

Research

Acupuncture as nonpharmacologic therapy for hypertension mediated cognitive function deficits

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ABSTRACT

Elevated blood pressure is a main vascular risk factor for neurocognitive impairment and dementia. Anti-hypertension drugs can not reduce the neurodegeneration induced by hypertension and have various side effects. Manual acupuncture and electroacupuncture (EA) are widely used as an alternative therapy of hypertension. It has been demonstrated that acupuncture has neuroprotective effects for neurological and neurodegenerative diseases such as AD. Acupuncture alleviates neurological deficit by regulating expression of neurotrophin, reducing oxidative damage and inhibiting apoptosis. In view of these, we hypothesized that acupuncture could be a potential nonpharmacologic therapy for hypertension mediated cognitive impairment, as well as anti-hypertension.

Keywords: Acupuncture, Hypertension, Cognitive function deficits.

HYPERTENSION AND DEGENERATION OF COGNITIVE FUNCTION

There is a close correlation between vascular risk factors and cognitive function deficits.¹ Hypertension is regarded as such a major vascular risk factor for neurodegenerative disorder, which can lead to poor quality of life in patients. Epidemiological and clinical studies have reported that hypertensive patients experience mild cognitive impairment (MCI) symptoms, especially more difficulties in calculation and language task, attention than those of normal blood pressure controls.² Wilke and Eisdorfer reported that hypertension was associated with memory deterioration 40 years ago.³ Further studies supported this conclusion and displayed that patients of hypertension performed poorly on the Wechsler Intelligence Test⁴ and several memory tests.^{5,6} The mechanism is comprehensive in cognitive function decline caused by hypertension. It has been reported that high blood pressure damages blood vessels by multiple ways, such as microvascular abnormalities and dysregulation of cerebral perfusion.^{7,8} A study also showed that more amyloid deposited in brain of hypertensive animals, which contributed to the incidence of Alzheimer's Disease (AD).⁹ Additionally, several hormonal and physiological systems are destroyed in spontaneously hypertensive rats which accelerate the process of cognitive deterioration.^{10,11}

Unfortunately, treatments of cognitive function deficits induced by hypertension are still not very available. Although antihypertensive drugs showed effective in hypertension control, they did not decrease the incidence of dementia.¹² It is necessary to find a therapeutic method to alleviate the hypertension induced cognitive damage and meanwhile control high blood pressure.

ACUPUNCTURE USED AS NON-DRUG TREATMENT OF HYPERTENSION

Acupuncture is a kind of nonpharmacologic anti-hypertension treatments which stimulates points of the body surface along meridians using a needle. The use of manual acupuncture and its alternative, electroacupuncture (EA), has been explored to treat hypertension in both traditional

Chinese and Western medicine.¹³⁻¹⁶ The underlying mechanism of acupuncture decreasing high blood pressure has been studied in recent years, which has been established long to associate with intrarenal rennin angiotensin system, sympathetic outflow and increased excretion of sodium.^{17,18} Recently EA was reported to attenuate elevated blood pressure by enhancing activity of NO/NOS in spontaneous hypertension rats (SHR).¹⁹ Moreover, acute acupuncture treatment can remedy endothelial dysfunction of hypertensive patients.²⁰

EFFECT OF ACUPUNCTURE ON ALLEVIATING OF NEUROLOGICAL AND NEURODEGENERATIVE DISORDERS

Acupuncture has been used as an alternative and complementary treatment to maintain homeostasis of the body. Recently, it is considered to be an efficient therapeutic method for cognitive-deficit symptoms of neurological and neurodegenerative diseases such as stroke-related dementia and AD.²¹⁻²³ Generally, the most widely used acupoints to improve cognitive function in neurological and neurodegenerative diseases are ST36 (Zusanli acupoint) and GV20 (Baihui acupoint). ST36 acupoint, located one finger breadth ahead of the anterior crest of the tibia, is primarily used for symptoms of digestive system. ST36 is an acupoint of stomach meridian, which is full with both Qi and blood, and the function of the entire body can be modified by stimulating the acupoint. So, not only digestive system, but also cardiovascular system and nervous system can be regulated by stimulating acupoint. Stimulation at ST36 has benefit on adult neurogenesis.²⁴ Data suggested that electropuncture at the ST36 acupoint possessed a neuroprotective effect by promoting the activation of ERK and PI3K/Akt signaling in ischemic stroke.^{25,26} GV20, located on the head, is another acupoint widely used for brain diseases. Han et al reported EA at GV20 increased the expression of CREB in the hippocampus of vascular dementia animal.²⁷

The underlying molecular mechanisms of acupuncture in treatment of nervous system disease have not been clearly clarified. Till now, studies indicate some possible mechanisms as follows. First, it is likely to affect the neurogenesis by regulating neurotrophin with the treatment of acupuncture. Researches demonstrated the link between acupuncture stimulation and the regulation of cognitive function in relation to neurotrophic factors such as BDNF, NGF, GDNF, etc.²⁸⁻³¹ Among these neurotrophic factors, BDNF is the most discussed one. Stimulating at special acupoints such as ST36 and GV20, can elevate the proliferating and differentiated neuroblasts in the dentate gyrus of hippocampus through increasing BDNF and phospho-cAMP response element-binding protein (pCREB) levels.^{32,33} Second, acupuncture improves neurological deficit due to the reduced oxidative damage in brain. Stimulating at certain acupoints improved cognitive function by increasing antioxidant enzymes SOD and GSH-Px in neurodegenerative animals.³⁴ Third, it increases the neuroprotective effect through inhibition of apoptosis. Recent studies reported that the counteract effect of apoptotic induced by acupuncture was connected with the increase of Bcl-2 and decrease of Bax.^{26,35}

Though many studies have investigated the therapy role of acupuncture on neurological diseases, few researches investigate the effect of acupuncture on hypertension induced cognitive impairment. So, we hypothesize if acupuncture at ST36 and GV20 may extract beneficial effects on the cognitive function damage induced by hypertension?

CONCLUSIONS

As what mentioned above, hypertension can induce impairment of cognitive function and vascular dementia. Besides the effect of anti-hypertension, acupuncture may relieve neuropathologic effects by mechanisms such as modulating neurotrophins and neuropeptides, anti-apoptosis and oxidation resistance. So, acupuncture is potentially to be used as a nonpharmacologic therapy approach to hypertension, and meanwhile remedy the cognitive function deficits mediated by elevated blood pressure in hypertensive patients. But to investigate whether acupuncture can reliably alleviate the cognitive impairment caused by hypertension and its mechanism, further experimental and clinical researches need to be done.

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CONFLICT OF INTEREST AND SOURCES OF FUNDING

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