Transcutaneous Electrical Nerve Stimulation Versus Relaxation in Post Partum Uterine Pain

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ABSTRACT

This study has been conducted to determine the efficacy of transcutaneous electrical nerve stimulation (TENS) versus relaxation (prone lying position), in alleviating post partum uterine pain. A random sample of thirty, post partum, multiparous volunteer women, their age ranging between 25-35 years, participated in this study. They were divided randomly into two groups of equal number. Group (A), was treated with TENS, and group (B), was treated through instructing each woman to relax via lying in prone position. Subjective reports were used as indices of pain intensity for all subjects in both groups. Pain intensity was recorded before treatment and pain relief was recorded after ½, 6 and 48 hours of starting the treatment, to evaluate post partum uterine pain intensity and the degree of pain relief. Data collected revealed a significant improvement ($p<0.02$) and ($p<0.01$) in alleviating post partum uterine pain in group (A) after ½ and 6 hours of treatment respectively, and a highly significant ($p<0.0001$) improvement in pain relief after 48 hours (end of the 2nd post partum day). These results demonstrate the efficacy of TENS in post partum uterine pain.

Key words: *Transcutaneous electrical nerve stimulation (TENS), relaxation, post partum uterine pain, after birth pain, after pains.*

INTRODUCTION

Many women experience post partum lower abdominal pain, which is probably uterine in origin[12]. This pain is central and intermittent, such that would originate from a muscular viscus, and exacerbated by breast-feeding. Pain lasts for a day or two, which is like a menstrual cramp or labour pain, these cramps are known as "after pains". Incidence of these pains was significantly higher in multiparous than primiparous women[22]. Perhaps because the uterus is a little more stretched and relaxed than after the first delivery. Immediately after delivery of the placenta, frequent strong myometrial contractions rapidly induce a decrease in its size and within 24 hours the uterus becomes a globular hard mass approximately the size it was at 20 weeks gestation[29].

Blood supply to the uterus at term is tremendous. It receives one-fifth to one-fourth of the entire cardiac output. Immediately after labour, there is a heavy flow of blood. Consequently, the figure of eight interlaced muscle bundles of the middle uterine layer compresses and squeeze off, blood vessels, which are widely opened, at the placental site. Thereby preventing excessive blood loss not

only at the time of delivery, but also for the first few days post partum[11,29].

Mothers who breast-feed their newborn babies are more likely to have more after-pains. It is thought that the uterus returns back to normal more quickly in mothers who breast-feed than in those who do not[18].

However, when the newborn baby suckles, the areola will compress, so it will stimulate the posterior lobe of the pituitary gland to secrete oxytocin, which not only causes the ejection of milk but also produces a uterine contractions[28]. This contraction is felt by the mother (abdominal cramp-like pains and / or back pain) as "after pain", which is usually accompanied by a gush of lochia, and the constant repetition of this reflex mechanism hastens the involution of the uterus[15].

Breast-feeding offers the advantage of maternal antibodies and mutually gratifying experience for mother and infant. However, extreme caution is warranted in breast-feeding an infant while the mother is taking any medication[31]. Catz and Giacoia[9] reported that any drug in the maternal organism must traverse the endothelium of capillaries into the alveolar cells and then are secreted into the lumen with the milk. Also, O'Brine[24] added that an infant might receive a therapeutic dosage of the drugs over a 24 hours period of breast-feeding from a mother who is receiving medication to control her pain. So, the safety of many drugs used by lactating mothers on their nursling has not yet been established, accordingly drugs must be regarded with suspicion during breast-feeding.

Several years ago, many clinical studies had been done on oral analgesics and anti-inflammatory drugs, showed different analgesic responses in alleviating post-partum uterine pain[4-7].

However, for those mothers who have severe after pains, who have contra-indications to or side effects from using anti-inflammatory or analgesic drugs, or who do not wish to use medication during breast-feeding, a non-pharmacological method of pain relief might be useful for relieving post partum uterine pain. Transcutaneous electrical nerve stimulation (TENS) is simple, non-invasive, non-pharmacological and comfortable modality that has been widely used for several pain conditions[8]. The present study was conducted to determine the effectiveness of TENS versus relaxation (prone lying position) in post partum uterine pain.

SUBJECTS, MATERIALS AND METHODS

Subjects

Thirty post partum multiparous volunteer women (had their second or subsequent baby), participated in this study from the Obstetric department, Kaser El-Aini Hospital.

All subjects were delivered with normal vaginal deliveries, complaining from severe post partum uterine pain (after pains). Their age ranged between 25-35 years (30.17 3.08), and they had never been treated with TENS before. Informed consent form was signed from each subject before starting the study.

They were randomly divided into two equal groups: group A (TENS) was treated with TENS, and group B (Relaxation) was treated through instructing each woman to lie in a comfortable relaxed prone position.

Instrumentations

1- Transcutaneous stimulator "Sembly Obstetric Pulsar" is a battery operated, dual channel four electrodes (the electrode size is 11040 mm), producing biphasic

pulses. It is a lightweight, portable TENS unit, manufactured by Sembly Medical limited, Newbury Road, Andover, Hampshire SP 104 DR, England. It has a pulse duration of 200 sec., a pulse frequency of 15-200 Hz, both were continuously adjustable, and the intensity of 0-48 mA at 1K ohm load.

2- Ranking scales[30]: [present pain intensity (PPi) scale and pain relief (PR) scale] were used for quantitative assessment of pain intensity and pain relief in both groups (A and B).

Methods

A- Evaluation:

Assessment of post partum uterine pain (after pains) intensity for each subject in both groups (A and B) was done through:

- Present pain intensity (PPi) scale (0-4), pain intensity was recorded as being: no pain = 0, mild pain = 1, moderate pain = 2, severe pain = 3, and unbearable pain = 4. It was done initially before starting the treatment.
  Pain relief (PR) scale (0-4): pain relief was recorded as being: no relief = 0, slight relief (satisfactory) = 1, good relief = 2, excellent relief = 3, and complete relief =4. It was done after half an hour, six hours of starting the treatment, and at the end of the second post partum day (48 hours).

B- Treatment:

For group (A), subjects were instructed about TENS to maintain their confidence and cooperation. Areas of skin, where the electrodes were replaced, were carefully inspected, washed and thoroughly dried (when a skin breach was present, it was covered with vaseline). The electrode surfaces were completely covered with gel. Each subject was asked to assumed sitting position, thoraco-lumbar electrodes were placed paraspinally, over the dermatomes from T_{10} - L_2 inclusively. Then the subject assumed a relaxed half- lying position to place the supra-pubic electrodes, anteriorly in a "V" pattern on the supra-pubic region. Electrodes were secured with a suitable sized strapping.

Parameters of TENS were adjusted as: pulse width of 200 Msec, frequency of 80-100 Hz (continuous mode) during post partum uterine pain, while in between after pains, frequency of 2 Hz (Burst mode). Each subject was allowed to adjust the current according to her needs, the amplitude was increased gradually till the subject felt a pleasant "tingling" sensation.

Before the mother breast-feed her neonate, frequency was adjusted either by the physical therapist or nurse, on a continuous mode (100 Hz), for 30 minutes, while during the rest of time (in between breast-feeding periods), frequency was adjusted on Burst mode (2 Hz).

TENS unit was checked periodically throughout the treatment period to ensure proper operation. Also, the unit was clipped in the mother's clothes continuously until it was no longer needed, or when the mother tended to take a shower.

Subjective evaluation by the subjects, was accomplished by turning the unit off for a few seconds to judge the effectiveness of TENS (all subjects were asked to switch the unit on again, as their after pains became more painful and unbearable).

While, for group (B), all cases were subjected to relaxation in prone lying position, during their post partum uterine pain. Through assuming prone lying position, the head was turned to one side and rested on crossed hands, a suitable sized pillow was put just below the

lower abdomen, and a cushion was put below the ankle joints to make the ankles free. This relaxing position was performed several times throughout the day, according to the subject's complaints (after pains), for 30 minutes, after the woman breast-feed her neonate.

All subjects in both groups (A and B) were confined to bed for the first 2 hours and were intermittently out of bed the remaining hours of study.

C- Statistical Analysis:

Collected data was fed into a computer for statistical descriptive analysis, which included: mean, standard deviation, and percentage of initial PPi and pain relief were calculated for both groups. Chi-square was also done to compare between the statistical differences in both groups. Alpha point of 0.05 was used as a level of significance.

RESULTS

In this study, the present pain intensity (PPi) score was investigated. The mean values of the initial present pain scoring before treatment, in both groups A and B were 3.47(0.49) and 3.33(0.47) respectively, the mean difference value was statistically non significant, (table 1).

Table (1): Demonstrating the initial present pain intensity (PPi) in both groups.

Pain score	Group A		Group B	
	(No.)	%	(No.)	%
Unbearable (4)	(7)	47%	(5)	33%
Severe (3)	(8)	53%	(10)	67%
Mean PPi score	3.47 (0.49)		3.33 (0.47)	

The degree of pain relief and the percentage number of subjects were represented in table (2). After half an hour of starting the treatment, the majority (87%) of the subjects in group (A) had a good relief, and few (13%) had slight (satisfactory) relief. While the subjects in group (B), the majority (73%) had slight relief and the remainder of cases (27%) had a good relief. Comparing both groups by using chi square test, the differences were found to be statistically significant ($p<0.02$) improvement in pain relief, table (3).

Table (2): The degree of pain relief in both groups during treatment.

Pain relief scale	f ttt.				After 6 hours of ttt.				After 48 hours of ttt.			
	Group A		Group B		Group A		Group B		Group A		Group B	
	%	(No.)	%	(No.)	%	(No.)	%	(No.)	%	(No.)	%	(No.)
Complete (4)	0		0		20%	(3)	0		80%	(12)	0	
Excellent (3)	0		0		47%	(7)	13%	(2)	20%	(3)	13%	(2)
Good (2)	87%	(13)	27%	(4)	33%	(5)	67%	(10)	0		80%	(12)
Slight (1)	13%	(2)	73%	(11)	0		20%	(3)	0		7%	(1)

ttt. = Treatment.

After 6 hours of treatment, the majority of cases in group (A), had an excellent pain relief (47%), some had a good relief (33%), and a few (20%) of cases had a complete pain relief. While the majority (67%) of subjects in group (B), had a good relief, few (20%) had a slight relief and only (13%) of cases had an excellent pain relief. Comparing both groups, by using chi square test, the differences were found to be statistically significant ($p<0.01$) increase in pain relief, table (3).

And after 48 hours (end of the 2nd post partum day) of treatment, the majority (80%) of subjects in group (A) had a complete relief,

and a few (20%) had an excellent pain relief. While, in group (B), the majority (80%) of cases had a good pain relief, few (13%) had an excellent relief, and the remainder of cases (7%) had a slight (satisfactory) pain relief.

Comparing both groups by using chi-square test, the differences were found to be statistically highly significant improvement in the degree of post partum pain relief ($p<0.0001$), table (3) & fig. (1).

Table (3): The mean values of pain relief score during treatment in both groups.

Treatment time	Group A		Group A		X^2	P. Value
	$\bar{X}$	S.D.	$\bar{X}$	S.D.		
	1.87	0.35	1.27	0.46	8.27	< 0.02
After 6 hours of ttt.	2.86	0.74	1.93	0.59	8.60	< 0.01
After 48 hours of ttt.	3.80	0.42	2.07	0.45	26.60	< 0.0001

ttt. = Treatment. S.D. = Standard deviation.
$\bar{X}$ = Mean. X^2 = Chi square test.

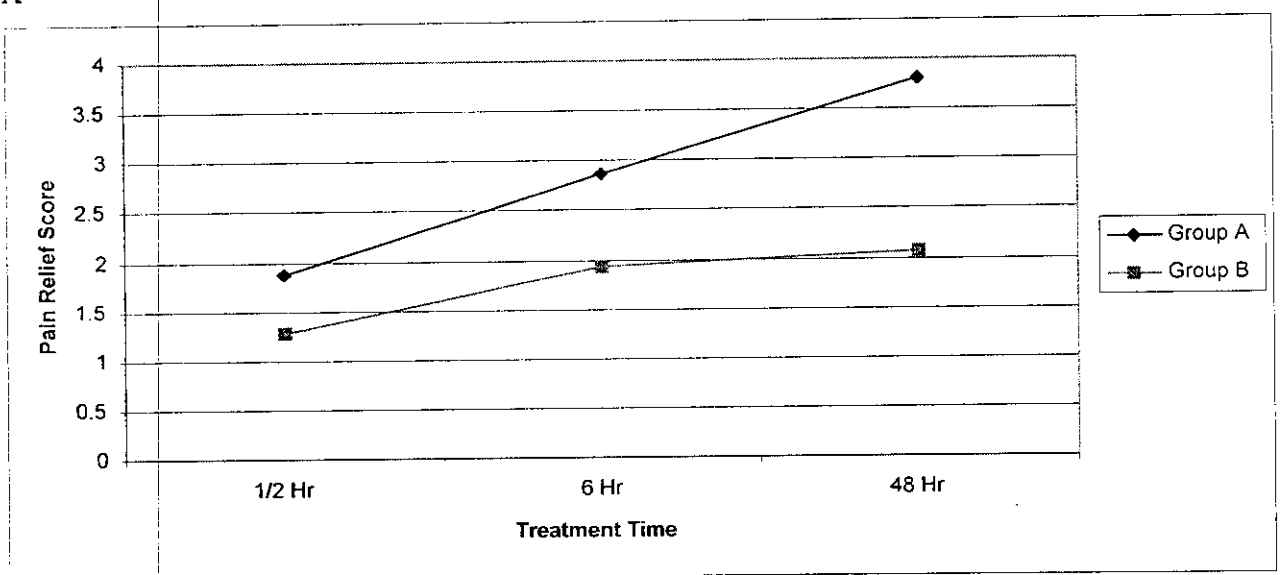

Fig. (1): Illustrates pain relief score throughout the treatment in both groups.

The percentage of subject's opinion on the degree of pain relief in general, after the end of treatment in both groups (A and B), was represented in table (4). The opinion of the majority (87%) of cases in group A (TENS), their relief was excellent and only (13%) of cases was good pain relief. While in group B (Relaxation), the opinion of the majority (53%) of cases was good, few (6%) was slight (satisfactory), and only (1%) of cases was excellent pain relief in general.

Table (4): Subject's opinion on pain relief after the end of treatment in general.

Degree of (PR)	**Group A**		**Group B**	
	(No.)	%	(No.)	%
Excellent	(13)	87%	(1)	7%
Good	(2)	13%	(8)	53%
Satisfactory	0		(6)	40%

DISCUSSION

Most commonly pain occurs by noxious event, resulting in releases of endogenous

chemicals called algogenic, algesic or pain-producing substances, into the extra-cellular fluid that surrounds the nociceptors. These substances play a causal role in pain associated with inflammation, ischemia and a variety of other pathophysiologic conditions[27]. The viscera are supplied by C afferent fibers, and some by A-delta afferents, which are activated by inflammation, contraction under isometric conditions, ischemia, rapid distention and other "adequate" visceral nociceptive stimuli. These nociceptors activated by noxious stimuli and endogenous algogenic substances transduce the stimuli into nociceptive impulses that are transmitted to the dorsal horn of spinal cord or medulla. The amount of neural activity in nociceptive afferents is influenced not only by the intensity and duration of stimulation but also by the micro-environmental of the nociceptors and other factors[25].

In this study multiparous females were chosen, who were delivered with normal vaginal deliveries. However, subjects who delivered with episiotomies were excluded to eleminate any factor that might interfere with the results.

The main purpose of this study was to investigate the effectiveness of TENS versus relaxation in prone lying position, for controlling post partum uterine pain.

Although it has been known that TENS can effectively suppress pain, this modality has not yet been used in clinical practice for the alleviation of post partum uterine pain (after pains). Therefore, the results of this study could not be compared with others, but only showed the effect of TENS for relieving acute pain without medication as in: parturition pain[13, 17], post-caesarean pain[1], dysmenorrheoic pain[10] and low back pain[21].

However, the pain relief obtained in group (A), who were treated with TENS, was almost always present in each case, whatever the degree of pain relief expressed by the subject, keeping in mind that there were always attempts to place the electrodes on the most painful areas. Results of the present study revealed a significant improvement in the degree of pain relief ($P<0.02$), ($P<0.01$), and a highly significant ($P<0.0001$) improvement of pain relief, compared to group (B), after ½, 6, and 48 hours of treatment respectively, which indicated a significant improvement in the group treated with TENS.

The rationale for successful TENS is believed to be used upon one of the following two theories: (1) the Melzack-wall[20] theory of pain modulation via the gating mechanism in the substantial gelatinosa of the posterior horn; or (2) the concept of enhanced production of beta-endorphin, the endogenous pain killer, by mild electric stimulation to the neural system[19].

According to the gate-control theory, by stimulating large-diameter, "A" sensory nerve fibers in a dermatomal segment, a blockade or "gating" effect is established at the dorsal horn level of the spinal cord, inhibiting the transmission of pain related impulses (presynaptic inhibition), thus, activation of non-nociceptive afferent fibers, that would block the transmission of nociceptive information acting via substantia gelatinosa, producing pain relief[20, 32].

However, the success with conventional TENS (low intensity, high frequency stimuli), may reside in the activation of remaining large afferent fibers or those in close proximity to the painful site, but which enter the neuraxis at the same or nearby segments as the ongoing noxious input[23].

Golding et al.,[14] showed that TENS decreased early and late somato-sensory evoked potential amplitudes, stimulus-intensity ratings and elevated the sensory detection threshold. They also indicated that

the effects could have been, due to changes at the spinal, subcortical, cortical levels or to a combination of changes at serial levels of neural organization, and not at the peripheral level.

Another mechanism that may account for pain modulation by TENS is "diffuse noxious inhibitory controls" in which responses of the small-diameter afferent fiber groups, evoked through continuous pain input to convergent dorsal horn neurons, are suppressed effectively by noxious or intense cutaneous stimulation such as with TENS[3].

So, transmission of nociception does not occur passively, it is rather under complex controlling and modulating influences. However, the attempts by TENS is to activate the body's own mechanisms for pain control so that producing analgesia[34].

This is actually done through the neuro-active peptides, endorphin, encephalin system and the opiate receptors[33]. There is a strong relation between this system and electro-stimulation; however, the analgesia produced could be reversed by specific antagonist Nalaxone. Also, it was proved that morphine sensitive pain responds well to TENS[34].

The maternal opinion about TENS and relaxation (prone lying position) on pain relief in post partum uterine pain was however, an expression to the total treatment period and to her personal experience as well. In group (A), TENS was claimed to be excellent in (87%), and good in (13%) of cases. The works of Augustinson et al.,[2] and Harrison et al.[16], who reported that TENS was found to have a good analgesic effect, also supports these results. While in group (B), relaxation through prone lying position was claimed to be excellent in (7%), good in (53%), and satisfactory in (40%) of cases.

Although pain relief was superior with TENS, compared to relaxation in prone lying position, pain relief in group (B) (relaxation group), was present in all cases, and there was an increase in the mean values of the degree of pain relief after ½, 6, and 48 hours of treatment. This result is confirmed with that of Polden and Mantle[26], who reported that mothers who acquire pain relieving skills (relaxation, movement and positioning) showed sufficient pain relief. Accordingly, relaxation in prone lying position assists in the drainage of blood clots and lochia from the contracted uterus, however, it decreases the uterine cramps so that the mother experienced post partum uterine pain relief.

CONCLUSION

Results of this study confirms and supports that transcutaneous electrical nerve stimulation (TENS) is an effective physical, non pharmacological and an excellent additional pain relief modality, so that it may be offered by the obstetric physical therapist to women suffering from post partum uterine pain.

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الملخص العربي

التنبيه الكهربي للعصب الحسي عبر الجلد مقابل الاسترخاء لعلاج الألم الرحمي بعد الولادة

أجـــريت هذه الدراسة لتقييم مدى فاعلية التنبيه الكهربي للعصب الحسي عبر الجلد، مقارنة بالاسترخاء (وضع الانبطاح الاسترخائي) ، في تخفيـــف و تســـكين آلام الرحم الانقباضية الحادة بعد الولادة. شملت الدراسة عينة عشوائية مكونة من ثلاثين سيدة متطوعة بعد الولادة مباشـــرة ممن سبق لهن الولادة اكثر من مرة و يعانين من ألم رحمي شديد ، و كانت تتراوح أعمارهن ما بين ٢٥-٣٥ سنة. تم تقسيمهن عشـــوائيا إلى مجموعتين متساويتين في العدد: المجموعة (أ) تم علاجهن بالتنبيه الكهربي للعصب الحسي عبر الجلد، و المجموعة (ب) تم علاجهن بالوضع الانبطاحي الاسترخائي . تم تقييم شدة الألم و درجة تخفيفه لكل من المجموعتين (أ ، ب) من خلال المقياسان المدرجان، وأجريت القياسات و التسجيل قبل بدء العلاج و بعده بنصف الساعة، ثم بعد ستة ساعات، ثم بعد ثمانية وأربعين ساعة. أوضحت النتائج أن هـــناك تحسن ذو دلالة معنوية في درجة تخفيف الألم الرحمي بعد الولادة لدى سيدات المجموعة (أ) بعد نصف الساعة و ستة ساعات من بدء العلاج، أيضا كان هناك تحسن كبير ذو دلالة معنوية عالية في درجة تخفيف الألم الرحمي بعد ثمانية وأربعين ساعة (نهاية اليوم الثاني من الولادة) من بدء العلاج. وهكذا فقد أثبتت النتائج، فاعلية التنبيه الكهربي للعصب الحسي عبر الجلد في علاج الألم الرحمي بعد الولادة.