

TRANSCUTANEOUS NERVE STIMULATION FOR TREATMENT OF PAIN IN SPINAL-CORD-INJURED PATIENTS ^a

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In the following study, 31 spinal-cord patients were tested with transcutaneous nerve stimulation (TNS). The patients ranged in age from 23 to 68 years old and had lesions from C3 to L5. Almost all of the patients required analgesics, such as pentazocine (Talwin, Winthrop), carbamazepine (Tegretol, Geigy), and oxycodon (Percodan, Endo), for relief.

Three different makes of nerve stimulators were used in this study: Medtronics, Stimtech, and Avery. All of these devices were solid state battery-operated pulse generators which delivered variable electrical spikes to a pair of electrodes.

The electrodes used in most cases (Fig. 1) were of our own design (Lentini, Davis, and Goldstein (1)), since those originally supplied with the devices were not as effective or as convenient to use. Conductive rubber electrodes have recently become available, and these were satisfactory in most cases.

We also tested epiconductive silver paint on electrodes and found these to be effective; however, they were time consuming to apply and they had a greater tendency to cause skin irritation.

In our study and treatment of spinal-cord-injured patients with chronic pain, three classifications were made (Types A, B, and C) depending upon which damaged tissues were involved associated with the pain. Type A pain was due to damage to the spinal column and surrounding tissues. This pain was localized around the site of injury. Type B pain was due to damaged nerve roots. This pain radiated along the involved dermatomes. Type C pain was due to damage to the spinal cord itself. This pain is sometimes called central pain and is "referred" from the patients' anesthetic areas.

^aPresented by John W. Gesink.

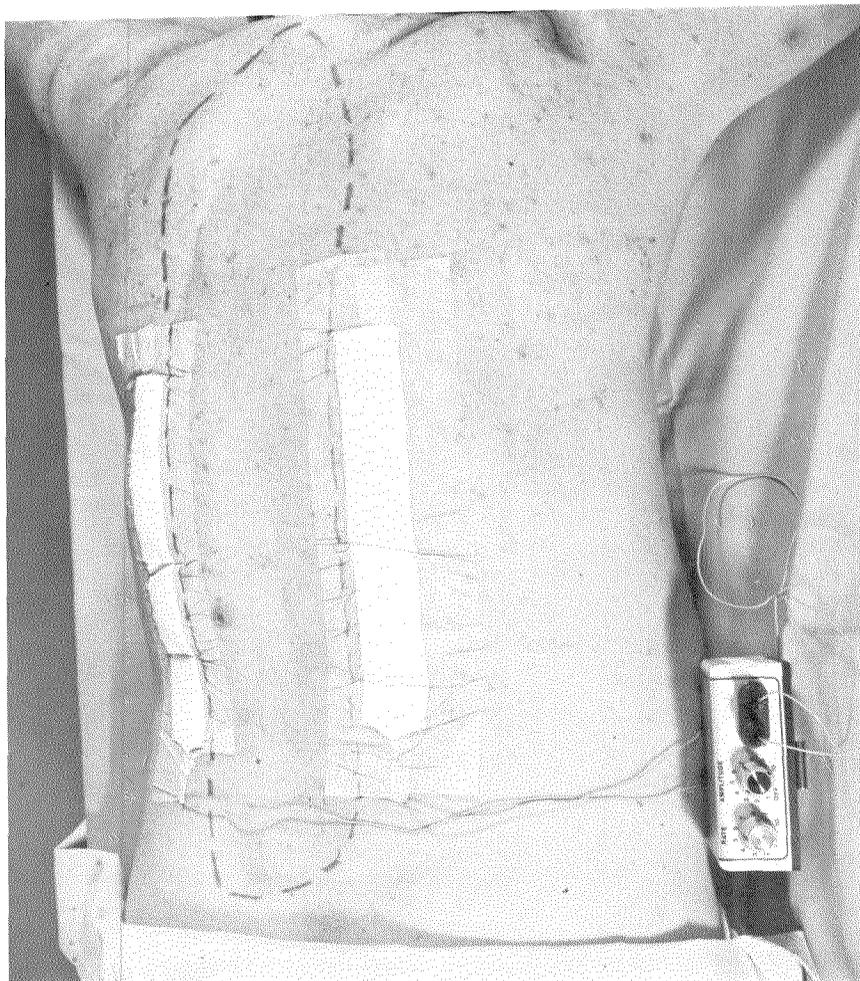


FIGURE 1.—Electrodes designed for TNS are placed adjacent to chronic pain area which is delineated with dotted lines.

Three treatment categories were formed depending upon the amount of relief obtained from the nerve stimulator. There were successes, partial successes, and failures.

In those cases considered “successes,” the patient claimed enough relief to warrant wearing the TNS whenever pain was present, and a reduction in the dosage of analgesics was noted. In the “partial success” category, the patients reported some relief, but not enough to want to bother taping on the electrodes and keeping the device with them during painful episodes. The “failures,” of course, claimed no relief at all.

Before any of these patients were placed into the above categories, they were allowed to use the device for at least 1 week. Some of the patients were not evaluated until they had the device for over 1 month. The time trial of several days was necessary in order to cancel any possible placebo effect. We found consistent results were not possible unless the patient became thoroughly acquainted with the nerve stimulator feeling and use.

Table 1 shows our results according to the site of the lesion: cervical, thoracic, and caudal. Although few cervical cases were treated, none of these patients responded to TNS. The other two sites responded almost equally to treatment.

TABLE 1.—*Results of TNS Treatments on Spinal-Cord-Injury Patients (as to site of lesion)*

Injury site	No. of cases	Successes	Partial successes	Failures
Cervical	4			4
Thoracic	11	5		6
Conus, Cauda equina	16	6	2	8
Total	31	11(36%)	2(6%)	18(58%)

Table 2 shows our results according to the type of pain treated. Note that those patients having Type A pain, localized around the site of injury, were more amenable to treatment than the other two groups. Seven out of 11 cases claimed a marked reduction in pain. Patients with Type B pain, radiating along nerve roots, showed little response to the stimulation. Only two of the nine cases were successfully treated.

TABLE 2.—*Results of TNS Treatments on Spinal-Cord-Injury Patients (as of pain type)*

Spinal Cord Injury Chronic Pain
From Damage To:

- A. Spinal Column (localized)
- B. Nerve Root(s) (radiating)
- C. Spinal Cord (referred)

Type of pain	No. of cases	Successes	Partial successes	Failures
A	11	7	1	3
B	9	2	1	6
C	11	2		9
Totals	31	11(36%)	2(6%)	18(58%)

The most refractory type of pain to that was the central or referred Type C. Only two out of 11 patients responded favorably.

Overall, slightly over one third of the spinal-cord-injured were successfully treated. The importance of this study is that it shows that spinal-cord-injured patients experience at least three different types of pain which respond differently to TNS. More study is needed because TNS as treatment for chronic pain is still in its infancy. Why it works well with some patients and not others is not known. TNS studies on spinal-cord-injured patients with all their subtle variations of paresthesias and dysesthesias may bring valuable insight into the theory and nature of pain.

REFERENCE

1. Lentini, R., R. Davis, and J. Goldstein: Modifiable Inexpensive Electrodes for Transcutaneous Stimulation. *J. Neurosurg.* 41:262-264, Aug. 1974.