

# *Research progress of acupuncture treatment of cognitive dysfunction of central nervous system diseases*

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**Abstract:** Central nervous system is the main body of the human nervous system, composed of brain and spinal cord, its main function is to transmit, store and process information, produce a variety of psychological activities, dominate and control all animal behavior. When central nervous system diseases occur, people's ability to process information has problems, cognitive problems will occur, such as aphasia, apraxia, agnosia, memory impairment, executive function loss, reduced orientation, visuospatial function decline, etc., collectively referred to as cognitive impairment. Currently, there is no specific treatment for cognitive impairment caused by central nervous system diseases. The use of acupuncture to treat central nervous system diseases has a long history. Acupuncture has attracted more and more attention as a safe and inexpensive treatment. This article will discuss the research progress of acupuncture in the treatment of cognitive disorders caused by vascular dementia, stroke, Alzheimer's disease, subcortical arteriosclerotic encephalopathy and insomnia, and provide effective treatment methods and scientific theoretical basis for clinical researchers.

## 1. Introduction

Central nervous system diseases can be defined as diseases affecting the spinal cord or the brain or both, including infection, trauma, stroke and neurodegenerative diseases, etc, with complex mechanisms and great harm to patients, can cause patients with different degrees of cognitive impairment, such as aphasia, apraxia, agnosia, etc. However, due to the influence of the blood-brain barrier, the effect of related drugs is limited. Acupuncture therapy, as an important method in the treatment of diseases in traditional Chinese medicine, is guided by the theory of traditional Chinese medicine. It has a long history and has been passed down for thousands of years with remarkable curative effect. Its functions of dredging meridians, nourishing and dispelling evil, and reconciling Yin and Yang make it widely used in the treatment of central system diseases.

## 2. Acupuncture therapy for cognitive impairment of vascular dementia

Vascular dementia (VD) is a central nervous system disease caused by acute or chronic cerebrovascular diseases with cognitive dysfunction as the main manifestation, also known as

"dumb disease" in ancient times. The lesion is located in the brain, which is closely related to the dysfunction of the heart, liver, spleen and kidney. At present, the research on the treatment of dementia is still in progress, and acupuncture as a safe and inexpensive treatment has received wide attention. Some researchers<sup>[1]</sup> have used "Tiaoxin Tongdu" acupuncture to effectively improve the learning and memory ability of VD rats, and the mechanism may be related to the regulation of VEGF and Ang-1 protein expression in hippocampus and induction of angiogenesis. Another researcher<sup>[2]</sup> used electroacupuncture and Zhisanacupuncture to treat VD, achieving good clinical efficacy and promoting the recovery of cognitive function, daily living ability and neurological function of VD patients. The mechanism may be to promote the establishment of the collateral circulation of the brain and improve the blood supply, oxygen supply and oxygen metabolism of the brain by electroacupuncture at specific acupoints. Moreover, it can enhance the activity of superoxide dismutase, improve the antioxidant capacity of the body and increase brain metabolic nutrition. Some researchers<sup>[3]</sup> have made a summary of the experimental studies on the treatment of vascular dementia by acupuncture and moxibustion in recent years. Acupuncture and moxibustion on vascular dementia can improve behavior, protect neurons, inhibit apoptosis, reduce inflammatory response, regulate neurotransmitters, reduce oxidative stress damage, nourish neurons and promote vascular regeneration. In the study of acupuncture treatment of VD, the selected acupoints are mainly the head and the foot sun bladder. The brain is the house of the Yuan God, palm human emotions, thinking, memory, etc. Du pulse into the collaterals of the brain, the bladder from the top of the sun into the collaterals of the brain, the two are closely related to the brain. Select the acupoints on the two meridians and play the role of "the meridians pass by and the indications reach". In the selection of all acupoints, Baihui is the most commonly used acupoint. The head is the meeting of the Yang, the king of the hundred arteries, and the hundred arteries are located at the top of the top, where the meridians converge, and it is the point to adjust the function of the brain.

### 3. Acupuncture for cognitive impairment after stroke

Mild cognitive impairment after stroke, belonging to vascular mild cognitive impairment (VMCI), refers to the neuropsychological disorders caused by ischemic stroke, hemorrhagic stroke and cerebrovascular disease resulting in memory, cognition, behavior and other brain areas of low perfusion. This is a disease state characterized by acquired and chronic progressive mild impairment of cognitive function caused by or accompanied by cerebrovascular disease, and white matter osteoporosis is considered to be a common imaging manifestation of this disease<sup>[4]</sup>. At present, the mechanism of cognitive impairment after stroke is not completely clear, and it is generally believed to be related to the direct brain damage and local blood supply disorders caused by stroke. And the therapeutic effect of acupuncture on cognitive impairment after stroke has been widely recognized. "Acupuncture and Moxibustion A and B Sutra" contains "loss of wisdom, internal Guan the main", "Acupuncture and Moxibustion Da Cheng" contains "the main head wind stroke, palpitation and forgetfulness, forget before and lose after, the mind trance". With the continuous development and innovation of acupuncture and moxibustion therapy, the methods of acupuncture and moxibustion for the treatment of cognitive impairment after stroke have become more diversified, including not only simple acupuncture and moxibustion, but also comprehensive therapies combined with electroacupuncture, medicine, rehabilitation and physical therapy<sup>[5]</sup>. For example, relevant researchers<sup>[6]</sup> increased vertebrae-basilar artery insufficiency through "Xiba acupuncture", so as to improve brain blood supply and lay a foundation for the recovery of brain function. Another researcher<sup>[7]</sup> used the method to improve the cognitive function of patients with mild cognitive impairment after stroke and improve their neurological function and daily living ability, which has clinical application significance. Acupuncture treatment of cognitive impairment after stroke mainly

has the following aspects: improving blood flow and regulating cerebral microcirculation; Regulate endothelin level, improve endothelial cells, promote vascular regeneration, increase blood supply to the brain; Inhibit cell apoptosis, reduce neuron damage and brain tissue damage; Inhibit the generation of free radicals, inhibit the release of inflammatory factors, reduce inflammatory response, inhibit the expression of adhesion factors, regulate the body's immunity; Promote the proliferation and differentiation of neural stem cells, stimulate neural plasticity, reshape the remaining brain tissue, and reduce the infarct size<sup>[8]</sup>. Acupuncture can inhibit cascade reaction and neuronal damage after stroke through various signal transduction pathways at the molecular level, so as to achieve therapeutic effects<sup>[9]</sup>.

#### **4. Acupuncture treatment of cognitive impairment in Alzheimer's disease**

Alzheimer's disease (AD) is a progressive neurodegenerative disease characterized by learning and memory loss and progressive cognitive deficits<sup>[10]</sup>. At present, the pathogenesis of AD is not clear, but it is generally recognized that the occurrence of AD is related to the pathological accumulation of A $\beta$  caused by the deposition of A $\beta$  and the hyperphosphorylation of tau protein. A large amount of A $\beta$  protein accumulates in neurons of cerebral cortex and hippocampus, which can lead to neuronal apoptosis in this region, and gradually reduce choline and dopamine neurotransmitters, and eventually lead to learning memory and cognitive dysfunction and the formation of AD<sup>[11]</sup>. Abnormal A $\beta$  metabolism in the nervous system is the key to the development of AD. The abnormal function of Wnt signaling pathway can promote the deposition of A $\beta$ , and the accumulated A $\beta$  can bind to GSK-3 $\beta$ , degrade  $\beta$ -catenin, aggravate the abnormal Wnt/ $\beta$ -catenin signal transduction, and cause the toxic and side effects of central nervous system. Acupuncture can regulate the major components of Wnt/ $\beta$ -catenin signaling pathway as a whole<sup>[12]</sup>. Modern pharmacology believes that acupuncture has the advantages of multi-target, multi-pathway and multi-level action in the treatment of this disease, which can effectively regulate the release of neurotransmitter, effectively protect neurons and improve the level of neurotrophic factor<sup>[13-14]</sup>. Relevant researchers<sup>[15]</sup> studied AD mice with "Sanxian needle" and found that "Sanxian needle" could reduce the expression of A $\beta$  protein in mice. Related studies<sup>[16]</sup> have shown that acupuncture can reduce the content of A $\beta$  in the brain tissue of dementia animal models and reduce the deposition of A $\beta$ . The study showed that in the animal experimental study of acupuncture treatment of AD, Baihui matched Shenshu appeared the most frequently, and the most frequently appeared acupoint was Baihui, followed by Shenshu. Other studies have shown that<sup>[11]</sup> the mechanism of acupuncture intervention in AD is mainly reflected in the reduction of A $\beta$  deposition, inhibition of Tau protein hyperphosphorylation, improvement of synaptic plasticity, inhibition of neuroinflammatory response, inhibition of oxidative stress, reduction of glial cell activation, improvement of mitochondrial dysfunction and other aspects, so as to achieve the purpose of treatment.

#### **5. Acupuncture treatment of cognitive impairment in subcortical arteriosclerotic encephalopathy**

Subcortical arteriosclerosis encephalopathy (subcortical arteriosclerotic encephalopathy, SAE), also called Binswanger disease, or BD. It is a disease characterized by extensive cerebral ischemia caused by atherosclerotic degeneration of deep perforator arteries in the subcortical region, and eventually by demyelination of white matter. The most characteristic clinical manifestation is chronic progressive cognitive impairment, often accompanied by pyramidal tract damage, and symptoms and signs of subcortical damage in the middle and late stages<sup>[17]</sup>. The white matter in deep brain is located in the junction area of terminal artery blood supply and lacks collateral

circulation. Once extensive arteriolar sclerosis in this area is caused by external factors and it is in a state of hypoperfusion, a series of pathological changes will be triggered to lead to white matter lesions, which will further damage the cholinergic pathway, resulting in the loss of acetylcholine and thus cognitive dysfunction<sup>[18]</sup>. From the lesion site, the disease often involves the basal ganglia and the center of the semi-oval, which are concentrated with a large number of nerve nuclei and fibers related to learning and memory functions, and the changes in cognitive function will naturally occur when these lesions occur<sup>[19]</sup>. For the treatment of BD, there is no relatively efficient method, and acupuncture is more and more popular among patients and doctors as a safe, simple and green treatment. Relevant researchers used scalp cluster acupuncture to intervene the cognitive function of BD patients, and found that the intervention effect of scalp cluster acupuncture on the frontal and parietal regions was better than that of oral Donepezil hydrochloride, which confirmed that scalp cluster acupuncture at the head point is helpful to improve the cognitive function of patients, and is a safe and effective green therapy<sup>[20]</sup>. Another researcher used Donepezil hydrochloride combined with acupuncture in Sishencong to treat BD cognitive dysfunction, and the results showed that the therapeutic effect of acupuncture Sishencong point combined with oral Donepezil hydrochloride was significantly better than that of oral Donepezil hydrochloride alone<sup>[21]</sup>. The disease is in the brain, with the brain is not full, God knows faint as the basic pathogenesis, so select the head acupoint as the main point of acupuncture, which is mainly to take the near treatment of acupoints, namely the so-called "acupoints, indications."

## 6. Acupuncture treatment of cognitive disorders after insomnia

Insomnia usually refers to a subjective experience of sleep duration and/or quality that is unsatisfactory and interferes with daytime social functioning. Lack of sleep leads to cognitive dysfunction from several aspects, such as enhancing inflammatory response, altering synaptic plasticity, inducing oxidative stress, regulating histone acetylation modification and inducing abnormal neurotransmitter secretion<sup>[22]</sup>. For example, sleep deprivation activates glial cells and other major immune inflammatory cells of the central nervous system, triggering the enhancement of the inflammatory response of the brain, causing the changes of inflammatory factor C-reactive protein, interleukin-1 $\beta$ , interleukin-6 and tumor necrosis factor  $\alpha$ ), thus damaging the learning and memory dependent on hippocampus, leading to the decline of cognitive function. Studies<sup>[23]</sup> have shown that acupuncture has an effect on the regulation of cytokines in rats with insomnia, which means that acupuncture may regulate sleep by regulating the content of cytokines in the brain. Some researchers<sup>[24]</sup> needled the "Shenmen" point of sleep deprived rats and found that the recognition rate of the acupuncture group was significantly higher than that of the model group, indicating that acupuncture at "Shenmen" point could effectively improve the behavioral cognitive ability of rats after sleep deprivation. Studies<sup>[25]</sup> have shown that tiaoshen Yizhi acupuncture can effectively improve mild cognitive dysfunction, such as forehead three acupuncture [ShenTing, Tou Wei (double)], Ding three acupuncture [Bai Hui, Si Shencong (two points 1 inch around Bai Hui)], temporal three acupuncture [Shuai Gu (three-way acupuncture)]. Bilateral Neiguan, Shenmen, Fenglong and Sanyinjiao were taken by body acupuncture. The total effective rate of the treatment group reached 83.3%. The "three acupuncture points on the head", "three acupuncture points on the top", "three temporal acupuncture points" and the inner guan and the divine gate of the mind were selected to regulate the divine mechanism of the human body as a whole and improve the intelligence and brain. Regulating the mind and waking the brain acupuncture can effectively improve the memory of patients, improve their cognitive function, so as to achieve therapeutic effect. And numerous studies have shown that acupuncture is also an effective treatment for insomnia. Baihui, four Shencong, Yintang, God gate, Neiguan, Sanyinjiao, Shenmai, according to

the sea as the treatment of insomnia commonly used points. The combination of the acupuncture method should be effective, but further research is needed.

## 7. Summary

Cognitive disorders of central nervous system diseases have attracted more and more public attention, which seriously affect people's life and threaten people's health. However, there are no specific drugs and methods to treat this disease, and acupuncture therapy with benign regulating effect is better for its treatment. The incidence of the above diseases is in the brain, so the acupoints on the head are selected to give play to the proximate treatment of acupuncture. To study the mechanism of acupuncture treatment of these diseases is conducive to deepen the understanding of these diseases and better play the role of acupuncture in diseases.

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