



Editorial



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Electroacupuncture for Spinal Cord Injury: A Scientific Study of Traditional Medicine

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Spinal cord injury is an irreversible disease with a high disability rate and leads to a heavy economic and social burden. The most common cause of spinal cord injury is trauma, but it can also be caused by tumors, infections, vascular disease, or iatrogenic injury. Spinal cord injury can lead to increased rates of depression, sleep disturbances, spasticity, bladder and gastrointestinal changes, bedsores, sexual dysfunction, involuntary movements, obesity, cardiovascular disease, and respiratory disease, etc. The treatment of spinal cord injury has always been a difficult problem in the medical field. At present, the treatment measures for spinal cord injury mainly include anti-inflammatory drugs, hyperbaric oxygen therapy, and electroacupuncture rehabilitation. the electroacupuncture stimulation treatment of spinal cord injury is a research hotspot in the field of spinal cord injury rehabilitation in recent years, and has shown good effects in both traditional medicine and modern medicine.

In 1920, Ingvars found that the electric field has an important role in the conduction of nerve fibers and could affect the growth of nerve. Marsh and Beams in 1946 first applied direct current implantation in culture medium containing chicken dorsal root ganglia and found axonal growth at the cathode. In 1988 Fehling reported that the application of direct current electric field can lead to the regeneration of spinal cord axons. Shapiro et al.¹ first conducted experiments with electroacupuncture in *in vitro* and *in vivo* models of spinal cord injury in moray, rodent, and canine, and found that it has nutritional and positive effects on injured spinal cord axons, which can improve spinal cord functional outcomes. Then an on-body vibrating electric field stimulator (OFS) was invented and tested on 10 fully motor and sensory SCI patients and found that the OFS was safe, reliable, simple, and effective in the treatment of SCI patients. Xiao et al.² observed the changes of Nogo/NgR and Rho/ROCK signaling pathway-related gene and protein expression in rats with spinal cord injury treated by electroacupuncture, and found that electroacupuncture can inhibit Nogo/NgR and Rho/ROCK signaling pathway after spinal cord injury, so that Mitigate negative effects on axonal growth.

The results of the animal experimental model of acute spinal cord injury treated by electric field show that the electric field can effectively prevent the secondary damage of the spinal cord, which is manifested in that the neurons of the spinal cord are protected and there is no liquefaction, necrosis, and cavity formation of the spinal cord. There are only a few scattered microcapsules in the white matter, and the function of the spinal cord can be largely restored. Under the electron microscope, it can be seen that there are a large number of new microvessels in the spinal cord tissue of animals with external electric field. These

microvessels play a role in improving the spinal cord microcirculation and reducing necrosis. The glial cells in the white matter repair and regenerate the myelin sheath of nerve fibers. Borgens et al.³ pointed out that after spinal cord injury, a strong endogenous injury current can be generated in the spinal cord injury area, which drops to a stable level at 36 hours after injury, but can last for at least 4 days or longer after injury. This injury current can increase the formation of Na^+ and Ca^{2+} ions, which can damage the nerve meridians and promote nerve degeneration. The external electric field and the electroacupuncture electric field can generate a micro current in the spinal cord that is opposite to the direction of the endogenous injury current, thus offsetting the injury current, thus playing a role in protecting the degeneration of the spinal cord axons.

Electroacupuncture stimulation is also an effective method for treat spinal cord injury in traditional medicine. Traditional medicine believes that the injury of the Governor Vessel is the main cause of spinal cord injury. When the Governor Vessel is injured, Qi and blood cannot reach the limbs, and the muscles and fascia of the limbs lose nutrition due to the obstruction of the meridians and collaterals, leading to atrophy, and the limbs gradually lose their functions. Therefore, when using acupuncture to treat paraplegia caused by spinal cord injury, the acupoints on the Governor Vessel are the preferred treatment sites. Acupuncture on the Governor Vessel points can not only cultivate and replenish the true yang, but also can pass the meridian qi so that the upper and lower parts can be connected, and the yang qi can be connected, then the paraplegia can be cured.

Clinical studies have shown that Governor Vessel electroacupuncture has a certain curative effect in the treatment of traumatic paraplegia, but the previous Governor Vessel electroacupuncture was considered to lack scientific basis. In recent years, it has been confirmed that electroacupuncture or electroacupuncture at Governor Vessel can reduce the secondary damage after spinal cord injury and protect neurons by regulating changes in neurotrophic factors, neurotransmitters, neuropeptides, and some signaling pathway protein molecules. And promote the regeneration of its nerve fibers and functional repair.⁴⁻⁶ Electroacupuncture combined with transplantation of stem cells at the spinal cord injury has become a new cell therapy strategy in recent years.⁷ Studies have shown that Governor Vessel electroacupuncture stimulates the afferent nerve fibers of the spinal meningeal branches of rats with total transected spinal cord injury or spinal cord demyelination injury to transmit information to the spinal cord,⁸ activate the synthesis and secretion of neurotrophin-3 (NT-3) by spinal cord tissue cells, mediates the

survival, differentiation and migration of exogenous neural stem cells and mesenchymal stem cells expressing the NT-3 receptor TrkC in total transection spinal cord injury/transplantation or spinal cord demyelination injury/transplantation, replacing and protecting damaged host neurons, improving injured tissue microenvironment, promote nerve fiber regeneration and myelination, improve cortical motor evoked potentials and motor function of paralyzed limbs.⁹ In addition, Governor Vessel electroacupuncture mediates inflammatory regulation via NT-3 to promote the survival and functional integration of transplanted stem cell-derived neural networks within the injured spinal cord.¹⁰ And now this study show us a potential molecular mechanism of Governor Vessel electroacupuncture for spinal cord injury in differential expression of RNA transcripts.¹¹

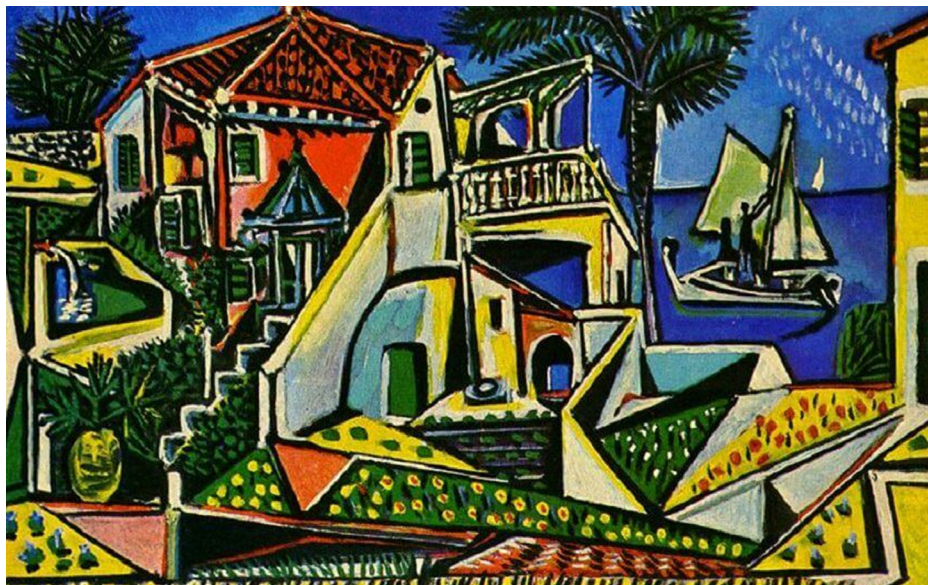
In short, electroacupuncture treatment can significantly improve the internal environment of the injured spinal cord and play a very important role in alleviating the secondary injury of the spinal cord. Therefore, the combination of electroacupuncture stimulation and traditional medical concepts has great potential in the clinical treatment of spinal cord injury. Future research should further clarify the molecular biological mechanism of the combination treatment and let the world accept the scientific nature of traditional medicine, so, as to better promote the treatment of traditional medicine.

Conflict of Interest: The author has nothing to disclose.

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