Effect of the Application Teas (Transcutaneous Acupoint Electric Stimulation) on the Women Been Used Oxytocin for Labor Pain at Latent Phase

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Abstract: Objective: To investigate the effect of the application TEAS (Transcutaneous acupoint electric stimulation) on the women been used oxytocin for labor pain at latentphase.Methods: Nul1iparous women were recruited and allocated into experimental group(n=61) and control group(n=60). The technique TEAS was applied to the TEAS groups at the points of Jiaji (T10-13)and Ciliao (BL 32). The VAS (Visual analogue scale) was used to assess the abdominal pain and low back pain during latent phase of labor before and 30mins, 60min, 120minand cervical dilatation2 to3cm after intervention. In order to observed the change of the score to evaluate the effect of the TEAS. The secondary outcomes of this study contains the operative delivery rate, duration of active phase, duration of second stage of labor, duration of third stage of labor, postpartum hemorrhage, maternal side effects, neonatal Apgar score at 1 and 5 min, neonatal arterial blood gas test values, level of β-EP, maternal satisfaction scores, cumulative consumption, the times of PCA.Results: After30 mins 60min,120min our intervention, the mean VAS scores of TEAS group about abdominal pain were significantly decreased compared with the control group ($P<0.05$), respectively. After30 mins 60min,120minintervention and the point of cervical dilatation2 to3cm, the mean low back pain scores of TEAS group were significantly decreased compared with the control group ($P<0.05$), respectively. The maternal satisfaction scores of the TEAS group were significantly compared with the control group ($P<0.05$) The β-EP level of TEAS group after 60min ,120min intervention was higher than the control group ($P<0.05$). No statistically significant differences in amount of duration the stage of labor, maternal side effects, maternal satisfaction scores, cumulative consumption and the times of PCA, neonatal Apgar score at 1 and 5 min,and umbilical venous blood gas test values.Conclusions: This study showed that TEAS applied in latent phase can reduce labor pain and the low back pain. It has no significant effect on the progress of labor and has no side effect on mother and the newborn.

1. Introduction

Percutaneous electrical stimulation of acupoints is a non-drug analgesic method which combines percutaneous neural electrical stimulation with acupuncture acupoint therapy. It has the advantages of both methods, not only simple and non-invasive, but also easy to accept by patients and medical staff. Percutaneous electrical stimulation of acupoints is mainly used to relieve all kinds of acute and chronic pain, and its effect is definite [1,2].It has been used in obstetric analgesia since 1970 [3]. Labor pain is a complex physiological and psychological process and it is a subjective experience, mainly manifested with abdominal and lumbar pain. At present, the main method of labor analgesia is intraspinal analgesia. However, the intraspinal analgesia is unable to cover the whole stages of labor in China because of various reasons. The timing of intraspinal analgesia is still when the orifice of the uterus is opening up 2-3 cm. Therefore, the labor analgesia cannot cover the latent phase up to eight hours. Hence latency analgesia has been a difficult problem so far. TEAS which is a non-invasive non-drug labor analgesia method has a unique advantage. A large number of studies

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have applied it as an auxiliary means of intraspinal labor analgesia during the delivery and its effect is definite [4]. Application of TEAS is rarely reported in the latent phase. The purpose of this paper is to evaluate its analgesic effect and safety in the latent phase so as to provide the basis for clinical application.

2. Materials and Methods

2.1 Case Selection and Grouping

This study has been evaluated and approved by the Ethics Committee of Shanghai First Maternity and Infant Hospital. The patients or their relatives have provided a signature on the Informed Consent Form. Primiparas with singleton births via vaginal delivery in Shanghai First Maternal and Infant Health Hospital from November 1,2016 to February 28,2017 were enrolled in this study. Inclusion criteria: Primiparas with singleton births via vaginal delivery received oxytocin when the latent phase began, with grade ASA I-II, gestational week >36 weeks, age of 18 to 35 years old and BMI 18-23kg/m^2. Exclusion criteria: Complications of pregnancy, contraindications to intraspinal anesthesia, history of opioid or local anesthetic allergy and fetal abnormalities were excluded. This is a randomized, controlled and single-blind study. A total of 121 patients were randomly divided into two groups: TEAS group (n=61) and control group (n=60).

2.2 Methods

The routine preparation was carried out for all lying-in women after they entered in the delivery room, including (1) routine oxygen inhalation with an oxygen flow rate of 3 L/min and ECG monitoring (including blood pressure, heart rate and finger pulse oxygen saturation); (2) an open vein access was established on a side of upper limb, and Ringer lactate solution 500 mL was dripped slowly;(3)changes in uterine contractions were recorded under fetal heart monitoring;(4) cervical examination was performed every 30 minutes and cervical canal opening was recorded. When the cervical canal disappeared in the beginning of the first stage of labor in the TEAS group, percutaneous electrical stimulation of acupoints for analgesia was performed at the bilateral Jiaji point (T10-L2) and ciliao point immediately, with stimulation parameters of 2/100 Hz of dilatational and dense (DD) waves and stimulation intensity of 1-50 mA. It was subject to the maternal tolerance and level of discomforts. The stimulation was done every one hour, lasting for 30 minutes up to the TEAS being stopped in the first active stage of labor (orifice of the uterus opening up to 2-3 cm), and then the epidural labor analgesia was performed immediately, with 0.0625% of ropivacaine hydrochloride + 0.3 ug/ml of sufentanil mixture 6 ml as loading. It was connected with an epidural self-controlled analgesia pump, with a drug concentration as same as before,and a background dose of 10 ml. Self-controlled administration was conducted when the maternal pain was unbearable, with a dose of 6 ml each time and lock time of 30 minutes. Intraspinal analgesia was finished until the end of the third stage of labor. No intervention was carried out in the first stage of labor in the control group, until the intraspinal analgesia was given when the active period of the first stage began. The regimen was the same as TEAS group. Visual analogue scale (VAS) was used to compare the abdominal and lumbar pain scores immediately (T0) in the beginning of latent phase,30 minutes (T1),60 minutes (T2) and 120 minutes (T3) after starting the latent phase, and the orifice of the uterus opening to 2-3 cm (T4) respectively using a 0-100 scale. The maternal venous blood was collected at T1,T2 and T3 points to determine the serum β- endorphin concentration. The umbilical venous blood was extracted immediately after fetal delivery. The pH value of umbilical vein blood was measured and the Apgar scores of newborns were recorded 1 minute and 5 minutes after birth. The maternal satisfaction score was carried out at the end of the third stage of labor using a 0-4 scale. The total amount of epidural drug use, the frequency of PCA presses, the duration of labor, the amount of postpartum bleeding, the way of midwifery and the adverse reactions were recorded in the stages of labor.

3. Statistical Analysis

SPSS20.0 statistical software was used for analysis. The measurement data were expressed by mean±standard deviation ($\bar{x}\pm s$) or median. The t test or non-parametric test was adopted for comparison between groups, and the enumeration data were used for chi-square test. P<0.05 was considered that the difference was statistically significant.

4. Results

The difference in general data was not statistically significant (*P*>0.05) between the two groups. See Table 1.

Table 1 Comparison of General Maternal Conditions between the Two Groups ($\bar{x}\pm s$)

	Age(years old)	Gestational weeks (W)	BMI(kg/m^2)	Height (cm)
TEAS group (n=61)	28.6±2.8	39.6±1.2	26.2±3.4	162.6±5.2
Control group (n=62)	28.8±2.8	40.2±4.5	26.1±3.2	161.3±5.0

Compared with the control group, there was no difference in VAS scores at T0 (P>0.05) between the two groups. VAS scores decreased at T1, T2, T3 and T4 (P<0.05); and VAS peak time point (T4) of the TEAS group was later than VAS peak time point (T2) of the control group. The VAS scores at T1 were lower (P<0.05) that those at T0. See Table 2.

Table 2 Comparison of Maternal Pain Scores between the Two Groups [Median (25% and 75%)]

	0min	30min	60min	120min	Orifice of the uterus 2-3 cm
TEAS group	80(70-85)	7O(60-80)^{ab}	80(60-90)^{a}	80(78-100)^{a}	100(80-100)^{a}
Control group	80(60-80)	90(80-100)	100(90-100)	100(100-100)	100(100-100)

Notes: Compared with the control group, Pa<0.05 while compared with T0, Pa<0.05.

There was no difference (P>0.05) in VAS scores at the T0 between the two groups, when compared to the control group. The VAS scores decreased (P<0.05) at the T1,T2,T3 and T4, and the peak value of VAS scores decreased (P<0.05) in the TEAS group. The VAS scores at T1,T2,T3 and T4 decreased (P<0.05) when compared to T0. See Table 3.

Table 3 Comparison of Low Back Pain Scores between the Two Groups [Median (25% and 75%)]

	0min	30min	60min	120min	Orifice of the uterus 2-3 cm
TEAS group	60(30-80)	20(0-30)ab	20(0-25)ab	20(0-40)ab	20(0-45)ab
Control group	60(5-80)	60(5-30)	80(20-100)	80(0-100)	100(40-100)

Notes: Compared with the control group, Pa<0.05 while compared with T0, Pa<0.05.

There was no difference (P>0.05) in maternal dosage, frequency of PCA presses and stages of labor in the TEAS group, when compared to the control group. The satisfaction score increased (P>0.05). See Table 4.

Table 4 Comparison of Maternal Dosage, Frequency of Pca Presses and Maternal Satisfaction Scores between the Two Groups [Median (25% and 75%), n=60]

Groups	Dosage	Frequency of PCA	Mean score of satisfaction	Stages of labor (min)		
	(ml)	(ml)	score	The first stage	The second stage	The third stage
TEAS group	41.7±21.8	1.3±1.5	3.8±0.5^{a}	557.8±204.0	42.5±28.8	612.8±205.9
Control group	38.4±22.5	2.4±3.5	3.4±0.7	516.8±219.3	38.2±29.5	565.2±224.1

Notes: P_a<0.05

Maternal peripheral blood serum β-endorphin concentration increased significantly at T2 and T3 after TEAS, and the difference was statistically significant (P<0.05), when compared to the control group. See Table 5.

Table 5 Comparison of B-Endorphin Concentrations in Maternal Peripheral Blood between the Two Groups (ng/l,$\bar{x}$±s)

Groups	0min	60min	120min
TEAS group	1408.7±384.9	1724.6±378.6[a]	1702.8±408.4[a]
Control group	1397.2±319.3	1424.4±318.3	1453.6±304.6

Note: Compared with the control group (Pa<0.05).

The differences in neonatal Apgar scores at 1 minute and 5minutes and pH, PO2, PCO2 and Lac of umbilical vein blood were not statistically significant (P>0.05) between the two groups. See Table 6.

Table 6 Comparison of Births between the Two Groups ($\bar{x}$±s)

Groups	(g) Weight (g)	Apgar scores(points)		PH	PO_2	PCO_2	Lactic acid
		1min	5min		(mmHg)	(mmHg)	(mmol/L)
TEAS group	3272.7±383.1	9.8±0.5	9.9±0.2	7.3±0.1	31.2±8.7	42.5±7.8	4.6±1.9
Control group	3351.8±387.1	9.8±0.4	9.9±0.2	7.3±0.1	32.8±8.5	40.9±5.8	4.6±1.9

5. Discussion

The application of TEAS in the latent phase at the two acupoints of Jiaji and Ciliao can promote the release β- endorphin in vivo, which can effectively relieve the pain in different parts of the body in the latent phase, delay the speed of elevated pain, and improve maternal satisfaction. This further verifies the mechanism of percutaneous electrical stimulation of acupoints to increase the release of endogenous analgesic substances.

Analgesic intervention timing is also an important factor affecting analgesic effect. Zhu Yuming et al .[5] confirmed that the use of acupuncture analgesia three days in advance can significantly improve the level of β-endorphin in vivo. Li Maojun et al .[6] proved that electroacupuncture preemptive analgesia in the latent phase can effectively relieve the labor pain of lying-in women. The main mechanism is to achieve the effect of preemptive analgesia in the latent phase by giving TEAS, thereby reducing the central and peripheral sensitization caused by the afferent nociceptive stimulation. Therefore, the use of percutaneous electrical stimulation of acupoints for labor analgesia in the latent phase should be promoted as soon as possible.

Almost one-third of the women who give birth may feel low back pain [7,8]. Clinical observations have found that the low back pain is mainly related to malposition, especially in a persistent occipitoposterior position. The main reason is that the malposition results in compression of pain sensitive parts in the pelvic cavity [9,10]. This low back pain often runs through the whole stages of labor and does not disappear during the uterine contraction interval. It can be alleviated by increasing the concentration of intraspinal analgesics [11].

We have found that the lower back pain is improved better than the abdominal pain in lying-in women with transdermal electrical stimulation of acupoints in this study. On the one hand, it is related to the anatomical position of these two acupoints (Jiaji and Ciliao). Both of them are located on both sides of the spine and close to the anterior root and posterior root (primary sensation) of spinal nerve (primary motion), which are not only the hub of sensory and motor nerve intersection, but also the key areas of qi and blood circulation. The Foot-Taiyang belongs to bladder meridian, Jiaji is against the waist, and Du meridian (governor meridian) runs through the Jiaji and belongs to the kidney. The combination of the two can not only stimulate the qi of Du meridian, but also

regulate the qi of bladder meridian. So that the lumbosacral qi and blood can be connected to achieve the goal that “pain is relieved with improved blood circulation”. TEAS can improve the local blood circulation, increase the metabolism, relieve the local muscle tension, and accelerate the degradation of metabolites such as lactic acid by acting on these two acupoints. On the other hand, acupuncture on the acupoints can partially block the pain of sacral nerve conduction, thus relieving pain and discomforts in the waist and sacrococcygeal region during giving birth to a child.[12]

In conclusion, TEAS can effectively relieve abdominal pain and low back pain during the latent phase, especially suitable for pregnant women with low back pain as the main clinical manifestation. Percutaneous electrical stimulation of acupoints neither affect the labor stages and fetal outcome nor increase the incidence of complications, thus greatly ensuring the safety of mother and child. It is in line with the requirements of labor analgesia and can be recommended for the application of labor analgesia in the latent phase.

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