

## Comparative Study of Transcutaneous Electrical Nerve Stimulation (TENS) and Tramadol Hydrochloride for Pain Relief in Labor

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**OBJECTIVE** – To compare the effect of transcutaneous electrical nerve stimulation (TENS) with 100 mg intramuscular tramadol for pain relief in labor. **METHODS** – Three hundred women with 37 to 42 weeks pregnancy in active phase of labor without any fetal or maternal complication were randomly allocated to three groups. To 100 women TENS was applied, 100 women received tramadol 100 mg intramuscularly while 100 were taken as control. **RESULTS** – Eighty percent in the TENS group, 86% in the tramadol group and none in the control group achieved significant pain relief. Onset of analgesic effect started in 11.7 minutes and lasted for 3.96 hours in tramadol group while in TENS group it started in 5.18 minutes and lasted for 3.30 hours. Maternal and fetal complications were more in the tramadol group in comparison with other groups. **CONCLUSION** – Pain relief in labor with TENS is as good as that with tramadol. TENS has hardly any side effects.

**Key words** : transcutaneous electrical nerve stimulation, pain relief during labor, tramadol

### Introduction

Labor pain is among the most severe pain experienced by women. Pregnant women are entitled to have basic information about pain and its relief. Since ages, obstetricians have been looking for helping these laboring women. Concern for maternal and fetal safety and desire for a satisfactory birth experience have fostered an antianesthesia atmosphere and has led obstetricians to resort to alternative methods for pain relief e.g., hypnosis, psychoprophylaxis and transcutaneous nerve stimulation (TENS). TENS is a non-pharmacological method based on gate theory of pain control and provides analgesia noninvasively. Tramadol, a pharmacologic method, has centrally acting analgesic action by opioid and nonopioid mechanism. Analgesic effect, progress of labor, fetal outcome and maternal side effects with pain relief by TENS and tramadol were compared in this study.

### Material and Methods

The present study was conducted from January 2001 to August 2002. It included 300 women in labor broadly classified into primigravidas (n=150) and multigravidas (n=150). They were randomly allocated to three groups. In group A, TENS was applied and in group B, 100 mg tramadol was given intramuscularly. No intervention was done in group C.

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Women with 37 to 42 weeks gestation, vertex presentation and established labor (effective uterine contractions, good cervical effacement and cervical dilatation >3 cm) were included in the study. Those with previous surgical scar, malpresentation, multiple pregnancy, cephalopelvic disproportion, antepartum hemorrhage, preeclamptic toxemia and other medical disorders were excluded.

In all women general examination, systemic examination, and obstetric examination including vaginal examination were performed. Informed consent for inclusion in the study was obtained. The study was done in collaboration with a pediatrician.

In the TENS group, TENS was given by Elpha-2000 Danmeter. Two pairs of skin electrodes were applied on both sides of the vertebral column at the level of T<sub>10</sub> – L<sub>1</sub> and S<sub>2</sub> – S<sub>4</sub> posterior primary rami. Frequency of electrical pulse used was 100 HZ. Current was gradually increased till pleasant tingling sensation was felt. During contraction, stimulation was increased.

In the tramadol group, 100 mg tramadol was given by deep intramuscular injection in upper and outer quadrant of gluteal region with a 2 ml syringe.

Labor was monitored by using partogram. Time taken for onset of analgesic action and degree of analgesia were noted on a verbal response scale. Mode of delivery was recorded. Apgar score of every newborn was noted at 1 and 5 minutes.

### Results

All groups were comparable in age, parity, socio-economic status and locality of residence. Among all

groups, 50% were primigravidas and 50% multigravidas. Mean age of women in TENS group was 22 years, in tramadol group 22 years and in control group 21 years. Most of the women were of low socio economic status and from an urban locality. Mean gestational age was 38 weeks in all the groups.

Eighty percent of the women responded to TENS. The response was complete in 8%, moderate in 62% and mild in 10%. In the tramadol group, 86% achieved pain relief, complete relief in 15%, moderate in 55% and mild in 16% of women (Table I).

Mean onset of analgesia was earlier in TENS group (5.18 minutes) in comparison to tramadol group (11.7 minutes). This difference was highly significant. Duration of analgesia was more in tramadol group (3.96 hours) in comparison to TENS group (3.2 hours) (Table II). This difference was also significant.

Mean duration of the 1<sup>st</sup> stage of labor was less in TENS (4.22 hours) and Tramadol group (4.26 hours) in

comparison to that in the control group (4.50 hours). Statistically there was no significant difference in the duration of various stages of labor in the three groups (Table III).

Normal delivery occurred in all women in TENS groups in comparison to 98% in tramadol group and 99% in control group. There was no significant difference in route of delivery in all the groups ( $P>0.05$ ) (Table IV).

Mean apgar score was more in the TENS group and less in the tramadol group in comparison to that in the control group. It was 7.18, 7.02, 7.05 at 1 min and 9.22, 9.05 and 9.06 at 5 minutes in TENS, tramadol and control group respectively. There was no statistically significant difference in the apgar scores in the three groups.

Side effects were more in the tramadol group in the form of nausea (7%), vomiting (3%), drowsiness (2%) and fetal distress (2%) while in the control group only 1% had fetal distress. In TENS group, none had any side effects (Table VI).

**Table 1. Degree of pain relief in Tens and tramadol group**

Degree of Pain Relief	TENS		Tramadol	
	No.	%	No.	%
No relief	20	20	14	14
Mild relief	10	10	16	16
Moderate relief	62	62	55	55
Complete relief	8	8	15	15
Total	100	100	100	100

Differences statistically insignificant

**Table II. Onset and duration of analgesia**

Analgesia	TENS (n=100)	Tramadol (n=100)	Z	P
Mean time for Onset	5.18 min $\pm$ 3.3	11.7 $\pm$ 5.06	11.5	p<0.01
Mean Duration	3.30 hours $\pm$ 2.08	3.96 hours $\pm$ 1.91	2.3	p<0.05

Table III. Duration of stages of labor

	TENS group (n=100) (a)	Tramadol group (n=100) (b)	Control group (n=100) (c)	Z	P Value	
Mean duration of Stage I (hours)	4.22 hr ± 1.45	4.26 ± 1.62	4.50 ± 1.46	Zab=1.3 Zbc=1.1 Zab=1.8	>0.05 >0.05 >0.10	
Mean duration of Stage II (minutes)	9.75 ± 4.53	11.95 ± 5.8	14.65 ± 10.9	Zac=4.15 Zbc=1.23 Zab=2.98	<0.01 >0.05 <0.01	HS HS
Mean duration of Stage III (minutes)	5.5 min ± 1.4	5.5 ± 1.5	5.4 ± 1.4	Zac = 0.12 Zbc=0.12 Zab=0.00	>0.10 >0.10 >0.10	

HS – Highly significant

Table IV. Mode of delivery in different groups

Mode of delivery	TENS groups (a)		Tramadol group (b)		Control group (c)	
	No.	%	No.	%	No.	%
Normal	100	100	98	98	99	99
Forceps	0	0	2	2	0	0
Cesarean	0	0	0	0	1	1
Total	100	100	100	100	100	100

The differences are not statistically significant

Table V. Mean apgar score of neonates

Mean apgar score	TENS group (a) (n=100)	Tramadol group (b) (n=100)	Control group (c) (n=100)
1 min	7.18 ± 0.45	7.02 ± 0.60	7.05 ± 0.78
5 min	9.22 ± 0.50	9.05 ± 0.88	9.06 ± 0.69

The differences are not statistically significant

Table VI. Side effects in mothers in different groups

Side effect	TENS (a)		Tramadol (b)		Control (c)		Z	P Value	Significance
	No.	%	No.	%	No.	%			
Nausea	0	0	7	7	0	0			
Vomiting	0	0	3	3	0	0			
Drowsiness	0	0	2	2	0	0			
Hypertension	0	0	0	0	0	0	Zac=1.1	>0.05	
Fetal distress	0	0	2	2	1	1	Zbc=4.3	<0.01	HS
Hypersensitivity	0	0	0	0	0	0	Zab=4.11	<0.01	HS
No side effects	100	100	86	86	99	99			
Total	100	100	100	100	100	100			

HS - Highly significant

### Discussion

Degree of pain relief in TENS group was 80% in comparison to 96% reported by Harrison et al<sup>1</sup>. Hughes et al<sup>2</sup> reported that 93% of patients achieved good to excellent pain relief and van der Spank et al<sup>3</sup> observed 96% of satisfaction in TENS users.

With 100mg intramuscular tramadol, 86% of cases achieved pain relief in our study in comparison to 78% reported by Prasertsawat et al<sup>4</sup>. Nawani et al<sup>5</sup> reported excellent to average pain relief with tramadol in 80%. Sarkar and Mukhopadhyaya<sup>6</sup> reported pain relief in 85%.

In the tramadol group, mean onset of analgesia was 11.7 minutes and the effect lasted for 3.96 hours in our study, while Husslein et al<sup>7</sup> reported that analgesic effect was observed after 10 minutes and lasted for only 2 hours.

In our series, no significant difference was noted in routes of delivery in different groups. Bundsen et al<sup>8</sup> reported more frequent use of vacuum extraction in control than in TENS group. Harrison et al<sup>1</sup> and van der Ploeg et al<sup>9</sup> in their trials found no significant difference in occurrence of normal and operative deliveries. Sarkar and Mukhopadhyaya<sup>6</sup> reported operative interference in 31% of the cases in tramadol group.

In our study, the mean duration of 1<sup>st</sup> stage of labor was found to be less in TENS group and tramadol group than that in the control group. But the differences are not statistically significant. Kaplan et al<sup>10</sup> observed highly

significant reduction in duration of 1<sup>st</sup> stage of labor with TENS. Suvonnakote et al<sup>11</sup> and Sarkar and Mukhopadhyaya<sup>6</sup> reported rapid progression of labor in women receiving tramadol.

In our study, maternal and fetal side effects were none in TENS group in comparison to few in tramadol and control groups. Kaplan et al<sup>10</sup> found no adverse effect on newborns in TENS users.

Bajaj et al<sup>12</sup> observed apgar score of > 8 in all neonates of tramadol group. Suvonnakote et al<sup>11</sup> and Prasertsawat et al<sup>4</sup> reported minimal side effects in women receiving tramadol.

We found that TENS gave good pain relief during labor and was as effective as tramadol. There were neither any maternal side effects nor any fetal or neonatal respiratory depression. Tramadol caused few maternal side effects and resulted in 2% forceps deliveries. TENS is safe and efficient for pain relief during labor.

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