Original Article

A clinical study of effect of transcutaneous nerve stimulation (TENS) in labour analgesia

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Abstract

Objective: Objectives are to observe the onset, effectiveness, extent of labour analgesia using TENS and cardiovascular and respiratory changes in mother. Effect of TENS on the progress of labour on fetal heart rate and adverse effect of TENS, if any.

Keyword: transcutaneous nerve stimulation.

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INTRODUCTION

Pain relief poses major problem in labour. Labour pain may reach excruciating level. After studying fifteen years on physiology of pain, Mezlack1 (19165) and his colleagues reported the intensity of naturally occurring and artificially provoked pain and the effectiveness of technique of analysis and concluded labour pain is most severe. Commonly used technique1 for labour pain relief are systemic analgesics[7], sedatives andanxiolytic3, hypnosis, acupuncture[2] and regional anaesthesia using epidural analgesia. The present methods are not without contraindication and complications. There is clearly room for improvement and more particularly the development of self administered method that is effective, non invasive, allows ambulation and which would interfere minimally with progress of safe, spontaneous and natural vaginal delivery. In this quest, TENS [4,5,6,8,9] analgesia has been used to reduce pain by activating physiologic mechanism which promotes analgesia. Melzack and walls gate control theory of pain (1965) provides the theoretical foundation of TENS and idea of stimulating large afferent fibres to prevent the pain carrying C fibres10 from transmiting to the brain. TENS has been shown to be safe during labour with no effect of new born infant various degrees of pain relief have been reported in studies which demonstrate possible advantage in outcome for mother and fetus. Thus, we have decided to study the effect of transcutaneous nerve stimulation (TENS) in labour analgesia.

MATERIAL AND METHODS

This prospective randomized double blind clinical study was carried out after approval from institutional ethical committe. Informed written consent was obtained from each patient and procedure was explained.60 parturientsundergoing labour at full term with vertex presentation and having cervical dilatation <= 5 cm of either primigravida or multigravida, ASA class I and II, scheduled for normal vaginal delivery were included in this study and divided into two groups: Group I notreceiving any sort of analgesia Group II received TENS as labour analgesia. Exclusion criteria are Age less than 18 year and more than 35 year, obstetrical contraindication to normal vaginal delivery, previous LSCS history, Allergy to local anaesthesia, Active local infection, Abnormal coagulation profile, Renal or hepatic failure, Patient's refusal. Pre operative assessment was done one day before planned surgery. Any significant past, family and personal history were noted. General physical examination was done. Vitals (Temperature, HR,

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BP, RR, SpO_2) and investigations like CBC, SE, RFT, LFT, ECG, coagulation profile were noted. Obstetric examination was carried out by obstetrician in the form of cervical dilatation, effacement, station of presenting part and fetal heart rate.

Technique

TENS was achieved by especially adapted twin channel nerve stimulator. TENS therapy requires pulse generator, skin electrodes and leads for connection. Electrical current is pass from the machine to the patient via four carbon rubber electrodes, placed on either side of spine, approximately 5 cm from it, contact being made with electrode gelly. The whole electrode is firmly fix to the skin with adhesive tapes. Electrodes are so planned to stimulate the posterior primary rami of spinal segment receiving the painful stimuli during labour. That is the upper pair from T10-L1 and lower pair from S2-S4. These electrodes were attached to electrically operated stimulus generator model no. TENS- excel 095, manufactured by kody medical electrical Ltd. Chennai. The machine was set initially with pulse duaration of 3-4 PPS and frequency of 3-4 Hz. The amplitude of current was set at 3mA in the beginning and increase gradually to gain analgesic relief as a contraction gained momentum. The TENS was kept applied till the delivery of fetus and placenta, upto end of third stage of labour. The current to the electrode was gradually increases until the patient could feel a pleasant tingling sensation. Pain assessment Labour was managed by regular staff in usual manner. Data collected like pulse, blood pressure, respiratory rate, spo2 before application of TENS and every 15 minutes after application of TENS till delivery. Assessment of pain throughout the labour was done by the patient on scale rated from 0 (no pain) to 4 (very severe pain), with the research observer also asking for assessment of amount of pain relief on a 0 (nil) to 4(excellent) scale, were recorded as follows.

Pain grade	pain relief grade
0= no pain	0= no relief
1=mild pain	1= minimal relief
2= moderate apin	2= significant relief
3= severe pain	3= satisfactory relief
4= excruciating pain	4= excellent pain relief

Also, simultaneously FHR was monitored and after delivery APGAR score were noted after[1,3,5] and 10 minutes.

Statistical Analysis

The data was collected are reported as Mean ± Standard deviation. Group comparisons of normally distributed variable were tested by two sample unpaired't' test. A 'P' value of 0.05 or less was considered to indicate a statistically significant difference for all statistical tests.

RESULTS

Results were expressed as follows

Table 1: Demographic Data And Perioperative Vitals

Variable	Group I (M ± SD)	Group II (M ± SD)	P value
Age (Yrs)	25.83 ± 3.82	23.89± 3.81	>0.05
Height (cm)	154.79± 4.18	152.43 ± 4.58	>0.05
Weight (kg)	58.36 ± 4.63	57.61 ± 5.28	>0.05
ASA Grade (II/III)	10/15	12/13	>0.05
Pulse rate	86.13 ± 5.6	85.67 ± 6.43	>0.05
MBP	92.84 ± 3.65	92.95 ± 8.45	>0.05
RR	18.4 ± 1.52	17.73 ± 1.72	>0.05
SpO2	95 ± 1	96 ± 1	>0.05

Table 1: shows there were no significant difference between two groups regarding to Age, sex, height, weight and ASA grade and preoperative vitals

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Table 2: showing onset of analgesia in all patient

Time in minutes	GROUP I	GROUP II	P VALUE
1-15	NA	10(33.33%)	<0.05
10-30	NA	7 (23.33%)	<0.05
31-45	NA	6(20%)	<0.05
46-60	NA	5(16.67%)	<0.05
Mean ±SD	NA	26.21± 17.01	

NA= Not Applicable

Table 2: Showing gradation of pain relief in patient receiving tens

Analgesia Grade	Group II no. of patient
0	2 (6.66%)
1	8 (20.66%0
2	20 (66.66%)
3	00
4	00

Mean Fetal heart rate (FHR) in Group I was s137.7± 4.03 and Group II was 139.4 ± 6.08. No significant difference in changes in FHR is noted when compared in both groups and no adverse effect on FHR is noted during TENS application. APGAR score was 10 in all neonate after 5 minutes and there is no significant difference noted. No clinically significant postpartum side effects were noted in group II patient as compared to Group I. there was no techniqual difficulty in application of TENS and was accepted by all patients without feeling any discomfort. There was no complications noted during and after TENS application.

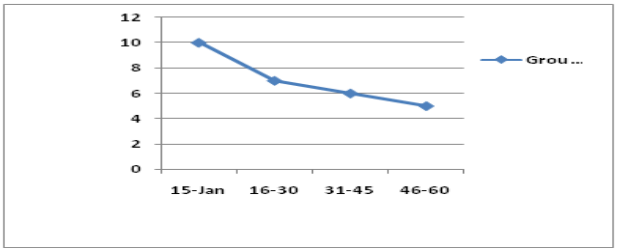

Figure 1: Showing onset of analgesia in Group II (TENS) receiving patients

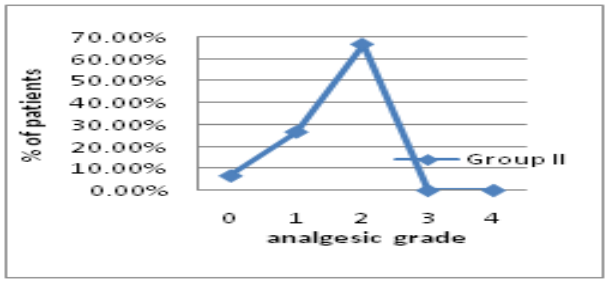

Figure 2: Showing percentage of patient in analgesic grade

DISCUSSION

In this era of high technology and era of consumer protection, the anaesthesiologist are made liable for many consequences of labour outcome, it has become important to select better mode of analgesia with least side effects of complication in labour processs on the mother and ferus. To provide better labour analgesia, the anaeshetic must aware of physiological changes during pregnancy, physiology of labour pain and anatomical pathways. There are various methods (pharmalogical and non pharmalogical[11]) used for pain relief during labour such as systemic analgesics like narcotics, sedatives and anxiolytis, inhalational analgesics, hypnosis, acupuncture and regional anaesthesia like lumbar epidural or caudal, paracervical block etc. the present methods are nor without side effect complications and contraindications. With introduction of "gate control theory of pain" by Mezlack[12] and Wall[13] (1965) the use of TENS come into practice. Shealy and Maured14 (1974) described their experience with TENS during labour in 50 parturients and report a very good effect on low back pain. Later on in 1979, peter Bundsen15 and his colleges carried out an elaborate evaluation of TENS in labour analgesia on the condition of newborn infant. They also described various positions for placement of electrodes for the relief of pain during various stages of labour. Bonicca J.J.[16] (1979) modified theory of pathway and mechanism of labour pain during different stages of labour. Reviewing literature, the present study was carried out to evaluate the efficacy of TENS in labour analgesia and various stastical data observed are discussed herewith. There as no significant difference in demographic data(age, height, weight) and postoperative vitals (pulse rate, mean arterial blood pressure, respiratory rate, spo2) were comparable in both groups in our study. Argent V.P. 17(1982) observed that pain if not relieved may induce hyperventilation leading to hypocapniand rarely tetany. Hyperventilation is not observed in any patient in any group in this study. Chia YT *et al*[18] (1990) had observed that patient were able to cough and breath deeply without any significant pain while receiving electrostimulation. TABLE II shows the time of onset of analgesia in group II patient, whoreceived TENS. The minimum time for onset of analgesia was approximately 15 min and maximum time was 45-60 min with mean time of [26.21 17]. 01 minutes. these finding suggest that more than >50% of patients had onset of analgesia after 30 minutes of TENS application. P.M.H. Pike (1978) stated that analgesic effect of TENS does not start immediately with onset of current flow but there is latent period. The electrophysiology of stimulation is ill-understood. Table III shows the grade of analgesia in group II. Almost two third 20 patient felt significant relief of pain (Grade II). Eight (26.67%) patient felt only minimal relief of pain (Grade I) during TENS application. Two patients (6.67%) did not have any pain relief. No patients have either total relief or even satisfactory relief (Grade IV or III) respectively of pain. Thes date suggest that TENS gives significant relief of pain in most patient (66.67%) n in this study. Shelay and Maurer14 (1974) reported good effect on; own back pain but poor effect on anterior pain. Augustinsson5 (1977) found very good effect on low back pain. Peter Bundesen6 (1981) suggested that TENS has a good effect on low back pain. Thus in above study it is not sufficient as a sole analgesic method because the current delivered was very low, so some modification in technique and use of supplementary analgesic in low dose may be required to achieve satisfactory relief of pain. In our study, there were no significant differences between mean FHR and neonatal APGAR score in both groups. Augustinsson 5 (1977) and Bundsen 6 (1981) did not found any interference with electronic monitoring fetal heart rate. Robert E. Harrison 19 (1986) nconfirmed that TENS is safe for infant interm of APGAR score. Peter Bundsen6 (1981) found that babies born by primiparae in TENS group tended to have better APGAR scores and no harmful effect on new born infat. So this tudy also suggest that ther is no fetal distress caused by TENS application during delivery. Because it is a non pharmacological method of analgesia, so no chances of crossing the placental barrier and causing any effect on fetus. in our study, there were no side effects in the form of nausea, vomiting, hypotension, hypertension, result lessnes or headache in any of the patient receiving TENS even after 24 hours of postpartum period Peter Bundsen

(1981) stated that all methods of obstetrical analgesia may involve potential hazard for mother and child.

CONCLUSION

TENS is non invasive, easily applied, easy to handled and operate, safe to mother and baby if used during labour analgesia. In our study, there was definite relief of pain in most of the patient with onset of analgesia within 30 minutes in more than 50% patients. There was no clinically significant adverse effect snored on cardiovascular or respiratory system of mother and also no fetal or neonatal depression was observed. TENs is comfortable to majority of patient and if effective, can be continued easily throughout labour. Though it provides safer analgesia, the effect is not adequate and may require supplementation with other anaesthetic and analgesics drug in small doses. Some improvement in machine and technology may overcome this drawback in future.

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