

Effectiveness of electroacupuncture for the treatment of long covid brain fog

Xiangping Peng¹, Guanhu Yang²

¹Acuenergie Clinic, Canada.

²Department of Specialty Medicine, Ohio University, United States.

Corresponding Author

Xiangping Peng, Acuenergie Clinic, Canada.

Submitted: 09 Nov 2022; Accepted: 16 Nov 2022; Published: 24 Nov 2022

Citation: Xiangping Peng, Guanhu Yang (2022) Effectiveness of electroacupuncture for the treatment of long covid brain fog. *Medical & Clinical Research* 7(11):01-06.

Abstract

Objective: This article is aimed at demonstrating the effectiveness of electroacupuncture in treating Long COVID brain fog in 57 cases in Eastern Canada.

Method: 57 patients (mean age 37, range 25-55 years, 56% female, 44% male), suffering from brain fog after a COVID-19 infection were treated with electroacupuncture using the acupoints DU20 (Baihui), DU24 (Shenting) and EX-HN1 (Sishencong), and the duration of each session was 30 minutes. The frequency of treatment was three times a week for 4 consecutive weeks.

Results: After a 12-treatment course for each of the 57 patients, 48 cases were clinically cured, and 9 cases were ineffective. The rate of overall effectiveness was 84.2%.

Conclusion: Electroacupuncture improved memory, concentration and attention; restored healthy function of the brain, liver, kidneys and spleen; and improved the patients' physical condition and quality of life.

Keywords: Long COVID, Brain Fog, Memory Issues, Concentration, Electroacupuncture

Introduction

COVID-19 infections increase the risk of long-term brain problems. A change in cognitive function is one of the most frequently reported symptoms in post-acute sequelae of COVID-19 [1]. The symptoms of long COVID can include cognitive difficulties such as short-term memory loss, confusion and difficulty concentrating. Brain fog (BF) is one of the most common brain-related, neurological symptoms in long COVID that is manifested with memory, thinking, and focusing problems. Brain fog is not a medical condition; it's a symptom of cognitive decline. It's a term used for certain symptoms that can affect one's ability to think [2]. A year-long study, published in the journal, *Nature Medicine*, assessed the impact of COVID-19 on 44 neurological disorders. The results show that the neurological conditions occurred in 7% more people with COVID-19 compared with those who had not been infected with the virus. The findings also show that people who contracted the virus were at a 77% increased risk of developing long-term memory problems. The study's results provide evidence of increased risk of long-term neurologic disorders in people who had COVID-19 [3]. A Canadian study confirms that a history of COVID-19 infection is a risk factor for cognitive dysfunction in the young and middle-aged [4]. Most SARS-CoV-2-infected individuals never require hospitalization. However, some develop prolonged symptoms like the neurologic

manifestations in non-hospitalized COVID-19 "long haulers". In a series of 100 patients at a Northwestern COVID-19 clinic who had neurological problems six weeks after initial COVID diagnosis, non-hospitalized COVID-19 "long haulers" experience prominent and persistent "brain fog" and fatigue that affect their cognition and quality of life [5]. Researchers found that even mild cases of COVID-19 set off enough inflammation to produce impairments to cognition and brain health [6].

Brain Fog in Western Medicine

The causes of brain fog and mild cognitive impairment have been investigated. Possible physiological correlates may be due to the effects of chronic orthostatic intolerance in the form of the Postural Tachycardia Syndrome and decreases in cerebral blood flow [7]. A study from January 2021 found increased levels of inflammatory cytokines in the fluid surrounding the brains of people weeks after their COVID-19 infection. Cytokines are molecules produced by the immune system that encourage inflammation [8]. Inflammation in the brain hinders the ability of the neurons to communicate with each other. This is one of the factors that contribute to brain fog. In individuals at low risk of COVID-19 mortality with ongoing symptoms, 70% have impairment in one or more organs 4 months after initial COVID-19 symptoms, such as lungs, heart, kidney, liver, spleen, or pancreas [9].

Brain Fog in Traditional Chinese Medicine (TCM)

From the perspective of TCM etiologies and pathologies, COVID-19 is caused by the invasion of the body by cold-damp with toxins, which is primarily located in the lungs and spleen, and can involve the stomach, liver, kidney and large intestine as well [10]. The theory of TCM believes that the main location of brain disease is in the brain, also involving the organs, including the heart, kidneys, liver, spleen and lungs [11]. Brain fog can be classified into the category of “forgetfulness”, “dizziness” or “absentmindedness” in traditional Chinese medicine (TCM).

According to the theory of TCM, insufficient kidney essence is one of the pathogenesises of brain fog in TCM. The references to which are found in the following sources. Wang Ang (1615-1694 AD), a great physician in the Qing Dynasty, pointed out: “The essence and wisdom of human beings are all stored in the kidney; when the kidney essence is insufficient, so people like to forget what they said before.” Cheng Zhongling (1662-1735 AD), a famous doctor in the Qing Dynasty, author of mental comprehension of medical learning (in Chinese, 医学心悟), said in his book: “the kidney controls wisdom, and the deficiency of kidney leads to the symptoms of lack of wisdom and forgetfulness.”

Another pathogenesis of brain fog is the depletion of brain marrow. The references to which are found in the following sources. The medical treatise, The Basic Questions of the Yellow Emperor’s Classic of Internal Medicine, the Essence of the Pulse (in Chinese, 黄帝内经素问·脉要精微论) states that: “The head is the house of intelligence.” The medical book of Qing Dynasty Classified Treatments Based on Categorical Identification (in Chinese, 类证治裁) written by Lin Peiqin (1772-1839 AD) states that: “The brain is the house of the primordial spirit, the sea of essence, the real evidence, and the foundation of nature.” The Lingshu-Sea Theory (in Chinese, 灵枢·海论) records: “If the sea of marrow is insufficient, the head will turn and the ears will have the tinnitus, the head will be dizzy, the eyes cannot see anything, and the body will be sluggish and fall asleep.”

Third pathogenesis of brain fog is the spleen qi deficiency. The spleen has hemopoietic functions, meaning it manages blood specifically, the blood encased within the vessels of all solid and hollow organs. It governs the thought that brain activities depend normally on furnishing the nutrients, qi (energy), blood, as well as Yin and Yang. With adequate qi and blood and normal function of the spleen and stomach, brain activities can proceed normally [12].

Brain Fog and Acupuncture & Electroacupuncture

Acupuncture, as a branch of traditional Chinese medicine (TCM), has been utilized for treating a wide range of diseases for over 2,000 years, and it is generally regarded as a safe and effective method. Acupuncture is not only effective for post-COVID-19 treatment, but it is also effective in preventing recurrence after recovery [13]. A combination of modern technology and traditional acupuncture, electroacupuncture is a form of acupuncture in which a small electric current is passed between pairs of acupuncture needles. Using small clips, the needles are attached to a device that generates

continuous electric pulses. These devices are used to adjust the frequency and intensity of the impulse being delivered, depending on the condition being treated. Electroacupuncture plays a role in promoting blood circulation, removing blood stasis, and dredging meridians and collaterals [14]. The research also showed that electroacupuncture at acupoints on the head or the acupoints of the Du meridian can reduce the death of brain nerve cells and improve cerebral circulation and cognitive function [15]. Electroacupuncture has both anti-inflammatory and cardio-protective effects [16]. The continuous wave of an electroacupuncture device regulates qi and blood. It dilates the blood vessels in the brain, which increases cerebral circulation, and improves a hypoxic-ischemic state [17]. Therefore, electroacupuncture on head points is an important treatment for brain fog.

General Information

Data was collected from 57 patients with long COVID brain fog as the core clinical manifestation in Montreal at Acuenergie Acupuncture Clinic from June 2020 to June 2022. The age of the patients ranged between 25 and 55, and the breakdown of case distribution according to age range was as such: age 25 to 30, 15 cases; age 31 to 35, 11 cases; age 36 to 40, 9 cases; age 41 to 45, 10 cases; age 46 to 50, 7 cases; age 51 to 55, 5 cases. There were 32 cases of women and 25 cases of men. The average age was (37.44 ± 8.65) years (Table 1).

Table 1: Age, gender and numbers.

	Numbers
Age	
25 - 30	15
31 - 35	11
36 - 40	9
41 - 45	10
46 - 50	7
51 - 55	5
Gender	
Female	32
Male	25

The most common clinical symptoms of long COVID brain fog of 57 patients are summarized as follows: memory loss (100%,57/57), concentration problems (100%,57/57), short attention spans (100%,57/57), forgetfulness and confusion (100%,57/57), inhibited decision making (78.9%,45/57), sluggish thinking (77.2%,44/57), poor appetite (75.4%,43/57), sleep problems (71.9%,41/57), fatigue (70.1%,40/57), lack of motivation (68.4%, 39/57), depression or anxiety (61.4%,35/57), muscle pain (54.4%,31/57), headaches (49.1%,28/57), dizziness (43.9%,25/57), other symptoms such as abdomen distension, palpitation, frequent urination, tinnitus, irritability and impatience, hot flashes and night sweats (38%, 20/57) (Figure 1).

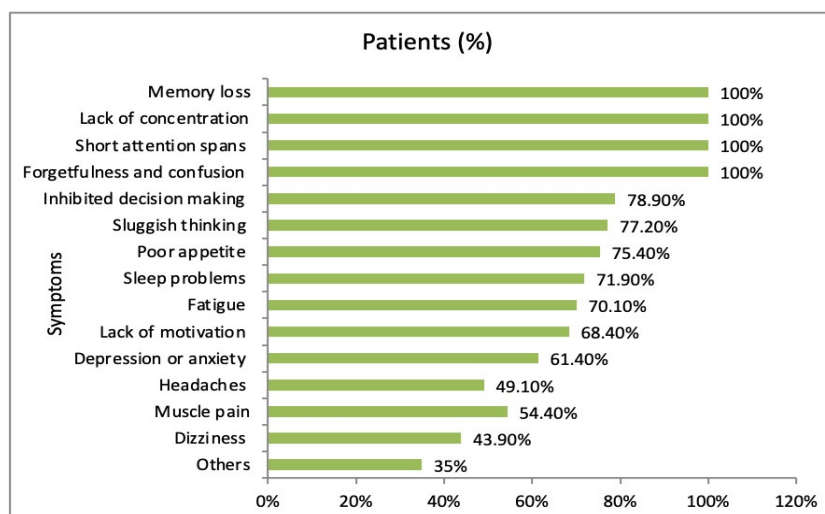


Figure 1: The most common clinical symptoms of long COVID brain fog.

Syndrome Differentiations in TCM

The 57 patients with brain fog after a COVID-19 infection were divided into 4 differentiations in TCM based on whether their main symptoms were related to spleen qi and kidney essence deficiency, qi and blood deficiency, liver qi stagnation or disharmony between heart and kidney.

Spleen qi and Kidney Essence Deficiency

Main symptoms: memory loss, concentration problems, short attention spans, forgetfulness and confusion, lack of motivation, sluggish thinking, accompanied by fatigue, tinnitus, dizziness, weak legs, gassiness, bloating, abdominal fullness, lack of appetite, lower back pain, frequent nocturnal urination, cold limbs, sensitive to cold, pale or sallow complexion, a puffy, pale and wet tongue with a slippery coating and tooth marks on the sides, a deep, weak and slow pulse.

Treatment strategy: invigorate the spleen qi and kidney essence, nourish qi and blood.

Qi and Blood Deficiency

Main symptoms: memory loss, concentration problems, short attention spans, forgetfulness and confusion, inhibited decision making, fuzzy thoughts, accompanied by palpitation, fatigue, dizziness, anemia, insomnia, pale or sallow complexion, poor appetite, loose stools, weak voice, shortness of breath, numbness in the skin and limbs, a pale tongue with a white coating, a thin and deep pulse.

Treatment strategy: nourish qi and blood; invigorate blood and qi circulation, strengthen the spleen and kidney qi.

Liver qi Stagnation

Main symptoms: memory loss, concentration problems, short attention spans, forgetfulness and confusion, inhibited decision making, sluggish thinking, muscle pain, headaches accompanied by chest, epigastrium or abdomen distension, fatigue, insomnia, nightmare, anger, sighing, anxiety, depression, mood swings, a red tongue with a thin coating, and a stringy pulse.

Treatment strategy: soothe the liver, invigorate the liver qi and kidney essence.

Disharmony between Heart and Kidney

Main symptoms: memory loss, concentration problems, short attention spans, forgetfulness and confusion, accompanied by palpitation, insomnia, dizziness, tinnitus, hot flashes and night sweats, low appetite, soreness and weakness of lower back and knees, a red tongue without coating, and a rapid pulse.

Treatment strategy: invigorate the qi of heart and kidney, nourish yin and blood, soothe the spirit, calm the mind, and create harmony between heart and kidney.

Treatment Acupoints and Methods

Group 1 Electroacupoints: DU20 (Baihui), DU24 (Shenting), EX-HN1 (Sishencong).

Spleen qi and kidney essence deficiency: Groups 1, and Sanyinjiao (SP6), Taixi (KID3).

Qi and blood deficiency: Groups 1, and Pishu (BL20), Geshu (BL17), Qihai (REN6).

Liver qi stagnation: Groups 1, and Ganshu (BL18), Taichong (LIV3).

Disharmony between heart and kidney: Groups 1, and Neiguan (PC6), Taixi (KID3).

Manipulation and Methods

Intervention was with an electroacupuncture device (model KWD-808I, brand Greatwall). The size of the disposable sterile needles used was 0.25×25 mm. After disinfecting all points with a cotton ball dipped in alcohol, the needles were inserted at 30° to the scalp. After provoking De-qi sensations, the electroacupuncture device was connected to the six needles. The six acupoints are divided into three pairs alternatively. Then each pair connects the two wires of the positive and negative poles to the two needle handles randomly and set to a continuous wave at 2 Hz. The duration of each session was 30 minutes. The frequency of treatment was three times a week for four consecutive weeks.

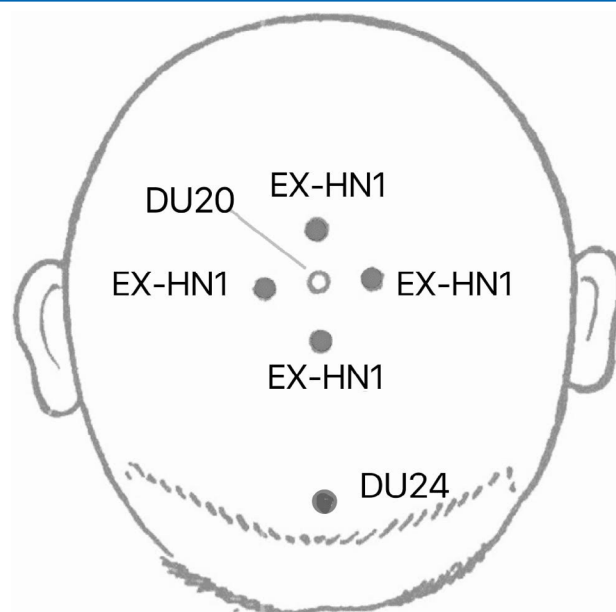


Figure 2: Needling Technique and Manipulation.

Outcomes

After a course of 12 treatments in one month, of the 57 patients, 48 cases were clinically cured, and 9 cases were ineffective. The rate of overall effectiveness was 84%. The total rate of clinically cured patients=the number of patients cured / the total number of patients×100%.

48 cases of patients’ brain fog disappeared, memory, concentration and attention recovered and other health conditions such as mood, heartbeat, sleep and appetite improved as well (Table 2).

Table 2: Outcomes of the 57 cases of long COVID brain fog (n (%)).

Patterns of differentiations in TCM	Number of cases	Clinically cured	Ineffective	Total rate of clinically cured
Spleen qi and kidney essence deficiency	16	15	1	93.8%
Qi and blood deficiency	12	10	2	83.3%
Liver qi stagnation	18	15	3	83.3%
Disharmony between heart and kidney	11	8	3	72.7%
Total	57	48	9	84.2%

Discussion

Acupuncture at the Du meridian point can effectively act on the function of the brain, the references to which are found in the following sources. The early record of acupuncture in the treatment of head disease can be found in the Magic Pivot (in Chinese, 灵枢) written in the Han dynasty 2,000 years ago, in Chapter the evil qi and the morphology of Zang and Fu (in Chinese, 邪气脏腑病形). It said, “The qi and blood from the 12 meridians and 365 branches all go to the head and then to each orifice (refers to the ears, eyes, nose, mouth, anus, urethra, etc.)” The classic of questioning, Twenty-Eight Difficulties (in Chinese, 难经·二十八难) is a medical treatise written by Bian Que (407-310 BC), a medical scientist during the Warring States Period. He wrote, “The Du meridian originates from the lower abdomen. It emerges to the surface of the body at DU1 (Changqiang) (at the root of the spine, midway between the tip of the coccyx and the anus) and then ascends along the midline of the sacrum and through the interior of the spinal column. At the nape, one branch enters the

brain and emerges at DU20 (Bai Hui) at the crown of the head. The head is the house of intelligence and the meeting place of all the yang meridians including the three yang meridians of the hand and foot that all ascend to the head and face.”

Brain fog, a term used to describe for people who’ve had COVID-19 trouble with memory, thinking, concentration or attention. Electroacupuncture (EA) has been used widely for neurological conditions in China and has also been used in many research studies. Electroacupuncture (EA) is regarded as an effective rehabilitation method for neuropathic pain. In addition, the EA-induced improvement in neuronal plasticity was inhibited by SCH58261 and A2AR siRNA, consistent with lower expression levels of A2AR, cAMP and PKA, and worse behavioral performance [18]. Electroacupuncture has both anti-inflammatory and cardio-protective effects [19].

In this article, Electroacupuncture is done by inserting the

acupuncture needles in the scalp and then connecting the electromachine to stimulate the 6 selected points DU20 (Baihui), DU24 (Shenting), and EX-HN1 (Sishencong). Use electrostimulation instead of hand stimulation to treat brain fog. The continuous wave of an electroacupuncture device enhances the effects and regulates qi and blood. It dilates the blood vessels in the brain, which increases cerebral circulation, improves a hypoxic-ischemic state, and relieves brain fog symptoms. The functions of selected electroacupoints are listed below.

The DU20 (Baihui) acupoint is the meeting point of the governor meridian, the three yang meridians of the hand and foot, and the liver meridian. Baihui is located above the head, which is the organ of the primordial spirit. In TCM it is called “the sect of a hundred meridians, the meeting point of a hundred spirits” (in Chinese, 百脉之宗, 百神之会). Therefore, this point can regulate the mind, refresh the mind, relieve evil wind and resolve phlegm.

DU24 (Shenting) (English translation: Spirit Courtyard). DU24 is a very important and powerful point to benefit the brain, and calm the mind and the spirit. It is the meeting point of the Governing Vessel with the Bladder and Stomach Channels. The main indications are poor memory, anxiety, vertigo, insomnia, epilepsy, dizziness, depression, blurred vision, allergic rhinitis, and runny nose.

EX-HN1 (sishencong) forms a star-shaped group of points around DU20 at the vertex (see Figure 2). This acupoint is located on the top of the head, the front and rear acupoints are on the line of the Du meridian, and the left and right acupoints are on the line of the bladder meridian. The Du meridian that passes through the spine belongs to the kidney, and enters the brain; the bladder meridian crosses the forehead, and ascends to the top of the brain. EX-HN1 (Sishencong) treats insomnia and regulates sleep as well as many mental and nervous symptoms. It is for a variety of neurological and psychological diseases. The main indications are headache, vertigo, insomnia, poor memory and epilepsy.

Animal experimental studies in recent years have shown that electroacupuncture at acupoints Shen Ting, Baihui, Neiguan, can increase the activity of superoxide dismutase (SOD) and decrease the content of malondialdehyde (MDA) in the brain tissue of rats. It is suggested that electroacupuncture can improve the learning ability of vascular dementia rat model and can enhance the body's ability to scavenge the free radicals in the body [20]. The results of acupuncture at acupoints Sishencong show that it can enhance the activity of nitric oxide synthase (NOS), increase the content of nitric oxide (NO), adjust sleep issues and various neurological symptoms, and promote brain function. It can also significantly improve the thymus index, spleen index, blood leukocyte count, and enhance SOD activity in the brain [21].

To summarize, electroacupuncture at acupoints DU20 (Baihui), DU24 (Shenting), EX-HN1 (Sishencong) brings efficient results in treatment of brain fog and cognitive dysfunction, making it worthy

to promote in clinical applications.

Conclusion

This article shows that electroacupuncture is an effective treatment for brain fog after a COVID-19 infection. It restores the memory and improves concentration and attention. It also shows that electroacupuncture is an effective method of naturally improving a patient's health outcomes.

Authorship and Contributions

Xiangping Peng wrote the manuscript. Guanhu Yang contributed on the use of traditional Chinese medicine (TCM) theory for brain fog (BF).

Funding

The authors declare that they did not receive any funding for the preparation of this article.

Conflict of Interest

The authors declare no conflict of interest.

References

1. Lynch S, Ferrando SJ, Dornbush R, Shahar S, Smiley A, et al. (2022) Screening for brain fog: Is the montreal cognitive assessment an effective screening tool for neurocognitive complaints post-COVID-19? *Gen Hosp Psychiatry* 78:80-86.
2. <https://www.nhsinform.scot/long-term-effects-of-covid-19-long-covid/signs-and-symptoms/long-covid-brain-fog>
3. Xu E, Xie Y, Al-Aly Z (2022) Long-term neurologic outcomes of COVID-19. *Nat Med* 2022.
4. Hall PA, Meng G, Hudson A, Sakib MN, Hitchman SC, et al. (2022) Cognitive function following SARS-CoV-2 infection in a population-representative Canadian sample. *Brain Behav Immun Health* 21:100454.
5. Graham EL, Clark JR, Orban ZS, Lim PH, Szymanski AL, et al. (2021) Persistent neurologic symptoms and cognitive dysfunction in non-hospitalized Covid-19 long haulers. *Ann Clin Transl Neurol* 8(5):1073-1085.
6. Fernández-Castañeda A, Lu P, Geraghty AC, Song E, Lee MH, et al. (2022) Mild respiratory COVID can cause multi-lineage neural cell and myelin dysregulation. *Cell* 185(14):2452-2468.e16.
7. Ocon AJ (2013) Caught in the thickness of brain fog: exploring the cognitive symptoms of Chronic Fatigue Syndrome. *Front Physiol* 4:63.
8. Remsik J, Wilcox JA, Babady NE, McMillen TA, Vachha BA, et al. (2021) Inflammatory Leptomeningeal Cytokines Mediate COVID-19 Neurologic Symptoms in Cancer Patients. *Cancer Cell* 39(2):276-283.e3.
9. Dennis A, Wamil M, Alberts J, Oben J, Cuthbertson DJ, et al. (2021) Multiorgan impairment in low-risk individuals with post-COVID-19 syndrome: a prospective, community-based study. *BMJ open* 11(3):e048391.
10. Wang L, Shi L, Ding Z (2021) Clinical research and thinking of traditional Chinese medicine in treating 40 cases of Covid-19

- in stages, Journal of Jiangxi University of Traditional Chinese Medicine 33:5.
11. Wang TJ (2020) Acupuncture for Brain-Treatment for Neurological and Psychological Disorders. Springer. 2020.
 12. Wu XN (1998) Current concept of Spleen-Stomach theory and Spleen deficiency syndrome in TCM. World J Gastroenterol 4(1):2-6.
 13. Xiangping P (2022) The Effectiveness of Acupuncture in The Treatment of Post COVID-19 Condition: A Retrospective Study. J Gynecol Reprod Med 6(3):106-109.
 14. Jiang Bo, Chen Yifei, Chen Hong (2019) Observation on the effect of electroacupuncture combined with swallowing disorder therapeutic device in the treatment of dysphagia after cerebral infarction. China Minkang Medicine 31(17):106-108.
 15. Wan Long, Sa Zheyang, Pan Xiaohua (2017) Effects of electroacupuncture at Du meridian points on the influence of vascular cognitive impairment in rats. Fujian Traditional Chinese Medicine 48(1):33-34.
 16. Xiao Y, Chen W, Zhong Z, Ding L, Bai H, et al., (2020) Electroacupuncture preconditioning attenuates myocardial ischemia-reperfusion injury by inhibiting mitophagy mediated by the mTORC1-ULK1-FUNDC1 pathway. Biomedicine Pharmacother 127:110148.
 17. Xiangping P, Guanhu Y (2022) The efficacy of electroacupuncture in the treatment of post-COVID dizziness. Medical & Clinical Research 7(9):1-4.
 18. Wu Q, Chen J, Yue J, Ying X, Zhou Y, et al. (2021) Electroacupuncture improves neuronal plasticity through the A2AR/cAMP/PKA signaling pathway in SNL rats. Neurochem Int 145:104983.
 19. Xiao Y, Chen W, Zhong Z, Ding L, Bai H, et al. (2020) Electroacupuncture preconditioning attenuates myocardial ischemia-reperfusion injury by inhibiting mitophagy mediated by the mTORC1-ULK1-FUNDC1 pathway. Biomedicine Pharmacother 127:110148.
 20. Gao L, Feng X (2016) Effects of electro-acupuncture at Shenting and Baihui points on learning and memory ability and the expression of autophagy-related genes and proteins in cognitively impaired rats after cerebral ischemia-reperfusion. J Rehabilitation 26(4):17-22.
 21. Gao X, Ma Q, Hu B (2007) Effects of acupuncture on Sishencong on the physiological function of sleep disorder model mice. China Acupuncture 27(9): 681-683.

Copyright: ©2022: Xiangping Peng, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.