can also be used as one of the indicators to assess the severity of consciousness disorders. fMRI detects the functional activity of the brain by allowing patients to perform specific tasks to assess the cognitive function of patients with disturbance of consciousness. For example, by allowing patients to perform language tasks, memory tasks, etc., to detect the patient 's language, memory and other cognitive functions.

5. The application of magnetic resonance imaging in the prognosis prediction of disturbance of consciousness

MRI can not only provide the location information of the lesion, but also evaluate the patient 's condition by observing the signal changes of the brain tissue during hospitalization and after discharge. After stroke, a series of pathophysiological changes will occur in the brain tissue, such as edema, ischemia, bleeding, etc.[17]. These changes show different signal characteristics on MRI, and doctors can judge the severity of the patient's condition based on these characteristics. For example, when extensive edema or hemorrhage occurs in the brain tissue, the patient's consciousness disorder may be more serious. The prognosis of patients with disturbance of consciousness is particularly important. Through the changes of MRI in different stages of lesions and the recovery of brain tissue after injury, the prognosis of patients can be preliminarily judged. When the lesion shrinks and the brain tissue signal gradually returns to normal, it means that the patient's consciousness may be improving, which is good news for doctors, patients and their families. However, if the lesion aggravates or new lesions appear, it means that the condition aggravates and the prognosis is poor [19].

Promoting awakening is the primary treatment for patients with disturbance of consciousness. The repair of brain injury in patients is stimulated by traditional Chinese and Western medicine treatment. The activation degree of brain region and the integrity of white matter fiber bundle are monitored by MRI to predict the possibility of awakening [20].

6. Conclusion

In summary, magnetic resonance imaging technology has important application value in the study of disturbance of consciousness[18]. Through the detection of brain structure and function, MRI can assist in the diagnosis of the type of disturbance of consciousness, assess the severity and predict the prognosis, but there are still some shortcomings. Patients with disturbance of consciousness cannot fully cooperate with the examination, and may have limb movement or head swing, resulting in motion artifacts, affecting the clarity and accuracy of the image. MRI examination takes a long time, and many patients with disturbance of consciousness cannot be separated from the care of companions for a long time, which may lead to emotional agitation and other behaviors that aggravate the patient's condition and cause some complications. Similarly, the more things MRI observes, the higher the level of the doctor's requirements. Some subtle changes can be prevented early by the doctor's ability to detect early. With the continuous development of MRI technology, its use in cerebrovascular diseases has become more mature, and it will play a more important role in the diagnosis, treatment and research of consciousness disorders.

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