



Research Article

"Xingnao Kaiqiao" Acupuncture Combined with Traditional Chinese Medicine for Delayed Encephalopathy after Carbon Monoxide Poisoning: A Case Report

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Abstract

Purpose: To explore the clinical effect of acupuncture combined with traditional Chinese medicine in the treatment of delayed encephalopathy of carbon monoxide poisoning, to provide basis for the treatment of delayed encephalopathy of carbon monoxide poisoning by traditional Chinese medicine. **Method:** "Xingnaokaiqiao" acupuncture combined with traditional Chinese medicine was used to treat delayed encephalopathy caused by carbon monoxide poisoning, and the evolution of the syndrome was observed in detail. **Result:** After 44 days of treatment, the general state, cognitive function, the function of motor system and sensory system of the patients were significantly improved. **Conclusion:** The results of this case show that acupuncture combined with traditional Chinese medicine is effective in the treatment of carbon monoxide poisoning delayed encephalopathy and has the advantages of short course of treatment and integration of treatment and prevention. It can significantly improve the prognosis of delayed encephalopathy and improve the quality of life of patients, which is of great significance to reduce the economic burden of societies and families.

Key words: Delayed Encephalopathy after Carbon Monoxide poisoning; Xingnao Kaiqiao Acupuncture; Traditional Chinese Medicine; Medical Case Report.

Introduction

Delayed encephalopathy of carbon monoxide poisoning refers to the brain dysfunction manifested

by dementia and pyramidal/extrapyramidal symptoms in patients with severe carbon monoxide poisoning after the acute poisoning symptoms

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disappear and close to the normal "false healing period". About 10%~30% of patients developed with delayed carbon monoxide poisoning after acute carbon monoxide poisoning. The disease is one of the common and frequently occurring diseases that seriously endanger people's health and life. The disability rate and mortality rate are remarkably high. At present, there is no specific treatment for the disease. The prognosis of most patients is poor, which brings a heavy burden to the family and society.

Modern medical research has found that acupuncture and moxibustion can protect the brain by improving the blood circulation of the brain and exciting the brain nerves. Delayed encephalopathy caused by carbon monoxide poisoning is caused by the heat toxin of carbon monoxide, which invades the human body. Heat evil injures Yin, Yin injures fire, and disturbs the house of gods; Hoodwink and clear the orifices, damage the brain marrow, lose the support of the brain, and the essence gradually withers and leads to dementia. The acupuncture method of invigorating the brain and opening the orifices is used to nourish the liver and kidney. By regulating the yuan spirit, benefiting the brain orifices, tonifying the liver and kidney and filling the brain marrow, the Qi can be guided by the spirit; It has the effect of activating meridians with Qi. This disease is mixed with deficiency and excess syndrome, and the evil of epidemic virus injures Yin and turns heat, so it is composed of Huanglian Ejiao decoction which can nourish yin, clear heat, and connect the heart and kidney. The Qi of epidemic poison drives directly into the lungs from the nose. When the lungs face the hundred veins, the poison will spread all over the body. This Qi is severe and fierce. It is most likely to consume Qi and blood, hurt the yuan God, damage his Yin and rob his essence and blood. Therefore, in the later stage, Buzhong Yiqi Decoction was added and subtracted by taking Buzhong Yiqi and ascending yang to lift depression as the method.

Case presentation

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A 55-years old male patient was admitted to our hospital on November 14, 2019, due to a 28-day history of speech arrest, slow response, and slow actions. The patient was initially treated with hyperbaric oxygen therapy at a local hospital for his unconsciousness after exposure to soot for 28 days. The patient regained consciousness after 5 days treatment at the local hospital; however, 2 days later, his condition worsened with symptoms of increased sleep, irritability, abnormal behavior, abnormal sensation of hunger, slow walking with reducing strides, sweating, urinary and fecal incontinence.

The patient was unable to speak and walk at the time of admission to our hospital. Irritable and distracted, the patient acted abnormally and unable to take care of himself. He did not present with headache, dizziness, nausea and vomiting, seizures, diarrhea, and hallucinations and did not have personal history of alcohol, smoking, and exposure to poison. Physical examination results: T36.8 °C, P: 132 times/minute, R: 20 times/minute, BP: 130/90mmHg; thin body, flushing complexion; slow response and dull expression; mixed aphasia; symmetrical frontal lines; freely moving eyeballs; nystagmus (-); identical pupils with a diameter of about 2.5mm; sensitive light reflection; slightly neck resistance; random groping with both hands; muscle power (grade 4); increased muscle tone; positive Babinski sign; with indwelling catheter and fecal incontinence; red tongue with less coating; rapid pulse. The patient could not coordinate with physical examination well. The mRS score: 4; The NHISS score: 5; MMSE score: uncooperative. Auxiliary examinations were performed on Oct. 18th, 2019. Blood routine examination: WBC 15.77*10⁹/L, NEUT% 90.1%. Blood-gas analysis after oxygen inhalation: Pao₂ 104mmHg PaCO₂ 26mmHg PH value 7.37. Lac: 8.5 mmol/L. Brain MRI: there were streaky and patchy shaped signal abnormalities in globus pallidus and partial cerebral cortex; iso-intense signal on T1WI; slightly hypo-intense signal on T2W1; slightly high-DWI signal; low-ADC map signal.

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Auxiliary examinations were done upon his admission to our hospital on Nov. 14th, 2019. Serum Lipid analysis: LDL-C 3.37mmol/L/. Results for liver function, renal function, blood glucose, blood coagulation, infectious diseases, thyroid function, and blood routine tests were normal. Head CT suggested multiple lacunar cerebral infarction. Based on these results, the patient was diagnosed with delayed encephalopathy after carbon monoxide poisoning, sinus tachycardia, hyperlipidemia and urinary retention.

Therapeutic intervention

"Xingnao Kaiqiao" acupuncture combined with traditional Chinese medicine

1. "Xingnao Kaiqiao" Acupuncture approach was used for the treatment of this patient (1). The approach was performed once a day and was adjusted according to the clinical manifestations during the disease.

Acupoints selection was as follows (Figure 1):

Major points: DU-26 (Ren Zhong), P6 (Nei Guan), SP6 (Sanjinjiao).

Assisting points: HT-1 (Ji Quan), LU-5 (Chi Ze), BL-40 (Wei Zhong).

Adjunct points: GB20 (Feng Chi), SI-4 (Wan Gu), UB-10 (Tian Zhu), LI10 (Shousanli), TE6 (Zhi Gou), SI-3 (Hou Xi), LI4 (He Gu), EX-UE 9 (Ba Xie), SP-10 (Xue Hai), ST 36 (Zusanli), ST-40 (Feng Long), SP-3 (Tai Bai), LV3 (Tai Chong), CV12 (Zhong Wan), ST-25 (Tian Shu), CV6 (Qihai), CV 4 (Guan Yuan), St 28 (Shuidao), ST-29 (Gui Lai).

Method of needling:

(1) Major points

Firstly, the acupoints of bilateral Nei Guan were acupunctured perpendicularly for about 0.5-1.0 cun, the reducing manipulation by twirling as well as lifting and thrusting the needle was performed for 1- 3 minutes. The two needle handles were twirled at an angle above 180 °with skin and at a frequency under 120 rpm towards opposite

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directions with reducing method of lifting and thrusting.

Secondly, the needle was inserted at Ren Zhong towards nasal septum for about 0.3-0.5 cun, using the method of manipulation of heavy bird-peck needling till the eyeballs of the patient were wet or tears fell.

Finally, the needle was inserted at Sanyinjiao, along the medial border of tibia at an angle of 45°with skin for about 0.5-1.0 cun. The reinforcing manipulation method by lifting and thrusting the needle was used till the patient's lower limbs had three tics.

(2) Assisting points

The Ji Quan was acupunctured at 2 cun below the source point along the channel. The needle was inserted perpendicularly for 0.5-0.8 cun. Reducing manipulation by lifting and thrusting was applied, which would cause numbness and shaking of patient's hands. The method should be applied till the patient's upper limbs had three tics.

Patient's elbows were flexed to 120°for acupuncture at Chi Ze. The needle was inserted perpendicularly for 0.5-0.8 cun. The reducing manipulation by lifting and thrusting was applied till the patient's hands had three tics.

With the patient maintained at supine position, the Wei Zhong point was selected by lifting the leg. The needle was inserted at an angle of 15°with skin for 1.0-1.5 cun. The reducing manipulation by lifting and thrusting was applied till the patient's lower limbs had three tics.

(3) Adjunct points

Uniform reinforcing-reducing method was used at adjunct points.

2. Eye acupuncture (2) was applied in the liver area, kidney area, spleen area, and upper-energizer area. The needle could be retained until the patient received the needle sensation of qi, which feels like electric shock, or itching and tingling, or fever, or cold, or relaxed and comfortable. If there is no sensation of qi after the needle is inserted, the needle can be slightly lifted and re-adjusted to insert.

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3. Thunder-Fire moxibustion therapy was used for treatment. Bird-pecking moxibustion and revolving moxibustion method were applied at acupoints of Dan Zhong, Zhong Wan, Tian Shu, Qi Hai, Guan Yuan, Shui Dao, Gui Lai, Zhong Ji once a day.

4. Formula of *Coptis chinensis* and donkey-hide gelatin decoction was given for 18 days in the treatment of early stage. Formula of *Buzhong yiqi* decoction was given for 13 days in the late stage. During treatment course, the using of

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traditional Chinese medicine would be adjusted according to patient's condition.

Western medicine

The patient was given piracetam injection once per day. Vitamin B1 and vitamin B12 were administered orally three times per day. Metoprolol Tartrate Tablets were given 12.5mg twice per day.

Improvement of patient's condition is summarized in Table 1.

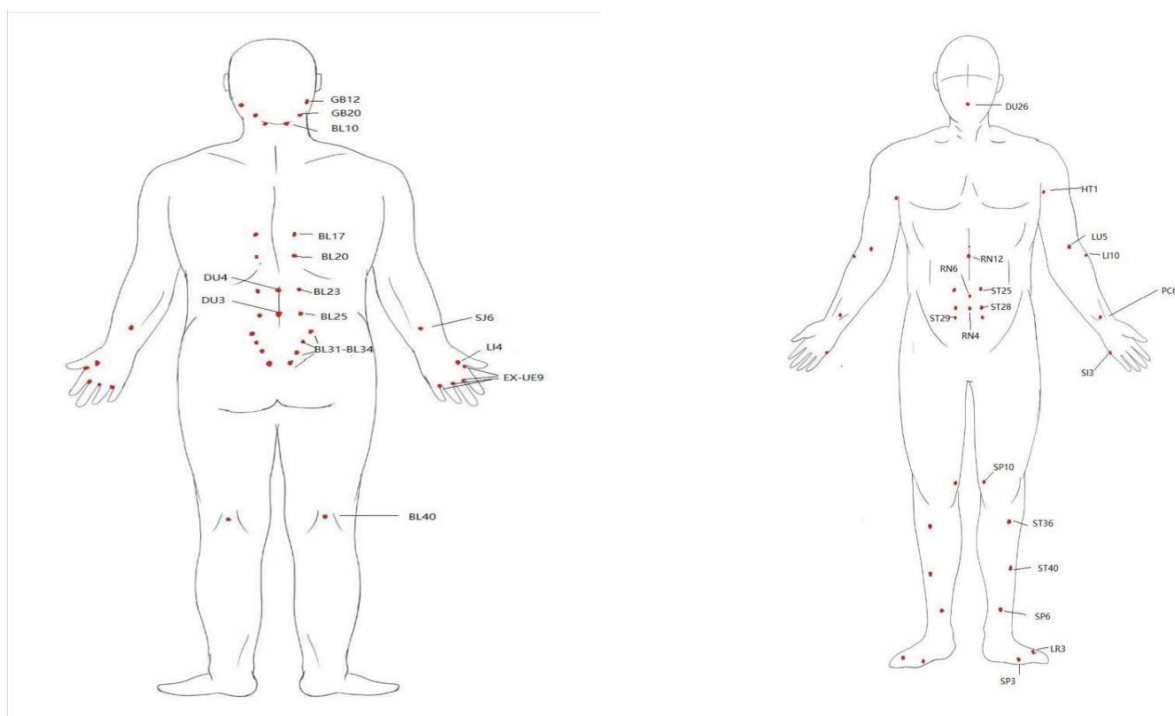


Figure 1. Acupoints selection.

Table 1. Improvement of patient's condition.

Hospitalization duration		On admission	6 th day	18 th day	35 th day	44 th day
General State	Complexion	Flushed face	Flushed face	Sallow face	Slightly sallow face	Ruddy and healthy looking
	Expression	No expression to daily conversation	Expression shown occasionally to daily conversation	Richer expression; occasionally eye contact	Expression of crying, smiling, Worried, etc.	Rich expression
	Reaction	Slow reaction	Slow reaction	Slow reaction	Intermediate	Quick

					reaction	reaction
	Bladder and bowel function	Urinary and fecal incontinence	Having trouble in automatic micturition after catheter extraction	Automatic micturition after catheter extraction	Normal	Normal
	Coating on the tongue; Pulse condition	Red tongue with less coating; rapid pulse	Red tongue with less coating; rapid pulse	Pink tongue with pale coating, weak pulse	Pink tongue with pale coating, weak pulse	Pink tongue with pale coating, slightly weak pulse
Cognitive function	Mental status		Unable to distinguish relatives from strangers	Taking off clothes without avoiding people	No abnormal behaviors	No abnormal behaviors
	Advanced cortical functions	Unable to speak	Unable to speak	Able to speak 1-2 simple word(s)	Able to communicate with others in simple words; calculation ability 100-7=93, 93-7=?	Able to communicate with others; calculation ability 100-7=93; 93-7=86; 86-7=?
Motion system	Limb function	Able to stand for a few minutes with holding on other things; unable to walk	Able to stand for a few more minutes with holding on other things; unable to walk by himself	Able to stand, able to walk 20 meters with the help of others	Able to walk 50 meters by himself with festinating gait	Able to walk 200-300 meters by himself with festinating gait
	Involuntary movement	Involuntary movement of limbs	Involuntary movement of limbs	Involuntary movements of upper limbs with less frequency	No involuntary movements of upper limbs; involuntary movements of lower limbs with less frequency	No involuntary movement of limbs
Sensory system	Uncooperative	Uncooperative	Uncooperative	Uncooperative	Uncooperative	Normal
Scale Score	MRS score	4	4	4	3	1
	NHISS score	5	3	2	1	0

	MMSE score	Uncooperative	Uncooperative	Uncooperative	12	24
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Discussion

Delayed encephalopathy caused by carbon monoxide poisoning is a type of "dementia" in traditional Chinese medicine. Based on medical history collected by means of four diagnostic methods (inspection, listening & smelling, inquiring and palpation), the disease was in the encephalon, pathogenic factors and pathogenesis of which was inhaling of poisonous gas from the mouth and nose. The pathogenic toxin got into the body to cause excessive heat that impair Yin, which lead to disturbance in residence of intelligence. Also, the pathogenic toxin affected the seven orifices and went up to the brain to deprive nourishment, which caused dementia as the essence gradually withered. According to the theory of traditional Chinese medicine, "The kidney controls bones and nourishes the marrow. The brain is the sea of the marrow." When the sea of the marrow dried up, the kidney water would be insufficient, which caused renal fluid insufficiency that could not decrease heart fire, which eventually resulted in disharmony of the heart and kidney and water-fire imbalance. Therefore, the patient was restless and upset due to the yin deficiency in with yang hyperactivity. Residual pathogenic factors were filled and could not flow in the body, which caused damage in spleen and stomach. Water and wetness stagnated within body due to dysfunction of the spleen in transport became sputum that stuck in body, which affected the function of stomach to receive food so that the patient had abnormal sensation of hunger. Invasion of pathogenic factors blocked the circulation of qi and blood, which caused phlegm and blood stasis that aggravated the dementia. Flow of pathogenic factors in the channels and collaterals resulted in limb activity disorder, and blocked the way of triple energizer, together with dysfunction of kidney, caused urinary and fecal incontinence. In modern medicine, the mechanism of the disease was that cerebral edema after hypoxic ischemia caused by inhaled carbon monoxide combined

with hemoglobin lead to microcirculation disturbance, which caused extensive pathological changes such as demyelination.

Xingnao Kaiqiao acupuncture method (3) was acted on Yin Meridian and the points of Du Meridian. Major points Ren Zhong, Nei Guan and Sanjinjiao were acupunctured for resuscitating and nourishing brain, nourishing liver and kidney, which eventually achieved the effect of regulating qi that dredged the channels and collaterals. The Nei Guan is the acupoint that corresponds to pericardium, which is the outer guard of the heart and consciousness. The Ren Zhong acupoint is in the Du Meridian that extends to brain, so if Du Meridian is smooth and unblock, the brain will be in a good state of consciousness. Sanyinjiao is the intersection of the three yin meridians of the spleen, liver, kidney, and benefits yin blood.

The selection of major points was based on the location of the points, that was, upper, middle and lower parts of the human body. On the one hand, acupuncture at the major points worked on the whole body. For example, acupuncture at Nei Guan activated the frontal lobe, temporal lobe, and other brain areas. Acupuncture at Sanyinjiao caused increase of average signals in bilateral median temporal gyrus, inferior frontal gyrus, central posterior gyrus, and ipsilateral superior parietal lobule, island lobe, and contralateral central anteroposterior gyrus, which enabled central nervous system to integrate information and regulates body functions. On the other hand, it also benefited some body functions, respectively. For instance, acupuncture of Nei Guan increased cerebral perfusion to enhance recovery after cerebral ischemia and improve neural function. Acupuncture of Ren Zhong point stimulated the sphenopalatine ganglion to motivate the regulation function of blood vessels, relieved cerebral vasoconstriction and improved microcirculation.

Medical researchers also find that acupuncture at Nei Guan first can strengthen myocardial contractility, provide sufficient blood perfusion to

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the brain, and prolong cerebral ischemic tolerance. Then, acupuncture at Ren Zhong can alleviate vasoconstriction, improve cerebral microcirculation, relax microvessels to better receive blood supplied by heart under the stimulation of acupuncture at Nei Guan, stimulate brain neurons to activate central nervous system, increase energy utilization and resistance to various damages in nerve cells, which is helpful for protecting the brain.

Acupuncture at Ji Quan, Chi Ze and Wei Zhong focused on dredging meridians, harmonizing qi and blood. Unblocking meridians and harmony of qi and blood were beneficial to the recovery of limb functions. Moreover, acupuncture at adjunct points for accompanied symptom was used according to changes of patient's condition, which played a key role in patient's recovery.

The syndrome of the disease was intermingled deficiency and excess, with heat from impairment of yin by pathogenic factors and pathogenesis. Therefore, formula of *coptis chinensis* and donkey-hide gelatin decoction that could nourish yin, clear heat, and coordinate heart-kidney was used as the main formula. Bitter in taste and cold in property, *coptis chinensis* and *scutellaria baicalensis* in this formula were used together to clear the heat of heart. Sweet and neutral in nature and acting on kidney to nourish yin and get rid of heat and agitation, donkey-hide gelatin was well-matched with *coptis chinensis* to achieve the effect of "reduce south and reinforce north" and to coordinate heart and kidney. Together with donkey-hide gelatin, yolk used this formula could tonify kidney yin, nourish heart and blood, to achieve the balance of yin between yang, harmonization of fire and water. Chinese herbaceous peony has a bitter and sour taste and is cool in property, which could clear heat with *coptis chinensis* and *scutellaria baicalensis* and nourish yin with yolk and donkey-hide gelatin.

The pathogenic toxin went directly into the lung that was essential to blood circulation, which caused the toxin spread all over the body. The highly toxic pathogenic toxin could consume qi and

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blood easily, damage consciousness, damage yin, and deprive essence and blood of the body. Considering the cause of the disease and based on patient's symptoms, including frequent urination at night, slight dysphoria at night, fatigue, pale red tongue with white coating, and weak pulse, formula of *buzhong yiqi* decoction was used to ascend spleen-Qi. Sweet in taste and warm in nature, *astragalus propinquus* Schischkin was working as the basic remedy in this formula to tonify lung-Qi, reinforce vitality and increase yang. What is more, *ginseng* and *radix glycyrrhizae preparata* which are warm in nature could assist *astragalus propinquus* Schischkin to recuperate spleen and stomach. As Li Dongyuan, an expert of traditional medicine of Jin Dynasty said, "Heat caused by deficiency of vital essence can be reduced by *ginseng*, *astragalus propinquus* Schischkin, and *radix glycyrrhizae preparata* effectively, which can also tonify primordial Qi for their sweet and warm nature. If *Atractylodes macrocephala* Koidz is added, the formula can tonify and moisten spleen, benefit qi and nourish blood. Warm but not dry, the *pericarpium citri reticulatae* has the effect of regulating qi and harmonizing stomach by using of acrid-release and bitter-descending method. Reasonable combination use of these herbs can tonify qi and descend qi, make primordial qi filled in the body, and elevate Yang, which will help to restore one's health."

The pathogenic toxin affected the seven orifices and went up to the brain to cause dementia. Flow of pathogenic factors in the channels and collaterals blocked the way of triple energizer, together with dysfunction of kidney, caused urinary and fecal incontinence. Acupuncture at Tian Shu, Qi Hai, Guan Yuan, Shui Dao, Gui Lai, etc. improved the function of Qi and induced diuresis. Together with the Thunder-Fire moxibustion therapy, the way of triple energizer could be cleared. With the help of the formula of *coptis chinensis* and donkey-hide gelatin decoction that could nourish yin, clear heat, and

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coordinate heart-kidney, the bladder and bowel function recovered.

This case of delayed encephalopathy after carbon monoxide poisoning has achieved satisfactory curative effect treated with comprehensive treatment methods, including "Xingnao Kaiqiao" acupuncture method, traditional Chinese medicine, and Thunder-Fire moxibustion therapy. However, the patient did not undergo brain MRI examination when discharged from our hospital, which should be considered in the future treatment in other cases.

Declarations

1) Consent to publication

We declare that all authors agreed to publish the manuscript at this journal based on the signed Copyright Transfer Agreement and followed publication ethics.

2) Ethical approval and consent to participants

This case has ethical approval and patient consent.

3) Disclosure of conflict of interests

We declare that no conflict of interest exists.

4) Funding

None

5) Availability of data and material

We declare that the data supporting the results reports in the article are available in the published article.

6) Acknowledgement

None.

7) Authors' contribution

Authors contributed to this paper with the case management (JPZ, YQB, YY, XHG, XLZ), writing (JPZ), revision (JPZ and XLZ), editing (JPZ and XLZ) and final approval (JPZ).

8) Authors' biography

None

References

1) Shi Xuemin. Practical Acupuncture and

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Moxibustion by ShiXuemin. Traditional Chinese Medicine Press of China 2009; 289-293.

- 2) Wang Pengqin. Study on Eye Acupuncture Therapy by Peng Jingshan ; People's Medical Publishing House 2015; 61-66.
- 3) Kang Mingming, Zhang Zhilong. Study on Characteristics of Major Points of "Xingnao Kaiqiao Acupuncture"; Liaoning Journal of Traditional Chinese Medicine 2010; 37 (5): 917 -918.
- 4) Analysis on therapeutic effect of acupuncture combined with hyperbaric oxygenation on delayed encephalopathy in the patient of acute carbon monoxide poisoning].He J.Zhongguo Zhen Jiu. 2008 Jan;28(1):30-2.
- 5) Observation on therapeutic effect of acupuncture intervention combined with hyperbaric oxygen therapy for delayed encephalopathy caused by carbon monoxide poisoning].Liu DF, Zhao B, Lü YL, Yao XR, Liao J.Zhen Ci Yan Jiu. 2013 Oct;38(5):407-10.
- 6) "Xingnao Kaiqiao" Acupuncture(Acupuncture Technique for Restoring Consciousness) Combined with Hyperbaric Oxygen in Patients with Hypoxic Ischemic Encephalopathy: Clinical Observation and Its Influence on Blood Rheology Zhen Ci Yan Jiu. 2017 Dec 25;42(6):518-21. <https://doi.org/10.13702/j.1000-0607.2017.06.010>.
- 7) Delayed leukoencephalopathy after acute carbon monoxide intoxication. Geraldo AF, Silva C, Neutel D, Neto LL, Albuquerque L.J Radiol Case Rep. 2014 May 31;8(5):1-8. doi: 10.3941/jrcr.v8i5.1721. eCollection 2014 May.
- 8) Xingnao Kaiqiao acupuncture on promoting wake-up of vegetative state after brain injury].Bao YC, Zhang F, Li Q, Liu M, Cheng XR, Zhang YB, Qiu B.Zhongguo Zhen Jiu. 2021 Nov 12;41(11):1225-8. <https://doi.org/10.13703/j.0255-2930.202011>

[01-k0002](#).

- 9) Idea of shen-brain-orifice in the acupuncture system of Xingnao Kaiqiao Yu L, Fan XN. Zhongguo Zhen Jiu. 2019 Aug 12;39(8):883-6. <https://doi.org/10.13703/j.0255-2930.2019.08.023>.