

Use of Electrical Stimulation at Acupuncture Points for the Treatment of Reflex Sympathetic Dystrophy in a Child

A Case Report

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Key Words: *Acupuncture, Electric stimulation, Reflex sympathetic dystrophy.*

Reflex sympathetic dystrophy (RSD) is a syndrome characterized by persistent, hyperesthetic pain in an extremity with concurrent evidence of autonomic nervous system dysfunction.¹ This syndrome frequently results in a serious functional impairment with associated trophic changes that may eventually develop into permanent dysfunction. Reflex sympathetic dystrophy has been referred to as causalgia, reflex neurovascular dystrophy, post-traumatic pain syndrome, shoulder-hand syndrome, and Sudeck's atrophy. It generally develops after nerve injury, trauma, surgery, cervical osteoarthritis, carcinoma, myocardial infarction, or cerebrovascular accident.¹ The antecedent illness or injury may be relatively minor compared with the severity of the symptoms. In some instances, no antecedent injury or illness can be identified. This syndrome is most prevalent in middle-aged and older adults and is infrequently found in children.¹⁻³ Classical treatments of RSD include active and passive range-of-motion exercises, casting, splinting, administration of corticosteroids, and sympathetic blocks.⁴ More recently, transcutaneous electrical nerve stimulation has been demonstrated to produce effective results.^{2,3}

The purpose of this report is to describe and contrast the effects of two different types of treatment for two successive occurrences of RSD in a 10-year-old girl.

FIRST OCCURRENCE

On March 5, 1981, the patient suffered trauma to the anterior aspect of her left distal tibia. Pain was immediate and localized to the traumatized area. Roentgenograms showed no fractures. Over the next two days, the patient became unable to bear weight on her left lower extremity and developed severe pain

in the ankle during movement. She also experienced hypersensitivity over the lateral aspect of her left leg and the dorsum of her left foot.

After removal of a plaster cast that immobilized the leg and the foot for four days, the leg appeared "normal," sensation and vascular supply appeared normal, and roentgenograms showed no evidence of lytic destruction or fracture. However, either passive or active movement exacerbated the extreme pain over the lateral malleolus. Nine days of bedrest provided a minimal amount of pain-free toe and ankle extension along with a slight decrease in the hypersensitivity of her leg and foot. After the bedrest, the patient was given crutches and instructed to use them as she returned to school. A trial of transcutaneous electrical nerve stimulation applied to the peroneal and tibial nerves was initiated with only minimal success in reducing pain. (No records are available with specific details of treatment given.)

On March 25 the symptoms were unchanged except for increased foot edema and discoloration. The patient's left foot and ankle were again immobilized in a short leg cast. On April 3 the patient still complained of pain over the dorsum of her left foot and lateral aspect of her leg. The pain was no longer continuous but increased at night and occasionally awakened her. The muscle strength of her left lower extremity was markedly decreased as a result of pain. The maximum circumferential measurements of her legs were 34 cm on the right and 33 cm on the left. Examination of the sensory system revealed that her left lower extremity demonstrated intact responses for pain, touch, temperature, vibration, and proprioception. However, dysethesias, characterized by burning, sharp pain, were produced by stimulation with any modality over the dorsum of the foot and the lateral aspect of the leg. The foot had a mottled appearance with nonpitting edema present. The condition was diagnosed as RSD, and the patient was given a three-week treatment course of steroids. Over the next month, the symptoms slowly improved to a point where the patient was demonstrating only a mildly antalgic gait. Joint range of motion and muscle strength returned to normal limits. Complications of the treatment were the development of a prominent cushnoid appearance and a weight gain of 15 lb.

SECOND OCCURRENCE

The second occurrence of RSD followed on May 10, 1981, when the same patient's right elbow was struck against a chair. When the patient came to our

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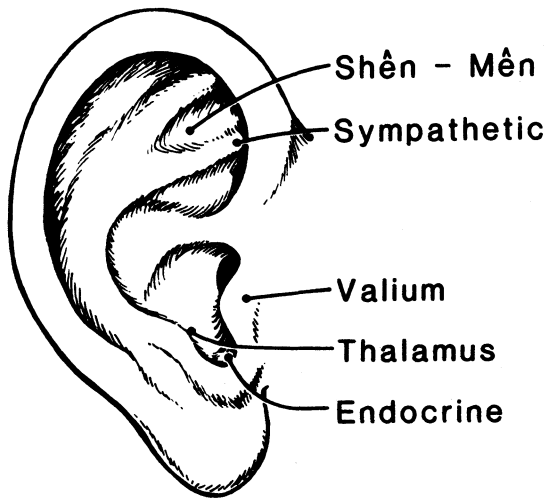


Fig. 1. Auriculotherapy points.

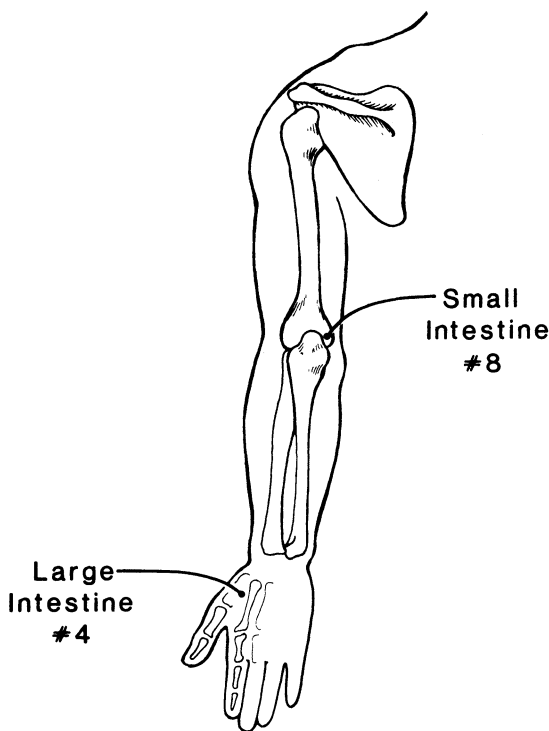


Fig. 2. Upper extremity acupuncture points (dorsal aspect).

clinic on May 21, she was virtually unable to move her right upper extremity. Severe hyperesthesia distal to her right elbow was also present. The patient and her mother stated that these symptoms, along with coolness of the right hand, had existed for approximately 10 days. The physical examination of the right upper extremity showed that light pressure applied over any aspect of the extremity would cause excru-

ciating and intolerable pain. The extremity was tonically held against her side in a flexed posture. The patient said her pain was constant and could be increased by movement or by stimulation with light touch or pressure. Active shoulder range of motion was limited to 10 degrees of glenohumeral abduction and 10 degrees of glenohumeral flexion. Active elbow flexion was present from 90 degrees to 135 degrees. Active wrist flexion was present from 10 degrees to 15 degrees. There was no active motion noted at the fully-extended metacarpophalangeal joints, and the patient was unable to tolerate any passive range of motion.

Low-frequency (4 Hz), direct current electrical stimulation was delivered bilaterally by a MRL Neuroprobe System II stimulator* to each of the points represented in Figures 1, 2, and 3. These points were specifically located by finding areas of decreased skin resistance as suggested by standard acupuncture charts. The stimulation current was delivered transcutaneously for 30 seconds at an intensity limited by the patient's pain tolerance. After the treatment, full passive range of motion of the right upper extremity was obtained except for elbow flexion that was limited to the range of 20 degrees to 135 degrees. Active range of motion was increased to 90 degrees of glenohumeral abduction, 80 degrees of glenohumeral flexion, and 90 degrees of metacarpophalangeal flexion. On May 22 the patient returned for a second treatment of low-frequency electrical stimulation, which was again delivered bilaterally to the points shown in Figures 1, 2, and 3. During this treatment session a program of nonresisted, active exercises was initiated. On May 26 the physical therapy was discontinued, and the patient was completely asymptomatic. The patient was able to perform all activities of daily living without pain. Range of motion was within normal limits without pain, and strength throughout her upper extremity was in the Normal minus range. A telephone follow-up approximately three months later revealed the patient's right upper extremity to be totally asymptomatic.

DISCUSSION

Stimulation of auriculotherapy and traditional acupuncture points has been shown by several authors to be effective in the control of pain associated with RSD.⁵⁻⁷ Spoerel et al obtained reduction of pain in all five patients with RSD, who were treated with traditional and auriculotherapy.⁵ Melzack obtained similar results in two patients treated with brief, intense, low-frequency transcutaneous electrical stimulation delivered to trigger and acupuncture points.⁶ Chun and Heather reported on one patient with RSD

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who received excellent relief with low-frequency electrical stimulation of auriculotherapy points only.⁷ In each of these reports, the patients with RSD were only part of a larger group of patients with a variety of chronic pain syndromes. After reviewing the outcome of their entire group of patients—200, 53, and 46, respectively—all authors concluded that stimulation of acupuncture points or auriculotherapy points, or both, are beneficial for the management of pain.

The use of bilateral auricular stimulation for this patient was based on traditional acupuncture laws which call for treating both sides of the body. Other methods of auriculotherapy include stimulating only the left ear, the ear on the side of the dominant hemisphere, the ear on the same side of the body as the pain, or the more sensitive ear.^{7,10} Because no objective data exist regarding which of these methods is most productive, we chose to use bilateral stimulation.

A variety of methods of stimulating acupuncture or auriculotherapy points have been shown to be of clinical benefit in the reduction of pain.⁸ These include deep pressure, heat and cold, ultrasound, electromagnetism, chemical injections, and even laser beams. Because we have had positive results with and are equipped to use low frequency, direct current electrical stimulation, we chose to use that form of stimulation for this patient. The use of this form of electrical current for stimulation is supported by Bresler and Kroening who suggest that there are three essential factors that are necessary for effective acupuncture stimulation.⁸ The first is that an immune/inflammatory response must be produced. The use of low-frequency, direct current delivered to the patient's pain tolerance produces a local erythema that indicates the presence of such an inflammatory reaction. The second element they believe is necessary is that the stimulation must be of a branch of a peripheral nerve. According to Bossy et al, the auricle is differentially innervated by the trigeminal, facial, glossopharyngeal, vagus, and superior cervical plexus nerves.⁹ Electrical stimulation of points within the auricle can thus result in stimulation of branches of at least five peripheral nerves. The upper extremity acupuncture points that we used in this case were also in close proximity to branches of peripheral nerves. The third element that according to Bresler and Kroening is necessary for effective stimulation is psychological support. In the case reported here, the patient was informed that the treatment had been shown to be very effective in controlling her problem and that she should expect to improve very rapidly. Every attempt was made to provide adequate psychological support.

This case study is presented to share our experience of treating hyperesthesia associated with RSD in children. We have seen several patients, both children and adults, with these symptoms and have been quite

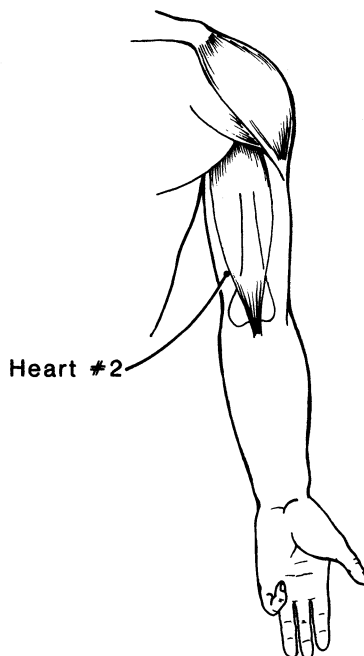


Fig. 3. Upper extremity acupuncture points (volar aspect).

successful in treating them with low-frequency, high-intensity direct current. Not all of our attempts have met with the degree of success achieved in this instance. This case indicates, however, that treatment with low-frequency current offers a distinct advantage over traditional methods, both in effectiveness and lack of side effects.

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