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Journal of Acupuncture and Meridian Studies

journal homepage: www.jams-kpi.com

Case Report

Scalp Acupuncture for the Treatment of Motor Function in Acute Spinal Cord Injury: A Case Report

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Available online 31 January 2018

Received: Nov 20, 2017
Revised: Jan 4, 2018
Accepted: Jan 10, 2018

KEYWORDS
acupuncture;
neural plasticity;
scalp acupuncture;
spinal cord Injury;
traditional chinese medicine

Abstract
An acute spinal cord injury is the result of a traumatic injury to the spinal cord caused by a contusion, compression, or severing of the spinal cord. There are approximately 17,000 new cases each year, of which, males account for 80%. Approximately 65% of these injuries cause incomplete or partial damage to the spinal cord. Comprehensive treatment is essential to restore maximum function. Surgical procedures, stem cell therapy, pharmaceutical agents, and physical therapy are employed to minimize and repair damage done to the nervous system. The majority of motor and sensory recovery occurs during the first 12 to 15 weeks after the injury. Acupuncture has shown promising results in mediating neural plasticity and could be a useful treatment modality in hospital and rehabilitation settings. This case presents the treatment of an acute spinal cord injury, level T5, incomplete, with scalp acupuncture both within and beyond the optimal recovery window. The treatments given within the optimal window seemed to facilitate better restoration of nervous system communication when performing specific action.

1. Introduction

Acute spinal cord injury (SCI) and secondary-associated conditions are debilitating and potentially life-threatening. There are 17,000 new cases a year in the United States. The American Spinal Association Impairment Scale (ASIA) is used to grade the severity of injury from A (complete) to E (normal) [1]. Sixty-five percent of these injuries are incomplete or partial damage to the spinal cord causing tetraplegia sustained from cervical injuries. The second most common injury is also classified as incomplete resulting in paraplegia. The type of SCI (contusion, laceration, or solid cord injury) as well as its level and severity dictates its functional impact and prognosis.

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pISSN 2005-2901 eISSN 2093-8152
https://doi.org/10.1016/j.jams.2018.01.002

Surgical procedures, stem cell therapy, pharmaceutical agents, and physical therapy are employed to minimize and repair the damage done to the nervous system. The optimal window for restoring maximum function through neural plasticity via functional training is 12 to 15 weeks, after which, continued progress can be made by physical therapy primarily through compensation and adaptation of the unaffected or lesser affected limb. The affected leg's muscle electromyography might record little or no change; however, there is an improvement in gait [2].

Numerous studies have demonstrated that acupuncture is an effective treatment for various neurological conditions. Functional magnetic resonance imaging has shown that acupuncture affects broad neurological pathways stimulating somatosensory, affective, and cognitive processing [3]. It has been reported that there are neuroprotective benefits from receiving acupuncture treatment for neurologic disease [4]. An animal study found that electroacupuncture greatly promoted neuronal function recovery in rats after SCI [5]. Another animal study suggested that electroacupuncture after a SCI reduces inflammation, reduces glial cell scar formation, and promotes the growth of neural stem cells [6]. A Chinese study published in 2003 found that SCI patients treated with acupuncture and physical therapy recovered to a higher ASIA impairment grading [7].

While scalp acupuncture has been cited in classical texts, the modern development of different scalp acupuncture systems is relatively new, dating back to 1935 when Dr Huang Xuelong first introduced the idea that there is a relationship between the scalp and the cerebral cortex. In the 1970's, the concept was resurrected and developed into complete systems [8]. Dr Ming Qing Zhu's system is based on zones which correspond to various areas of the body [9].

2. Case presentation

This case describes the treatment of a 25-year-old male who presented with monoplegia resulting from a SCI sustained during a motor vehicle accident. He was diagnosed with a T5 dislocation, ASIA Scale C, incomplete spinal cord injury. He was given a 35% chance of regaining the ability to walk. The patient sustained multiple injuries in addition to the SCI including a fractured cervical spine at C5, a detached scalp, a fractured sternum, and scapula. At the time of the injury, he suffered paralysis in both legs; however, sensory and motor function in his left leg returned to normal within 2 months.

The patient was transferred to three different hospitals and two rehabilitation facilities during the 3 months after the injury, and it was not until week 11 that he was able to receive treatment in the long-term residential rehabilitation center where he was undergoing daily intensive physical therapy. He received four acupuncture treatments over a span of 4 weeks. The treatments focused on restoring the neurological communication between his brain and right leg, specifically focusing on movements that he had been unable to initiate during that day's physical therapy. The same points were used during all four treatments (see Table 1). The needles were removed at the end of the treatment.

Table 1 Zhu System scalp acupuncture zones [10].

Point	Location	Function	Needle
Head and face area	1 cun square centers at Du24 and extends .5 cun in all directions.	Calms spirit, sedates, and calms fear	Gauge 34 length 1.2 in (metric 0.22 × 30 mm)
Thoracic area	.3 cun anterior to Du19, extending 1.3 posterior. DU 19 corresponds to T3 vertebra. Urinary bladder (UB) channels are lateral borders.	Problems in the mid-back region, pain, and stiffness of back muscles.	Gauge 36 length 0.8 in (metric 0.20 × 20 mm)
Lumbar area	Centers at DU18 which corresponds to L2 vertebra. Extends .5 cun anterior and posterior. Urinary bladder channels are lateral borders.	Lumbar problems, injuries causing lumbar pain, or paralysis.	Gauge 36 length 0.8 in (metric 0.20 × 20 mm)
Lower Jiao area	Du21 extending 1 cun posteriorly. Urinary bladder channels are lateral borders. The contralateral side is treated.	Tonifies kidney and liver meridians, promotes urination, ascends Yang Qi, unblocks channels, and alleviates pain.	Gauge 34 length 1.2 in (metric 0.22 × 30 mm)
Lower limb area	Two rhomboids. The left represents the right lower limb and vice versa. Line DU21 to UB6, .5 cun ipsilateral side of DU meridian and extend 1.5 can laterally across the DU. Posterior borer is parallel and .75 can apart from anterior border.	Unblocks channels and alleviates pain.	Gauge 34 length 1.2 in (metric 0.22 × 30 mm)

All needles were inserted approximately 1 cun into the subaproneurotic space of the scalp at a 15—25% angle. A thrust and pull method was initiated for 1—2 minutes until a "grabbing" sensation was felt. The patient was then asked to initiate movements that had been challenging during physical therapy to promote neural plasticity changes.

2.1. First treatment

The patient felt feverish and had trouble focusing on movement. The treatment lasted only 25 minutes as he experienced discomfort in his ribcage and was fatigued. The patient was diagnosed with pneumonia later that evening and began receiving treatment.

2.2. Second treatment

45-minute treatment. The needles were stimulated every 15 minutes. The patient focused on right hip flexion. He had been unable to initiate this movement during physical therapy that day; however, he made the movement four times during the treatment.

2.3. Third treatment

45-minute treatment. The needles were stimulated every 15 minutes. The focus was on right hallux extension. The patient was able make the connection and initiate the movement.

2.4. Fourth treatment

30-minute treatment with needles stimulation every 15 minutes. This treatment was administered at the patient's home. The focus was on dorsiflexion of the foot.

3. Discussion

SCI and associated secondary conditions are debilitating and life threatening. The optimal time for acupuncture intervention is during the first 12—15 weeks after injury. This patient suffered extensive injuries, required multiple surgeries, and was moved to several hospital facilities until he was placed in the long-term rehabilitation facility. These factors placed limitations on his ability to receive acupuncture treatment which was not authorized until Week 11, toward the end of the ideal window of treatment. Another issue was needle retention. Dr Zhu recommends a minimum retention time of 4 hours; however, the needles were removed after each 30—45 minute treatment, as requested by the patient. Thirdly, the first and fourth treatments were given when the patient was either ill or very tired and which reduced his ability to focus. In spite of these limitations, there did appear to be an observable improvement in the patient's ability to access particular muscle groups and initiate movement after the needles had been inserted and stimulated when he was feeling rested and well.

The patient was young, healthy, and quite determined to walk again. He has continued to make progress and, as of 15 months after injury, is walking without a cane the majority of the time. Scalp acupuncture is particularly useful in a hospital setting while the patient is performing all physical therapy from the hospital bed and treatment can begin soon after the patient is stabilized. Although the results of this study were encouraging, further studies need to be carried out. It would be interesting to see if recovery measures could be improved if scalp acupuncture and physical therapy were incorporated into the same treatment.

Disclosure statement

The author declares that they have no conflict of interest and no financial interest related to the matter of this manuscript.

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