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Research Article

# Analgesia with Transcutaneous Electrical Nerve Stimulation (TENS) During Labor

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## Abstract

The objective of this study is to evaluate the Transcutaneous Nerve Stimulation (TENS) application in reducing the pain intensity during the labor. In the period between February 2011 to December 2011, 60 pregnant women who agreed to participate in the study by signing a consent form approved by the Ethics Committee of the Maternity of the Irmandade da Santa Casa de Misericórdia de Sao Paulo. Women were randomized into two groups: 30 women who used TENS, and Control group: 30 women without the TENS. All women answered the visual analog scale (VAS) of pain at the beginning and during the labor. To compare mean VAS between the groups it was used repeated measures of ANOVA with alpha risk of 5%. There was a reduction in the pain intensity with the TENS application when Intervention group was compared with Control group. The TENS use showed to be efficient in reducing pain intensity during labor.

**Keywords**: Pain; Obstetric Labor; Transcutaneous Electric Nerve Stimulation; Physical Therapy Modalities

## Introduction

Many physiological changes occur in women bodies and the most frequent changes occur during and immediately after pregnancy. The birth of a child is a special moment of happiness for the family, but even being a physiological process of birth labor can result in severe pain for many women [1,2].

The pain of labor has always been a concern to the pregnant women and, sometimes, it can even cause troubles to the obstetrician´s work [3].

To relieve the pain, Transcutaneous Electrical Nerve Stimulation (TENS) has been used for about 20 years to relieve acute as well as chronic pains. It is a noninvasive method based on the pain physiology, according the control gates theory [4,5].

The pain represents an unpleasant sensation that affects one's comfort, and it also triggers important endocrine and metabolic responses which interfere in the maternal and fetal homeostasis. In association to the labor stress, pain activates the sympathetic nervous system, what releases adrenaline and noradrenaline; as consequence, the uterine vascular resistance is increased and the blood flow is reduced. The mother's pain may carry to modifications in the respiratory and cardiovascular systems. Analgesia with pharmacological agents is frequently used; however, some of these agents can easily cross the placental barrier, what can lead to uterine hypo contractility, and depression of the central nervous system in the fetus [6,7]. Considering that, we developed this study that aimed to avoid these undesirable effects.

The pain control during the labor, as well as the mother and fetus suffering prevention, is one of the obstetric team goals, who has to ensure a safe and satisfactory labor and delivery. TENS is a safe resource used by physiotherapists, in order to provide comfort and pain relief to the woman during labor [7].

The first reports of the TENS use for analgesia inspired studies to look at severe pain that causes great suffering. Labor pains are inexorably a very unpleasant experience for some women, mainly by precipitating series of physiological responses that can be harmful to both mother and fetus [1,8].

The use of TENS as an adjuvant method of analgesia during labor does not eliminate the pain, but it reduces intensity, delaying the use of analgesics and reducing the exposure time of the mother and her fetus to the effects of the drugs used to relieve the pain [9,10].

The Visual Analog Scale (VAS) (Figure 1) has been a useful way to measure the subjective level of pain intensity [11].


**Figure 1.** Visual Analog pain Scale. Lukacz, 2004.

## Objective

This study aimed to evaluate TENS application in the reduction of pain intensity during the labor, and to compare the TENS application response to both primiparous and multiparous women.

## Material and Methods

This study involved 60 women with mean age of 26.5 years old, during labor, in the maternity of Irmandade da Santa Casa de Misericórdia de São Paulo and Hospital Municipal São Luiz Gonzaga, between February/2011 to December/2011. All of them agreed to participate and signed a consent form approved by the Ethics Committee of both institutions (project nº. 395/09).

The 60 pregnant women were randomized into two groups:

- Intervention Group: 30 pregnant (15 primiparous e 15 multiparous) women who received the TENS application.

- Control Group: 30 pregnant (15 primiparous e 15 multiparous) women without TENS application.

It was applied the Visual Analog Scale (VAS) of pain to all women of both groups (Figure 1), since their arrival to the Obstetric centre, and it was repeated every 20 minutes, named Time 1, or T1, T2, T3, end so on until to the end of the second period of labor.

To establish each group, since many women were all together in a common room, it was settled to define one room just for VAS and TENS application – Intervention Group -, and another room just to VAS application – Control Group.

• Inclusion criteria

Pregnant women in the first period of labor, without using any painkillers or/nor anesthetics.

• Exclusion criteria

- Indication for elective cesarean cut

- Pacemakers

- Twin pregnancy

- Hypertension or preeclampsia

- Cognitive impairment

The TENS was applied with 100Hz of frequency, pulse width of 250us, and intensity (mA) according to the woman tolerate / toleration level. It was used the apparel TENSMED II - Carci® – with two channels and two surface electrodes, each one settled in the lateral region of the spine on T10-L1 levels, corresponding to the uterus and cervix innervations, and two electrodes on S2-S4 levels, corresponding to the birth canal and pelvic floor innervations (Figure 2).

All this work was developed and carried on by the author, a pelvic floor physiotherapist.

For statistical analysis the software programs SPSS v16, Minitab 15 and MS Excel 2007 were used. Statistics were done by parametric tests to analyze quantitative and continuous data,

setting the alpha risk in 5%. It was used the Analysis of Variance - ANOVA, to compare the mean of VAS between the two groups in the different times. We used mixed linear model to analyze the difference in VAS between the Intervention and Control group among time.

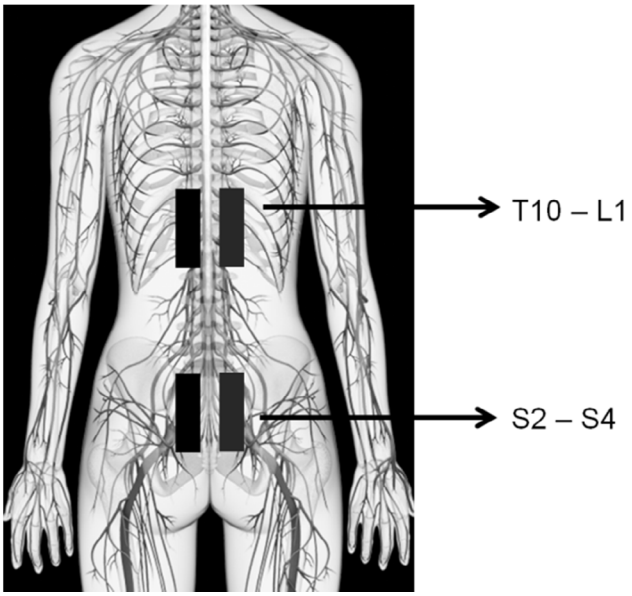


**Figure 2.** Electrodes Position (Orange et al. 2003).

## Results

The VAS comparison between both Intervention and Control groups showed a statistical difference ($p<0.05$) on the intervention group with the reduction of the pain intensity on T1-T8 and final time (Figure 3). Intervention and Control group started with the same level of VAS ($p>0.05$) and changed during time due to TENS application. This difference between groups was observed by the fixed effects of time and group with a slope with -0.132 per time point with a standard deviation of 0.554 on Intervention group ($p<0.05$).

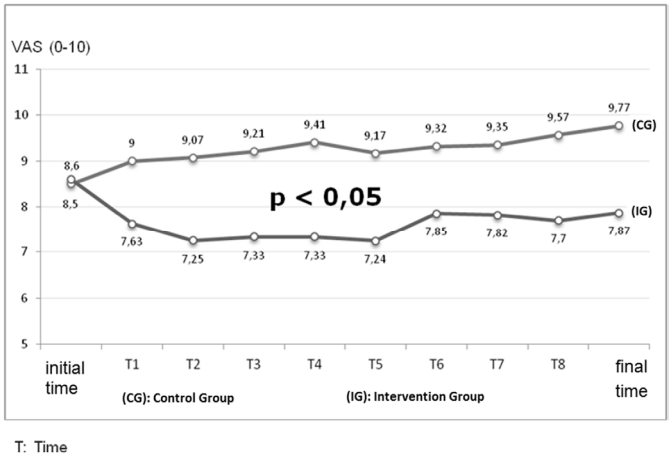


**Figure 3:** Comparison of the Visual Analogic Scale (VAS) between Control Group and Intervention Group.

Figure 4 shows a significant difference between primiparous women of both intervention and control groups, in every evaluation times (T1-T8 and final time) ($p<0.05$), where the Intervention Group presented lower level of VAS.

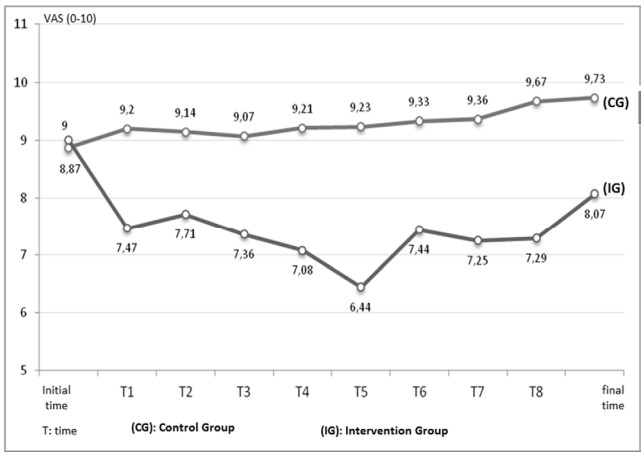


**Figure 4.** Comparison of the Visual Analogic Scale (VAS) on primiparous women from Control Group and Intervention Group.

Figure 5 shows significant difference ($p<0.05$) in the multiparous women, on the T2, T3, T4 and on the final time. However, interestingly on T7 the peak pain intensity is the same in both groups ($p>0.05$). After that, there is a reduction of the pain intensity in the Intervention Group and an increase on VAS on Control group.

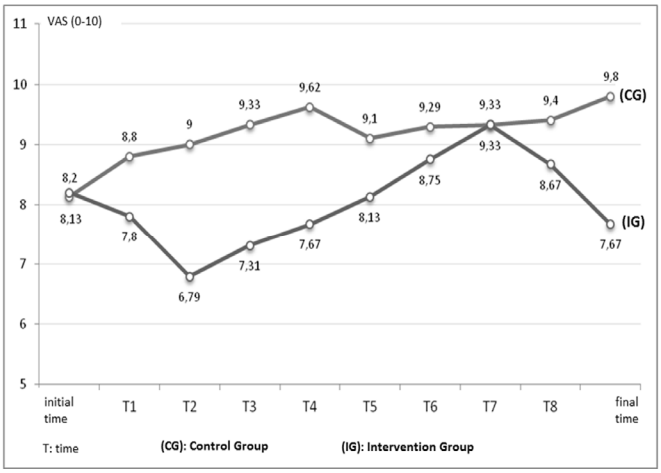


**Figure 5. Visual Analogic Scale (**VAS) comparison between multiparous women from Control Group and Intervention Group.

Figure 6 shows no significant difference ($p>0.05$) between primiparous and multiparous women from Control Group in any time point evaluated.

Figure 7 shows no significant difference ($p>0.05$), between primiparous and multiparous women from Intervention Group among time. However, there is an important difference ($p=0.058$) at T7. After this time point, once again there is an equivalence between the times (T8 and final time) ($p>0.05$).

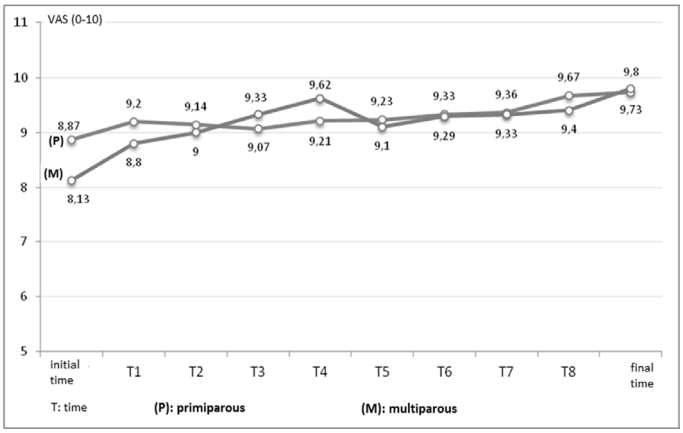


**Figure 6.** Visual Analogic Scale (VAS) comparison between primiparous and multiparous women from Control Group.

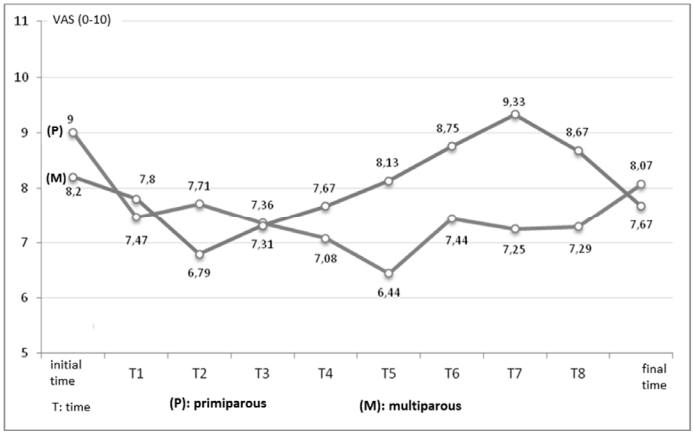


**Figure 7**. VAS comparison between primiparous and multiparous women from Intervention Group.

## Discussion

In our study, Figure 3 shows a significant difference between the Intervention Group, in opposition to the Control Group, with the decreasing of the pain intensity since after the first 20 minutes of application, as other authors had already reported [12, 5, 13]. It is believed that this effect is due to the pain neuromodulation via dermatomes, according to the pain control theory. It was also observed by other authors, who compared TENS and placebo, the reducing of the need of medication [1, 14, 5] and it is also according to Van der Spank et al. [15] who reported that 96% of the pregnant women were satisfied with the significant reduce of pain intensity.

On the other hand, Simkin et al. [16] observed, on a systematic review that, generally, there was no significant difference between TENS and the Control Groups, although women who underwent the TENS application were less likely to report a lot of pain. We can consider the lack of methodology of these studies, in order to keep each group homogeneous. Besides, after Simkin et al., mostly studies had a small sample, at around 30 women. So, our work established 60 women to follow their labor.

The present study aimed to compare the TENS effectiveness on primiparous and multiparous women, since it is widely believed that multiparous women have a higher threshold of pain. However, in this study, the comparison of VAS between multiparous and primiparous women in each group separately, showed no difference. As it is seen on Figure 6 – Control Group –, there is no difference between them, and it means that they feel real pain, and we have not found any data about that in literature.

On the other hand, Figure 7 also shows that there is no significant difference between primiparous and multiparous women in the Intervention Group, although it is observed a difference on T7, when multiparous women reported more pain. After that we noticed a new modulation.

Even more, we found a statistically significant difference when we compared primiparous women between both Intervention and Control Groups (Figure 4).

Also the comparison of the multiparous women between Intervention and Control Groups, showed a significant difference at the times T2, T3, T4 and at the final one, what suggests that the pain intensity does not depend on the number of pregnancies the woman had (Figure 5). These data relative to primiparous and multiparous were according to Kaplan et al., [17], who also verified that TENS was efficient in relieving pain during labor in 72% of the primiparous women and 69% of the multiparous.

In our study, however, again on T7 we noticed an increase of peak pain in both groups and soon after there was a new neuromodulation, leading to a significant difference again. We have no explanation for that.

It is important to notice that there was no interference on the duration of the labor, and, again, we found no explanation for that.

The literature review showed that many studies had no appropriate methodology since they were not often randomized trials, besides some of them did not compare homogeneous groups. In our study, we believe / think, the comparison between homogeneous groups justifies the good results with the use of TENS.

Finally, this study showed that TENS is a safe and effective treatment in reducing pain during labor, taking into account all aspects and conclusions of the various studies. We can summarize this discussion by stating that physiotherapy could play a very good role in obstetrics practice.

## Conclusion

The Transcutaneous Electrical Nerve Stimulation (TENS) use was efficient in reducing the pain during labor to both primiparous and multiparous women.

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