

# The effect of using Transcutaneous Electrical Nerve Stimulation (TENS) in acupuncture points (Hegu [LI-4] and Sanyinjiao [Sp-6]) on labor pain reduction

Azar Aghamohammadi,  
Mandana Zafari,  
Maryam Tofighi

1. Department of midwifery,  
Sari Branch,  
Islamic Azad University,  
Sari, Iran

Correspondence:  
Azar Aghamohammadi  
e-mail: azareaghahamohammadi@iausari.ac.ir

Acknowledgement:  
This article is the result of investigational plan approved by Islamic Azad University, Sari Branch with the contract number of p/5884. We appreciate the research assistance of Islamic Azad University, Sari Branch and also all Razi hospital personnel in Qaemshahr who has helped us to present this study.

## Abstract

**Background.** Labor pain is one of the most important factors which increases mother's anxiety. This study has been performed with aim of assessing the efficiency of transcutaneous electrical nerve stimulation (TENS) on specific acupuncture points to reduce the labor pain. **Methods.** In this double-blind, placebo-controlled trial study, we assigned 64 nulliparous women, randomly who were in the active phase of the first labor stage. According to TENS on four acupuncture points (Hegu [LI-4] and Sanyinjiao [Sp-6]) (n = 32) or the Sham TENS (n = 32). Based on selecting and omitting conditions, the data were chosen as goal-oriented. Then, they were randomly assigned in two groups in the way that women were distributed by chance through their recorded even and odd numbers in their registration form. The first stage of labor pain was assessed in two groups. Finally, data was analyzed by SPSS (T-test and  $\chi^2$ ). **Results.** TENS application on acupuncture points resulted in a significantly better pain relief than that of TENS placebo ( $p < 0.0001$ ). The first stage time was shorter in the TENS group than in the TENS placebo group. (180min in TENS and 238 min in TENS placebo group,  $P > 0.0001$ ). TENS group decreased the need for labor augmentation. (16(50%) in TENS and 25(78.1%) in TENS placebo group,  $P = 0.019$ ). **Conclusion.** TENS used on acupuncture points can be used as a non-drug method to reduce labor pain without any immediate observed side effects on mother and fetus.

**Keywords:** TENS, acupuncture points, labor pain

## Introduction

Labor is one of the most painful experiences, but the pain severity is different from women to women. The pain tolerance is also different in different positions and from cases to cases. Some experts suggest that pain is a kind of biological response to labor. On the other hand, pain has adverse effects on fetus and mother; so labor pain must be relieved in some extent to reduce its adverse side effects keeping normal physiology<sup>(1)</sup>.

Labor pain relief is a very important task in medicine as it may concern thousands of reproductive women<sup>(2)</sup>.

To have a painless labor, there are several methods such as systemic drugs (narcotic, sedatives, analgesics and NSAIDs), inhalation analgesia, regional anesthesia (spinal block or sub arachnoidal analgesia, epidural, caudal or bilateral pudendal or cervical block) and some other methods used<sup>(1)</sup>. Transcutaneous nerve stimulation (TENS) has been proposed as a means of labor pain reduction. The TENS unit emits low-voltage electrical impulses which are various in frequency and intensity. During labor, TENS electrodes are generally placed on the lower back, although TENS may be used to stimulate acupuncture points and the physiologi-

cal mechanisms to relieve pain which is uncertain<sup>(3)</sup>. There are some results in many studies regarding the acupuncture usage in labor, although significant improvement in labor pain derived from controlled clinical trials is limited<sup>(2-6)</sup>.

Acupuncture is a familiar medicine used in china to reduce pain for thousands of years<sup>(7)</sup>. Usually, four to six needles are inserted at the adequate acupuncture points with twirling and then left in the place for 15-20 min. in each application. In this study, the TENS on acupuncture points, which is designed as a pain relief during the labor, has been combined with the central and peripheral actions to release much more endogenous opioid peptides<sup>(2)</sup>.

On both hands Hegu (LI-4) and on both legs Sanyinjiao (Sp-6) points are chosen because they are some of the traditional acupuncture points used in labor. Hego (LI-4) points has intensifying contraction effect. Sanyinjiao (SP-6) points is an important point to help the cervix dilatation<sup>(2)</sup>.

Combining implications of acupuncture and TENS studied to treat the low-back pain, reported that the electroacupuncture group consistently demonstrated greater improvement than TENS on the outcome mea-

**Table 1** Demographic characteristics in TENS and TENS placebo groups

Characteristic	TENS (n = 32)	TENS placebo (n = 32)	P-value
Age (years, mean[SD])	28.4 ± 2.19	27.6 ± 2.1	0.157
Body mass index (mean[SD])	26.5k ± 1.3	26.3 ± 1.3	0.319
Gestational age	39.0 ± 0.9	39.1 ± 0.6	0.429
Cervical dilatation at enrollment	4.3 ± 0.4	4.2 ± 0.4	0.273
Birth weight (mean[SD])	3285 ± 353	3301 ± 470	0.881

sure of the pain. Their study indicated that placing TENS over acupuncture points had the same good results<sup>(8,9)</sup>.

We decided to make randomized double blind clinical trial by the combination of acupuncture and TENS to find out its effect on labor pain reduction in the first stage of labor.

### Materials and methods

In 2009, there were 64 healthy nulliparous women in spontaneous labour enrolled in clinical trial double-blinded study at Razi Hospital in Iran. Parturients randomly received TENS on acupuncture points or TENS placebo. Visual analogue pain scale was determined at the beginning of active phase, when there was 7 cm cervical dilatation and at the time of full dilatation. One midwife assessed cervical dilatation in all of cases.

Time from starting study up to the first stage ending was measured (to minute) in all data.

Patients were selected according to inclusion (nulliparous patients who had term gestational age, were in active phase of labor with cervical dilatation of  $\leq 5$  cm without epidural analgesia, had singleton pregnancy and fetal vertex presentation and had the age between 20-34 years and no experience in acupuncture or TENS already) and exclusion criteria were: cesarean section in this pregnancy, smoking and addicted women, suffering from known physical and mental diseases including all heart, renal and immune diseases, all kinds of cancers, hepatitis and diabetes mellitus, maternal skin lesions on the application sites and maternal use of pacemaker.

Labor augmentation was used to achieve three uterine contractions per 10 minutes in the first stage of labor.

After their agreement to enroll in this study, we divided them randomly into two groups.

TENS unit had two pairs of pads (NEWDYN 620F, Iran). The current output was titrated for each person separately between 10-15 milliampere, a frequency of 100 Hz with a burst frequency of 2 Hz (dense-dispersed waveform), pulse duration (0.25 ms) was used 30 minutes. The two pairs electrode-pads were placed at

bilateral LI-4 (Hegu) points (midpoint between the first and the second carpal bones, the first web space dorsal side) and Sp- 6 (Sanyinjiao) points [3 Cun (4 finger of the same person) above medial malleolus in lower leg]<sup>(2)</sup>. For randomly collecting data, we toss a coin for the first time and after that we put cases decussate in TENS and TENS placebo group. In the TENS placebo group, we turned on the TENS with very low electrical stimulation with only less than 5 mA. Turnig on and

Reclamă G25(3)0413 ▼



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**Table 2** | Pregnancy Outcome in TENS and TENS placebo groups

TENS	TENS placebo		P-value
Starting VAS score (median[range])	8(1-10)	8(1-10)	1.00
VAS score in 7cm cervical dilatation (median[range])	7.5(3-9)	8.3(4-10)	0.059
VAS score in full cervical dilatation (median[range])	8.1(3-10)	9.8(3-10)	<0.000
Time from starting study to the end of the first stage (mean[SD])	180.9 ±25	238.2 ±30.7	<0.000
Augmentation of labor	16(50%)	25(78.1%)	0.019
Apgar score at 1 min(median [range])	8.9(8-9)	8.9(7-9)	0.703
Apgar score At 5 min(median [range])	9.9(9-10)	9.9(9-10)	1.0

off was done by a personnel of midwifery and patients and investigators did not about it. If the patients were not satisfied with the pain relief provided by TENS such as discomfort, they could change their analgesia. We compared labor pain in two groups. Data was recorded in the special forms according to our variables. We also compared neonatal birth weight and Apgar score in two groups. Data collected in questions were taken and analyzed by SPSS (students t-test and  $\chi^2$ ). Statistical significance was defined as  $P < 0.05$ . This study was done after getting the licence from ethical committee of Islamic Azad University, Sari Branch, Iran.

## Results

This study was included deliveries from October 1 2008 to December 30 2008. 64 women were eligible for evaluation. There was no significant difference in age, gestational age, body mass index, neonatal birth weight and diameter of cervical dilatation at enrollment between the two groups (Table 1).

The median pain score was not different in the groups at the beginning of TENS. After assigning the treatment, the median VAS (Visual Analogue Pain) score in the first labor stage at 7 cm dilatation, was marginal difference in the TENS group from TENS placebo group (7.5 [3-9] vs 8.3 [4-10])  $P = 0.059$ ; the median VAS in full dilatation had a significant lower score in TENS group in comparison TENS placebo group (8.1 [3-10] vs 9.8 [3-10],  $P < 0.0001$ ).

There was no significant difference in the median Apgar score at 1 and 5 min of each group. In these two groups, there was statistically significant difference in time from starting study up to the first stage ending. Time in the TENS group was shorter than TENS placebo group ( $P < 0.0001$ ). The need for labor augmentation in the TENS group was decreased ( $p = 0.019$ ) (Table 2).

## Discussion

In this study the pain management during labor could be the synergistic effect of acupuncture and TENS. TENS revealed week positive effects as an only method to reduce pain during labor in eight randomized control trial studies<sup>(10)</sup>. Although, experience of TENS and acupuncture in low-back pain treatment had good results, but electroacupuncture (combination of TENS and acupuncture) showed better result<sup>(7,8)</sup>.

Our finding in this study showed the median VAS score in first stage of labor, at 7 cm dilatation, was marginal different in two groups but in full dilatation, the median VAS score was significantly lower in the TENS group than in the TENS placebo group and the time in two groups from starting the study to the end of the first stage was significantly different.

As the results of Chao & et al. study by the title of (Pain relief by applying transcutaneous electrical nerve stimulation on acupuncture points during the first stage of labor), they found that in this trial, the TENS group experienced the VAS score reduction significantly more than the placebo group (31.50 [62%] vs 7.50 [14%],  $P < 0.001$ ). In some extent their results seem the same as ours. Chao's study has some potential limitations. As acupuncture usage is a traditional practice to relieve pain in their culture, the psychological effect of higher acceptance might play a role. This may create a higher satisfactory result in comparison with the other ethic groups. But acupuncture usage is not a familiar practice for pain relief in our culture. In Chao's study, there is no difference in the length of the first stage after TENS application in the two groups so, there are not the same results as we found<sup>(2)</sup>.

The need for labor augmentation was decreased in the TENS group vs TENS placebo group. In this study, Hego (LI-4) points on both hands were chosen and this had the intensifying contraction effect. Sanyinjiao

(SP-6) points were chosen as important point to help the cervix dilate<sup>(2,10)</sup>. Dun & et al. studied the TENS effect on acupuncture points in order to labor induction in post term women and found that using TENS in acupuncture points in post term women caused a raise in contraction intensity and length as well as it decreased the need to oxytocin and the cesarean rate in post term women<sup>(12)</sup>.

This study showed that there was no significant difference in the median Apgar scores at 1 and 5 min of each group. Dowswell & all demonstrated that there was little information on outcomes for mothers and babies in TENS using to reduce the labor pain. No adverse events were reported in other study<sup>(3)</sup>.

In 1990, Aleccander & all showed that there were no strong evidents to prove the effect of TENS pain decline during the labor. The result of Alleccander & all studies is not in coordination with that of the present one because he has put the TENS on back nerves not on acupuncture points<sup>(13)</sup>.

### Conclusion

This double blind clinical trial has shown that the pain of labor in the first stage when using TENS on acupuncture points is significantly less than TENS placebo group.

Because acupuncture needs to use various needles and an expert staff, TENS supply in acupuncture points can be usable and acceptable as well as combining the effect of TENS and acupuncture.

This study has been done in nulliparous women so it is suggested to study the multiparous women, too. This research also studies the first stage of labor and reviewing the second and third stages of the labor is also suggested. ■

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