HIGH FREQUENCY TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION TREATMENT IN PATIENTS WITH GENERALIZED PRURITUS

GENERALİZE PRÜRİTİSLİ HASTALARDA YÜKSEK FREKANSLI TRANSKUTANÖZ SİNİR STİMULASYONU TEDAVİSİ

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Gazi Medical Journal 2003; 14: 67-70

ABSTRACT

Purpose: *Itching is a major symptom in several systemic and skin diseases and generalized pruritus. Generalized pruritus is a troublesome dermatological disorder with unknown etiology and is usually unresponsive to pharmaceutical and other conventional treatments. In this study, we evaluated the short-term efficacy of transcutaneous electrical nerve stimulation (TENS) in 15 patients with generalized pruritus for a 3-week period.* ***Materials and Methods:*** *All patients were treated by a transcutaneous electrical nerve stimulation device once daily for 1 hour. Scores of the visual analogue scale (VAS) of the patients were obtained 1, 2, 3 and 4 weeks after the TENS treatment.* ***Results:*** *The mean age and standard deviation of the patients was 44.13±15.79 years. The mean duration of the disease was 4.00±4.81 years. A significant reduction of pruritus was obtained in all patients after the first week ($p<0.0001$).* ***Conclusion:*** *We conclude that transcutaneous electrical nerve stimulation is useful to ameliorate the itching in patients with generalized pruritus for at least 3 weeks and long-term efficacy has to be investigated with further studies.*

Key Words: *Itching, Generalized Pruritus, Transcutaneous Electrical Nerve Stimulation.*

ÖZET

Amaç: *Kaşıntı birçok deri ve sistemik hastalıklar ile generalize prüritisde majör bir semptomdur. Generalize prüritis dermatolojik bozukluklar arasında etyolojisi bilinmeyen, genellikle farmakolojik ve diğer konvansiyonel tedavilere cevap vermeyen sıkıntılı bir hastalıktır.Bu çalışmada, generalize prüritisi olan 15 hastada, transkutanöz elektrik sinir stimulasyonunun (TENS) kısa dönem etkilerini 3 hafta boyunca değerlendirdik.* ***Gereç ve Yöntem:*** *Tüm hastalar günde bir defa, bir saat süreyle bir transkutanöz sinir stimulasyon cihazı ile tedavi edildiler. Hastalardan TENS tedavisi sonrası 1. 2. 3. ve 4. hafta görsel analog skorları (GAS) alındı.* ***Bulgular:*** *Hastaların yaş ortalamaları ve standart sapmaları 44.13±15.79 idi. Ortalama hastalık süresi 4.00±4.81 yıldı. Tüm hastalarda 1. haftadan sonra önemli oranda kaşıntıda azalma oldu ($p<0.0001$).* ***Sonuç:*** *Transkutanöz sinir stimulasyonu generalize prüritisli hastalarda kaşıntıyı azaltmada en azından üç haftalık sürede yararlı olduğuna ve uzun dönem etkilerinin daha ileri çalışmalarla değerlendirilmesi gerektiği sonucuna vardık.*

Anahtar Kelimeler: *Kaşıntı, Generalize Prüritis, Transkutanöz Elektriksel Sinir Stimulasyonu.*

INTRODUCTION

Transcutaneous electrical nerve stimulation (TENS), which transmits electrical pulses of a specific intensity, duration and frequency generated transcutaneously by a device to excite nerve fibers, is widely used for chronic pain therapy such as in arthralgia, myalgia and postherpetic pain. The beneficial effects of TENS on chronic leg ulcers and wound healing via improving local blood flow have been shown in various clinical and experimental studies (1, 2). TENS has also been used in the relief of experimentally induced itch. The therapeutic effect of low-frequency TENS treatment on generalized pruritus and atopic eczema has been reported (3-5). Generalized pruritus is a chronic, sometimes distressing clinical condition that

dermatologists often find difficult to manage because of its unsatisfactory response to conventional medications and absence of specific anti-itch drugs with proven efficacy. The pathophysiology of pruritus is not well understood (6). However, itch and pain are believed to share common molecular and neurophysiologic mechanisms despite some well-known differences (7). Here, we present our experience with TENS to treat 15 patients with severe generalized pruritus unresponsive to other treatments. We also discussed the possible neurophysiologic mechanisms of TENS on pruritus in the light of current knowledge.

PATIENTS AND METHODS

Patients who attended our dermatology outpatient clinic with generalized pruritus were invited for a 3-week TENS treatment and evaluation between January and September 2001 after obtaining written, informed consent. Patients in good general health with no history of significant peripheral vascular or cardiovascular diseases including cardiac pacemaker insertion, and absence of the fluctuation of clinical severity and intensity of the itch in the preceding month were included. All medications including topical therapies, oral and parenteral antihistamines, were discontinued 3 weeks before the study.

A portable TENS device (Bio-Stim T.M. SD-980: Skylark Device Co. Ltd, Taipei, Taiwan) producing different combinations of burst, constant, alternate, positive and negative mono-phasic and bi-phasic wave forms was applied to each patient. The treatment procedure was performed in the hospital with a constant-current mode, 4-channelled, wave frequency range of 2-120 Hz and a pulse width of 250 μs. The frequency ranged from 80-100 Hz and pulse widths from 80 to 95μs were defined as the high mode setting, whereas 1-10 Hz and 70-400 μs was defined as the low mode setting. Carbonized electrode pads, using a conductive gel between the skin and electrodes, were placed on the most itchy area of the skin and secured with adhesive tape. The high mode setting was applied to all subjects. If the skin was excoriated, electrodes were placed more proximally or distally in the same area. Current density was self-adjusted to achieve a maximum but comfortable level without any muscle twitching. The procedure was carried out for 1 hour, independent from the changes of itch intensity during the treatment. Patients were asked to decide about the discontinuation of TENS treatment if there was a significant reduction in the severity of the itch. No TENS treatments were performed if there were no symptoms in the patients. Patients were excluded from the study if any adverse effects including erythema, swelling, irritation, numbness or any other altered sensation were noted. The longest duration of effective itch reduction for each patient was also recorded.

Itch was evaluated by visual analogue scale (VAS) and all patients were told to submit a VAS score sheet on a 10 cm horizontal line ranging from 0 to 10 to rate the intensity of the itch. The lowest end of the scale represented 'no itch' while the highest end represented 'greatest imaginable itch'. VAS scores were recorded 3 (VAS 1), 7 (VAS 2), 15 (VAS 3) and 21 (VAS 4) days after the TENS treatment started. After the last TENS treatment, the patients were also asked to rate the overall efficacy of TENS as 'poor', 'fair', 'good' and 'very good'.

Statistical Analysis

All statistical analyses were performed using SPSS version 9.0 for Windows (SPSS for Windows, Chicago, IL, USA). Descriptive statistics are reported as the means±standard deviation (SD). The Freidman test (non-parametric) was used to assess VAS score changes. A level of $p<0.05$ was considered statistically significant.

RESULTS

Eight patients were excluded from the study for the following reasons: contact dermatitis due to carbonized electrode pads in one patient; two patients recommenced taking conventional medications; one patient changed his residency and four patients discontinued the treatment for unknown reasons. A total of 15 patients were successively recruited and all completed a 3-week evaluation. All treatments were carried out in our dermatology clinic. The main demographic and clinical characteristics of the patients were as follows: Seven of the patients were male and 8 were female. The mean age and standard deviations of the patients were 44.13±15.79 years. The mean duration of the disease was 4.00±4.81 years (1-20 years). A significant reduction in itch severity was noted in all patients

without any adverse effects ($p<0.0001$). VAS scores for all patients fell more rapidly within the first week when compared to the second week, and no significant reduction was noted in the last week (Table 1). Four patients had 14 TENS treatment sessions, while 6 patients had 12, and 5 patients had 10 TENS treatment sessions. In 6 patients, itch reduction extended to the extremities, beyond the area where TENS was applied. The rating of overall efficacy revealed 'very good' for 7 patients, 'good' for 6 patients and 'fair' for 2 patients. There was no significant re-occurrence of the symptoms during the treatment period.

Table-1: Clinical characteristics of the patients.

Patients' Characteristics (n=15)	Minimum	Maximum	Mean	Standard Deviation
Age (years)	20	69	44.13	15.79
Duration of itching (years)	1	20	4.00	4.81
VAS 1 (0-10cm)	3	10	7.13	2.23
VAS 2 (0-10cm)	2	8	5.00	1.77
VAS 3 (0-10cm)	0	7	3.93	2.12
VAS 4 (0-10cm)	0	7	2.93	2.12

DISCUSSION

Pain and itch are the commonest noxious stimuli and the neural mechanisms underlying itch and itch control are poorly understood. Despite many similarities, there are some obvious differences in itch and pain sensibilities. For instance, itch does not appear to be reduced by non-steroidal anti-inflammatory drugs (NSAIDs), and opiates may actually potentiate itch (7). Scratching the skin produces an instant reduction of the itch, but intense scratching may exacerbate the pruritic condition (8). On the other hand, Wall and Melzack have proposed a mechanism called the "Gate Control Theory" by which the analgesic effect of TENS might be explained. It is theorized that TENS selectively activates large type A fibers to close the gate at the spinal or at higher levels. Thus, the transmission of pain stimuli to the thalamus and cerebral cortex, carried by small type C fibers, is prevented (9). It is generally believed that there are no specific itch receptors in the skin, and the peripheral stimulus that provokes itching is mediated by the same small C-fibres sensory nerves which mediate pain. If itch is mediated by the same pathway as pain, one can speculate that TENS may be helpful in the treatment of itchy skin disorders. Bjorna and Kaada reported that low-frequency TENS treatment was effective in controlling the pruritus of a patient with atopic dermatitis (4). Monk reported 2 patients with generalized idiopathic pruritus in whom significant a cessation of itching was attained by high-frequency (175 Hz) TENS application (10). More recently, Tang et al. have reported their experience with high-frequency TENS to treat 5 subjects with pruritic skin disorders. They found a rapid reduction of VAS scores, particularly in the first 2 days without the discontinuation of conventional medications. They also claimed that the amelioration of pruritus could not only be explained by Gate Control Theory, but also a direct peripheral effect of TENS could be involved, as the amelioration of itch was well beyond the treatment time and relief of itch was not confined to the area that was stimulated (11).

The present study supports these earlier reports suggesting that TENS is effective in the treatment of generalized pruritus at least for 3 weeks. We also noted that the most rapid reduction of VAS scores was attained in the first week for all patients. However, further reduction of itch in the following stages was not observed even though VAS scores never exceeded pre-treatment levels. One of the most remarkable observations in the patients studied, consistent with earlier papers, was that the relief of pruritus was not limited to the area of stimulation. Since our present knowledge of the neurophysiology of itching is still limited, we cannot explain the exact mechanism of this observation, but we believe that the central pathways responsible for itch may also be involved. Nilsson et al. have developed a new technique termed cutaneous field stimulation (CFS) and tested this technique on 21 subjects with experimentally induced itch. When compared to TENS, CFS was found to be more effective in the inhibition of itch. They also stated that CFS could act through endogeneous central inhibitory mechanisms that are normally activated by scratching the skin (8).

Our study has some limitations. Firstly, we are unaware of the efficacy of the long-term therapeutic effect of TENS, since treatment was confined to 3 weeks and the patients were not monitored after the last TENS treatment. Therefore, we can only conclude that the treatment produces symptomatic relief rather than a cure. Secondly, the subjective nature of itch makes a placebo influence possible, as many stimuli can influence itch perception. Finally, the absence of a placebo TENS group may limit the generalizability of our findings.

In conclusion, TENS treatment is effective with high mode settings for generalized pruritus at least for a 3-week period but the beneficial effects of TENS on long-term use for generalized pruritus is still unknown. Further investigations for understanding the underlying mechanisms of generalized pruritus, particularly placebo-controlled studies, are needed.

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