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SHORT COMMUNICATION

Acupuncture as complementary therapy for hypoxic encephalopathy: A case study

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Summary
Objective: In acute carbon monoxide intoxication, more serious neuronal damage may induce hypoxic encephalopathy with variable degrees of brain damage, ranging from confusion to deep coma. We report herein on a patient who developed hypoxic encephalopathy and acute respiratory failure after acute carbon monoxide intoxication. Acupuncture therapy has been applied along with prescription medication to restore consciousness.
Clinical presentation: The patient had a 2-month history of consciousness disturbance and frequent generalised episodic clonic twitching with upward gazing, which was diagnosed as hypoxic encephalopathy.
Intervention: Acupuncture therapy has been applied to restore consciousness with routine treatment and medication prescription. The patient was treated 29 times by abdominal acupuncture in conjunction with scalp, body and foot acupuncture according to the 12 meridians' points as an assistant therapy. After 2 months of acupuncture treatment, the patient regained consciousness; the Glasgow Coma Scale (GCS) index increased from 7 to 15, before and after acupuncture therapy.
Conclusion: This case report suggests that there may be a role for complementary treatment with acupuncture in such cases, and it would be more definitive, meaningful and a welcome addition to our database of knowledge if more case studies about the possibility of acupuncture use in these circumstances were done.

The severity of carbon monoxide (CO) poisoning is dependent on several factors, including the ambient concentration and the duration of exposure. The clinical presentations associated with CO intoxication may be diverse and nonspecific. The commonly encountered sequelae are coma and hypoxic encephalopathy in patients with more serious neuronal damage, and are clinically characterised by cognitive deterioration, loss of consciousness and a recurrence of neurological or psychiatric symptoms.

Acupuncture has become a more acceptable alternative form of medical treatment now, and has been the focus of studies using brain-imaging techniques to investigate the effects of acupuncture in humans.[1] Clinical reports concerning acupuncture for cerebral hypoxic-ischaemic

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encephalopathy are very limited.[2] This case demonstrates the successful use of acupuncture with prescription medication to restore consciousness.

Case study

History and examination

The patient, a 33-year-old single female, was presented to our acupuncture clinic with a 2-month history of consciousness disturbance, and, in the past few days, a frequent generalised episodic clonic twitching with upward gazing. According to her parents' statements, she had undergone an insidious-onset continuous illness of 2 years' duration that was characterised by delusions of persecution, third-person auditory hallucinations and compulsive behaviour. She was diagnosed with schizophrenia; however, the target poor insight and symptoms of non-adherence to medication made it harder to treat and control.

The patient, who suffered from depression, attempted suicide by burning charcoal and inhaling the fumes. She had a carboxyhaemoglobin (COHb) level of 43% on arrival to the Accident and Emergency Department in Taipei-CTH. The total time that the patient spent in the intensive care unit (ICU) was 20 days, and she had subsequently been transferred to ward care for an 8-day period. Owing to the continued coma, the patient's family expressed their wish for her to be discharged to a nursing home for private care.

Two months after CO poisoning, the patient was admitted to our hospital (Kaohsiung-EDAH) in a stupor and displayed a left head tilt. We respected the guidelines of good clinical practice and conformed to the principles outlined in the Declaration of Helsinki. The patient was diagnosed as hypoxic encephalopathy. Physical examination on admission revealed a blood pressure of 148/85 mm Hg, a regular pulse of 87 beats min^{-1} and respiration of 20 min^{-1}. The extremities were cool; no cyanosis or pitting oedema was detected. The patient had relatively large muscle bulk of the upper arm and lower leg on the left side, and an ulcerated wound covered by a moist leathery eschar with purulent discharge measuring 5 cm $\times$ 5 cm on her left sole. She was unresponsive to painful stimuli and had a Glasgow Coma Scale (GCS) of 7 (E2V1M4). On neurological examination, the visual fields and visual acuity were considered fair; there was tonic gaze deviation to the left side. Her pupils were 2 mm bilaterally with less-than-brisk reaction, and with positive corneal and light reflexes. Present examination revealed bilateral foot deformities with a tonic plantar-flexed contracture. Hoffman and Babinski reflexes were present bilaterally. Furthermore, the patient showed hypersensitivity of the sensation in touch.

Treatment

The patient initially received 20 hyperbaric oxygen (HBO) treatments in the early stage of CO intoxication in Taipei-CTH. Medical management over the next 2 months of hospitalisation included piracetam, tizanidine, clonazepam, baclofen, propranolol, diltiazem, methylphenidate, valproic acid, risperidone, diazepam, triazolam and zolpidem at our neurology clinic in Kaohsiung-EDAH. Simultaneously, given the severity of symptoms, acupuncture intervention according to the 12 meridians' points occurred during the hospitalisation period as an assistant therapy. Meanwhile, the patient began a rehabilitation programme under supervision.

There followed 2 months of intensive scalp, body, abdominal and foot acupuncture. In clinical practice, a 28-gauge, 1.5-inch needle (0.32-mm diameter) was used in scalp and food acupuncture; a 32-gauge, 1.5-inch needle (0.28-mm diameter) was used in the extremities and a 30-gauge, 2.5-inch needle (0.30-mm diameter) was used in abdominal acupuncture. The following points were used in our patient: (1) scalp acupuncture: Anterior oblique line of vertex-temporal, Du 20 (Bai Hui), Du 24 (Shen Ting), GB 13 (Ben Shen), GB 20 (Feng Chi); (2) 12 meridians' points: LI 4 (He Gu), Liv 3 (Tai Chong), TB 5 (Wai Guan), BL 40 (Wei Zhong), St 36 (Zu San Li), GB 34 (Yang Ling Quan), GB 39 (Xuan Zhong); (3) abdominal acupuncture: Ren 12 (Zhong Wan), Ren 10 (Xia Wan), Ren 6 (Qi Hai), Ren 4 (Guan Yuan), Kid 13 (Qi Xue), St 24 (Hua Rou Men), St 26 (Wai Ling); (4) foot acupuncture: Head point. Furthermore, warm needle moxibustion was applied on the acupoints: St 36, Ren 12, Ren 6, Ren 4, St 24, St 26 and Head point. The treatment was given when the acupoints were located with the left forefinger, and the needles were manipulated with the right forefinger by eliciting a 'de-qi' response — tapping a needle into a point through a guide tube and then leaving it should fulfill the criteria, and then retain the needle for 30 min after insertion; the needles were then taken out. The acupuncture treatment was initiated and consisted of a series of 2-month treatments. The patient started to show clinical improvement at day 15; she had complaints of pain in the right hand during rehabilitation. Repeated neuropsychological assessment at 1.5 months showed improvement in her verbal response; the patient began to call her parents Mommy and Daddy, and at 2 months, she was able to express her feelings distinctly. Around the 65th day, a considerable improvement was observed; the patient regained consciousness after 29 treatments; the GCS index had increased from 7 to 15, before and after acupuncture therapy. Presently, with voluntary hand movements, the patient was able to have independence in her self-care, eat on her own, and it became possible to maintain verbal communication with her. She was able to transfer information from short-term to long-term memory and performed within the average range when attempting to retrieve learned information from long-term memory.

Discussion and conclusion

We report a complication of acupuncture as a complementary therapy to the pharmacological treatment of hypoxic encephalopathy in cooperation with scalp, abdominal and foot acupuncture according to the 12 meridians' theory. Acupuncture is one of treatment modalities of traditional Chinese medicine (TCM) that develops a different conceptual and theoretical basis to modern biomedicine.[3] In practice, TCM and biomedicine focus on different ends of the spectrum — objectivity and subjectivity — of any medical entity, respectively; that is why TCM may complement biomedicine well in its distinct approaches to some medical

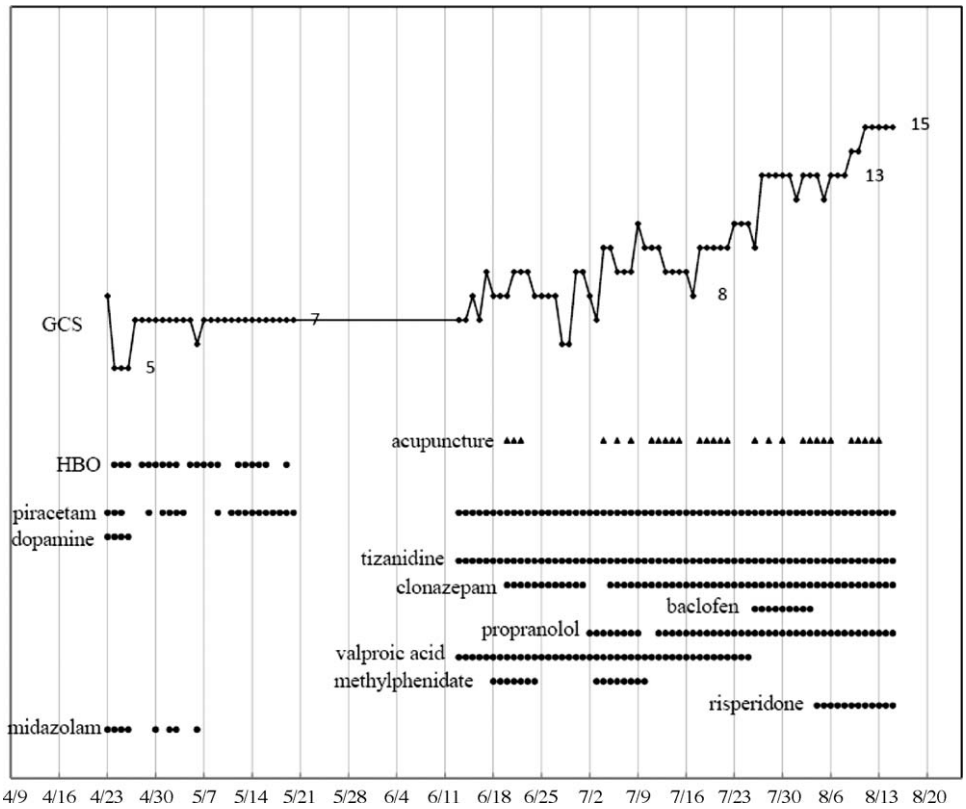

Figure 1 Serial Glasgow Coma Score (GCS) of management with HBO treatments, medication prescription and acupuncture therapy. Time after carbon monoxide poisoning = time since hospitalisation (month/date).

conditions without clear biomedical pathogenesis.[4] Qi is the flow of vital energy that runs through hypothesised channels called meridians, and there are numerous designated acupoints that can be used for one to apply stimulations via pressure, needle, moxibustion, or more recently, laser and electrical stimulation, that can regulate the flow of Qi and restore good health.[5]

CO inhalation leads to tissue hypoxia by binding to haemoglobin and reducing the oxygen-carrying capacity of blood. Disorders and dysfunctions of zang-fu organs and disturbances of Qi and blood will occur. The gentle needling method used for this system has the ability to adjust the circulation of Qi and blood flow within the body's meridian system. Scalp acupuncture, abdominal acupuncture, foot acupuncture and related techniques were then added to the treatment.

The characteristics of abdominal acupuncture therapy are based on the traditional acupuncture system in combination with bioholographic reflexology.[6] This bioholographic reflex system is used to treat corresponding areas of the human body. As the abdominal meridians and the points are located at the middle layer of the abdomen and are used to treat meridian system disorders, abdominal acupuncture has the ability to adjust zang-fu functions to treat whole-body disease. The indications for abdominal acupuncture are mainly for internal organ disease, long-term illness or difficult conditions, such as cerebral brain disease, heart disease and hypertension.[7] Scalp acupuncture therapy treats and prevents disease by needling specific stimulation areas on the scalp, which is based on traditional Chinese medicine theory and is based on Mu point theory, meridian theory, holographic theory and a modern knowledge of the representative areas and functions of the cerebral cortex.[7] The scalp has a close relationship with the human body's physiologic functions and pathologic changes. Clinically, scalp acupuncture is widely used and has been proven to be especially useful in the treatment of central nervous system disorders, pain control and acute conditions, such as hemiplegia, numbness of limbs and aphasia caused by cerebral thrombosis, cerebral haemorrhage or cerebral embolism.[8]

We explored treatment options for adjuvant therapy for a hypoxic encephalopathy patient, who suffered from the disturbance of consciousness and physical disability for about 2 months. Scalp acupuncture (Du 20, Du 24, GB 13, GB 20, etc.) adjusts the function of the cerebral cortex, thus improving the circulation of the brain and vascular system. It can improve motor function and speed up the healing process. Body acupuncture at the Four Gates, LI 4 and Liv 3, would be used to circulate energy (Qi) throughout the body and remove stagnation and toxicity. The abdomen is an important area of the human body. The vital activities of many important internal organs are associated with the abdomen, including the spleen, stomach, liver, gallbladder, kidney, urinary bladder, large intestine, small intestine and reproductive organs. The purpose of using abdominal acupuncture (Ren 12, Ren 10, Ren 6, Ren 4, Kid 13, St 24, St 26, etc.) is to open the microcosmic orbit meditation. The abdomen provides an abundance of blood and energy circulation to the human body. Foot therapy provides a holistic result. Stimulating specific points on the feet can have the effect of

regulating zang-fu function through the meridian systems. Warm needle moxibustion was applied on the Head point in foot acupuncture along the running course of the Chong meridian.

The patient was admitted to our neurology clinic due to 2 months consciousness disturbance and frequent generalised episodic clonic twitching with upward gazing. The patient suffered from hypoxic encephalopathy and her baseline GCS score was 7. During a 2-month hospitalisation period, the patient underwent extensive investigation. We recorded the conscious state for initial as well as continuing assessment; the patient was admitted to the hospital following HBO treatment, medication and acupuncture therapy for clinical intervention as depicted in Fig. 1. The following describes the prescription medications used without antibiotics, gastrointestinal remedies, emollient laxative and resolving phlegm. Treatment with piracetam through a gastrostomy tube was initiated. Numerous neuronal and vascular effects of piracetam have been described. Piracetam has neuroprotective and anticonvulsant properties, and improves neuroplasticity; it also appears to reduce erythrocytes adhesion to cell wall and facilitate microcirculation. Tizanidine is approved as a muscle relaxant used to reduce spastically increased muscle tone, but has no influence on muscle force, tendon reflexes, Babinski sign and ankle clonus; and can produce hypotension. Clonazepam, a classical anti-epileptic drug, can be useful for symptomatic treatment of post-hypoxic myoclonus. Valproic acid is used in the prophylaxis and treatment of manic depression; using valproic acid with other anticonvulsant drugs, such as clonazepam, may cause excessive sedation (drowsiness and lack of physical and mental alertness). Methylphenidate is a psychostimulant drug, which has been used to reduce the duration of comas. Risperdal is a psychotropic agent indicated for the treatment of schizophrenia, and is generally prescribed to treat psychotic disorders and symptoms such as hallucinations, hostility and delusions. Midazolam is a relatively short-acting benzodiazepine central nervous system (CNS) depressant, and has anxiolytic, sedative, hypnogenic and muscle-relaxant effects.

It is well known that the brain is more sensitive to hypoxia than other organs as its oxygen demand is high. Brain areas, such as the striatum and the hippocampus, are particularly vulnerable to hypoxia. The neurochemical mechanisms of the dopamine efflux may change over the course of the hypoxia, with dopamine transporters being involved only at the onset of the hypoxic exposure.[9] Although the patient was prescribed dopamine agonists at the beginning of hypoxia, the therapies were of limited benefit. Two months after initiation of acupuncture treatment, the patient regained consciousness after 29 treatments; the GCS index had increased from 7 to 15, before and after acupuncture therapy. As a consequence, the patient showed remarkable improvement in consciousness restoration; the favourable response obtained in this case was probably due to the combined complex therapy; the acupuncture treatment would be an add-on treatment to the routine treatment.

This is only a single case and acupuncture was used in combination with many other therapies. This report suggests that there may be a role for complementary treatment with acupuncture in hypoxic encephalopathy cases, and a welcome addition to our information if more case studies about the possibility of acupuncture use in these circumstances are done.

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