TO COMPARE THE EFFECT OF HIGH FREQUENCY (CONVENTIONAL) TENS AT DERMATOME LEVEL & LOW FREQUENCY (ACUPUNCTURE LIKE) TENS AT ROOT LEVEL IN PAIN MANAGEMENT OF DYSMENORRHEA

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ABSTRACT

Background: Dysmenorrhea is the occurrence of painful uterine cramps during menses and is the most common of all gynecologic complaints. Transcutaneous electrical nerve stimulation (TENS) is a treatment that has been shown to be effective for pain relief in a variety of conditions. Electrodes are placed at dermatomal level and at root level and electric current applied at different pulse rates (frequencies) and intensities is used to stimulate these areas so as to provide pain relief in dysmenorrhea.

Objective: The main aim of this study is to compare effect of high & low frequency tens at dermatome Level & root level.

Method: All subjects are selected randomly for two experimental. In 1st experiment high frequency TENS is applied at dermatome level T12-L1 & In 2nd experiment low frequency TENS is applied at root level L3. Pain is measured by VAS before & after giving treatment.

Outcome Measure: Length of menstrual period (LMP); Total no. of painful days during menstruation (PDB); Overall mean percentage of pain relief (PPR); Overall mean duration of pain relief (DPR), VAS were taken as outcome measures.

Result: PPR is found to be statistically significant between patients of group 1 and group 2 since P=0.001. While LMP, PDB and DPR shows no significant difference between patients of group 1 and group 2 since P>0.05.

Conclusion: High TENS at Dermatomal level and Low TENS at root Level both are effective in reducing pain but High TENS at dermatomal Level is more effective. TENS placements has no significant effect in reducing LMP, PDB and DPR.

KEYWORDS: Dysmenorrhea, High TENS, Low TENS, Root level, Dermatomal placement

INTRODUCTION

Dysmenorrhea is the occurrence of painful uterine cramps during menses and is the most common of all gynecologic complaints. Dysmenorrhea is divided into primary and secondary forms. Primary dysmenorrhea has no known pelvic pathologic etiology. Whereas secondary dysmenorrhea is related to the presence of pelvic lesions secondary to organic disease such as endometriosis, salingitis, PID (pelvic inflammatory disease), adhesions, etc. Characteristically, primary dysmenorrhea starts shortly after menarche. The pain lasts for 48-72 hours of menstruation and is most severe during the first or second day of the menstrual cycle. Reported prevalence rates are as high as 90 percent. [20] It is the leading cause of absenteeism of women from work, school, and other activities[1, 21].

Dysmenorrhea is pain concentrated in the lower abdomen, in the umbilical region or the suprapubic region of the abdomen. It may radiate to the thighs and lower back. Dysmenorrhea can feature different kinds of pain, including sharp, throbbing, dull, nauseating, burning, or shooting pain. Symptoms often co-occurring with menstrual pain include nausea and vomiting, diarrhea or constipation, headache, dizziness, disorientation, hypersensitivity to sound, light, smell and touch, fainting, and fatigue. Symptoms of dysmenorrhea often begin immediately following ovulation and can last until the end of menstruation.

Dysmenorrhea is often associated with changes in hormonal levels in the body that occur with ovulation. During menstrual cycle, the endometrium thickens in preparation for potential pregnancy. After ovulation, if the ovum is not fertilized and there is no pregnancy, the built-up uterine tissue is not needed and thus shed. Women with primary dysmenorrhea have increased production of endometrial prostaglandin, resulting in increased uterine tone and stronger, more frequent uterine contractions. Majority of prostaglandins are released during the first 48 hours of menstruation, thus explaining the timing and limitation of symptoms. Prostaglandins stimulate an increase in myometrial muscle tone and contractions, and release of vasopressin in uterine blood vessels which may result in ischemic pain and other associated symptoms. Compared with other women, females with primary dysmenorrhea have increased activity of the uterine muscle with increased contractility and increased frequency of contractions[3]. It is observed that in dysmenorrheic patients, visible

features on cycle days 1-3 correlated with the degree of pain, and differed significantly from the control group.

Methods of treatment for dysmenorrheal range from prostaglandin synthetase inhibitors and oral contraceptives to noninvasive methods such as heat packs, biofeedback, relaxation techniques, and acupressure[5]. Traditional acupuncture has been used successfully. Use of transcutaneous electrical nerve stimulation over traditional acupuncture points to achieve the same success[18].

Trenscutaneous electrical nerve stimulation is an accepted method of noninvasive, nonnarcotic pain control. The Particular advantage of this modality are that it can be self-administered as needed without significant side effects[16]. It has been used successfully in control of postoperative pain low back pain, labor and delivery pain. Pain due to dysmenorrheal is similar to pain during child birth. TENS has been successfully used for pain control during labor and delivery without complication[4,7,9,10]. Conventional TENS and "acupuncture-like" TENS are used most frequently for treatment.

Conventional TENS requires a high pulse rate with a low intensity, whereas Low TENS uses a low pulse rate with a high intensity. TENS has also been use with varying pathologies not considered primarily musculoskeletal origin such as cystitis, Pancreatitis, angina pectoris and thrombophelebitis[2,11,12]. Longitudinal muscle fibers of uterus contract downward on circular fibers of cervix. The resultant tension prohibits relaxation of cervix Producing simultaneous contraction of uterus. Conventional TENS, electrodes are commonly arranged to stimulate the region of discomfort, above and below, medial and lateral or criss-crossing over area of pain[6, 16].

The effect of acupuncture like TENS are considered to be supraspinal[13,16]. Conventional TENS activate the large mylinated A alpha and beta fibers.[16] This fibers transmit propriceptive information which according to gate control theory, inhibits the smaller nociceptive fibers primarily at level of substentia gelatinosa in the dorsal horn of spinal cord. TENS seems to work by altering the body's ability to receive or perceive pain signals, rather than by having a direct effect on the uterine contractions[22].

Pain relief with TENS is postulated as involving two possible mechanisms, the gate-control theory as proposed by Wall and Melzak in 1965, or endorphin-mediated pain relief. The "gate" to sensory input is present in the spinal cord, which is stimulated by activity in small-diameter nociceptive fibers and closed by activity in large-diameter fibers. Therefore, if electric stimulation is applied to a peripheral site, the large diameter fibers are activated first and thus inhibit the small nociceptive fiber input transmitted to higher centers. The "gating" effect is established at the dorsal horn level of the spinal cord thereby inhibiting the transmission of pain-related impulses. This mechanism is thought to be responsible for the action of high frequency TENS.

Other studies on TENS have shown the pain relief attributed to TENS is reversible with opioid antagonists, leading to postulations that it somehow stimulates endogenous endorphins. An increased release of endogenous endorphins, resulting in potent analgesic effects, has been demonstrated with electrical stimulation. Pain relief that is partially reversible by naloxone has been shown to occur in low frequency TENS[17]. However, increased levels of endorphins are found in CSF with both high and low frequency TENS[17,19].

AIMS AND OBJECTIVES:

- To study the effectiveness of High TENS at Dermatomal Level in pain.
- To Study effectiveness of Low TENS at root Level in pain due to Dysmenorrhea.
- To compare effect of high & low frequency tens at dermatome level & root level in pain due to Dysmenorrhea.

METHODOLOGY

Sample size: 30.
Study Design: Comparative study.
Sampling Design: Selective sampling.
Materials: TENS machine, Paper, Pen, Watch

Inclusion criteria

- Between age from19 to 25years
- Primary dysmenorrhea, i.e. no identifiable pelvic pathology
- Self-reported pain during the majority of the menstrual cycles
- Self-reported pain for three consecutive menstrual cycles;
- Moderate to severe primary dysmenorrhoea (pain that does not respond well to analgesics, affects daily activities, or has a high baseline score on a validated pain scale).

Exclusion criteria

- diagnosed secondary dysmenorrhea (e.g. fibroids, endometriosis);
- Dysmenorrhoea resulting from use of an intra-uterine device (IUD);
- Mild or infrequent dysmenorrhea.

PROCEDURE

The study was conducted over a 2 month period. 30 girls who were experiencing self-reported dysmenorrhea volunteered to participate in this study. The girl rated age from19 to 25 year. Each subject notified the investigator upon onset of her pain, and a time was scheduled for that day for either a TENS treatment. The subjects were instructed to take no pain medication for at least 4-6 hours before treatment. Before beginning treatment, the subjects completed a menstrual history and a pre & post TENS pain rating scale with the help of VAS. The VAS was used to establish a baseline level of pain. Girls who only had low back pain & not abdominal pain were eliminated from the study. Randomly 2 groups of 15 girls were made.

In group 1 conventional TENS was placed at dermatome level & in group 2 Low TENS was placed at root level. Electrode pads are self-adherent, thus eliminating the need for transmission gel & electrode tape & activated by moistening with water. All participants use same electrode.

In group 1conventional TENS is placed at T12-L1 at dermatome level. The umbilicus and ASIS as a land mark for electrode placement. They were instructed to place the electrodes at the most antero lateral area of pain but not higher than the umbilicus or lower than ASIS. Electrical parameter consistent with conventional TENS use a high frequency (50-100 HZ), pulse width (40-75 micro sec) & the intensity that produce comfortable perceptible paresthesia without muscle contraction for the subject for 30 minutes[16]. Electrodes were arranged so that stimulation was occurred in a criss-cross manner over the abdomen and after 5 min rechecked the TENS unit. After completing the treatment session electrodes were then removed and pain was rated subjectively on VAS immediately after use of TENS & participants were also ask to determine the pain reduced after 2hrs, 4hrs, 8hrs & next day early morning.

In group 2 low frequency TENS was used. Participants in group 2 were instructed to place the electrodes at L3 root level over low back. Electrical parameter consistent with accupunter like TENS requires a low frequency (1-4HZ), with pulse width (100-250 micro sec) & intensity to tolerance level to produce rhythmic muscle contraction. The TENS unit was rechecked after 5 minutes. The treatment was given for a total of 30 minutes.[16] After completing the treatment session electrodes were then removed and pain was rated subjectively on VAS immediately after use of TENS & participants were also ask to determine the pain reduced after 2hrs, 4hrs, 8hrs & next day early morning.

RESULT

PPR is found to be statistically significant between patients of group 1 and group 2 since P=0.001. While LMP, PDB and DPR shows no significant difference between patients of group 1 and group 2 since P>0.05.

Statistical Analysis

TABLE 1: STATISTICS (GROUP 1)

		LMP	PDB	PPR	DPR
Percentiles	25	4.0000	2.0000	60.0000	4.0000
	50	4.0000	2.0000	90.0000	8.0000
	75	5.0000	2.0000	1.0000E2	8.0000

LMP: Length of menstrual period; PDB: Total no. of painful days during menstruation; PPR: Overall mean percentage of pain relief; DPR: Overall mean duration of pain relief

TABLE 2: STATISTICS (GROUP 2)

		LMP	PDB	PPR	DPR
Percentiles	25	3.0000	2.0000	20.0000	4.0000
	50	4.0000	2.0000	50.0000	8.0000
	75	5.0000	3.0000	70.0000	8.0000

TABLE 3: MEAN RANK VALUES

	Group	N	Mean Rank	Sum of Ranks
LMP	1	15	15.93	239.00
	2	15	15.07	226.00
PDB	1	15	13.00	195.00
	2	15	18.00	270.00
PPR	1	15	20.70	310.50
	2	15	10.30	154.50
DPR	1	15	16.63	249.50
	2	15	14.37	215.50

TABLE 4: TEST STATISTICS

	LMP	PDB	PPR	DPR
Mann-Whitney U	106.000	75.000	34.500	95.500
Wilcoxon W	226.000	195.000	154.500	215.500
Z	-.286	-1.871	-3.254	-.803
p-value	.775	.061	.001	.422

It is clear from table 4 that only PPR is found to be statistically significant between patients of group 1 and group 2 since p = 0.001. While LMP, PDB and DPR shows no significant difference between patients of group 1 and group 2 since p>0.05. Low TENS at root level is effective in reducing PDM but it is statistically not significant as p=.061. Mean Rank of group-1 is higher for percentage of pain relief. (Statistically significant as p=.001) And mean duration of pain relief so it suggests that High TENS at dermatomal level is effective. (Statistically not significant as p=.422)

DISCUSSION

Conventional and Low TENS are commonly used modes of TENS but are directly opposite to one another in terms of stimulation parameters. For conventional TENS electrodes are arrange in criss-cross manner over area of pain. For low TENS electrodes can be placed at root level because it has supraspinal effect. When high TENS is applied at dermetomal level it activate large mylinated A alpha and beta fibers. According to Gate control theory this inhibits smaller nociceptive fibers primarily at the level of substentia Gelatinosa in the dorsal horn of the spinal cord and thus inhibits pain. Low TENS at root level activate small diameter afferent fibers and also excite efferent fibers. It produces endorphin liberation in cerebrospinal fluid, brainstem and circulatory system. The neurohumaral liberation in to inhibit the activity or release of substance P thus dampning the systemic transmission of pain to the higher centre of perception. Thus it will produce long lasting effect due to suprasegmental stimulation which is not much effective in reducing pain as compare to high TENS at dermatomal level.

According to population coding property of receptors when the brain uses input from multiple receptors to calculate location and timing of a stimulus it will produce more effect. The sensory receptor responds to its stimulus modality by initiating sensory transduction. High TENS relieves pain by a segmental mechanism. Segmental mechanisms suggest that TENS induced A-d activity causes long-term depression of central nociceptive cell activity for up to 2 hours. Low TENS activates extra segmental descending pain inhibitory pathways. Extra segmental mechanisms TENS-induced activity in small diameter afferents (A-d) leads to activation of the midbrain periaqueductal grey and rostral ventromedial medulla and inhibition of descending pain facilitatory pathways. Larger effects have been observed, when muscle rather than skin afferents are used. TENS is thought to work by alteration of the body's ability to receive or perceive pain signals rather than by having a direct effect on the uterine contractions. Receptors and pain pathways play important role in transmitting pain signals. When we place Electrodes at dermetomal level the pain signals are modulated resulting in pain relief.

Sjolund and Erikson reported that by low frequency electrical stimulation increase release of endogenous endorphin which is used for chronic pain condition while dysmenorrhea is acute condition so high TENS will be more effective for the condition.

T. Lundeberg, L. Bondesson and V. LundstrOm concluded in their study that about **70%** of the patients experienced pain reduction when treated with high-TENS. Low-frequency TENS was clearly less effective and relieved only about 45% of the patients.

Other studies on TENS have shown the pain relief attributed to TENS is reversible with opioid antagonists, leading to postulations that it somehow stimulates endogenous endorphins. An increased release of endogenous endorphins, resulting in potent analgesic effects, has been demonstrated with electrical stimulation. Pain relief that is partially reversible by naloxone has been shown to occur in low frequency TENS[16]. However, increased levels of endorphins are found in CSF with both high and low frequency TENS[16,4].

A study by Mannheimer et al, randomized women to the following three groups. High frequency TENS, Low frequency TENS, and placebo TENS. There was no significant difference between the two types of TENS but the high frequency TENS achieved slightly more pain relief[9,10].

LIMITATIONS

- Sample size is small.
- More Precise stimulation Parameters Required.
- Pain assessment is subjective

FUTURE RECOMMENDATIONS

- Study can be performed with large sample size.
- Same stimulation parameters will be taken for different Placements.
- Along with abdominal Pain Back pain is also included in the study.

CONCLUSION

High TENS at Dermetomal level and Low TENS at root Level both are effective in reducing pain but High TENS at dermetomal Level is more effective. TENS placements has no significant effect in reducing LMP, PDB and DPR.

CLINICAL APPLICATION

It is proven that TENS is useful modality for pain reduction. It can also be use for relief of Dysmennorhic pain. High TENS at dermetomal level can be use as a part of treatment for pain due to Dysmenorrhea.

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