PERSPECTIVES

Acu-TENS might alleviate the dysfunction following spinal cord injury

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Spinal cord injury (SCI) influences approximately 1000 individuals per million in the general population, and almost 12,000 new cases of SCI occur every year in the United States, which is a heavy social and economic burden for the society and involved families. A series of therapies exist for functional recovery following SCI, including surgery, prescription drugs, physical therapy, and supportive treatment.

Acupuncture, which is based on traditional Chinese medicine theory, has been widely used for pain relief or neurological dysfunction in China. A recent systematic review demonstrated that the acupuncture treatment was beneficial for the functional recovery based on the motor American Spinal Injury Association scores and total Functional Independence Measure scores. Both basic research and clinical study have demonstrated the effect of acupuncture on SCI.

The combination of implanted electroacupuncture electric stimulation and bone marrow-derived mesenchymal stromal cells transplantation obviously promotes functional improvements for animals with SCI, indicating that this combination method has the potential to treat SCI in humans. Electroacupuncture treatment may increase the expression of neurotrophin-3, and promote the cell number and differentiation of endogenous oligodendrocyte precursor cells, along with the functional improvement of demyelinated spinal cord. Electroacupuncture can alleviate mechanical allodynia of the neuropathic rats, possibly via decreasing neuronal nitric oxide synthase expression of the spinal cord.

The neuroprotective effect of acupuncture may be partially regulated by downregulating inflammation and microglial activation after SCI, and acupuncture may be a potential therapeutic method for treating patients with acute SCI. Furthermore, the analgesic effect of acupuncture might be partly regulated by reducing reactive oxygen species-induced microglial activation and inflammatory responses following SCI, indicating that acupuncture may be an effective treatment of chronic pain after SCI.

A systematic review indicated that acupuncture might be effective for functional recovery and improvement of bladder dysfunction according to the results of seven randomized controlled trials. The acupuncture treatment in the specific acupoints might mobilize human CD133(+) 34(−) cells, which would help in the mobilization of stem cells so as to alleviate the dysfunction following SCI. The functional magnetic resonance imaging study indicated that the acupuncture interventions at LI 4 and LI 11 can result in activation mainly at C6 and C2, which might be the potential therapeutic mechanism of acupuncture for the spinal cord disease.

The acupuncture treatment might alleviate the chronic shoulder pain following SCI, which is superior to sham acupuncture. Acupuncture had been widely used to treat a series of conditions following SCI, including motor dysfunction, pain, and spasm. The combination of concomitant auricular and electrical acupuncture therapies can alleviate neurologic dysfunction and promote functional recovery. Approximately 50% of the enrolled patients reported pain...
relief following acupuncture treatment after SCI. The acupuncture treatment at bilateral BL-33 (Zhongliao) points can alleviate urinary incontinence caused by detrusor hyperreflexia after SCI.7 The paraplegia—triple-needling method, which is a specialized electroacupuncture treatment, may promote activities of daily living and comprehensive function of patients with SCI. However, acupuncture is invasive and might be involved in a series of complications, including pneumothorax, injury to internal organs, infection, and vasovagal reaction. Therefore, noninvasive treatment was required.

Transcutaneous electrical nerve stimulation (TENS), a noninvasive modality, was widely used in the area of analgesia. A previous study indicated that TENS promoted the release of frequency-dependent opioid receptors through the same mechanism as acupuncture.8 TENS application at a tolerable level intensity was proved to activate Aa and Ab nerve fibers, which was analogous to the actions of electroacupuncture in animals.

TENS at specific acupuncture points is termed Acu-TENS. Acu-TENS is a noninvasive type of acupoint stimulation, which promotes heart rate recovery following exercise. A recent study suggested that Acu-TENS regulated heart rate and helped maintain postoperative blood pressure at an appropriate level after open heart surgery.9 Acu-TENS can maintain cardiovascular stability in patients with required postural changes for treatment.

In summary, we propose that the application of Acu-TENS at specific acupoints can induce signal transmission similar to acupuncture, and influence functional recovery via spinal cord stimulation, including motor function and bladder function.

References