

Adverse Responses to Transcutaneous Electrical Nerve Stimulation in a Patient with Rheumatoid Arthritis

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Transcutaneous electrical nerve stimulation (TENS) has been widely used in recent years to relieve pain in various acute and chronic disorders,¹ with significant pain reduction reported by many investigators. However, few studies have investigated the effect of TENS in patients with rheumatoid arthritis. Mannheimer and associates found that high-intensity TENS reduced joint pain in 18 of 19 rheumatoid patients, but that one of the patients did report that wrist pain "returned with a greater intensity after TENS-induced analgesia had worn off."² The nature of that pain was not described. The use of TENS has produced significant relief in patients with reflex sympathetic dystrophy, in which signs and symptoms are strikingly similar to those of patients with rheumatoid arthritis.^{3, 4}

Side effects associated with TENS have been minor, the most frequently mentioned being skin irritation around or under electrodes and unpleasant sensations.⁵ More serious complications include cardiac arrhythmia⁶ and interference with cardiac pacemakers.⁷ No complications such as vasodilatation or numbness have been reported in literature reviewed to date. This case report describes such neurovascular responses associated with the use of TENS in a patient with rheumatoid arthritis.

PATIENT DATA

The patient, a 43-year-old woman, had been definitively diagnosed as having rheumatoid arthritis for five months, although she had a two-year history of joint pain and swelling. She had received outpatient physical therapy for three months to treat progressive flexion and ulnar drift deformities in wrists and

hands. Her deformities slowly resolved, but pain and moderate swelling in wrists and metacarpophalangeal joints remained a persistent problem, particularly in the right hand.

The TENS* was applied following the patient's Hubbard tank treatment. Electrodes were placed proximal to both wrists, on dorsal and ventral surfaces, in the manner described by Mannheimer.² Duration was set at "0" and frequency at "3" (corresponding approximately to 40 μ sec and 10 to 25 pulses a second, according to the manufacturer*). Amplitude was increased until the patient reported a strong but not painful sensation. The patient reported immediate pain relief in both hands, and the stimulation period lasted 10 minutes. When the patient left the clinic, she was asked to note the duration of pain relief.

The patient subsequently reported that the initial relief had lasted for three hours, at which time she realized that her right hand was "numb from the wrist down" and that her fingertips were numb. She reported that the numbness lasted about 30 minutes. For the rest of that evening her hands felt alternately hot and cold, yet such perceptions of temperature variation were not unusual for her. The pain in her hands and wrists remained significantly decreased below its usual level the following morning, with no numbness. During that day she reported that pain had slowly returned to its original level, accompanied by a "slightly funny feeling" in her hands. She was eager to try TENS again.

The following day, TENS was applied, again after a Hubbard tank treatment. Alternate electrode placement was employed to avoid direct peripheral nerve stimulation. Electrodes were positioned on acupuncture sites Li4, Sj5, Li5, and Si4⁸ on the right and Li4 and Sj5 on the left. Duration, frequency, and intensity settings were identical to the first TENS session and stimulation lasted 15 to 20 minutes. The patient again stated relief of pain began with onset of stimulation. The patient was instructed to note carefully the du-

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ration of pain relief and extent of paresthesia after the stimulation session.

The patient later reported that about one hour after treatment she noted "sharp" pains in her hands and fingers, which lasted about five minutes. Further symptoms were absent until around 9:30 that night, when she reported pain beginning in the right hand and spreading into the right shoulder. She described the pain as "deep, like in the bones," and it lasted throughout the night. She arose the next morning with swollen, painful fingers and wrists as well as distended superficial veins in both hands and forearms. One day later the distention of superficial veins was still prominent, with the metacarpophalangeal joints and wrists slightly more edematous and warm than usual. The pain had returned to its "usual" level. Two days later the patient reported that venous distention had abated. The patient refused further TENS.

DISCUSSION

The primary objective in using TENS with this patient was to relieve pain in her wrists and hands. Although the pain was initially relieved, the patient developed numbness, distention of superficial veins in her arms, and severe pain subsequent to stimulation. Although a causal relationship between these clinical signs and the use of TENS cannot be established, an association appears to exist. The patient did have a history of some paresthesia in the hands, but she had never experienced symptoms of the mag-

nitude described and had no history of spontaneous superficial vein distention. During the sequence of TENS application she did not deviate from her usual medication of one to two aspirin tablets every six hours and did not undergo any apparent emotional stress.

Increased blood flow has been noted with electrical stimulation applied transcutaneously and through electrodes implanted over dorsal columns and posterior nerve roots.⁹ Implanted electrical stimulation of spinal cord and posterior roots was found to improve blood flow and relieve pain in the nine patients with vascular insufficiency, and results were judged superior to those of a sympathectomy.¹⁰ In these studies, however, stimulus duration, frequency, and amplitude were not reported. Possibly the stimulus duration or frequency used with this particular patient produced, or interacted with the patient's pre-TENS heat treatment to produce the side effects noted.

In summary, TENS appears to have beneficial as well as potentially adverse effects on sensory and peripheral vascular systems. Because many patients referred for physical therapy have signs suggesting dysfunction of these systems, the use of TENS as a treatment modality seems reasonable. However, until more definitive clinical research data become available on the physiological effects of various pulse widths and frequencies, TENS should be used cautiously. Patients with rheumatoid arthritis should be told about possible side effects, and therapists should document patient responses to TENS up to 24 hours after treatment.

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