

TRANSCUTANEOUS NERVE STIMULATION AND ITCHING

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Abstract. The response to transcutaneous nerve stimulation (TNS)—a method used for treatment of chronic pain—was studied in 41 patients with itching of diverse etiology. At a first trial, 63% of the patients found that TNS ameliorated their itching, 20% reported complete relief. As a rule the effect lasted for many hours, although TNS was given only for 5–30 min. In 15 of the patients, having suffered from extensive pruritus for more than one year, TNS was given several times a day for 5–47 days. During this time the effect declined. Twelve patients were relieved initially, either partially or completely, but ultimately only 6 had a partial relief and in none had the itching disappeared completely. Only one patient wanted to continue the TNS therapy. The decreasing efficacy is discussed; probably there was an initial placebo effect which declined during the course of treatment. The results indicate that TNS is of limited value for treating chronic itching.

Key words: Transcutaneous nerve stimulation (TNS); Itching; Placebo effect

Pain and itching are both unpleasant sensations but pain may appear in many organs, whereas itching is limited to the skin. The peripheral nerve endings registering pruritus are localized very superficially in the dermo-epidermal junction area (17), but how the nerves are stimulated is not well understood. It is assumed that chemical mediators, such as histamine (5), endopeptidases (17) and prostaglandins (9) are released or activated in various pruritic conditions and that these mediators stimulate the fine terminals of unmyelinated C fibres (17). Itching and pain are transmitted in the sensory C fibres to the lateral spinothalamic tract and thence to the thalamus and sensory cortex (1, 3, 7, 17, 19). Some authors regard itching as a subliminal pain sensation (4, 8, 13), whereas others consider itching and pain to be separate processes (10).

The sensation of itch, like that of pain, can be extremely severe and distressing. However, our

therapeutical aids are limited and no effective antipruritic drugs are available. Antihistamines, for example, seem to relieve itching only in certain conditions such as urticaria, and analgetics have little or no effect in most pruritic conditions. Consequently, it seemed very promising when it was reported recently that transcutaneous nerve stimulation (TNS), apart from relieving pain (15, 16), could also alleviate pruritus (2, 6). This observation seemed to be of interest both from a therapeutic and neurophysiological point of view.

The effect of the TNS method on ameliorating itch has been evaluated at our department and the present paper is a summary of our experiences.

MATERIALS AND METHODS

Stimulation equipment

Epicutaneous electric nerve stimulation was performed with so-called transcutaneous nerve stimulators intended for pain relief (Neuromod, Neurostal), or with a conventional nerve stimulator (Grass). Neuromod (Medtronic Inc., Minneapolis, USA) and Neurostal (Dan-Sjö Electronic AB, Sundbyberg, Sweden) are battery-powered portable stimulators delivering pulses with durations of 0.12 and 0.2 msec, respectively. Amplitude was adjustable from 0 to 90 V and 0 to 120 V, respectively and frequency from 12 to 100 and from 45 to 170 Hz, respectively. In our investigation the Grass stimulator S9 (Instrumental Comp, Quincy, Mass. USA) was set to deliver 0.5 msec square wave pulses at a frequency of 50 Hz. Amplitude was adjustable from 0 to 300 V.

Stimulation technique

Pairs of rubber electrodes were moistened with electrolyte paste to ensure electrical contact and then attached to the skin around the most irritating areas. Mostly the electrodes were tried on each side of the spinal column at the scapula level (Fig. 1). This localization was always used when general relief of itching was not obtained. The distance between the electrodes was usually in the order of 10–15 cm. Pulse amplitude and (except for the Grass

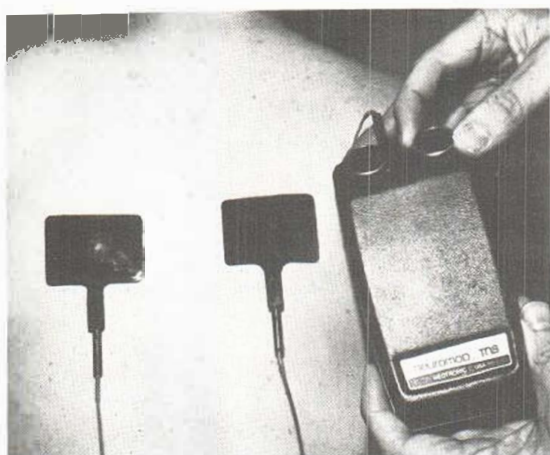


Fig. 1. In this case the electrodes were applied on each side of the spinal column at the scapula level.

stimulator) frequency were adjusted to find the optimal stimulus parameters. Stimulation was given for 5 to 30 min.

Patients and investigation schedule

Forty-one patients, 16 men and 25 women, aged 19–82 years, with various pruritic conditions were included in the investigation. In 26 of the patients transcutaneous nerve stimulation was given only once, while 15 patients with extensive itching for more than one year were treated daily for a longer period, 5 to 47 days. The initial stimulations were given at the hospital. After careful instructions the patients who were treated for longer periods obtained a stimulator on loan. The out-patients were instructed to keep a daily record and were frequently controlled at the clinic. The relief of itch was registered as complete (no itching), partial, or none. Duration of the relief was also noted.

RESULTS

Two of the 41 patients reported relief of itching even before the current was switched on. Thirty-five of the remaining 39 patients had extensive itching and 4 only focal. The effect of TNS on the first occasion is summarized in Table I. Initial relief was experienced by 24 of the 35 patients with extensive itching; two of them had only local relief between the electrodes. The remaining 11 patients experienced no relief at all. The 4 patients with focal itching all reported that TNS alleviated their symptoms.

The results of long-term TNS treatment of 15 patients with extensive pruritus lasting for more than one year are summarized in Table II. Initially,

12 patients reported general relief of TNS treatment; in 2 of them the relief was complete, in 10 there was a partial relief. However, after having used TNS for 5–47 days no patient had complete relief and only 6 had a partial effect. The local effect between the electrodes was more pronounced both initially and ultimately.

Optimal effect was obtained with a frequency of 60–80 Hz (the Grass stimulator was set at 50 Hz) and an amplitude of 40–60 V. The best relief was noted when stimulation gave a strong but not painful sensation. Usually the relief appeared soon after the stimulation had begun. Often 5 minutes was enough. Longer stimulation did not seem to increase the efficacy. The relief of itch usually continued for 2–4 hours (15 min to 24 hours) after discontinuation of the TNS.

DISCUSSION

The neurophysiological background to the effect of TNS is uncertain. In 1965 Melzack & Wall (12) presented the "gate control" theory according to which stimulation of large, non-pain afferent fibres exerted a presynaptic inhibition of the impulses in pain-carrying fibres. Interneurons in substantia gelatinosa were believed to be responsible for mediating this inhibition. As a consequence of this theory electrical nerve stimulation was introduced as a method for treating chronic pain (18). However, later investigators have shown that large-fibre and small-fibre activity does not result in presynaptic effects of opposite polarity as postulated in the theory (14). Moreover, it has not been satisfactorily explained why pain relief can remain for hours after the TNS has stopped. Nevertheless, TNS has repeatedly been shown to relieve pain in many patients (11, 15, 16). As pain and itching have some

Table I. Short-term effect (first trial) on itching in 39 patients

	Extensive itching (n=35)			Focal itching (n=4)
	Local effect	General effect	No effect	
Complete relief	13	7		1
Partial relief	11	15		3
Total	24	22	11	4

Table II. Long-term effect on extensive itching (15 patients)

2=complete relief, 1=partial relief, 0=no effect

Pat.	Diagnosis	Duration of symptoms (years)	Duration of TNS treatment (days)	Local effect		General effect	
				Initially	Ultimately	Initially	Ultimately
TS	Mycosis fungoides	3	25	2	2	1	1
JP	Mycosis fungoides	1	47	2	0	2	0
GH	Mycosis fungoides	1	5	2	2	1	1
SH	Hodgkin's disease	15	8	1	0	1	0
MS	Hodgkin's disease	10	14	0	0	0	0
SE	Urticaria	15	7	2	2	1	1
AB	Contact dermatitis	4	31	1	1	1	1
EH	Atopic dermatitis	2	25	1	0	1	0
BS	Atopic dermatitis	2	12	2	2	2	0
BF	Atopic dermatitis	4	14	1	1	1	1
TH	Prurigo nodularis	3	12	2	2	1	1
LS	Pruritus	23	7	0	0	0	0
ME	Pruritus	15	6	1	1	1	0
AO	Pruritus	9	5	2	0	1	0
IO	Chronic hepatitis	2	7	0	0	0	0
Total numbers of patient responding				12	8	12	6

features in common it is not entirely unexpected that TNS has also been reported to alleviate itching (2, 6).

In our investigation 22 of 35 patients (63%) with extensive itching experienced general relief initially; in 7 patients (20%) the itching disappeared completely. Augustinsson et al. (2) had somewhat better results, reporting complete relief in 68%. No partial relief was mentioned in their investigation.

The subjective sensation of itch is naturally to a great degree influenced by psychological factors. Thus, the placebo effect can be expected to be pronounced. This is evidenced in our investigation by the fact that 2 patients noticed complete disappearance of itching even before the current was switched on. According to Shealy the duration of the placebo effect is limited and it usually disappears within a week. Therefore, it would be better to evaluate the effect of TNS on itching in a long-term study. Out of 15 patients with over one year's history of extensive itching, 12 experienced general relief initially (2 reported complete, 10 partial relief). However, after long-term use of TNS (5–47 days) none experienced complete relief and only 6 reported a partial effect. Furthermore, the partial effect was considered weak and only one patient expressed a wish to continue the treatment and received a stimulator of his own. These observations indicate the potency of the placebo effect. The

local effect between the electrodes was better than the general effect, but the patients did not consider that this local relief was any better than conventional topical treatment.

Thus, in our experience the TNS method has proved to be of limited value for treatment of patients with chronic itching.

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