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TENS vs. PENS vs. Exercise Therapy for Low Back Pain

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Most published studies of nonpharmacologic therapies for low back pain, such as electric nerve stimulation, spinal manipulation and exercise, have lacked appropriate control groups. To avoid this problem, Ghoname and colleagues conducted a randomized, "sham"-controlled, crossover study to compare the effectiveness of percutaneous electric nerve stimulation (PENS), transcutaneous electric nerve stimulation (TENS) and exercise therapy in 60 patients with chronic low back pain secondary to degenerative disc disease. The authors describe PENS as a therapy that combines the advantages of TENS and those of electroacupuncture.

The 29 men and 31 women in the study participated in each of the four treatment groups: "sham" PENS, PENS, TENS and flexion-extension exercises. Each treatment was administered for 30 minutes three times a week for three weeks, and each three-week period of treatment was separated by a one-week period when no treatment was given.

PENS therapy consisted of the placement of 10 needles of 32 gauge, to a depth of 2 to 4 cm, into the soft tissue or muscle of the lower back in a dermatomal distribution of the pain. Each pair of probes was connected to a bipolar lead that transmitted electric stimulation. Needles were inserted for the sham PENS, but no electric stimulation was administered. For TENS therapy, four cutaneous electrode pads were placed at the T12 and L5 levels. Exercise therapy included flexion and extension exercises with the hips abducted and the patient seated.

To assess response to the different types of therapy, a health status survey was completed after each treatment period. This instrument provided scores for both physical and mental components. Patients also rated the quality of their sleep, the degree of low back pain and their physical activity level during the 48-hour interval between each treatment session.

At baseline, the scores for overall health-related quality of life on the health self-assessment survey were significantly lower in the study population than in the general population. Patients in the study had physical component scores of 28.4 and mental component scores of 40.2. In contrast, general population norms for these components are 50.

Compared with sham PENS, TENS and exercise therapy, PENS therapy produced greater improvement in function. A comparison of scores following PENS therapy and TENS therapy revealed that the physical and mental component scores were higher by 4.66 and 1.7, respectively, following PENS therapy. The differences in scores following PENS therapy versus exercise therapy were +5.82 and +1.84 for the physical and mental components, respectively.


Similarly, scores derived from visual analog scales for pain, physical activity and quality of sleep revealed that PENS resulted in greater improvement than sham PENS, TENS or exercise therapy. Following PENS therapy, scores for pain, physical activity and quality of sleep were improved by 46 percent, 42 percent and 44 percent, respectively. TENS therapy produced 11 percent and 15 percent improvements in the scores for degree of pain and physical activity, respectively. In addition, PENS therapy was associated with a 50 percent reduction in the amount of oral analgesics used daily. PENS therapy was preferred by 91 percent of the patients. No significant pain relief was noted with sham PENS and exercise.

The authors conclude that PENS therapy is more effective than sham PENS, TENS and exercise therapy in relieving low back pain caused by degenerative disc disease. The authors believe future studies should examine the cost benefit of PENS therapy as part of a multimodal approach that would include anti-inflammatory analgesic drugs and exercise therapy.

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Ghoname EA, et al. Percutaneous electrical nerve stimulation for low back pain. A randomized crossover study. *JAMA.* March 3, 1999;281:818-23.

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