

## Micro Current Versus Trans Cutaneous Nerve Stimulation in Treatment of Post Herpetic Neuralgia

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### Abstract

**Background:** This study aimed to compare the effect of microcurrent versus trans cutaneous nerve stimulation on post herpetic neuralgia. It was a randomized controlled trial. Overall, 102 post herpetic neuralgia patients, aged 40-55 years, were randomized into 2 equal groups. Group (A) composed of 51 patients who received micro current for 3 times per week for 4 weeks after rashes disappear in conjunction with medical treatment. Group (B) composed of 51 patients who received (TENS) 3 times per week for 4 weeks after rashes disappear in conjunction with medical treatment.

**Aim of Study:** The aim of the study is to evaluate which is more effective Micro current or TENS in treatment of post herpetic neuralgia.

**Subjects and Methods:** Hundred two patients of both genders were participated in the study their ages ranged between (40-55) years.

#### Equipment:

- Micro-current device.
- Trans cutaneous electrical nerve stimulation device.

#### Measurement Methods:

- Color analogue scale.
- Serum cortisol level test.

**Results:** There was a significant decrease in color analog scale and serum cortisol level in group (B) who received (TENS) compared to that in group (A) who received micro current.

**Conclusion:** TENS was more effective than micro current in treating patients with post herpetic neuralgia.

**Key Words:** *Herpes zoster — Neuropathic pain — Post herpetic neuralgia — Micro current — TENS — Color analog scale and Serum cortisol level.*

### Introduction

**POST** herpetic neuralgia (**PHN**) is neuropathic pain syndrome resulting from combination of inflammatory and viral damage to primary afferent fibers of sensory nerves and the corresponding levels of the spinal cord [1].

Pain of Post herpetic neuralgia is characterized by allodynia and hyperalgesia in response to non-noxious mechanical and thermal stimuli and by spontaneous pain variably described as burning, sharp, shooting, or electric shock-like [2].

Approximately 1 million cases of herpes zoster occur annually in the US, 1 of 3 people in USA develop Post herpetic neuralgia in their life time because the virus lie dormant for years and then reactivate as post herpetic neuralgia [3].

Variety of treatment methods have been tried to ease the pain of post herpetic neuralgia. However, what is effective for one person may not be effective for another [4].

Electrical modalities have been used for many years to control acute and chronic pain. Clinicians also routinely use neuromuscular electrical stimulators to rehabilitate injured athletes. Trans-cutaneous electrical nerve stimulation (TENS) and other similar devices use a mild form of electrically induced pain to block body's ability to perceive the pain that is being treated, stimulating nerves closes a "gate" mechanism in the spinal cord, and that help eliminate the sensation of pain [5].

Micro current electrical therapy represents significant improvement in rapid pain control and acceleration of healing. It uses current in the micro ampere range, 1000 times less than that of TENS and below sensation threshold. The pulse width,

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or length of time that the current is delivered with micro current device is much longer than previous technologies. A typical micro current pulse is about 0.5 seconds, which is 2500 times longer than pulse in a typical TENS unit and a good micro current unit has approximately ten times the electronic circuitry of a TENS unit [6].

To authors' knowledge, there is no previous study that compare the effect of micro current and TENS on post herpetic neuralgia. Therefore, the aim of this study was to evaluate which is more effective Micro-current or TENS in treatment of post herpetic neuralgia. It was hypothesized that it would be no difference between the effect of Micro-current or TENS in treatment of post herpetic neuralgia.

### Subjects and Methods

#### Design:

Hundred and two patients were participated in the study, they were selected from belbis central hospital sharkia government, Egypt. From 2022-2023.

The study is a prospective, randomized, controlled trial. The protocol of the study was explained in detail to each patient who signed an informed consent at starting of this study.

The protocol of the study was approved by the Ethical Committee of the Faculty of Physical Therapy at Cairo University (P.T.REC-012-003746).

#### Participants:

A sample of 102 patients were recruited from Belbis Central Hospital, Sharkia government, Egypt. The inclusion criteria include patients of both genders, received the medical protocol for post herpetic neuralgia and their age ranged from 40 to 55 years. Subjects were excluded if there were pacemaker, pregnancy, malignant tissue, phlebitis, impaired mental status, thrombosis, metal plates in the application area, psychiatric and personality disorders.

#### Randomization:

One hundred and two patients were randomly assigned into 2 equal groups (group A, and group B) with the use of sealed envelope system by an independent person; the envelope contained a letter indicating whether the patient would be allocated to group A or group B. The patients were blinded about which group they were allocated.

#### Interventions:

The patients in both groups received medical treatment in the form of anti-viral, short term corticosteroid course, non-steroidal anti-inflammatory drug and vit B complex.

#### Group (A) Microcurrent electrical stimulation:

This group included 51 patients with post-herpetic neuralgia and they received the application of MENS and traditional medical treatment. The patients of this group received MENS for 30min duration and intensity of maximum tolerable paresthesia three times per week for 4 weeks.

#### Group (B) Trans Cutaneous Electrical Stimulation:

This group included 51 patients with post-herpetic neuralgia and they received the application of TENS and traditional medical treatment. The patients of this group received TENS was applied for 30min duration and intensity of maximum tolerable paresthesia three times per week for 4 weeks.

Outcome measures:

#### 1- Color analogues scale:

Color pain analogues scale use colors (CAS) in Measurement instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and represented by colour-swath with red representing severe pain, yellow representing moderate pain, green representing comfort. The patients marks on the line the colour that represent their perception of their current state. These measurements were conducted by the same physical therapists as the following: First measuring (pre-treatment): Before the first session of treatment. Second measuring (post-treatment) at the end of the fourth week of treatment m.

#### 2- Serum cortisol level:

The samples of blood were taken at the same time of the day before and after the treatment as the level of cortisol varies throughout the day. The reference ranges for serum cortisol are as follows: Morning -7-28mg/dl, Afternoon -2-18mg/dl, Stimulated\* - more than or equal 18mg/dl and Suppressed\* - less than 2mg/dl [8,9].

#### Statistical analysis:

Unpaired t-test was conducted for comparison of age between groups. Chi-squared test was conducted for comparison of sex distribution between groups. Unpaired t-test was conducted for comparison of color analog scale and serum cortisol level between groups. Paired t-test was conducted for comparison of color analog scale and serum cortisol level between pre and post treatment in each group. The level of significance for all statistical tests was set at  $p < 0.05$ . All statistical tests were performed through the statistical package for social studies (SPSS) version 25 for windows. (IBM SPSS, Chicago, IL, USA).

## Results

#### Subject characteristics:

Table (1) shows the subject characteristics of group A and B. There was no significant difference between groups in age and sex distribution ( $p > 0.05$ ).

**Effect of treatment on color analog scale and serum cortisol level:**

There was a significant interaction of treatment and time ( $F=79.32, p=0.001, n^2=0.62$ ). There was a significant main effect of time ( $F=251.05, p=0.001, n^2=0.94$ ). There was a significant main effect of treatment ( $F=51.92, p=0.001$ ).

**Within group comparison:**

There was a significant decrease in color analog scale and serum cortisol level of group A and B post treatment compared with that pre-treatment

( $p>0.001$ ). The percentage of change in color analog scale and serum cortisol level of group A was 35.36 and 27.74 and that in group B was 66.74 and 36.66% respectively. (Table 2).

**Between groups comparison:**

There was no significant difference between groups pre-treatment ( $p>0.05$ ). Comparison between groups post treatment revealed that there was a significant decrease in color analog scale and serum cortisol level of group B compared with that of group A ( $p<0.001$ ). (Table 2).

Table (1): Subject characteristics.

	Group A	Group B	MD	t-value	P-value
	Mean ± SD	Mean ± SD			
Age (years)	47.58±4.53	48.72±4.84	-1.14	-1.22	0.22
<b>Sex, n (%):</b>					
Females	27 (53%)	26 (51%)		x2C1.03	0.84
Males	24 (47%)	25 (49%)			

SD : Standard deviation. x2: Chi squared value.  
MD: Mean difference. p-value: Level of significance.

Table (2): Mean color analog scale and serum cortisol level pre and post treatment of group A and B.

	Group A	Group B	MD (95% CI)	P value
	Mean ± SD	Mean ± SD		
<b>Color analog scale:</b>				
Pre treatment	8.88±0.97	8.72±0.87	0.16 (-0.21: 0.52)	0.39
Post treatment	5.74±1.31	2.90±1.14	2.84 (236: 3.32)	0.001
MD (95% CI)	3.14 (2.77: 3.50)	5.82 (5.46: 6.18)		
% of change	3536	66.74		
	p1:1.001	p=0.001		
<b>Serum cortisol level (agldl):</b>				
Pre treatment	3133±2.18	30.74±2.23	0.59 (-0.28: 1.45)	0.18
Post treatment	22.64±2.46	19.47±2.16	3.17 (226: 4.08)	0.001
MD (95% CI)	8.69 (8.01: 936)	1127 (10.59: 11.59)		
% of change	27.74	36.66		
	p1:1.001	p=0.001		

SD : Standard deviation. CI: Confidence interval.  
MD: Mean difference. p-value: Level of significance.

**Discussion**

Post herpetic neuralgia is chronic neuropathic pain condition that persists 3 months or more following an outbreak of herpes zoster, which result in significant morbidity, severe pain, lost productivity and diminished quality of life [10].

This study showed that there was a significant decrease in color analog scale and serum cortisol level in group (B) who received TENS compared to that in group (A) who received micro current.

The results of this study agreed with a previous study that Proper application of TENS has been found to relieve multiple neuropathic pain disorders such as carpal tunnel syndrome, diabetic neuropathy [11]. Also, Lin et al., [12] reported that TENS showed a significant reduction in pain in patients with sciatica, radiculopathy and post herpetic neuralgia.

In addition, when directly compared to antiviral drug administration as a preventive measure to post herpetic neuralgic pain, results revealed that in acute phase of the disease TENS has no unusual impact that is different from the control group. None-

theless, following the acute stage, most patients in the study group did not experience post herpetic neuralgic pain [13].

Moreover, the results were in line with a previous study, which reported that Application of the microcurrent electrical stimulation had a valuable effect on post-herpetic trigeminal neuralgia as evidenced by highly significant decrease in VAS (visual analogue scale) and serum cortisol level [11,12,14,15].

McMakin observed reductions in inflammatory cytokines, the increase in b-endorphin release and the accompanying subjective data reporting pain relief can be explained by a moderate anti-inflammatory effect in this patient group that is modulated by the micro current treatment [16].

While Chevalier et al., theorized that electro-acupuncture and micro current electro-currents have different modulating effects on the autonomic nervous system and pain outcomes [17].

Norrbrink and Lundeborg researched the effects of LF-TENS for the treatment of neuropathic pain in SCI patients in a case-control, prospective study. The results of this study revealed that LF-TENS reduced neuropathic pain intensity in the morning, noon and evening but not at night, in SCI patients. [18].

In the literature, 63.3% of patients with spinal cord injury pain had tried non-pharmacological treatment. TENS is one of the most tried non-pharmacological treatments. Five studies (across various neuropathic conditions) were suitable for pooled analysis of TENS versus sham TENS investigating pain intensity using a visual analogue scale. Gibson et al found a mean post intervention difference in effect size favouring TENS of  $-1.58$  (95% confidence interval (CI)  $-2.08$  to  $-1.09$ ,  $p < 0.00001$ ,  $n = 207$ , six comparisons from five studies [19].

#### Limitations:

Although the current study reveals objective data with statistically significant differences, there are some limitations. The main one is the short study duration. Therefore, longitudinal studies are needed to evaluate long-term effects of TENS and MES on pain in patients with post herpetic neuralgia. Further researchers using low level laser in conjunction with TENS are needed to detect the most effective in reducing pain in post herpetic neuralgia. Further studies using other programs of physical therapy should be conducted on post-herpetic neuralgia. Further researchers should include a comparison between another physiotherapy modalities and protocols. More studies should be conducted comparing different physical therapy programs on post-herpetic neuralgia. More extensive studies assessing the efficacy of the microcurrent stimulation (MENS) in combination with other modality in the treatment of post-herpetic neuralgia.

#### Conclusions:

Application of Micro current and TENS have beneficial effect in treating pain of post herpetic neuralgia but TENS was more effective than Micro current in treating pain in patients with post herpetic neuralgia by highly significant decrease in CAS and Serum cortisol level.

#### Acknowledgments:

We would like to thank all individuals who contributed to the completion of this work, especially the study participants.

#### Disclosure statement:

No author has any financial interest or received any financial benefit from this research.

#### Conflict of interest:

The authors state no conflict of interest.

#### Funding:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

#### Ethical approval:

This was approved by the Ethics Committee of the Faculty of Physical Therapy at Cairo University (P.T.REC-012-003746).

#### Consent:

The procedures of this study were explained to all participants, who signed consent form before the beginning of the study.

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## التيار الكهربائي الدقيق مقابل التنبيه الجلدي العصبي في علاج الحزام الناري

تم تصميم هذه الدراسة لمعرفة أيهما كان أكثر فعالية في علاج الام الحزام الناري.

أجريت هذه الدراسة على مائة واثنين مريض يعانون من الألم العصبي التالي للحزام الناري. تراوحت أعمارهم بين (٤٠-٥٥) سنة، وتم اختيارهم من مستشفى بليس المركزي.

تم تقسيم المرضى بشكل عشوائي إلى مجموعتين متساويتين المجموعة (أ) مجموعة التيار الدقيق المكونة من ٥١ مريضاً (٢٧ أنثى و٢٤ ذكراً) الذين تلقوا تحفيزاً كهربائياً بالتيار الجزئي ٣ مرات في الأسبوع لمدة ٤ أسابيع بعد اختفاء الطفح الجلدي بالتزامن مع العلاج الطبي والمجموعة (ب) مكونة من ٥١ مريض، ٢٦ أنثى و٢٥ ذكر الذين تلقوا التحفيز الكهربائي للعصب عن طريق الجلد ٣ مرات في الأسبوع لمدة ٤ أسابيع بعد اختفاء الطفح الجلدي بالتزامن مع العلاج الطبيعي قياس الألم لكلا المجموعتين قبل وبعد ٤ أسابيع من خلال مقياس الألم بالالوان ومستوى الكورتيزول في الدم.

تم اجراء اختبار t غير المقترن لمقارنة مقياس الألم بالالوان ومستوى الكورتيزول في الدم بين المجموعات.

تم اجراء اختبار t الزوجي للمقارنة بين مقياس الألم بالالوان ومستوى الكورتيزول بالدم بين المعالجة السابقة واللاحقة في كل مجموعة .

بعد مناقشة النتائج وفقاً لتقارير الباحثين السابقين في المجالات المتعلقة بهذه الدراسة ، يمكن الادعاء أن تطبيق التحفيز الكهربائي للعصب الجلدي عبر الجلد على الألم العصبي الناتج عن الحزام الناري كان له تأثير قيم كما يتضح من اختبار تقييم الألم بالالوان. CAS ومستوى الكورتيزول بالدم.

كان لتطبيق TENS و MENS تأثير مفيد في علاج الام الحزام الناري، لكن التحفيز الكهربائي للعصب عبر الجلد كان أكثر فاعلية من التيار الجزئي في علاج الألم في المرضى الذين يعانون من الام الحزام الناري عن طريق انخفاض كبير في مستوى الـ CAS ومستوى الكورتيزول في الدم.