

# ELECTROPUNCTURE IN NON-SPECIFIC NECK PAIN: A PILOT STUDY

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**Abstract** The aim of the study was to evaluate the effect of electropuncture, i.e. the stimulation of acupuncture points by TENS electrotherapy, on non-specific neck pain and the associated symptoms regularly reported. 16 participants, 10 female and 6 male, completed the study. A TENS machine with a point electrode was used to stimulate a selection of acupuncture points. The primary outcome measure was the intensity of neck pain as measured by changes in scores on pain VAS, the secondary measure was the degree of the associated symptoms regularly reported such as headaches, restriction in daily activities, stress, troubled sleep and general health satisfaction. The results showed that participants who received 3 treatments over 8-14 days experienced a significant short-term reduction in neck pain and restriction in daily activities immediately after the treatment and at 1-month post-intervention follow-up. Our findings also show improvement in the intensity of headaches, degree of stress, quality of sleep and general health satisfaction but the changes were not statistically significant. The present pilot study suggests that stimulation of acupuncture points by the means of TENS electrotherapy may effectively reduce neck pain.

**Key words** acupuncture, electropuncture, TENS, neck pain

## Introduction

Neck pain constitutes a serious public health problem, being one of major causes of disability in many countries (van Randeraad-van der Zee et al., 2015). A variety of therapeutic interventions for neck pain are available including manual therapy, strengthening exercises, laser therapy (Nunes, Moita, 2015) and electrotherapy (Nunes, Moita, 2015; Kroeling et al., 2013). A systematic review of electrotherapy for neck pain showed that TENS might be more effective than placebo for patients with chronic and myofascial neck pain (Kroeling et al., 2013). Another review assessed TENS as effective in treating neck pain, however the evidence was of low quality (Nunes, Moita, 2015). The treatment modalities include also therapies based on acupuncture points. Acupuncture is accepted and

recommended for the treatment of neck pain (Nunes, Moita, 2015; Yuan et al., 2015; Liang et al., 2010; Witt et al., 2006; Vas et al., 2006; He et al., 2004; Irnich et al., 2001). Acupressure reduces neck pain intensity, neck stiffness and stress level (Yuan et al., 2015; Matsubara et al., 2011; Yip, Tse, 2006).

Since both acupuncture points therapies and TENS are effective in neck pain, we decided to investigate a combination of the two. In this study we designed an intervention where acupuncture points are stimulated by TENS by means of a point electrode. We called this electropuncture (as opposed to electroacupuncture). There are studies investigating the effect of electroacupuncture in neck pain therapy (Zhang et al., 2013; Cameron et al., 2011; Sahin et al., 2010). In all the studies, however, acupuncture needles were inserted into acupuncture points and then an electroacupuncture machine was attached to the needles. In one study (He et al., 2004) "electroacupuncture" involved placing electrodes on the body acupoints without the use of needles. In this study, however, electrotherapy on acupoints was only a part of the intervention. The treatment was a combination of body acupuncture, ear acupressure and body electroacupuncture (He et al., 2004). In all the above mentioned studies the electrotherapy was provided by means of a specialist electroacupuncture equipment. We decided to use a TENS machine with a point electrode.

The aim of our study was to evaluate the effect of electropuncture, i.e. the stimulation of acupuncture points by TENS electrotherapy, on non-specific neck pain and the associated symptoms regularly reported such as headaches, restriction in daily activities, stress, troubled sleep and general health satisfaction.

## Material and methods

The study and its protocol were approved by the Ethical Committee of the Medical University of Silesia, Poland (KNW/0022/KBI/56/II/14). All participants were informed about the purpose of the study, the treatment procedures and contraindications for electrotherapy treatment.

Participants for the study were recruited from May 2011 to January 2012 by advertising at the School of Health Sciences, Medical University of Silesia, Poland and via the website [www.Qi-med.com](http://www.Qi-med.com) of a physiotherapy practice. The advertisement regarding electropuncture treatments and the study protocol was directed at individuals suffering from dysfunctions, tension and other ailments causing neck pain.

The inclusion criteria for participating in the study were: 1) reporting neck pain, classified by a pain score >0 on a pain Visual Analogue Scale (VAS); 2) not undergoing any other therapy for the pain during the study.

Candidates were assessed in order to ensure they had non-specific neck pain and were safe to participate in the study. Non-specific neck pain was pain in the area of neck and shoulders experienced by a person on most days in the past two weeks. Non-specific pain was not caused either by any pathologies including systemic rheumatic disorders, spinal tumors, fractures, infections or by any known causes including degenerative changes, trauma or surgical intervention (Yip, Tse, 2006). The patients were excluded who suffered from any systemic disease, neurological disorders, infections, fractures or degenerative disorders as well as those with contraindications to the treatment. Also pregnant and breastfeeding women were excluded. Administration of sedatives, analgesic or other medication was an exclusion criteria as well.

The results were measured using Visual Analogue Scales in an anonymous questionnaire on pain and related symptoms which all participants agreed to complete before the first treatment, immediately after the last treatment and one month after the last treatment.

The questions were related to neck pain and the associated symptoms such as headaches, restriction in daily activities, stress, troubled sleep and general health satisfaction. A VAS with the range 0–100 was attached to every question. The range was coloured green from 0 to 25, yellow from 25 to 50, orange from 50 to 75 and red from 75 to 100. Each VAS was accompanied by an explanation what 0 and 100 scores meant. The colour and description on each VAS indicated that scores near 0 were more positive (e.g. lack of pain) and those near 100 were more negative (e.g. the worst pain imaginable).

All treatments were free for the participants.

A total of 35 acupuncture points were used, both local and distal to the neck area. It was shown (Matsubara et al. 2011) that using both local and distal acupuncture points improved pain-related condition. Local points included *Dazhui* (GV14), *Yamen* (GV15), *Fengfu* (GV16), *Fengchi* (GB20), *Jianjing* (GB21), *Tianzhu* (BL10), *Fengmen* (BL12), *Tianliao* (TE15), *Naoshu* (SI10), *Tianjing* (SI13), *Jianwaishu* (SI14), *Jianzhongshu* (SI15); distal ones were located on the upper limbs: *Hegu* (LI4), *Quchi* (LI11), *Houxi* (SI3); and on the lower limbs: *Fengshi* (GB31), *Yanglingquan* (GB34), *Shenmai* (BL62), *Taichong* (LR3). The selection of acupuncture points was based on previous publications. The points chosen proved to be effective in neck pain (Yip, Tse, 2006; Vas et al., 2006; He, Veiersted, Høstmark, Medbø, 2004; Irrnich et al., 2001).

A TENS machine (EMS/TENS 271513; Handelshaus Dittmann GmbH Germany) with a point electrode was used to stimulate the points. Participants received electropuncture treatments with TENS at a frequency of 10Hz with 200-microsecond pulse widths and 1mA amplitude. Each point was stimulated for about 30 seconds. The points were stimulated for a total of 18 minutes (35 points, 30 seconds each) and the treatment procedure lasted from 30 to 40 minutes as some time was needed for the points' localisation. All participants received 3 treatments within 8–14 days.

The primary outcome measure in this study was the intensity of neck pain as measured by changes in scores on pain VAS (0 = lack of pain; 100 = the worst pain imaginable). The secondary measure was the degree of the associated symptoms regularly reported such as headaches, restriction in daily activities, stress, troubled sleep and general health satisfaction as measured by changes in scores on Visual Analogue Scales attached to each question about the symptoms: the degree of restriction in daily activities caused by the neck pain (0 = the neck pain did not affect the everyday activities at all; 100 = the neck pain prevented the person from performing everyday activities); the intensity of headaches (0 = lack of pain; 100 = the worst pain imaginable); the degree of stress experienced in life by a person (0 = lack of stress; 100 = the worst stress imaginable); the quality of sleep (0 = the perfect sleep; 100 = lack of sleep); the satisfaction with the general state of health of a person (0 = total satisfaction with the state of one's health; 100 = complete dissatisfaction).

Data analysis was conducted using the Statistica PL software. For each parameter the following descriptive statistics were calculated: arithmetic mean, minimum, maximum, standard deviation. The statistical significance was set at 0.05.

To compare the differences between results pre- and post-intervention Student's t-test or ANOVA were used. The results are presented as mean  $\pm$ SD.

## Results

During the recruitment 20 people were screened but 4 of them did not meet the inclusion criteria. The study was completed by 16 participants, 10 female and 6 male. The average age was 24 years (age range 19–29 years). There were no drop-outs either during the treatment period or during the 1-month follow-up.

The intensity of neck pain was reduced significantly. It fell from the baseline of  $51.31 \pm 18.88$  to  $30.63 \pm 20.07$  after the last treatment and remained significantly lower at  $29.13 \pm 18.52$  at the 1-month post-intervention follow-up ( $p < 0.05$ ;  $p = 0.001$ ). The results are presented in Table 1.

Among the secondary outcomes only the degree of restriction in daily activities caused by the neck pain was significantly reduced. Before the intervention the scoring here was  $47.06 \pm 20.61$  and fell significantly first to  $26.63 \pm 18.66$  immediately after the treatments and then to  $21.13 \pm 13.42$  at a month follow-up ( $p < 0.05$ ;  $p = 0.0003$ ). There were no significant differences in the intensity of headaches, degree of stress, quality of sleep and general health satisfaction, although all the parameters improved. The results are presented in Table 1.

## Discussion

This pilot study investigated the effect of electropuncture on non-specific neck pain. This is, to our knowledge, the first study investigating the stimulation of acupuncture points by TENS in non-specific neck pain. The results show that participants who received 3 treatments over 8–14 days experienced a significant short-term reduction in neck pain and restriction in daily activities immediately after the treatment and at 1-month post-intervention follow-up. Our findings also show improvement in the intensity of headaches, degree of stress, quality of sleep and general health satisfaction but the changes were not statistically significant.

The results of our study are in line with several studies investigating the effect of therapies based on acupuncture points in neck pain. Electroacupuncture proved to significantly reduce neck pain after therapy and at 3 months post-therapy (Cameron et al., 2011; Sahin et al., 2010) as well as significantly reducing restriction in daily activities after the treatment and at the 3-month and 6-month follow-up (Cameron et al., 2011). Acupuncture and acupressure also could be efficacious in neck pain and the related disability (Yuan et al., 2015). An overview of Cochrane reviews concluded that acupuncture is effective in reducing some types of pain but not all of them. Neck pain is proved to be reduced by acupuncture treatments (Lee, Ernst, 2011).

The participants in our study were young people (age range 19–29 years) without any serious degenerative changes. Therefore it cannot be assumed that the same effect of a 1-month pain reduction would be obtained in older people. Another study focusing on older population is needed.

Our pilot study suggests that stimulation of acupuncture points by the means of TENS electrotherapy may effectively reduce neck pain. It implies that electropuncture may be performed not only by acupuncturists equipped with a specialist electroacupuncture machines but also by physiotherapists equipped with a TENS machine and instructed about the location of acupuncture points used in non-specific neck pain therapy.

There are several limitations to this study, including the lack of a control group to eliminate the placebo effect and a short follow-up. This was, however, a pilot study and a larger randomized controlled trial is planned. The study also lacks individual diagnosis according to Traditional Chinese Medicine, which resulted in the use of 19 local and distal acupuncture points. The TCM diagnosis would reduce the number of points as only those related to a specific

syndrome would be used for each case. Another limitation is the fact of high values of SD in all outcomes measures which may suggest that the treatment group was heterogeneous.

## Conclusion

This pilot study shows that electropuncture reduces non-specific neck pain intensity and restriction in daily activities, caused by the pain, for a month period.

**Table 1.** Comparison on the mean change in the pre-intervention and post-intervention outcomes immediately after therapy and at 1 month post therapy

Outcome variables	Baseline mean $\pm$ SD	Post last treatment mean $\pm$ SD	Post 1 month mean $\pm$ SD	p-value
Intensity of neck pain	51.31 $\pm$ 18.88	30.63 $\pm$ 20.07	29.13 $\pm$ 18.52	0.001*
Degree of restriction in daily activities	47.06 $\pm$ 20.61	26.63 $\pm$ 18.66	21.13 $\pm$ 13.42	0.0003*
Intensity of headaches	40.25 $\pm$ 28.11	29.69 $\pm$ 22.23	25.25 $\pm$ 24.91	0.234
Degree of stress	49.94 $\pm$ 18.24	40.75 $\pm$ 25.81	36.19 $\pm$ 22.37	0.219
Quality of sleep	46.75 $\pm$ 23.40	34.38 $\pm$ 21.98	29.31 $\pm$ 23.60	0.099
General health satisfaction	47.38 $\pm$ 24.12	36.63 $\pm$ 22.05	34.69 $\pm$ 20.53	0.232

\* significant difference ( $p < 0.05$ )

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