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Case Report

Treatment of a Chronic Spinal Cord Injury through Scalp Electroacupuncture: A Case Report

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Abstract

This case report presents the ongoing treatment of a chronic spinal injury of a 55-year-old female with treatment modalities specific to Oriental Medicine. Traditional Chinese needle technique incorporating electrical stimulation, Moxibustion and massage were applied at various intervals throughout the treatments. However, the primary intervention was focused on scalp electroacupuncture. This method forms the foundation of the author's approach to central nervous system injury management. Information pertaining to the incidence, effects and recovery associated with spinal cord injuries is provided in the background information. A description of the author's treatment using scalp electroacupuncture and various outcomes are noted in the case presentation. The discussion recognizes a lack of information about Chinese Medicine modalities and highlights the importance of communicating with other providers and being an advocate in all aspects of the patient's health and wellbeing. This case addresses the need for additional research in acupuncture and spinal cord neurological recovery.

Keywords: Acupuncture; Scalp electroacupuncture; Spinal cord injury

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Introduction

According to the World Health Organization (WHO), every year, around the world, between 250,000 to 500,000 people suffer from a Spinal Cord Injury (SCI) [1]. It is estimated that there are 17,500 new spinal cord cases each year in the United States, with that number increasing with modern advancements [2]. A substantial number of people whom sustain a SCI die before reaching the hospital. The majority of SCI cases are due to road traffic crashes, falls, or violence - theoretically all preventable.

Symptoms of the SCI depend on the severity of the injury and are proportionally related to the location along the vertebrae. Other processes within the body, like bowel regulation, bladder control, breathing, heart rate and blood pressure may also be impacted [3]. Chronic pain is experienced with most SCI. Without quantifying personal and family distress, it has been estimated in the United States healthcare system that SCI cost $40.5 billion each year [2].

The American Spinal Association Impairment Scale (ASIA) describes the severity of sensory and motor impairment from A (complete) to E (normal). The outcome of complete impairment is defined as no motor or sensory function at the distal end of the sacrum. The Frankel Grade is another assessment tool used to assess spinal cord neurological function graded similar to ASIA. The Modified Ashworth Scale (MAS), originally designed to examine the effects of antispastic drugs, measures resistance to passive movement from 0 (no resistance) to 4 (rigidity) [4].

In Traditional Chinese Medicine (TCM), a passage from the Ling Shu states, "the brain is the sea of marrow", critical for memory and concentration [5]. Marrow contains the material foundation for the central nervous system. From a Western point of view, the marrow is the tissue found in the center of large bones and contains two types of stem cells. Different stem cells vary in their regenerative ability and are a vital process to give rise to new cells. Both perspectives understand that the brain is the control center of the body and it has a significant role on vitality.

Acupuncture, tracing back 2,500 years, is a therapeutic and restorative modality of Oriental Medicine. Scalp acupuncture is a modern innovation, integrating Western concepts of neurophysiology researched since the 1950s. The scalp has numerous acupuncture points with traditional locations along major meridians. Scalp acupuncture differs from classical acupuncture in that there are zones mapped onto the scalp correlated with brain-function. The needles are inserted about one cun (variable measurement based on size, approximately one inch) at an angle of 15-30 degrees. Studies on scalp acupuncture transforming various central nervous system disorders have shown substantial positive outcomes, especially in the treatment of paralysis and pain management [6,7].

Electromedicine is considered one of the oldest documented sciences with electric fish used therapeutically in the Fifth Dynasty Egypt. During the 1700s, there is documentation of Benjamin Franklin

using an electrical device to treat 'frozen shoulder' and post-stroke sequelae. The combination of acupuncture and electrotherapy evolved in France in the early nineteenth century [8].

Electroacupuncture works similar to a Transcutaneous Electrical Nerve Stimulation (TENS) unit to stimulate the nerves, altering the messages of pain that are being sent to the brain. However, because the electrodes are attached to needles which are inserted subcutaneously, the electrical current is able to travel through the tissues without encountering resistance from the skin [8].

Nerve Growth Factor (NGF) protects the intactness of nerve tissue and stimulates the repair process of the spinal cord. Research of electroacupuncture in treating SCI shows that it can enhance NGF mRNA expression in spinal cord tissue [9]. Although the mechanism is not clear, electroacupuncture activates sympathetic nerve fibers, releasing endogenous opioids, inhibiting pain [10].

The WHO admits that many of the consequences associated with a SCI do not result from the condition itself, but from inadequate medical care and rehabilitation services [1]. Presently, there are no accepted mechanisms of action to reverse the damage to the spinal cord. SCI treatment should focus on preventing further injury, pain management, and empowering the individual to live a productive life [11].

Case Presentation

On August 1, 2004, a 42-year-old woman was abruptly struck on her right-side while bicycling via a motor vehicle, injuring the spinal cord at C4-C5, leaving her tetraplegic. She spent the first ten weeks in the hospital, slowly recovering from multiple, intensive surgeries, resulting in permanent internal hardware in her neck. Other injuries included a right fractured knee and right-sided shattered pelvic bone and tailbone.

Besides the skeletal damage, she continues to face the degenerative phenomena and functional difficulties of a SCI. Her condition titles her to disability. It limits her physical mobility, independence and daily tasks, all while challenging her emotionally, mentally and financially.

Prior to the injury, she took on the daily responsibilities of a homemaker and a primary caregiver to her four children. At the time of the injury, the youngest child was age thirteen. She would describe herself as physically active with no significant medical history. Family medical history includes diabetes fraternally and rheumatoid arthritis maternally.

In mid-December of 2004, she sought medical guidance through a rehabilitation association in Portland, Oregon. At this initial appointment, documentation states that many complications and frustrations arose due to insurance limitations, prescription medications and restorative rehabilitation. Home therapy had ceased and now she was only eligible for one physical therapy visit per year, which may be summarized as a basic evaluation with minimal contact.

The rehabilitation consisted more as half-hour counseling sessions and medication alterations, remaining monthly for the first year and a half, then gradually decreasing. The timeline record of pharmaceutical pain management dosages is unclear due to multiple providers involved in prescribing her medication.

Her Primary Care Physician (PCP) also manages care through labs, imaging and referrals. For the past thirteen years, she has tried numerous medical modalities in hopes of restoring function through chiropractic, massage and a variety of therapists. It has been documented several times that she attributes consistent acupuncture treatments to her rehabilitation successes.

She began receiving weekly acupuncture from Oregon College of Oriental Medicine (OCOM) in February 2005, seven months post-injury. OCOM is a graduate-level medical school focusing on Eastern medicine modalities. The transportation costs to these visits are covered. The patient pays $15 per appointment. She must also be accompanied by a caregiver to assist with transfers.

Between initiations of care at OCOM in 2005 to present there are several notes about wheelchair complications, repetitive urinary infections and recurrent bowel issues. Initially she presented very emotional, stating in various ways that "everything seemed to be falling apart" and overall life felt very stressful. The pain was waking her at night, her hands would not open and her legs would not lift. She was unable to operate the chair independently or hold a fork to feed herself. Most of her teeth had been broken and she endured intense toothaches, leading to complete extraction. Her menstruation had ceased post-trauma for 18 months, reporting only a four-day menses in 2006. As time progressed, emotions stabilized and treatments mainly focused on musculoskeletal pain and restoring function.

In January 2018, now age 55, she arrived for treatment number 893. She sat slumped in her motorized wheelchair; her left clavicle angled 30 degrees lower than the right. She appeared stiff above and had mild edema in the lower limbs. She had no teeth with visible eczema patches surrounding the mouth. At this time, she reported currently taking antibiotics due to a urinary tract infection. She had not had a bowel movement for five days. Sleep was not a concern aided with medication. She expressed moderate-constant-achy pain mainly present in her right scapula, shoulder and down through the wrist. Both hands clasped and contracted into fists. Her arms abducted to less than 45 degrees and the lower limbs had insignificant mobility findings.

To track progress, hand-grip strength relative from left to right, along with active range of motion of the limbs were assessed at various intervals. The long-term treatment plan aimed on improving arm and hand mobility through active range of motion and grip strength. Her quality of life would dramatically improve if controlled grasping function were to be restored.

Inspecting the tongue from a TCM perspective, it was viewed as deviated to the right, moderately red overall with visibly reddish-orange sides, dry with a moderate thick-yellow coat and transverse cracks in the center. Her pulse bilaterally was deep, weak and difficult to feel in all positions and heart rate was 64 bpm.

Because OCOM operates as a teaching clinic, patients are often under the care of more than one supervisor and/or intern. The patient received 49 treatments during the six-month period of this report and continues to receive care at this facility.

TCM Diagnosis

"Wei Syndrome" refers to many conditions, including spinal cord trauma manifested by muscular flaccidity or atrophy of the limbs with

motor impairment [12]. As a result there is Qi and Blood Stagnation in the Du Mai and Tai Yang Channels with underlying Kidney Yin and Yang Deficiency signifying a chronic internal pattern.

Biomedical summary

The Western diagnosis of the SCI has been graded as a C4-C5 ASIA-A and a Frankel-C, marked by tetraplegia since 08/01/04. A non-specific MAS score of 2-3 measuring spasticity. Bowels and bladder function neurogenically and she has a suprapubic catheter. Prescription medications have been prescribed for anxiety, depression, ADHD, pain, constipation, coagulation and numerous antibiotics. At the time of writing, the current medications can be found in table 1.

Medication	Dosage	Frequency
Alendronate	70 mg	q 7 days
Baclofen	10 mg	take two, qid
Bupropion	100 mg, 12-hour	q morning
Calcium-Vitamin D	600 mg - 200 units	take two, bid
Cyclobenzaprine	10 mg	qid prn
Diazepam	5 mg	take one or two, bid prn
Docusate Sodium PO	-	bid
Escitalopram	10 mg	q morning
Gabapentin	600 mg	qid
Methylphenidate	10 mg	bid (q morning and at 1pm)
Metoclopramide	10 mg	bid
Morphine	30 mg ER	bid
Oxycodone	20 mg	q 6 hours prn
Phenytoin	100 mg ER	bid
Tolterodine	2 mg	bid
Warfarin	2.5 mg	take one to two, as directed

Table 1: As of June 2018, the list of patient's prescribed medications.

An x-ray of the lumbar spine, captured in March 2017, noted the impression of degenerative disc disease and spondylosis. An MRI of the left humerus, completed in April 2017, captured a soft tissue mass medially in upper arm, distal to the coracobrachialis muscle with possible involvement of the short head of the biceps femoris and the musculocutaneous nerve.

Treatment principles

The focus of treatments involves moving Qi and Blood and unblocking channels to increase mobility through range of motion and grip strength. Nourishing Yin and tonifying Yang by addressing the kidney energetics supports her constitutionally. Ultimately, the intention is to reduce intensity and frequency of pain to gradually decrease patient's pain medication usage and reform Activities of Daily Living (ADL).

Treatment

Chinese scalp acupuncture attached with electrostimulation was used to treat this patient following proper protocols. Areas most often needled included the leg motor and sensory area, apraxia area and the upper two-fifths of the motor line. The electrodes were set to a continuous frequency of either five or ten hertz, and the needles were retained up to 40 minutes per treatment.

Using TCM channel pathway theory, various combinations of acupuncture points were then inserted on the neck, trunk and limbs. The "de qi" sensation, characterized by a grabbing or pulling from the needle, was obtained and felt by both the patient and practitioner.

Based on other symptoms reported, inspection and palpation, each treatment was ultimately individualized. For example, if the patient reported symptoms of a UTI, a damp-heat pattern in TCM, then acupuncture points LV-5 (Li Gou) and BL-28 (Pang Guang Shu) would be added to clear damp-heat and benefit the genitourinary system.

Other TCM modalities were used in combination with scalp electroacupuncture. Treatments also included Moxibustion, cupping and bodywork. Kinesiology tape and ear seeds were applied intermittently at the end of visits to extend treatment.

Outcome and follow-up

After the first treatment with scalp electroacupuncture, the patient returned the following week reporting significant changes. For the first day after, she stated her "feet were dancing". She also reported an increase in peripheral sensory perception, noticing the ability to feel different fabrics and the temperature variation when holding snow. She often described the sensation of scalp electroacupuncture as "waking her body up".

From a TCM evaluation, tongue and pulse have perceptibly shifted. Her tongue still deviates to the right, but the color has improved to a mild red body with a thin white coat. Overall the pulse is far less deep and weak with one supervisor occasionally defining it as moderate.

While spending most of the day in her seven-year old wheelchair, it was necessary to address her posture from a seated position. Concluding appointments, she expressed a decrease in pain with an increase in mobility, demonstrated throughout the process of transferring from the treatment table to her wheelchair. The magnitude of progress showed to be limited with the wheelchair misalignments and consistent malfunctions. There were multiple occasions where her right foot slid off the platform, getting caught in the wheel, inhibiting her from propelling forward without assistance. Her medical insurance provider approves wheelchair updates every five to ten years.

After three months of treatments and writing two letters explaining the concerns to her doctor, she received a modern mobilized chair. The new chair allows her to rise from near-standing to a horizontal position, helping her caregivers with transfers and reducing pressure points along the spine and hips. Her posture has dramatically shifted, observed through clavicle symmetry with a difference of less than 10 degrees. Subjectively, she also reports her pain has decreased from moderate to mild and has recently discussed with her PCP an interest in decreasing medications.

Due to the concern of destruction of the gastrointestinal microbiome with frequent antibiotic use, urinary tract infections were of concern. Her suprapubic catheter is changed every three weeks. With no sensory awareness in the pelvic region, a culture is taken at these appointments. Changes in color and quantity of urine output are also monitored. In the first month of treatments, she was prescribed two series of antibiotics due to bacterial infections, followed by a yeast infection. It has been ten weeks with no urinary issues.

Constipation continues, averaging about one bowel movement every three days. The first step of digestion begins in the mouth through the process of mastication which increases the surface area of foods to allow enzymes to act more efficiently. Without teeth, she has had to alter her diet, making it more difficult to consume essential nutrients. Encouraging her weekly to continue to follow up with her dental provider, she received dentures at week 19.

Improvements and increases in mobility have also been observed, most notably when treatments began twice a week. She is able to abduct the arms to 90 degrees, activate her hip flexors to lift her knees and perform ankle circles in both directions simultaneously. Minimal change has been measured in grip strength; however, the spasticity has dramatically reduced with minimal effort to passively move joints, in particular the distal upper limbs. Thoracic rotation increased 50 percent. The stone-like left humerus mass found in previous imaging is untraceable.

The patient was approved for weekly Physical Therapy (PT) for twelve weeks and Occupational Therapy (OT) for five weeks. She has quickly reported progress in mobility and strength. Guided and lifted by a harness, the latest accomplishment has been successfully walking on a treadmill. PT also implements the stationary bike and swimming pool. Concentrating on fine-motor abilities, OT aims to restore hand dexterity. Initially she was not able to accomplish any task assigned. At week four she successfully placed a set number of pins into holes timed to just overfour minutes. She was also excited to share her first time using her smart phone, dialing her friend and holding the device to her ear for several minutes. Impressing her care providers through her recent progress, therapy will be extended and she remains optimistic.

Discussion

This case report presents a complex treatment regime for the management of a chronic spinal cord injury. Due to the length of time from the initial injury, the chances that a full recovery, discarding the wheelchair, is questionable. However, significant progression has been documented from January through June 2018.

My first day working with this patient will remain memorable. Her fingers, hands, and wrists were aggressively spastic. She had not received a treatment in three weeks due to the school winter break closure. I peeled her fingers open, made circles with her wrists, pumped her biceps and listened to her story.

Coming to OCOM for over thirteen years, she has been treated by numerous interns and supervisors. Each practitioner applies and specializes in various modalities.Some patients have miraculous recoveries using acupuncture with few treatments. Successful acupuncture research shows with more acute patterns, frequent treatments resultsin shorter overall recovery time.

Besides acupuncture, other modalities common to Oriental Medicine were used in this case study. Moxibustion is a form of heat therapy in which dried Mugwort (*Artemisia*) is burned on or near the skin to increase circulation. This technique was used weekly, focused around the elbow and shoulder joints. The combination of temperature, smoke, odor and herbs are likely to attribute to its healing nature.

Cupping therapy is a type of negative pressure massage, created by suction, and applied to the surface of the body. Flash cupping is a style where the cups are quickly applied and removed effective for improving circulation and blood flow. After adjusting her posture with the new wheelchair, her left scapula was visibly elevated and winged. To stimulate her serratus anterior and other atrophied muscles, flash cupping was completed a total of three times in the last four weeks. She reported increased sensation in those areas and greater thoracic rotation following this technique.

A more modern approach to address position and posture was the application of kinesiology tape. Creating specific direction of stretch via the tape can redirect sliding and gliding, allowing for a change in movement patterns. For the last eight weeks of this writing, kinesiology tape was applied one time per week and left on for three to four days post-treatment. Based on palpation and visible location of the scapula, the angles of which the tape was applied varied weekly. After the first week with the tape, the winging was significantly decreased and currently the inferior angles of the scapulae are level.

The healthcare system is constantly evolving and can be viewed as quite complex when interpreting legislation and standard of care. However, TCM involves understanding the individual's needs as a whole rather than isolating symptoms. This approach was applied throughout this case. Simultaneously serving the patient as an acupuncturist and an advocate has been a major contributor to her progress.

Dr. Wang, graduate of Nanjing University of TCM with a Ph.D. in medicine, has been involved in conducting research and contributed to the WHO-TCM Collaboration Center. He successfully treated a patient with the loss of sensory and motor function one-year post-SCI. Tian Long, a student of Dr. Wang, has summarized the main concepts. He noted that his focus was on the patient's real time condition rather than the focal being the SCI. He considers punctual treatments and adequate acupuncture stimulation most critical when recovering the spinal cord function.

Curiosity questions the impact of post-SCI recovery if the standard of care involved acupuncture, especially utilizing scalp acupuncture and electrostimulation.

Conclusion

This case report organized a complex spinal cord injury presenting with tetraplegia. A multidimensional approach using TCM and modern interventions were applied. It can be concluded that there is insufficient scientific evidence and understanding in the treatment of SCI.

TCM can be seen as an alternative, holistic solution in situations where Western medicine treatments are limited. TCM treatment aims on restoring allostasis within the body, rather than zoning in on a particular system. Acupuncture is becoming more widely accepted, particularly for pain management.

There are several theories regarding the mechanism of acupuncture, scalp acupuncture and electroacupuncture. The body has multiple pathways, with chemical feedback loops in place to achieve stability. Additional research on effectiveness and the mechanism of action of TCM modalities is required.

Disclosures

No conflicts of interest, financial or otherwise, are declared by the author.

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